Guidelines for Invasive Procedures and Surgery

DURING THE COVID-19 PANDEMIC

The novel Coronavirus SARS-CoV-2 (COVID-19) represents an emerging pathogen with significant morbidity and mortality. It is probable that infected, asymptomatic or pre-symptomatic patients will require invasive and/or operative procedures as part of their care. Because such patients may shed the COVID-19 virus and place healthcare providers at risk for infection, the following guidelines are intended to direct the safe and appropriate performance of procedures during the pandemic.

Perioperative / periprocedural screening of patients

All patients should be clinically screened upon admission / pre-procedure, where possible, for symptoms of COVID-19 infection. Rapid COVID-19 testing is becoming available and can help guide procedure planning. COVID-19 testing should be performed 24-48 hours prior to the scheduled procedure.
Signs of COVID-19 infection include:

- Fever
- Dry cough
- Sore throat
- Runny nose or nasal congestion
- Loss of sense of smell or taste
- Muscle aches
- Difficulty breathing
- Diarrhea

Making the decision on how and when to perform a procedure

- If the patient has none of the above symptoms, the procedure can be performed using Standard Precautions.
- If the patient has any of these symptoms, or cannot provide a history, the procedure should be deferred, if possible, until symptoms resolve.
- If the procedure cannot be deferred, rapid COVID-19 testing should be performed to guide appropriate PPE use.
    - If the COVID-19 test is positive, follow the guidelines for COVID-19 positive cases.
    - If the COVID-19 test is negative, the procedure can be performed using Standard Precautions.

General comments

For procedures on COVID-19 known or suspected patients:

- All unnecessary procedures, operations and endoscopies should be postponed to both reduce risk to patient and healthcare provider, and conserve PPE.
- Procedures should be performed in dedicated airborne infection isolation rooms (AIIR) (negative pressure / air flow), where possible, to reduce the risk of environmental contamination and healthcare provider exposure.
- The minimum number of hospital staff should participate in performing any procedure to reduce healthcare provider risk and conserve PPE.
    - Traffic in and out of the operating / procedure room should be strictly limited.
    - A runner should be stationed outside the procedure area to retrieve additional medications or equipment as needed.
    - Staff breaks during the procedure should be strongly discouraged.
    - No visitors or observers should be allowed.
- Team members and physicians should receive education regarding appropriate PPE and its proper use prior to caring for COVID-19 patients.
- Items such as hospital charts, pagers, cell phones and personal bags must be left outside the operating room; anything that was in contact with the patient, such as the ward bed, should also be considered contaminated.
- Only bring that which is absolutely required for the case into the room.
- Remove all unnecessary equipment from the operating room before a COVID-19 procedure; cover items unable to be removed with plastic to minimize contamination and facilitate cleaning.
- Patient clothing/linen should be gently handled to minimize aerosolization of any viral load.
- Consider intubation and other procedures early to avoid the risk of emergent procedures where team members cannot don PPE properly before patient care is necessary.
- After properly removing PPE, team members should avoid touching their hair or face before washing their hands.

Bedside procedures on COVID-19 patients

- Signs should be clearly posted on the patient's room door to alert staff of the need for appropriate PPE and respiratory protection.
- The most experienced proceduralist available should perform the procedure.
- Confirmed or suspected COVID-19 status should be discussed during the Procedural Timeout so all personnel are aware of the potential risks of exposure.
- If there is significant risk of exposure to aerosolized body fluids (see Appendix 1), all personnel involved in the procedure should wear "High Risk" PPE (see Appendix 2 & 3):
  - N-95 (or greater) respirators
    - Powered air-purified respirators (PAPRs) will be available at each hospital for use according to the indications in Appendix 5.
    - PAPR use requires education and return demonstration before use.
  - Eye protection (face shield or tight-fitting goggles)
  - Head covering (such as a surgical hood or bouffant surgical cap to cover the exposed face and neck)
  - Fluid-resistant gown
  - Double gloves
- See Appendix 6 for instructions on proper intubation technique for patients at risk of COVID-19 infection.
- Technical considerations
  - Although COVID-19 is primarily transmitted via aerosolized respiratory droplets, viral particles have been found in nasal swabs, pharyngeal swabs, sputum, bronchoalveolar lavage fluid, gastrointestinal tissue, blood and stool.
    - Keep sharps to a minimum.
    - Use instruments, rather than fingers, to grasp needles, retract tissue and load/unload needles.
    - Use disposable, round-tipped scalpel blades instead of pointed, sharp-tipped blades.
    - No recapping of needles.
    - Continue "sharps safety" techniques during clean up post-procedure.
- At the conclusion of the procedure, all personnel should properly doff their PPE under observation by an experienced team member ("Safety Officer") to catch potential breaks in technique before they occur. Absolutely avoid touching the face, especially the nose, mouth or lips.

Surgical / endoscopic procedures on COVID-19 patients

- Patients with suspected or confirmed COVID-19 infection should NOT be brought to the Pre-op Holding or Post-Anesthetic Care Unit (PACU) areas. Such patients should be transported directly to the designated operating / procedure room without stopping at the front desk.
- Each operating theater / procedure area should have a dedicated COVID-19 cart with appropriate PPE and supplies just outside the designated operating / procedure room including:
    - Appropriately sized N-95 respirators and/or PAPRs
    - Eye protection (face shield or tight-fitting goggles)
    - Head covering (such as a surgical hood or bouffant surgical cap to cover the exposed face and neck)
    - Level 3 & 4 fluid-resistant gowns
    - Gloves
    - Appropriate COVID-19 signage
- Signs should be clearly posted on the operating / procedure room door to alert staff of the need for appropriate PPE and respiratory protection.
- Where possible, patients should be intubated in their intensive care unit (ICU) or negative pressure room prior to transport to the operating / procedure room.
- See Appendix 6 for instructions on proper intubation technique for these high-risk patients.
- An HME (Heat and Moisture Exchanging)/HEPA filter rated to remove at least 99.97% of airborne particles 0.3 microns or greater should be placed on the anesthesia machine exhaust port.
- Suspected or confirmed COVID-19 status should be discussed in the pre- and post-operative briefing and be part of the Surgical Timeout so all personnel are aware of the potential risks of exposure.
- If there is significant risk of exposure to aerosolized body fluids (see Appendix 1), all personnel involved in the procedure should wear "High Risk" PPE (see Appendix 2 & 3):
    - N-95 (or greater) respirators
        - Powered air-purified respirators (PAPRs) will be available at each hospital for use according to the indications in Appendix 5.
        - PAPR use requires education and return demonstration before use.
    - Eye protection (face shield or tight-fitting goggles)
    - Double gloves
    - Appropriate gown and head covering
        - Level 4 impervious fluid-resistant gown (surgeon, anesthesia team, scrub nurse) (example: Halyard "AeroChrome Select" surgical gown)
        - Level 3 fluid-resistant gown (circulator, others) (example: Halyard "Ultra" surgical gown)
- Level 4 surgical drapes should be used to resist liquid and viral penetration.

- Technical considerations
  - Although COVID-19 is primarily transmitted via aerosolized respiratory droplets, transmission via blood and body fluids is theoretically possible as viral RNA has been detected in the blood and body fluids of COVID-19 infected individuals.
    - Use suction or a smoke evacuator when electrocautery is used to decrease the possibility of aerosolized virus.
    - Keep sharps to a minimum.
    - Use instruments, rather than fingers, to grasp needles, retract tissue, and load/unload needles and scalpels.
    - Give a verbal announcement when passing sharps.
    - Avoid hand-to-hand passage of sharp instruments by using a basin or neutral zone that has been agreed upon at the case start.
    - Laparoscopic procedures: carefully decompress the abdomen or chest of all insufflated gas prior to removing ports to avoid aerosolization of material from the cavity.
    - Use round-tipped scalpel blades instead of pointed sharp-tipped blades.
    - Use electrocautery preferentially to scalpel for incisions.
    - No needles or sharps on the Mayo stand.
    - No recapping of needles.
    - Use blunt tip suture needles when possible.
    - Continue "sharps safety" techniques during operating room table clean up post procedure.
- At the conclusion of the procedure, all personnel should properly doff their PPE under observation by an experienced team member ("Safety Officer") to catch potential breaks in technique before they occur. Absolutely avoid touching the face, especially the nose, mouth or lips.
- Upon conclusion of the operative procedure, intubated patients should be transferred back to their ICU room for recovery. Non-intubated patients should be recovered in the operating room before transfer back to their room.
- Specimens should be properly labeled as coming from a known or suspected COVID-19 patient. The exterior of the specimen container should be decontaminated with viricidal wipes prior to delivery to Pathology.
- All operating room waste should be discarded according to operating room policy.
- Following the procedure, a minimum of 60 minutes should be planned between cases to allow for any airborne virus to be cleared. Operating / procedure rooms should then be cleaned per Orlando Health protocol with a terminal clean and Xenex™ treatment at the end of the day.

APPENDIX 1

High-Risk Procedures for Aerosolization

The following is a list of common high-risk aerosol generating procedures (AGP). This list should not be considered all-inclusive.

- Any procedures on the airway, throat, mouth, sinuses or lungs (including bronchoscopy, tracheostomy, glossectomy, laryngoscopy, lung resection, etc.)
- Endotracheal intubation and extubation
- Manual bag-mask ventilation
- Cardiopulmonary resuscitation (CPR)
- Open airway suctioning
- Upper endoscopy (including transesophageal echocardiography)
- Colonoscopy
- Collection of diagnostic naso/oropharyngeal specimens
- Aerosolized respiratory treatments (nebulizations)
- Autopsy of suspected or confirmed COVID-19
- Noninvasive ventilation (CPAP / BiPAP)
- High-frequency oscillatory ventilation (HFOV)

APPENDIX 2

Appropriate Personal Protective Equipment (PPE) for Invasive Procedures In Known or Suspected COVID-19 Patients

	Mask	Gown	Head covering*	Face shield	Goggles**	Gloves
Low Risk of Respiratory Aerosols – Droplet Precautions						
Routine patient care	Level III surgical	Level II (yellow isolation)		✓		✓
High Risk of Respiratory Aerosols – Airborne Precautions (This list should not be considered all-inclusive)						
Naso/ oropharyngeal specimen collection	N-95	Level II (yellow isolation)		✓		✓
Open airway suctioning	N-95	Level II (yellow isolation)	✓		✓	✓
Aerosolized respiratory treatments (nebulization)	N-95	Level II (yellow isolation)	✓		✓	✓
Intubation	N-95	Level III	✓		✓	✓
Bronchoscopy	N-95	Level IV	✓		✓	✓
Cardiac arrest	N-95 or PAPR	Level II or Level III	✓		✓	✓
Autopsy of suspected or confirmed COVID-19	N-95 or PAPR	Level IV	✓		✓	✓

* Disposable surgical hood head covering, Tyvek™ suit, or similar covering

** Certain aerosol generating procedures (AGP) may require a specific type of eye protection (i.e., tight-fitting goggles)

Goggles or face shield are not required when using a PAPR.

North reusable N-100 masks or valved N-95 respirators MAY be used in sterile procedures at the bedside as long as a Level II or Level III surgical face mask is worn over the exhalation port of these masks to protect the patient's wounds from the proceduralist's exhaled air.

APPENDIX 3

Appropriate Personal Protective Equipment (PPE) for All Operative / Endoscopic Procedures

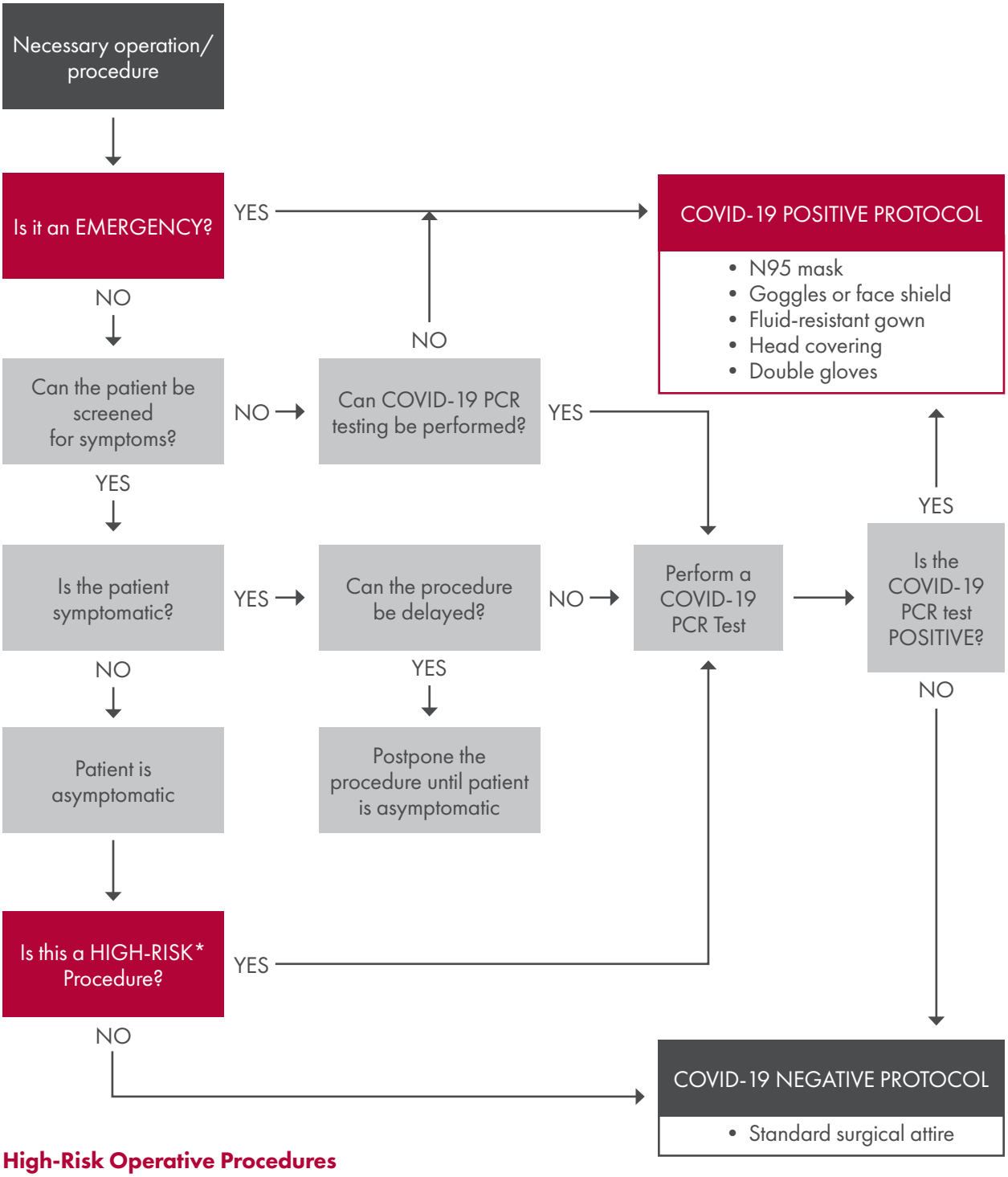
All patients scheduled for operative / endoscopic procedures should be clinically screened for COVID-19 symptoms 24-48 hours prior to procedure and again upon presentation to the hospital. COVID-19 testing should be performed 24-48 hours prior to the scheduled procedure as necessary (such as for high-risk procedures) to help guide operative planning and proper use of PPE. Rapid in-hospital PCR testing should be reserved for inpatients while outpatient testing should be sent to outside reference labs to preserve in-hospital testing capacity.

Scenario	Anesthesia Provider PPE	Surgery / Nursing / Scrub PPE	Notes
COVID-19 POSITIVE patient OR COVID-19 suspected patient	• N-95 mask • Goggles or face shield • Fluid-resistant gown • Head covering • Double gloves	• N-95 mask • Goggles or face shield • Fluid-resistant gown • Head covering • Double gloves	• PPE to be worn by all members throughout procedure. • Minimize number of providers present. • Evacuate electrocautery smoke and laparoscopic insufflation gas.
Emergent procedure OR Symptom screening / PCR testing unavailable	• N-95 mask • Goggles or face shield • Fluid-resistant gown • Head covering • Double gloves	• N-95 mask • Goggles or face shield • Fluid-resistant gown • Head covering • Double gloves	• PPE to be worn by all members throughout procedure. • Minimize number of providers present. • Evacuate electrocautery smoke and laparoscopic insufflation gas.
Asymptomatic patient OR NEGATIVE COVID-19 PCR testing	• Standard PPE	• Standard PPE	

North reusable N-100 masks or valved N-95 respirators MAY be used in sterile procedures in the operating room as long as a Level II or Level III surgical face mask is worn over the exhalation port of these masks to protect the patient's wounds from the proceduralist's exhaled air.

APPENDIX 4

Perioperative Covid-19 Testing for Operative & Endoscopic Procedures



High-Risk Operative Procedures

Airway, throat, mouth, sinuses or lungs

Bronchoscopy, endoscopy, colonoscopy, intestinal surgery

APPENDIX 5

Appropriate Use of Powered Air-Purified Respirators (PAPRS) In Known or Suspected COVID-19 Patients

- PAPRs will be available at each hospital for team members who:
  1. Cannot wear N-95 or North masks (determined by fit testing) OR
  2. Appropriately sized N-95 masks are unavailable AND another clinician with an appropriate N-95 mask is unavailable to perform the necessary patient care OR
  3. The necessary procedure cannot be appropriately performed with an N-95 or North mask
- **When the patient is COVID-19 positive, symptom screening / PCR testing is not available and use of a N-95 or North mask is not possible**, appropriate indications for use of a PAPR include (this list should not be considered all-inclusive):
  - Surgical procedures that involve opening the airway or sinuses
  - Endotracheal intubation and extubation
  - Cardiopulmonary resuscitation (CPR) – immediate code team only
  - Open airway suctioning
  - Endoscopy
  - Collection of diagnostic naso/oropharyngeal specimen collection
  - Aerosolized respiratory treatments (nebulizations)
  - Autopsy of suspected or confirmed COVID-19
- Each operating room should have a PAPR cart available containing the following:
  - PAPR motors / filters, hoses, hoods and pressure testers
  - Gloves
  - Super Sani-cloth wipes
  - Alcohol hand foam
  - Hydrogen peroxide
  - 4 x 4 gauze (to use with hydrogen peroxide to clean splashed blood)
  - 3” plastic tape to secure surgical gowns around PAPR motors
  - Handheld dry erase boards (2) (for communication through the operating room window)
- All users must be properly trained in the use of PAPRs, including return demonstration, before use. No member of the operating room staff should don a PAPR without prior training.
- A Level III surgical face mask must be worn underneath a PAPR during sterile bedside and operative procedures (inhaled PAPR air is filtered, exhaled air is not).
- PAPR use must be combined with appropriate use of PPE, including gloves and appropriate fluid-resistant gowns.

- PAPRs MUST be appropriately doffed and cleaned following any use.
- Headlights may not be used in conjunction with a PAPR.
- Surgical loupes may be used, depending upon the type of loupe.
- Hearing and communication are impaired / more difficult with a PAPR.
- Schedule additional procedure time to account for donning and doffing of PAPRs.
- As there are a limited number of PAPRs at each hospital, simultaneous PAPR cases will not be possible and cases may need to be staggered accordingly.
- Recommended Operating Room (OR) PAPR Utilization Process
    - Team
        - Inside Circulating RN
        - Outside Circulating RN (serves as "Safety Officer")
        - CRNA / Anesthesiologist
        - Surgeon
        - Scrub techs
        - Runner
    - OR team sets up case without PPE (assuming a clean OR) (scrub techs take short break, return and don PPE).
    - CRNA and Inside Circulating RN check patient in preop and complete pre-surgery checklist with Pre-op RN.
    - CRNA and Inside Circulating RN return to OR to don PPE.
        - Wear a fluid-resistant surgical gown in lieu of a yellow gown.
        - Use long sterile gloves for the first pair to keep gown cuffs tucked in. Non-sterile gloves should be used as a second pair and can be changed during the case as needed.
    - Outside Circulating RN and additional team member pick up patient in Pre-op and deliver patient to OR when the "inside" team is properly donned.
    - Outside Circulating RN applies "PAPR in Use, Do Not Enter" sign on hall and core doors.
    - Scrub team dons PPE, folding up the front of the PAPR veil while scrubbing so hands do not get contaminated.
    - Outside Circulating RN (as Safety Officer) tapes back of gown above and below PAPR motor on each inside team member to prevent air vents from becoming obstructed.
    - Entire team will wear a Level III surgical face mask under their PAPR unless suspected/confirmed case of COVID-19 which will require N-95 face mask (see Appendix 3).
    - Preferred mode of communication is by whiteboard (one for inside room and one for outside room).
        - It is difficult for staff to hear the radio or telephone while wearing a PAPR because of the fan.

- Place an IV pole with a bottle of Sterilium in the OR in case a member of the operating team has to re-scrub, gown and glove during the procedure to avoid having to exit the operating room and doff / re-don the PAPR.
- Inside Circulating RN documents members of the outside team.
- Upon conclusion of the operation, the CRNA and Inside Circulating RN will transport the intubated patient to their previous ICU room or will recover the patient in the OR.
- Each member of the team will back up to the OR door and will properly doff their PAPR and PPE under the direction of the Outside Circulating RN / Safety Officer.
- All team members should avoid touching their hair or face before washing their hands.

APPENDIX 6

Intubation of Patients With Known or Suspected Covid-19 Infection

- Patients should be intubated in a negative air flow room where possible.
- Surgeons and personnel not needed for intubation should remain outside the operating room for 15 minutes following anesthesia induction and intubation to allow sufficient air exchanges in the room to occur.
- Intubation team members should be in the following PPE:
  - N-95 (or greater) mask
  - Eye protection (tight-fitting goggles)
  - Level 3 fluid-resistant gown with head covering
  - Double gloves – one pair under the suit / gown and one pair over
- Perform passive preoxygenation with patient breathing spontaneously (if possible)
  - Non-rebreathing face masks, high-flow nasal cannula oxygen and continuous positive airway pressure (CPAP) masks can all increase aerosolization and environmental contamination.
  - If a non-rebreathing (NRB) face mask is used for preoxygenation, place a Level I surgical mask over the NRB mask to cover exhalation ports.
- Rapid sequence induction (RSI) with high-dose paralytic should be utilized.
- Only those medications necessary for the procedure should be brought into the OR.
- The most experienced proceduralist available should perform the intubation to facilitate intubation on the first attempt.
- The use of a video laryngoscope (i.e., GlideScope™) and intubating stylet are strongly recommended to reduce the risk of prolonged intubation attempts and increased aerosolization.
- Avoid repeated attempts at unsuccessful intubation; insert a laryngeal mask airway (LMA) if intubation is unsuccessful and cover the patient's face to reduce aerosolization.
- Inflate the endotracheal tube cuff fully and attach an HME (Heat and Moisture Exchanging) filter rated to remove at least 99.97% of airborne particles 0.3 microns or greater to the endotracheal tube prior to bagging / connecting the patient to a ventilator.
- Confirm placement with end-tidal carbon dioxide (ETCO2) monitoring and returned tidal volumes rather than auscultation to avoid contamination.
- Attempts should be made to minimize the number of times the respiratory circuit is "broken" to avoid aerosolization and environmental contamination. Consider briefly clamping the endotracheal tube when disconnecting or changing respiratory circuits.
- Following intubation, all used airway equipment should be immediately sealed in a double zip locked plastic bag and appropriately discarded or removed for decontamination and disinfection per Orlando Health protocol.

REFERENCES

- American College of Surgeons. *Information for Surgeons*. https://www.facs.org/about-acs/covid-19/information-for-surgeons. Accessed March 13, 2020.
- Centers for Disease Control and Prevention. *Interim infection prevention and control recommendations for patients with suspected or confirmed Coronavirus Disease 2019 (COVID-19) in healthcare settings*. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html
- Kim Y, Hale M. *Pilot Study to Examine the Use of a Powered Air Purifying Respirator (PAPR) in the Operating Room*. Am J Infect Control 2017; 45(6) Supplement pS84. https://doi.org/10.1016/j.ajic.2017.04.124
- *3 Interventions When Using a Powered Air-Purifying Respirator in the OR*. AORN. https://www.aorn.org/about-aorn/aorn-newsroom/periop-today-newsletter/2019/2019-articles/powered-air-purifying-respirator. Accessed April 2, 2020.
- Howard RA, Lathrop GW, Powell N. *Sterile Field Contamination from Powered Air-Purifying Respirators (PAPRs) versus Contamination from Surgical Masks*. Am J Infect Control 2020; 48: 153-156. https://doi.org/10.1016/j.ajic.2019.08.009
- Wong J, Goh QY, Tan Z, Lie SA, Tay YC, Ng SY, Soh CR. *Preparing for a COVID-19 Pandemic: A Review of Operating Room Outbreak Response Measures in a Large Tertiary Hospital in Singapore*. Can J Anesth 2020; 11:1–14.
- Kah L, Ang LS, Foong TW, Ng BS. *What We Do When a COVID-19 Patient Needs an Operation: Operating Room Preparation and Guidance.* Can J Anesth 2020; https://doi.org/10.1007/s12630-020-01617-4
- Wax RS, Christian MD. *Practical Recommendations for Critical Care and Anesthesiology Teams Caring for Novel Coronavirus (2019-nCOV) Patients*. Can J Anesth 2020
- Brat GA, Hersey SP, Chhabra K, Gupta A, Scott J. *Protecting Surgical Teams During the COVID-19 Outbreak: A Narrative Review and Clinical Considerations*. Ann Surg 2020 (In press)
- University of California – San Francisco. *"PPE for Surgery in Asymptomatic Adult Patients (COVID-19 Non-Confirmed/Non-Suspected)."* https://infectioncontrol.ucsfmedicalcenter.org/sites/g/files/tkssra4681/f/Asymptomatic_COVID_PPE.pdf. Accessed April 3, 2020.
- American Academy of Otolaryngology. *Tracheotomy Recommendations During the COVID-19 Pandemic*. https://www.entnet.org/content/tracheotomy-recommendations-during-covid-19-pandemic. Accessed March 31, 2020.
- Peng PWH, Ho PL, Hota SS. *Outbreak of a new coronavirus: What anaesthetists should know.* Br J Anaesth 2020 (In press).
- Forrester JD, Nassar AK, Maggio PM, Hawn MT. *Precautions for Operating Room Team Members during the COVID-19 Pandemic*. JACS 2020. doi: https://doi.org/10.1016/j.jamcollsurg.2020.03.030.