



Coronavirus COVID-19

BC Centre for Disease Control | BC Ministry of Health



B.C. Aerosol Generating Medical Procedure Expert Group

Decision Summary: Transesophageal Echocardiogram

June 4, 2021

This decision summary is intended for health-care providers and is based on known evidence as of December 9, 2020.

Request and Decision

The B.C. AGMP expert group reviews medical procedures being performed on patients with suspected or confirmed COVID-19 in health-care settings in B.C. The expert group does not provide personal protective equipment (PPE) guidance.

The B.C. AGMP expert group received a request from Fraser Health to determine if transesophageal echocardiography (TEE) is an aerosol generating medical procedure (AGMP). The B.C. AGMP expert group determined TEE is not an AGMP.

B.C. AGMP Expert Group Review

The B.C. AGMP expert group reviewed evidence for this request on January 8, 2021.

Evidence Review

The B.C. AGMP expert group conducted a literature search to identify relevant primary evidence, review articles, and guidelines/recommendations from governing bodies, medical societies, and other expert groups (See Appendix on page 4).

Assessment

The B.C. AGMP expert group assessed the search results for evidence quality and source using the provincial AGMP decision framework.



The group was not able to find studies at the time of review providing direct evidence for airborne transmission while performing a TEE. The group considered one study that demonstrated bacterial exposure to the person performing an endoscopy, however, this study did not demonstrate the production of airborne aerosols from the procedure. Since the COVID-19 pandemic, some guidelines have recommended that TEE be considered an AGMP in patients with suspected/confirmed COVID-19. These recommendations stem from the following concerns:

1. Risk of inadvertent endotracheal intubation

Endotracheal intubation should be considered separately from TEE for a number of reasons:

- The majority of TEE procedures are performed without the use of endotracheal intubation.
- Unplanned endotracheal intubation for airway management may occur during the TEE procedure. However, this is not common and can most often be foreseen when assessing the patient's risks prior to the procedure.

2. Potential for extensive coughing

The TEE procedure by itself does not involve manipulation of the airway and the only particle generation may come from coughing and suctioning of the oropharynx. Induction of coughing alone as a result of the procedure does not warrant automatic classification of a procedure as an AGMP.

3. Requirement for suctioning of the oropharynx

There is inconclusive evidence surrounding the aerosol generating risk involved in oral suctioning that occurs during a TEE procedure, which is different from deeper airway suctioning.

Taking the above points into consideration, there was insufficient evidence at the time of this review to classify TEE in isolation as an AGMP.

Considerations

The group recognises that some patients undergoing a TEE may be critically ill and require emergent resuscitation that includes AGMPs. In such situations, we recommend the team involved in the patient's care conduct a point-of-care risk assessment, don the appropriate personal protective equipment and implement additional local AGMP guidance to minimize risk, based on their discussion.

The group also recognizes important considerations in the clinical context of the procedure beyond just the use of the echocardiography probe:

1. **Anesthetic procedures involved with TEEs:** Most TEEs are done under procedural sedation directed by the cardiologist with no secondary sedation provider or designated airway manager. There are instances where separate AGMPs could be performed during or before the procedure. For example, in rare instances when a patient becomes apneic and requires ventilatory support, the cardiologist may have to provide bag valve mask ventilation. Additionally, a small number of TEEs done under general anesthesia require endotracheal intubation.



2. **Frequent coughing, belching or retching** without any source control (i.e., masking) due to the nature of the procedure: These actions generally lead to large droplet generation and not airborne spread. While induction of such reactions alone do not warrant automatic classification of a procedure as an AGMP, other engineering and administrative factors (such as a room's available controls for airflow management and the number of patients seen in rapid sequence that would add to the particles produced in the same room) contribute to the overall risk of aerosol exposure to the providers. Such factors vary across clinical contexts.



Appendix: Evidence Pertaining to TEE and AGMP Status

Search date: December 9, 2020

Objective

To summarize the current evidence used to inform recommendations pertaining to TEE and AGMP status.

Methods

The B.C. AGMP expert group searched databases (Cochrane, PubMed, Google Scholar) for relevant primary evidence, review articles, and guidelines/recommendations from governing bodies, medical societies, and other expert groups.

Search terms used:

"aerosol generating medical procedure" OR "aerosol generating procedure" AND "transesophageal echocardiogram" OR "TEE".

Results

Findings from the literature search identified three relevant articles (summarized in table 1) and 12 guideline/recommendation articles (summarized in table 2) from six medical societies, five health authorities/government bodies and one expert group. Less relevant references used as support for the stances taken in the guidelines/recommendations are summarised within the "References used" column of table 2.

The article from Johnston et al. was the only primary evidence article found. It shows bacterial exposure during endoscopy procedures by culturing swabs taken from endoscopists' face shields after the procedures.

The review article from Harding et al. concluded there was no evidence that TEE generates aerosols or conveyed an increased risk of transmission of viruses.

The case report from Ng et al. looked at the effectiveness of personal protective equipment for health-care workers who take care of patients infected with the novel coronavirus. None of the health-care workers in this situation acquired infection, suggesting that surgical masks, hand hygiene and other standard procedures protected them from being infected. It is important to note that TEE was not one of the AGMPs performed in this case report however, the procedures performed could be expected to be similar or possibly higher risk as they included: "endotracheal intubation, extubation, non-invasive ventilation, and exposure to aerosols in an open circuit."

Of the guidelines/recommendations:

- Seven explicitly consider TEE as an AGMP;
- Five do not consider TEE as an AGMP.

Common themes cited to support the categorization of TEE as an AGMP include patient coughing, proximity between the provider and the patient, inadvertent tracheal intubation and the use of open airway suctioning. However, conclusions on aerosol generation with TEE alone that would suggest a clinically significant need for N95 respirator use cannot be drawn from the one primary evidence article found. Furthermore, guidelines frequently reference other



guidelines to support conclusions made about TEE as an AGMP that similarly do not have evidence-based recommendations regarding TEE as an AGMP.

Conclusion

The B.C. AGMP expert group concluded that TEE is not in isolation an AGMP.

Table 1: Evidence Summary

	Study type	Article Title and Authors	Findings
1	Experimental	Risk of Bacterial Exposure to the Endoscopist's Face During Endoscopy Johnston E et al., April 2019	Significantly increased colony-forming units detected on face shields of endoscopists post-endoscopy compared to controls. Provides strong evidence of sprays of droplets directed to health-care workers, but the methods used provide no evidence of any aerosols smaller than 30 microns.
2	Review article	Aerosol-generating procedures and infective risk to healthcare workers from SARS-CoV-2: the limits of the evidence Harding et. al, June 2020	<p>“There is no evidence that endoscopy or transesophageal echocardiography (TOE) generate aerosols or convey an increased risk of transmission of viruses. It has only been shown that there is bacterial exposure to proceduralists during endoscopy procedures by culturing swabs taken from endoscopists' face shields” after their procedures. It has been suggested that endoscopic procedures for patients that are intermediate to high risk of being infected with SARS-CoV-2 should be treated with airborne precautions due to risk of viral transmission, but there is no further evidence to support this.”</p> <p>“... no specific studies on TOE to establish any increased risk of viral transmission. Driggen <i>et al.</i> suggest that consideration for increased precautions should be given to procedures associated with increased risk of patient deterioration, as resuscitation is associated with increased disease transmission”</p>
3	Case report	COVID-19 and the Risk to Health Care Workers: A Case Report Kangqi Ng et al., June 2020	“In the situation we describe, 85% of health care workers [(a total of 41 HCWs in this case report)] were exposed during an aerosol-generating procedure while wearing a surgical mask, and the remainder were wearing N95 respirators. That none of the health care workers in this situation acquired infection suggests that surgical masks, hand hygiene, and other standard procedures protected them from being infected. Our observation is consistent with previous studies that have been unable to show that N95 masks were superior to surgical masks for preventing influenza infection in health care workers. We emphasize, however, that nearly all experts recommend that health care workers wear an



	Study type	Article Title and Authors	Findings
			N95 respirator or equivalent equipment while performing an aerosol-generating procedure.”

References:

1. Johnston, Elyse R., et al. “Risk of Bacterial Exposure to the Endoscopist’s Face during Endoscopy.” *Gastrointestinal Endoscopy*, vol. 89, no. 4, 2019, pp. 818–24. [doi:10.1016/j.gie.2018.10.034](https://doi.org/10.1016/j.gie.2018.10.034).
2. Harding, H et al. “Aerosol-generating procedures and infective risk to healthcare workers from SARS-CoV-2: the limits of the evidence.” *The Journal of Hospital Infection*, vol. 105, no. 4, 2020, pp. 717-725. doi: [10.1016/j.jhin.2020.05.037](https://doi.org/10.1016/j.jhin.2020.05.037).
3. Ng, Kangqi, et al. “COVID-19 and the Risk to Health Care Workers: A Case Report.” *Annals of Internal Medicine*, vol. 172, no. 11, 2020, pp. 766–67. [doi:10.7326/l20-0175](https://doi.org/10.7326/l20-0175).



Table 2: Guidelines and Recommendations from Governing Bodies, Medical Societies and Other Expert Groups

	Agency/Article Type	Title/Publication Date	Stance on TEE as an AGMP	Statements on AGMP and TEE	References used pertaining to statements on AGMP and TEE
A	INSPQ (Quebec National Institute of Public Health)/ Recommendations	Aerosol- Generating Medical Interventions on Suspected and Confirmed cases of COVID-19 November 2020	No	"...associated with an <u>undocumented</u> risk of infectious aerosol transmission (undocumented AGMP) for suspected and confirmed cases of COVID-19."	Based on current literature
B	Public Health Ontario/ Technical brief	COVID-19: Aerosol Generation from Coughs and Sneezes April 2020	No (see page 3)	"Coughs, sneezes, and even breathing generate aerosols. These activities can result in spread of aerosols ... in the air over various distances, and in some cases distances greater than two metres. Depending on the room's airflow, small droplets in rooms with no airflow can remain suspended for periods of seconds to minutes, but with proper airflow...droplets are displaced and diffused even faster."	Bourouiba, Lydia. "Turbulent Gas Clouds and Respiratory Pathogen Emissions: Potential Implications for Reducing Transmission of COVID-19." JAMA, 323, no. 18 (March 26, 2020): 1837–1838. Wei, L. (2016). Airborne spread of infectious agents in the indoor environment. American Journal of Infection Control, 44(9), S102–S108. https://doi.org/10.1016/j.ajic.2016.06.003



C	Alberta Health Services	Aerosol Generating Medical Procedure Guidance Tool No date specified	No		Based on current evidence
D	Saskatchewan Health Authority	AGMP List Updated April 2021	No		No references provided
E	Shared Health Manitoba	COVID-19 Provincial Guidance for Aerosol Generating Medical Procedures (AGMPs) Last updated February 23, 2021	No	"... NOT deemed AGMPs. However, out of an abundance of caution, for the procedures specified below only, use of an N95 respirator is recommended for patients with suspected or confirmed COVID-19"	Based on current literature
F	Canadian Society of Echocardiography (CSE)	Practice of Echocardiography During the COVID-19 Pandemic: Guidance from the CSE March 30, 2020	Yes	"The CSE considers TEE to be an AGMP.... due to the risk of inadvertent endotracheal intubation, potential for extensive coughing and the requirement for suctioning of the oropharynx."	No references provided
G	American Society of Echocardiography (endorsed by American College of Cardiology)	ASE Statement on Protection of Patients and Echocardiography Service Providers During the 2019 Novel Coronavirus Outbreak: Endorsed by the American College of Cardiology June 1, 2020	Yes	"TEE carries a heightened risk for spread of the SARS-CoV-2, because it may provoke aerosolization of a large amount of virus because of coughing or gagging that may result during the examination."	No references provided



				“...airborne precautions are required during TEE for suspected and confirmed cases, because of the increased risk for aerosolization.”	
H	British Cardiovascular Society	A practical guide to assessment and treatment of cardiac conditions in COVID-19 patients April 17, 2020	Yes	“Transoesophageal echocardiography is also considered high risk of aerosolization.”	No references provided
I	Australian and New Zealand Society of Cardiac and Thoracic Surgeons and the Anaesthetic Continuing Education Cardiac Thoracic Vascular and Perfusion Special Interest Group.	COVID-19 safety: aerosol-generating procedures and cardiothoracic surgery and anaesthesia — Australian and New Zealand consensus statement October 12, 2020	Yes	“Transoesophageal echocardiography (TOE) carries a high risk of aerosol generation in an awake or sedated patient because of the risk of coughing. In an anaesthetised, paralysed patient with a cuffed endotracheal tube, the risk is currently unknown, and some regions have determined TOE in intubated patients to be non-aerosolising.”	American and British Societies of Echocardiography
J	American Society of Echocardiography Endorsed by the Society of Cardiovascular Anesthesiologists	Specific Considerations for the Protection of Patients and Echocardiography Service Providers When Performing Perioperative or Periprocedural Transesophageal Echocardiography	Yes	“TEE carries a heightened risk for SARS-CoV-2 spread in non-intubated patients due to possible direct droplet transmission and/or viral aerosolization during insertion and removal of the	No references provided



		<p>during the 2019 Novel Coronavirus Outbreak: Council on Perioperative Echocardiography Supplement to the Statement of the American Society of Echocardiography Endorsed by the Society of Cardiovascular Anesthesiologists</p> <p>April 13, 2020</p>		<p>probe, as well as coughing. Although performing TEE in an already intubated patient may reduce the risk for viral aerosolization, viral transmission may still occur through direct contact with the patient's secretions, resulting in contaminated hands and surfaces."</p>	
K	<p>Cardiac Society of Australia and New Zealand (CSANZ), the Australian and New Zealand Society of Cardiac and Thoracic Surgeons, the National Heart Foundation of Australia and the High Blood Pressure Research Council of Australia</p>	<p>Cardiovascular disease and COVID-19: Australian and New Zealand consensus statement</p> <p>August 2020</p>	Yes	<p>"Transoesophageal echocardiography involves instrumentation of the oropharynx, known to harbour the virus with high risk of aerosol transmission..."</p>	<p>Brewster, C. (2020). Consensus statement: Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. Medical Journal of Australia, 212(10), 472–481. https://doi.org/10.5694/mja2.50598</p>
L	<p>Expert opinion</p>	<p>Perioperative Preparations for COVID-19: The Pediatric Cardiac Team Perspective</p> <p>Ing et. al, Sept 2020</p>	Yes	<p>"The pediatric cardiac anesthesiologist will be called on to help with placement of the transesophageal echocardiography (TEE) probe in COVID-19 patients because it is considered a significant AGMP."</p>	<p>Augoustides JR. Perioperative echocardiography: Key considerations during the coronavirus pandemic [e-pub ahead of print]. J Cardiothorac Vasc Anesth. doi: 10.1053/j.jvca.2020.03.046, Accessed May 19, 2020.</p>



References

- A. "Aerosol- Generating Medical Interventions on Suspected and Confirmed Cases of COVID-19." INSPQ, 2020.
- B. "COVID-19: Aerosol Generation from Coughs and Sneezes." Public Health Ontario, 2020.
- C. "Aerosol Generating Medical Procedure Guidance Tool." Alberta Health Services, 2021.
- D. "AGMP List." Saskatchewan Health Authority, 26 Nov. 2020.
- E. "COVID-19 Provincial Guidance for Aerosol Generating Medical Procedures (AGMPs)." Shared Health Manitoba, 23 Feb. 2021.
- F. "Practice of Echocardiography During the COVID 19 Pandemic: Guidance from The Canadian Society of Echocardiography." 31 Mar. 2020.
- G. "ASE Statement on Protection of Patients and Echocardiography Service Providers During the 2019 Novel Coronavirus Outbreak: Endorsed by the American College of Cardiology." PubMed Central (PMC), 1 June 2020.
- H. "A Practical Guide to Assessment and Treatment of Cardiac Conditions in COVID-19 Patients." BCS, 17 Apr. 2020.
- I. Irons, Joanne. "COVID-19 Safety: Aerosol-generating Procedures and Cardiothoracic Surgery and Anaesthesia — Australian and New Zealand Consensus Statement." The Medical Journal of Australia, 12 Oct. 2020.
- J. "Specific Considerations for the Protection of Patients and Echocardiography Service Providers When Performing Perioperative or Periprocedural Transesophageal Echocardiography during the 2019 Novel Coronavirus Outbreak: Council on Perioperative Echocardiography Supplement to the Statement of the American Society of Echocardiography Endorsed by the Society of Cardiovascular Anesthesiologists." Journal of the American Society of Echocardiography, 2020.
- K. Zaman, Sarah, et al. "Cardiovascular Disease and COVID -19: Australian and New Zealand Consensus Statement." Medical Journal of Australia, vol. 213, no. 4, 2020, pp. 182–87.
- L. Ing, Richard J et al. "Perioperative Preparations for COVID-19: The Pediatric Cardiac Team Perspective." Journal of Cardiothoracic and Vascular Anesthesia, vol. 34, no. 9, 2020, pp. 2307-2311.

