**RECOMMENDATIONS FOR THORACIC ANESTHESIA DURING THE COVID PANDEMIC**

The following recommendations are based on the most current information provided by Shared Health in adherence to Manitoba Health and Public Health Agency of Canada guidelines and supported by consensus statements and guidelines published by different specialty and subspecialty societies.1-3

Our knowledge and understanding of the SARS-Cov-2 infection is evolving. There are many uncertainties and a definitive list of thoracic surgical procedures capable of generating infectious aerosols cannot be determined at this point due to limitations of available data.4-9 In situations where there is insufficient information or poor level of evidence, we took a precautionary stand, prioritizing the safety and protection of the healthcare team.

The same nomenclature adopted by Shared Health is used in this document:

**Green Zone - COVID-19 Non-Suspect** are patients who do not meet the criteria for testing and/or those deemed “recovered” by Public Health or by Infection Prevention and Control.

**Orange Zone - COVID-19 Suspect** are patients who have been tested and the result is pending OR those who, based on clinical symptoms or exposure history, need to be tested for COVID-19.

**Red Zone - COVID-19 Positive** are patients who have a positive test result and have not been deemed “recovered” by Public Health or by Infection Prevention and Control.

**Enhanced Droplet and Contact Precautions (EDCP)**: N95 mask, gown, face shield and gloves.

**Aerosol Generating Medical Procedures (AGMP)**: any procedure carried out on a patient that can induce the production of aerosols of various sizes, including droplet nuclei.

With regards to preoperative testing:

I- We recommend that **ALL** patients scheduled for **ELECTIVE** thoracic procedures should receive PCR testing for COVID-19 preoperatively, not only to guide PPE decisions but mostly because of the high risk of morbidity and mortality associated with lung resections in asymptomatic or presymptomatic patients.10-12

With regards to personal protective equipment (PPE):

I- **Green Zone - COVID-19 Non-Suspect** patients **DO NOT** require EDCP for AGMP if and only if:
   a. they had a negative swab in the last 24 hours
   b. they have been hospitalized for at least 14 days and have no symptoms that have prompted testing for COVID-19
c. they have been hospitalized for at least 14 days, they have developed symptoms that have prompted testing for COVID-19 AND the test result is negative

II- AGMPs routinely performed during thoracic anesthesia and common to other subspecialties include bag-mask ventilation, intubation, extubation and deep suctioning of endotracheal tube. Recommendations about adequate PPE and best practices to avoid risk of infection during these procedures have been made elsewhere.

III- There is currently controversial and insufficient data to create a comprehensive and definite list of thoracic procedures capable of generating infectious aerosols. The following is a suggestion based on limited evidence and consensus amongst the thoracic surgical and anesthetic team, and corroborates with practices being adopted across the country. Thoracic procedures considered to be AGMP include:
1. Diagnostic bronchoscopy (with washings and bronchoalveolar lavage)
2. Tracheostomy
3. Tracheal resection
4. Rigid bronchoscopy
5. Dilatation of subglottic stenosis
6. Lung decortication
7. POEM (Per Oral Endoscopic surgery) for Zenker’s diverticulum

* EDCP should be used at all times during AGMPs for:
  Orange Zone - COVID-19 Suspect
  Red Zone - COVID-19 Positive
  Green Zone - COVID-19 Non-Suspect who has been tested, has received a negative result but the AGMP is occurring more than 24 hours from when the swab/sample was taken OR who has been in hospital less than 14 days and has not been tested

IV- Medical procedures performed in the thoracic operating room considered at risk for aerosol generation:
1. Sleeve lobectomy
2. Bronchoplasty
3. Pericardial window (due to risk of lung injury)
4. Lung isolation and One-lung ventilation (OLV)

* EDCP should be used at all times during procedures at risk for aerosol generation for:
  Orange Zone - COVID-19 Suspect
Red Zone - COVID-19 Positive

Green Zone - COVID-19 Non-Suspect who has been tested, has received a negative result but the AGMP is occurring more than 24 hours from when the swab/sample was taken OR who has been in hospital less than 14 days and has not been tested

With regards to air clearance time:

I- Operating rooms are considered to have 20 air changes per hour (20 ACH). It takes 14 minutes for 99% air clearance after an AGMP. OR doors must remain closed at all times while an AGMP is performed, and remain closed for 15 minutes after the last AGMP was performed.

With regards to lung isolation:

I- There is a small, theoretical risk of environmental contamination during OLV which derives from continuous manipulation of the operative lung, possible air leaks from endotracheal tube malposition or dislodgement during surgery, and circuit disconnection which can be accidental or necessary for bronchoscopies and repositioning of the double-lumen tube (DLT) or bronchial blocker (BB) once surgery is underway. Deep endotracheal suctioning is frequently necessary before lung re-expansion, in patients with lung infections, hemoptysis and hyperreactive airways. In-line suctioning can be used through the tracheal lumen of a DLT, but the catheters may not be long enough to be used through the bronchial lumen depending on which size of DLT is chosen. For these reasons, we recommend that appropriate PPE should be used during lung isolation and one-lung ventilation as mentioned above.1-3

II- We suggest preference should be given to the use of DLT for lung isolation because 1) it is the device most providers are familiar with; 2) repositioning during surgery is less often required; 3) it allows access to the non-dependent lung for bronchoscopy, suction or continuous positive airway pressure (CPAP) if necessary; 4) it can be placed without bronchoscopy if necessary.

III- The DLT position should be checked immediately after intubation. Ensure apnea and absence of flow. Confirm adequate placement with the Tower Video Bronchoscope or a Disposable Flexible Bronchoscope. Avoid using the eyepiece to maintain safe distance from the airway during bronchoscopy. Positive pressure ventilation should be initiated once position is confirmed, circuit is connected and cuffs are inflated.3,13
IV- The dirty bronchoscope poses a significant risk for contamination and cross-infection. Make sure to keep it in a designated area during the case. (ie: Mayo stand or plastic container).\textsuperscript{1-3,13}

V- Reconfirm the position of the DLT in the lateral position following these steps: 1) stop ventilation and open APL valve to release positive pressure from the circuit; 2) clamp the surgical lumen and correspondent angle piece before disconnection; 3) apply another N100 filter to surgical lumen and then release the correspondent clamp – non-dependent lung deflation and any aerosol generated from lung manipulation will then be vented through this filter. (Figure 1)

![Figure 1 - DLT with N100 filter on lumen of operative lung](image)

VI- If bronchoscopy or repositioning of the DLT is necessary during the case, make sure to stop ventilation, open the APL and allow lung deflation before removing the N100 filter from the surgical lumen or disconnecting the circuit.

VII- If CPAP is necessary no manage hypoxia during OLV, the device can be applied to the N100 filter as shown in Figure 2.
VIII- In patients who are already intubated, it is reasonable to use a bronchial blocker instead of attempting to exchange the single lumen tube for a DLT, to minimize AGMPs and complications from airway management. The same steps described above should be used while performing bronchoscopy to position the BB. To avoid aerosolization through the BB, an N100 filter can be connected using the 15 mm adapter provided in the package (as shown in Figure 3). As an alternative, the BB can also remain occluded as there is evidence that adequate lung deflation can be achieved without opening the device to the atmosphere.14

IX- Ensure adequate neuromuscular blockade at all times when manipulating the DLT and no positive pressure ventilation should occur unless the circuit is closed.

X- Minimize testing for lung leaks or bronchial staple line leaks. Encourage visual inspection by the surgical team.
XI- Ensure slow, low pressure gradual expansion of the lung at the end of the procedure to avoid aerosol generation.

XII- With a large air leak, there is a potential to aerosolize through the chest tube system suction port. Consider a filter on the chest tube suction port.

XIII- GOOD COMMUNICATION BETWEEN SURGERY AND ANESTHESIA IS ESSENTIAL TO MINIMIZE AEROSOL GENERATION DURING THE PROCEDURE

References:


