Surgery for COVID-19 PUI/Confirmed Patients

It is important to be prepared for possible need for surgical intervention on COVID-19 suspected (person under investigation, PUI) or confirmed patients. Preparation of a specific operating room and detailed education of the entire OR team who will be providing care for these patients during their OR procedures is imperative. The specific roles and responsibilities of all OR team members must be clear with a common goal to minimizing the spread of infection to our healthcare workers. Below are the current recommendations for how best to prepare for surgery for COVID-19 PUI/confirmed patients.

- Develop a dedicated COVID-19 operating room to control the spread of the disease
  - CDC Guidelines for droplet/aerosol room environments with # air exchanges. [https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html#c5c](https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html#c5c) (section c)
- Empty it of all non-essential materials
- Consider a negative pressure anteroom with separate access if possible
- Anteroom is used for donning/doffing of PPE and separate OR carts for the COVID-19 OR
- Separate OR airway cart, Specific airway guidelines for COVID-19 PUI/Confirmed patients
- Separate OR equipment cart
- Separate OR medication cart
- Runner outside OR for drugs, devices, equipment
- If intubation required for OR procedure, recommend intubation in negative pressure room prior to OR, avoid intubation in OR
- Use Dedicated transport ventilator if being transported on mechanical ventilation (ambu bag with viral filter if ventilator not available)
- Additional HME filter rated to remove at least 99.97% of airborne particles 0.3 microns or greater is placed between breathing circuit and airway
- Consider additional Viral filter on expiratory limb of anesthesia machine circuit
- Minimize airway circuit disconnection, ETT must be clamped if any circuit disconnection planned
- Special PPE for OR (N95 or OR PAPR, goggles or face shield, gown, boot covers)
- Provide appropriate PPE education (CDC guidance copied below) and post in anteroom in OR
- Must use N95 or OR PAPR for ALL aerosol-generating procedures
- Extubation should occur in a negative pressure ICU/ward room if possible
- Recover patient in the negative pressure ICU/ward room or in the dedicated COVID-19 OR if negative pressure room not available
- Consider dedicated OR teams to manage COVID-19 patients in the OR with detailed education
- Consider performing procedures in negative pressure rooms with anesthesia team support if possible
What is the best strategy for protecting the anesthesia machine from contamination by a potentially infected patient?

**Short Answer:** Place “high quality” viral filters between the breathing circuit and the patient’s airway and between the expiratory limb and the machine. The use of these filters is essential to preventing contamination of the machine. (See next FAQ for details on which filtration devices to use)

**NOTE:** Even with filters, breathing circuits should be discarded after every patient.

There are two reasons to protect the anesthesia machine from contamination by a potentially infected patient. First, if pathogens are allowed to enter the internal parts of the machine, they could be passed on to a subsequent patient. Second, respiratory gases sampled for gas analysis can pass pathogens on to other patients or healthcare workers after leaving the gas analyzer if not managed properly.

The good news is that the same precautions can be applied to all patients. The strategy is not different depending upon the patient’s risk of infection. A “high quality” filter placed between the breathing circuit and the patient’s airway will protect the machine from contamination and also filter gas sampled for analysis. **Heat and moisture exchange filters (HMEFs)** are a good choice since they preserve airway humidity, and are designed so that sampled gas is filtered before it enters the gas analyzer. It is possible to use a filter at the airway that is not also a heat and moisture exchanger. If a filter only is used, lower fresh gas flows (1-2 L/min or less) are desirable during maintenance of anesthesia to preserve humidity in the circuit.

![Diagram of filter configuration](image)

**Preferred Filter Configuration**

VFE > 99.99% for each filter. Gas sampling on machine side of filter. (Courtesy Draeger Medical)

It is also recommended to add an effective **viral filter** between the expiratory limb of the circle system and the machine. Not only is this second filter a reasonable backup to protect the machine from any particles that pass the primary filter, but it significantly amplifies the effectiveness of the first filter. Given the fact that the primary filter can become less effective if soiled, the backup filter is a good recommendation. Adding another filter between the machine and the inspiratory limb is also done sometimes but is not necessary to protect the machine from the patient, nor protect the patient if the machine is kept clean. The main reason to add an inspiratory limb filter is to eliminate the chance of error by placing a single filtered limb on the inspiratory rather than expiratory port.
Consistent use of an isolated operating room with thorough understanding of its airflow characteristics

Transfers in full personal protective equipment (PPE) including a well-fitting N95 mask, goggles or face shield, splash-resistant gown, and boot covers

Use disposable equipment, including airway equipment whenever possible

The airway should be secured using the method with the highest chance of first-time success to avoid repeated instrumentation of the airway, including using a video-laryngoscope

Dedicated transport ventilator; to avoid aerosolization, the gas flow is turned off and the endotracheal tube clamped with forceps during switching of ventilators

Powered air-purifying respirator (PAPR) is worn for induction and reversal of anesthesia

A minimum of one hour is planned between cases to allow thorough decontamination of all surfaces, screens, keyboard, cables, monitors, and anesthesia machine

After confirmed COVID-19 cases, a hydrogen peroxide vaporizer will be used to decontaminate the OR

From: https://twitter.com/ThielsCA/status/1239328372439875592/photo/3
Recommendations for Airway Management in a Patient with Suspected Coronavirus (2019-nCoV) Infection

General

Your personal protection is the priority. Personal protective equipment (PPE) should be available for all providers to ensure droplet/contact isolation precautions can be achieved. Providers and organizations should review protocols for donning and doffing PPE. Careful attention is required to avoid self-contamination.

Patients with confirmed or suspected 2019-nCoV infected cases:
- Should NOT be brought to holding or PACU areas
- Should be managed in a designated OR, with signs posted on the doors to minimize staff exposure.
- Should be recovered in the OR or transferred to ICU into a negative pressure room. Ensure a high quality HMEF (Heat and Moisture Exchanging Filter) rated to remove at least 99.97% of airborne particles 0.3 microns or greater is placed between the ETT and reservoir bag during transfers to avoid contaminating the atmosphere.

Plan ahead:
- For time to allow all staff to apply PPE and barrier precautions
- Consider intubation early to avoid the risk of a crash intubation when PPE cannot be applied safely.

During Airway Manipulation

Apply:
- Disposable mask, goggles, footewear, gown and gloves. Consider adopting the double glove technique.
- Standard ASA monitoring should be applied before induction of anesthesia.
- N95 mask at a minimum should be utilized. PAPR devices may offer superior protection when manipulating an airway of an infected patient.

Assign:
- Designate the most experienced anesthesia professionals available to perform intubation, if possible. Avoid trainee intubation for sick patients.

Avoid:
- Awake fiberoptic intubation, unless specifically indicated. Atomized local anesthetic can aerosolize the virus.

Prepare to:
- Preoxygenate for 5 minutes with 100% FiO2
- Perform a rapid sequence induction (RSI) to avoid manual ventilation of patient's lungs and potential aerosolization of virus from airways.
- Consider using a video-laryngoscope.

RSI:
- Depending on the clinical condition, the RSI may need to be modified. If manual ventilation is required, apply small tidal volumes.

Use:
- Ensure there is a high quality HMEF (Heat and Moisture Exchanging Filter) rated to remove at least 99.97% of airborne particles 0.3 microns or greater placed in between the facemask and breathing circuit or between facemask and reservoir bag.

Dispose:
- Re-sheath the laryngoscope immediately post intubation (double glove technique)
- Seal all used airway equipment in a double zip-locked plastic bag. It must then be removed for decontamination and disinfection.

Remember:
- After removing protective equipment, avoid touching your hair or face before washing hands.


RECOMMENDATIONS FOR SURGICAL PROCEDURES ON POTENTIAL COVID-19 PATIENTS

VIRAL EXPOSURE RISK
- Blood
- GI Tract
- Respiratory Tract

Examples of Potentially Aerosolizing Procedures
- Intubation / Extubation
- Bag masking a patient
- Bronchoscopy
- Laparoscopic Surgery
- Electrocautery

PERSONAL PROTECTIVE EQUIPMENT
Because surgery is a potentially aerosolizing procedure, both “Special Pathogen Precautions” (Red) and “Droplet Precautions” (Yellow/Orange) require the use of:
- N95
- OR
- PAPR*

*Only use a PAPR that has been approved for OR use by OR charge nurse

PREPARATION
- Careful coordination between surgery, anesthesia, nursing, ward/ICU teams
- For ICU patients, consider using ICU vent; discuss with anesthesia/ICU teams pre-op
- Minimize overnight cases
- Talk with OR charge nurse to locate special pathogen equipment including N95s & PAPRs that are appropriate for OR use

IN THE OPERATING ROOM
- Only essential personnel
- Runner outside of room for needed equipment
- Leave pagers / IDs outside with covering residents

- Don / Doff OUTSIDE of operating room
- N95 or PAPR
- Full Coverage Eye Protection (or visor)

Though not a part of official Covid-19 PPE, surgeons may consider the use of shoe covers as with any operation

- Don / Doff INSIDE of operating room
- Surgical Gown (don’t tie back knot, just the front knot)
- Double Glove

- Other keys for Donning and Doffing
  - Review donning/doffing videos online before the case
  - Don/Doff as a team with observation of each other
  - Doffing carries highest risk of self-contamination
  - Questions: page 30434 (weekday) or 7136 (off hours)

Updated: March 18. These recommendations will evolve to maintain alignment with official policies of Michigan Medicine.
SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection isolation precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

1. GOWN
   - Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
   - Fasten in back of neck and waist

2. MASK OR RESPIRATOR
   - Secure ties or elastic bands at middle of head and neck
   - Fit flexible band to nose bridge
   - Fit snug to face and below chin
   - Fit-check respirator

3. GOGGLES OR FACE SHIELD
   - Place over face and eyes and adjust to fit

4. GLOVES
   - Extend to cover wrist of isolation gown

USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene
HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE)
EXAMPLE 1

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. Here is one example. **Remove all PPE before exiting the patient room except a respirator, if worn. Remove the respirator after leaving the patient room and closing the door. Remove PPE in the following sequence:**

1. **GLOVES**
   - Outside of gloves are contaminated!
   - If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer.
   - Using a gloved hand, grasp the palm area of the other gloved hand and peel off first glove.
   - Hold removed glove in gloved hand.
   - Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove.
   - Discard gloves in a waste container.

2. **GOGGLES OR FACE SHIELD**
   - Outside of goggles or face shield are contaminated!
   - If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer.
   - Remove goggles or face shield from the back by lifting head band or ear pieces.
   - If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container.

3. **GOWN**
   - Gown front and sleeves are contaminated!
   - If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer.
   - Unfasten gown ties, taking care that sleeves don’t contact your body when reaching for ties.
   - Pull gown away from neck and shoulders, touching inside of gown only.
   - Turn gown inside out.
   - Fold or roll into a bundle and discard in a waste container.

4. **MASK OR RESPIRATOR**
   - Front of mask/respirator is contaminated — **DO NOT TOUCH!**
   - If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer.
   - Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front.
   - Discard in a waste container.

5. **WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE**

**PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE**


