

MEDICLINIC SOUTHERN AFRICA

COVID-19: IPC PRINCIPLES

DURING THE RESPIRATORY

MANAGEMENT OF CRITICALLY ILL

PATIENTS

INTRODUCTION

Critically ill patients infected with COVID-19, or any other transmissible respiratory disease should receive the best possible care without putting healthcare workers at unacceptable risk. For this reason, we should ensure high reliability of identification, isolation and use of appropriate personal protective equipment (PPE) in high risk areas, such as critical care units and emergency centres – especially in units that frequently accept transfers from other hospitals. The three most important infection prevention and control (IPC) measures for transmissible respiratory disease include isolation of infected patients, appropriate transmission based precautions and the appropriate and rational use of PPE for health care workers and adherence strict hand hygiene protocols for all.

The following principles should be adhered to:

- Ensure that PPE is worn correctly and that healthcare workers do not self-contaminate during donning and doffing
- Thorough hand hygiene should be done after contact with the patient or contaminated objects and after removal of PPE
- The care team should participate in multi-professional huddles at least once per shift to discuss the goals and safety strategies for the day. This information should be shared between all staff
- Minimise the number of individuals that care for the patient
- During an outbreak, the clinical team should consider all additional risks to the staff and other patients, and how this may influence their care decisions
- Critically ill patients may have a greater extent of viral shedding, and some patients may “act” as “super shedders” with an enhanced ability to transmit and therefore frequent and meticulous environmental cleaning is needed in addition to the above measures
- Please refer to the following IPC policies:
 - Cleaning and disinfection bed and patient environment
 - Care of the deceased with a communicable disease
 - Disinfection guidelines
 - Environmental cleaning
 - Hand hygiene
 - Handling of used dirty and contaminated linen
 - IPC Bundles Implementation Guideline

- Isolation, standard and transmission based precautions
- Masks and N95 respirators – wearing, storage and care
- Specimen collection guidelines

INTUBATION AND RESUSCITATION PRECAUTIONS

Emergency intubations have been linked to high-risk transmission events. For this reason, it is important to consider planned intubations, when the patient’s oxygen needs are lower. The timing of intubation is really important and can play a role in the outcome of the patient.

Bag valve mask ventilation principles

- A bacterial-viral filter should be placed between the manual resuscitator (bag-valve-mask device) to filter out the exhaled air and reduce the risk of transmission of pathogens
- The mask of the manual resuscitator should be a good fit and with a proper seal to prevent any air leakage from the mask. Special attention should be given to ensure a good fit/seal (i.e. patients with facial hair, lack of teeth, difficult facial contours, etc.)
- The period of manual ventilation should be of the shortest possible time. With proper pre-oxygenation, bag-valve ventilation can ideally be avoided before laryngoscopy

Intubation principles

- Endotracheal intubation increases the risk of infection when the necessary precautions are not taken. All staff members involved with intubation should wear the appropriate PPE, and ensure that they don’t self-contaminate with removal of PPE. The procedure should be performed by the most experienced person available, both to minimize the dispersal of infectious particles and to reduce the number of individuals exposed during intubation
- Ideally, intubation should be performed using video laryngoscopy, with a display separate from the blade (i.e. Glydescope®) to avoid placing the face of the intubator close to the patient
- If a difficult intubation is anticipated, a flexible bronchoscope intubation can be performed using a video bronchoscope with the display away from the patient
- The ventilator should only be switched on after confirmation of the endotracheal tube placement
- Ensure that the patient is well sedated or even paralysed during the procedure to limit coughing (and subsequent droplet aerosolisation). Inadequate sedation can also place the intubator at risk if the patient becomes agitated and dislodges PPE.
- Management of patients requiring intubation or resuscitation warrants specific caution:
 - As far as possible, careful consideration and planning of these interventions is required
 - As far as possible, these procedures should be undertaken in an isolation room with negative pressure ventilation and airborne precautions
 - If this is not possible, try and use **low risk resuscitation interventions**, while everything is put into place for protected resuscitation (PPE for airborne precautions)
 - The number of people in the room should be minimised to essential team members
 - All healthcare workers in the room must be using the appropriate PPE

- Recurrent traffic of people bringing stock and equipment into the room may increase the risk of viral transmission
- Rather than bringing in the emergency trolley into the isolation room, a specialised trolley / box containing modular packs of stock and equipment should be in the room, with the remainder out of the room
- Following resuscitation, the team members can exit the room when appropriate, and should remove their PPE under careful supervision of an observer (who has been trained to observe that doffing is done correctly to prevent self-contamination)
- **Low risk resuscitation interventions** include:
 - Placement of an oral airway
 - Chest compressions
 - Defibrillation, cardioversion & transcutaneous pacing
 - Obtaining intravenous or intraosseous access
 - Administration of intravenous resuscitation drugs
- **High risk resuscitation interventions (because they are aerosol-generating procedures)** include:
 - High-flow nasal cannula (HFOT)
 - Bag mask ventilation (manual ventilation)
 - Non-Invasive Ventilation (NIV)
 - Endotracheal intubation / surgical airway
 - Bronchoscopy
 - Gastro-intestinal endoscopy
- **Aerosol generating procedures should as far as possible not be performed in a positive pressure environment! However, we realise that there are limited negative pressure rooms**
- **Additional precautions to be taken during aerosol-generating procedures**
 - Perform procedures in an adequately ventilated room
 - High risk PPE: PPE for airborne precautions (Eye protection/N95/gown/gloves)
 - Minimising respirator face-seal leakage by ensuring a proper seal with a 2 hand seal to fully protect the healthcare worker from exposure to aerosolized infectious droplets
 - Eye protection (goggles/ face shield) to protect the eyes from respiratory splash or spray
 - Contact precaution (non-sterile long-sleeved gown and gloves)

VENTILATOR PRINCIPLES

- It is best to have two (2) bacterial-viral filters per ventilator. One between the inspiratory port and the ventilator circuit (on inspiratory limb) and the other on the expiratory limb. The use of bacterial-viral filters on the expiratory limb of the circuit or on the exhalation port will reduce contamination to the surrounding area
- Heated humidification is often used for ventilated patients. Some of the initial guidelines advised against the use thereof, but this has changed. Doctors and nurses can follow the same guidelines they normally use

- An HMEF not only provides humidification, but can also filter the exhaled air from the patient before it reaches the ventilator
- Disconnection from the ventilator should be limited – maintain a closed circuit as far as possible. **Any form of disconnection will lead to aerosol dispersion.** For this reason, staff should wear appropriate airborne PPE
- HMEF'S only needs changing when necessary and according to manufacturer's guidelines (typically only when blocked with excessive water condensation or mucous plug)
- As far as possible, use single-use consumables, such as breathing circuits, flow sensors, airway adapters, expiratory valves, and filters to minimize the risk of cross contamination
- If possible, dual-limb ventilator circuits should be used
- Make use of in-line suctioning, in-line nebulisation and/or MDI ports as far as possible to prevent disconnection and aerosol dispersion
- Suctioned fluids and secretions should be stored in the sealed containers and disposed as medical waste
- If disconnection should happen (i.e. for the change of a filter, suctioning etc.), remember to clamp the tube! It is advisable to pre-oxygenate the patient, and temporarily switch the ventilator to standby mode to minimise droplet spray to the surroundings. The healthcare worker should wear the appropriate airborne PPE before disconnection
- Disinfect the outer surface of the ventilator and other equipment during and after use of a patient
- When caring for a critically ill patient that is being ventilated, the following PPE should be worn at all times because of the risk of possible exposure:
 - Fit tested N95 respirator
 - Eye protection (goggles or face shield)
 - Disposable gown
 - Disposable gloves

USE OF SUPPLEMENTAL OXYGEN

The guidelines on the use of supplemental oxygen therapies such as non-invasive ventilation (NIV) and high flow oxygen therapy (HFOT) has changed over the course of the pandemic. In the initial stages, the guidelines advised against the use. However, in South-Africa the use of HFOT has been used with good success. Both NIV and HFOT remains to be seen as aerosol generating procedures and should be managed as that

Nasal prongs

- Patients who are not treated in a single room, and wearing nasal prongs, a surgical mask can be worn by the patient over the prongs to reduce droplet spread

High Flow Oxygen Therapy (HFOT)

- The Critical Care Society of South Africa recommends the use of HFOT in patients that are unable to maintain a SpO₂ >90% with reservoir bag oxygen mask @ 15L/min
- HFOT have eliminated the use for mechanical ventilation in a large number of patients

Nebulisation

- Nebulisation of medications should be avoided, particularly outside of airborne isolation, due to the risk of viral aerosolisation and spread.
- If bronchodilators and steroid inhalations are unavoidable, they should rather be administered using metered-dose inhalers

Non-invasive ventilation

- The Critical Care Society of South Africa advise to use NIV with caution. It be clinically indicated and requested by the doctor, please ensure that the correct airborne PPE is worn
- Face masks are preferred to nasal masks during NIV to prevent potential spread of contaminated exhaled air particles from unintended air leaks through the mouth
- NIV equipped with expiratory bacterial-viral filters should ideally be used in negative pressure isolation cubicles.
- If no negative pressure isolation room is not available, the patient should be placed in a single room with closed doors.
- Ideally, the ventilator should only be switched on after the NIV mask is on, and switched off before removal of the NIV mask

GENERAL PRINCIPLES TO AVOID ENVIRONMENT CROSS CONTAMINATION

- Avoid sharing ICU equipment as far as possible. Preferentially, use single use equipment when available
- Minimise personal effects, i.e. cell phone, handbags, etc. in the workplace
- No personal devices in COVID-19 areas
- Stethoscope use should be minimised
- All pens should be cleaned and disinfected at the end of each shift

ADDENDUMS

1. Addendum 1: CCSSA - Critical Care Management of Patient Confirmed with COVID-19
2. Addendum 2: CCSSA - Personal Protective Equipment (PPE) for Critical Care Providers during the COVID-19 Pandemic
3. Addendum 3: CCSSA – Principles of Airway Management in COVID-19
4. Addendum 4: Society of Critical Care Medicine / Surviving Sepsis Campaign – COVID-19 with hypoxia
5. Addendum 5: Society of Critical Care Medicine / Surviving Sepsis Campaign Decision Tree on ventilation practices
6. Addendum 6: Intubation guideline of the COVID-19 patient (PUI or confirmed)
7. Addendum 7: Intubation tick list with COVID-19 modifications

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