

Care of the Adult Critically Ill COVID-19 Patient Annex D

Provincial Critical Care Communicable Disease Working Group

Critical Care Strategic Clinical Network Alberta Health Services

Note: This is a document that adapts prior pandemic and ILI guidance to the current COVID-19 crisis. This document has been developed by the Provincial Critical Care Communicable Disease Working Group.

Intention for use:

- To guide all providers of critical care in Alberta as to the basic care of adult critically ill patients with known or suspected COVID-19 infection to ensure such patients receive optimal, consistent and equitable care throughout the ICUs of Alberta
- Recognize that the application of the guidance in this document will need to be adapted to the characteristics of each individual unit, zone and department.

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Revision History

Version	Author	Summary of Updates
March 11, 2020	CCSCN with Provincial Critical Care COVID-19 Working Group	Initial draft
March 14, 2020	Zuege, based on feedback from Provincial Working Group	<ul style="list-style-type: none"> • Suspected or confirmed COVID-19 added throughout • Negative pressure rooms preferred if available • Updates to charting for code blue • PPE reminders for visitors • Delete reference to use of airborne isolation rooms if available • Changed guidance on humidity to: <ul style="list-style-type: none"> ○ “Avoid use of heated humidity systems other than when they are fixed integral systems of a particular ventilator” ○ “Humidity should be preferentially provided via in-line HME devices. Active/heated humidity systems should only be used when necessary (eg to manage difficult secretions or to provide inhaled epoprostenol) and only when such as system is part of a fixed integral part of a particular ventilator” • Replace prostacyclin with epoprostenol

A. Surveillance

Case Description for COVID-19

COVID-19 is an infectious syndrome caused by SARS-CoV-2, a novel coronavirus that has not been previously detected in humans. Though information is rapidly evolving, at this point it is noted that though the vast majority of patients have only mild symptoms, a small portion develop critical illness, in particular hypoxemic respiratory failure. COVID-19 is believed to be spread via respiratory droplets (similar to influenza, MERS, and SARS) and/or contact (e.g. contaminated hands to mucous membranes). Person to person spread has been identified.

COVID-19 Screening Criteria:

Click link to see the current updated screening criteria for COVID-19:

<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-ncov-case-def.pdf>

B. Preparation and Admission of COVID-19 Patients to ICU

1. AHS Point of Care Risk Assessment <https://www.albertahealthservices.ca/ipc/hi-ipc-routine-practices-algorithm-cc.pdf> must be applied to patients with a suspected COVID-19, irrespective of location.
2. Patients who meet the case definition of COVID-19 or have laboratory confirmed COVID-19 admitted to the ICU will be cared for using contact and droplet precautions. Use N95 respirators for aerosol generating medical procedures (AGMP) which are defined as:
 - a. Intubation and related procedures (e.g. manual ventilation, open endotracheal suctioning)
 - b. Cardio pulmonary resuscitation
 - c. Bronchoscopy
 - d. Sputum induction
 - e. Nebulized Therapy
 - f. Non-invasive ventilation (i.e. BiPAP)
 - g. Open respiratory/airway suctioning
 - h. High frequency oscillatory ventilation
 - i. Tracheostomy care
 - j. Nebulized therapy/aerosolized medication administration
 - k. High flow heated humidity oxygen therapy devices (ex. ARVO, Optiflow)

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/hi-ipc-respiratory-additional-precautions-assessment.pdf>

For patients receiving continuous or frequent AGMP (eg. High flow heated humidity oxygen therapy devices, NIV, tracheostomy with frequent suctioning) healthcare providers should wear N95 masks. In addition, due to the risk of disconnection of endotracheal tube and ventilator, healthcare providers should use N95 masks when providing care to all intubated, presumed or confirmed, COVID-19 patients.

3. Due to the higher risk of aerosol generation, critically ill patients with COVID-19 should be admitted to single patient rooms. Negative pressure (Airborne isolation) rooms are not required and should be reserved for patients with disease processes requiring airborne isolation. If single patient rooms are occupied by patients without COVID-19, attempts should be made to transfer patients not in need of droplet or airborne isolation, to accommodate COVID-19 patients in single patient rooms. If all single patient rooms are occupied with patients in need of droplet or airborne isolation then admit COVID-19 patients to open areas of the ICU attempting to cohort COVID-19 patients in one area of the ICU with a minimum 2 meter separation between patients.
4. Stock isolation cart with adequate supply of N95 masks (all brands and sizes), goggles, face shields, gloves (all sizes), yellow isolation gowns, surgical masks and disinfectant wipes. Ensure the entire spectrum of brands and sizes of N95 masks are available and placed on the isolation cart outside of the patient room. Ensure canisters of disinfectant wipes inside and outside the patient room are adequately full.

5. Close room doors with enough of an opening to allow for hearing in-room alarms. Close room doors fully during aerosol generating medical procedures.
6. Enter order for “Contact and droplet isolation precautions” in the patient record, adding the comment “**Use N95 masks for aerosol generating medical procedures and all intubated patients**” as additional information.
7. Review IP&C Contact and Droplet Isolation Precautions:
COVID: <https://www.albertahealthservices.ca/assets/healthinfo/ipc/hi-ipc-emerging-issues-ncov.pdf>
8. Post the AHS Contact and Droplet Isolation Sign:
<http://www.albertahealthservices.ca/ipc/hi-ipc-contact-and-droplet-sign.pdf> dated 2018
9. Ensure appropriate viral diagnostic tests are ordered and obtained on admission to ICU (if they have not already been collected prior to admission).

C. Admission Laboratory Testing

1. **Diagnostic studies:** Though nasopharyngeal swabs (NPS) are commonly used for screening for infection with respiratory viruses, molecular viral studies on sputum samples (eg endotracheal aspirates (ETA) or expectorated sputum) are more sensitive. Intubated patients with COVID-19 should always have both ETA and NPS performed as soon as possible on admission to ICU if not already collected. Non-intubated patients with COVID-19 should have an NPS performed and consideration of an expectorated sputum sample if there is a productive cough (sputum induction is NOT recommended to reduced aerosolization risk). If there is a clinical possibility of other more unusual pathogens (as in an immunosuppressed patient), consideration should be given to performing bronchoalveolar lavage (BAL) recognizing that bronchoscopy is an aerosolizing procedure. Bronchoscopy solely for the purposes of microbial sampling in otherwise uncomplicated patients is not recommended. If necessary, bronchoscopy should be performed only in intubated patients and used only exceptionally in non-intubated patients with COVID-19 in order to minimize aerosolization. Some patients may shed virus intermittently and consideration should be given to repeating viral studies if the initial samples are negative in a patient with a persisting high clinical suspicion of COVID-19. As viral pathogens are only one diagnostic possibility for most clinical presentations, additional testing should be obtained in the patient presenting with COVID-19 to look for other pathogens. At a minimum this would generally include blood cultures, endotracheal aspirate for bacterial culture (if intubated) or expectorated sputum for bacterial culture (if not intubated), urine Legionella antigen testing, liver function tests, urinalysis, and sampling of pleural fluid if present in significant quantities.
 - a. **Nasopharyngeal Swab (NPS):** Collect NPS using a flocked swab inserted deep into the nasopharynx. Place the swab in Universal Transport medium that is stored at room temperature. Mark sample as STAT. Order **both COVID-19 and Respiratory Virus Panel** for the same sample (only a single sample is required for all respiratory viral testing). Send sample to lab.
 Directions for Provincial Lab:
<https://www.albertahealthservices.ca/assets/wf/plab/wf-provlab-collection-of-nasopharyngeal-and-throat-swab.pdf>
 - b. **Endotracheal Tube Aspirate (ETA)/Expectorated sputum:** Collect ETA/sputum and place minimum 0.5-1 ml of secretions into sterile leak proof container. No additional transport medium is required. Mark sample as STAT. Order **both COVID-19 and Respiratory Virus Panel** for the same sample (only a single sample is required for all respiratory viral testing). Send sample to lab.
 - c. **Bronchoalveolar Lavage (BAL) Fluid:** Collect and send in per site Policy and Procedure. Mark sample as STAT. No additional transport medium is required. Bronchoscopy is generally to be avoided for the sole purpose of diagnosis of viral pneumonia given higher risk for aerosolization but may be indicated, however, in immunosuppressed patients who may have multiple and/or unusual organisms. Clinical specimens should be placed in a separate biohazard bag and sealed with the ziplock closure. Ensure that the outside of the bag remains uncontaminated.

2. The expected turn-around time for Provincial Laboratory reporting of the full respiratory virus panel including COVID-19 testing is <72 hours.
3. Look for the results of viral testing in **Alberta Netcare**. In Calgary, results will also be reported in Sunrise Clinical Manager. Please note that COVID-19 results cannot currently be reported in Connect Care.
4. Most responsible health practitioner (MRHP) with COVID-19 positive patients will be notified by the APL-Public Health Lab Virologist on-call (VOC) or the local Medical Officer of Health (MOH).
5. Only one nasopharyngeal swab +/- ETA/sputum sample needs to be collected for both routine respiratory panel testing and COVID-19 investigation.
6. For all hospitalized and emergency department patients with respiratory virus testing ordered, COVID-19 testing will be performed along with the usual respiratory pathogen panel (RPP).
7. For all hospitalized and emergency department patients with rapid influenza/RSV testing ordered (if available at that site), COVID-19 testing will be performed along with the rapid influenza/RSV test.
8. Nucleic acid amplification (PCR-based) tests for COVID-19 are run at both ProvLab sites (Edmonton and Calgary).
9. Manual test requests should be made by submitting respiratory specimens with the Serology and Molecular Testing Requisition (<https://www.albertahealthservices.ca/frm-20676.pdf>) and writing "COVID-19" in the bottom box (Specify Other Serology and Molecular Tests). Date of symptom onset and any relevant travel/exposure history, including country of travel and return date, MUST be included for testing to proceed. Asymptomatic patients will not be tested.
10. For sites using Connect Care, use the above paper requisition to order COVID-19 testing.
11. Sites using Sunrise Clinical Manager (SCM) can order COVID-19 testing directly through SCM.
12. Specimens can be shipped to APL-Public Health Lab as per routine practices but known COVID-19 positive patients specimens must be shipped as Transportation of Dangerous Goods Category B (TDG B). For information on TDG B shipping requirements, call the ProvLab Virologist on-call (VOC) in Edmonton (780-407-8822) or Calgary (403-333-4942)

D. Transport and Admission to ICU

1. All health care providers involved in transport must use appropriate isolation precautions. For intubated patients and those with active AMGP underway (eg open suctioning), staff involved in the transport should don N95 respirators. In the absence of the above conditions, surgical masks should be worn.
2. Staff providing direct care during the transport should also don protective eye wear, masks, gown and gloves. Note: personal eye wear is not sufficient.
3. Hand hygiene should be performed before and after patient transport.
4. Wipe the handles of the bed before transport with disinfectant wipes. Designate one porter/assistant as 'clean' to open doors and touch elevator buttons.
5. Transport with minimum number of people necessary - registered nurse (RN), registered respiratory therapist (RRT), most responsible health practitioner (MRHP), and health care aide (HCA) as appropriate.

6. If patient intubated:
 - a. Transport using an in-line filter, in-line suction catheter and heat moisture exchange filter (HMEF).
 - b. Use of transport ventilators (with filtering systems) is preferred to minimize the need for hand bagging. If use of a transport ventilator is not possible, use a manual bagging unit (with PEEP valve).
 - c. RRT will manage airway and oxygen requirements.
 - d. Clean O₂ cylinder(s) and transport stretcher with disinfectant wipes before returning to general circulation. Clean and disinfect transport ventilator after use and discard breathing circuit.
7. If patient not intubated:
 - a. Transport with non-humidified (dry) oxygen supply - respiratory to identify the most appropriate oxygen delivery mask.
 - b. Patients should wear a procedure mask if tolerated
8. Clean O₂ cylinder(s) and transport stretcher with disinfectant wipes before returning to general circulation.

E. Staffing Considerations

The principle is to minimize the number of staff involved directly with the patient while providing quality patient care.

1. The nurse in charge and the respiratory therapy supervisor are responsible to determine patient assignment and will coordinate care of all patients in the unit with the principle in mind that the total number of staff caring for a COVID-19 patient should be kept to a minimum. If possible, cohort staff so that RNs and RRTs caring for COVID-19 patients are not caring for non-COVID-19 patients. Geographical cohorting of COVID-19 patients may assist with staff assignments if appropriate to facilitate.
2. All members of the healthcare team, inclusive of MRHP, NPs, RNs, RRTs, allied health, and support staff will continue to perform their usual duties. They must review and adhere to all appropriate isolation precautions prior to entering rooms.
3. For staff members who have recently returned (within 14 days) from travel outside of Canada, refer to the most current AHS guidance as to appropriate notification (AHS Workplace Health and Safety (WHS)) and work restriction requirements.
<https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-ncov-2019-staff-faq.pdf>

If instructed to self-isolate, self-isolation guidance can be found here:
<https://open.alberta.ca/publications/self-isolation-information-sheet>.

4. Staff (including those who are pregnant, immunocompromised, or have underlying medical conditions) do not need to be restricted from providing care to patients who are under investigation for COVID-19, or who have probable or confirmed COVID-19, so long as the staff member or student is able to demonstrate proper use and fit of personal protective equipment, including donning and doffing, and can competently adhere to the IPC recommendations for COVID-19.

For students (medical or otherwise) working within an ICU, please check with current educational institution guidelines for any restrictions to practice or exposures.

5. Individuals who are unable to competently adhere to the IPC recommendations for COVID-19 (e.g. skin condition that precludes proper hand hygiene practices) should not provide care to patients who are under investigation for COVID-19, or those who have probable or confirmed COVID-19. Staff who are unable to be Fit Tested for N95 masks should not care for COVID-19 patients that are intubated or require any AGMP.

F. Infection Prevention Precautions

1. Confirmed and suspected COVID-19 cases in the ICU should be managed with contact and droplet precautions. Use N95 respirators for all aerosol generating medical procedures (AGMP, see definitions Section B 2.) and for all intubated patients.

2. All staff providing care must be successfully N95 fit tested and masks must be seal checked when applying.
3. Personal eyewear is not sufficient eye protection.
4. Hand washing is critical to prevent spread of COVID-19. Special attention to hand hygiene is essential for staff, patients and visitors; wash hands with soap and water or use antiseptic hand rub before and after each and every contact with patients or their environment. Remind colleagues if you see lapses in hand hygiene behavior. Educate patients and visitors about how and when to use hand hygiene products.

<https://www.albertahealthservices.ca/assets/healthinfo/ipc/if-hp-ipc-flu-handwash-how-to.pdf>

5. For patients with suspected but not confirmed COVID-19 infection, maintain contact and droplet isolation precautions including N95 respirators for AGMP and intubated patients until the COVID-19 and full respiratory viral panel results are back on all respiratory samples (ETA, NPS and BAL) indicating negative results. If any results are positive – maintain current precautions and contact IPC for further advice.

6. **Discontinuation of Isolation for patients with confirmed COVID-19 infection:**

Do not discontinue isolation without consulting IPC. IPC will consult with a Medical IPC officer and the MRHP to evolve a plan for repeated testing and advise when it is appropriate to discontinue isolation.

The period of communicability for COVID-19 is not currently known. People known to be infected with COVID-19 will be isolated until they are confirmed by medical tests to no longer carry the virus.

Applying N95 respirators: Hold mask in your hand and pull both elastic ties, bottom first, over your hand for ease of putting mask on. Test to ensure that mask is secure and that there are no leaks. Discard immediately outside of room after use.

Eye protection (disposable face shields/goggles): Face shields or goggles are to be worn upon entering the patient room. Personal eyewear (glasses) is not sufficient. Face shields are single use. Discard face shields outside of the room after use. If goggles are re-used they must be fully wiped down with disinfectant wipes prior to re-use.

Gloves: Always perform hand hygiene prior to putting on gloves and after removal.

Gowns: Remove lab coat before donning. Ensure the back of the gown is secured.

Donning: <https://www.albertahealthservices.ca/assets/Infofor/hp/if-hp-ipc-donning-ppe-poster.pdf>

Doffing: <https://www.albertahealthservices.ca/assets/Infofor/hp/if-hp-ipc-doffing-ppe-poster.pdf>

Meals: Menus do not enter the room. Disposable dishes are not required. Leave tray outside the room to avoid contamination. Take only food and dishes into isolation room. Return used dishes to tray and follow routine precautions.

G. General ICU Care

1. Patient Room Supplies
 - a. Use disposable supplies wherever possible
 - b. Additional supplies should be delivered by a clean staff member to the room at the request of the in-room nurse/RRT
 - c. All equipment should be kept in the patient's room to avoid transmission via objects. Dedicate equipment to isolation room or clean with hospital grade disinfectant after use prior to returning to general circulation.
 - d. Avoid overstocking rooms – only bring in supplies as required. All items that cannot be surface disinfected should be discarded when the patient is discharged.
2. 'Code Blue' for patients with suspected or confirmed COVID-19 infection in the ICU
 - a. In the event of a 'code blue', all responding staff must apply all appropriate PPE, including N95 masks and eye protection, before entering the patient's room.

- b. The crash cart will be brought into the patient's room and used as required.
- c. The crash cart must be appropriately decontaminated according to the equipment cleaning guidelines before it is removed from the room.
- d. Charting:
 - i. Use code blue standardized paper charting sheets or code narrator charting in Connect Care if there is an electronic device already residing in the patient room.
Do not use portable electronic devices for charting.
 - ii. To avoid contaminating documents or rhythm strips, the recorder should be located as far from the patient as possible and both the recorder and charting record should remain clean.
 - iii. The recorder should refrain from doing any direct patient care and should not come in contact with anything in the environment.
 - iv. Extra assistance may be required from other staff due to the recorder being a "hands off" member of the team.
 - v. The recorder should use the following PPE:
 - 1. N95 respirator and face shield.
 - 2. With the above recommendations, gloves and gown are not necessary.
 - vi. When resuscitation is complete, recorder to place the clean documents outside the room without leaving the room. Remove face shield, then mask, perform hand hygiene and exit room.

3. Charting

- a. Do not take the paper chart or laboratory results into the patient room.
- b. Mobile computer terminals are to remain outside the patient room at all times unless a dedicated mobile terminal is available to remain in room (e.g. for units where dedicated mobile terminals are available for very sick patients requiring in-room presence of staff a majority of the time).

4. Visitors

- a. Visitors must don surgical mask, eye protection, gown and gloves.
- b. Visitors must perform hand hygiene before donning PPE and after doffing PPE.
- c. Visitors require orientation to the use of PPE. This orientation should occur on the first visit and be reinforced frequently, especially when the staff notice lapses in practice.
- d. Visitors will be asked to leave the room during aerosol generating procedures.
- e. For patients on HFO or Heated/humidified high flow nasal therapy (ex. ARVO, Optiflow), visitors should wear a surgical mask, eye protection, gown and gloves. A non-fit tested N95 respirator provides no additional benefit over surgical mask.
- f. Where small children are requested to visit, pediatric surgical masks and eye protection should be worn (if available).
- g. Visitors should be asked to stay home if they are ill.
- h. Minimize number of visitors.

H. Code Blue/Rapid Response Team call outside of ICU

1. Staff responding to emergencies outside of the ICU during an epi/pandemic may not have adequate time to perform a thorough risk assessment.

If the patient is on specified isolation precautions, ICU staff should don appropriate PPE before entering the room as indicated on the isolation sign.

For patients with unknown isolation status, resuscitation team staff should assume the patient may have COVID-19 and don all appropriate PPE (N95 respirator, eye protection, gown and gloves) for all intubations and aerosol-generating medical procedures.

2. Hospitals with rover carts will place PPE supplies (including the full spectrum of N95 masks and goggles) on the crash carts. For sites with a decentralized crash cart model staff will carry PPE to the Code Blue or Rapid Response Team call.
3. The crash cart will be brought into the patient's room and used as required.

4. The cart must be appropriately decontaminated by ICU staff according to the equipment cleaning guidelines before it is removed from the room.
5. Preference for intubation would be in the most controlled and single room environment of the ICU following rapid transport to the ICU. It is recognized this will not always be possible and optimal resuscitation including airway capture should not be delayed by this guidance. Follow intubation guidelines for maintaining door closure post intubation.
6. If performing intubation during cardiopulmonary resuscitation, intubate patients early and hold CPR during intubation to minimize aerosolization of particles and optimize intubation success

I. Respiratory Care

The basic principles are to always use personal protective equipment in addition to appropriate isolation precautions and minimize the use of aerosol-generating procedures.

For Non-Intubated Patients:

1. Provide O₂ as ordered with continuous SpO₂ monitoring.
2. No peak flow monitoring.
3. Nebulization should be avoided and be used only as an exception.
<https://insite.albertahealthservices.ca/main/assets/tls/ep/tls-ep-2019-covid-nebulizer-memo.pdf>
4. Bronchodilator delivery via MDI via spacer is preferred if patients can effectively utilize.

High flow heated humidity oxygen therapy devices (ARVO, Optiflow):

Aerosolization of respiratory secretions may result from high flow heated humidity oxygen therapy devices. As such it is **not recommended** for routine use in patients with suspected or confirmed COVID-19 infection. If used in patients with suspected or confirmed COVID-19 infection, treatment must be performed in a single patient room with the door closed and with staff using contact and droplet precautions including use of N95 respirators.

Non-Invasive Ventilation (CPAP or BIPAP):

Non-invasive positive pressure ventilation (NIV) may result in aerosolization of respiratory secretions and thus is **not recommended** for use in suspected or confirmed COVID-19 patients. If used with ILI (COVID-19 or other pathogens) with hypoxemic respiratory failure or ARDS, NIV is associated with high failure rates and need for emergent intubation. Patients with hemodynamic instability, multi-organ failure, or abnormal mental status are at very high risk for failure and should not receive NIV. Pro-active intubation under less emergent conditions is the preferred strategy. If used in patients with suspect or confirmed COVID-19 infection (eg in patients with goals of care limiting intubation or in patients with COPD and predominant airways disease or co-existing cardiogenic pulmonary edema), NIV treatment must be performed in a single patient room with the door closed and with staff using contact and droplet precautions including use of N95 respirators.

Intubation guidelines:

Hypoxemic respiratory failure/ARDS commonly results from intrapulmonary shunt and usually requires mechanical ventilation. NIV and high-flow oxygen therapies frequently fail to adequately support such patients making intubation necessary. Close monitoring is crucial in order to detect failure of non-invasive support means so that intubation can be performed in a timely and controlled manner using all optimal infection prevention strategies.

1. Endotracheal intubation should, ideally, be performed by the most experienced MRHP available (attending Intensivist, anaesthesiologist or Critical Care Resident/Fellow.)
2. Minimize number of people involved. **Close the room door.** Nursing and RRT support ideally should be provided by the same individuals assigned to patient.
3. In units with adjustable room airflow rates, increase the rate of airflow (or put the room in "bronchoscopy mode") prior to intubation.
4. Don full PPE including N95 respirator, face shield, gown and gloves. Proper application of PPE should be verified by an independent observer prior to entry into the patient room.

5. Consider the additional use of goggles given the potential for expectorated secretions to flow around front-covering face shields and contact ocular mucus membranes with coughing and during head turns of the intubator. If goggles are re-used they must be fully wiped down with disinfectant wipes prior to re-use.
6. Patients with hypoxemic respiratory failure usually have poor oxygenation reserves. Pre-oxygenate as much as possible using non-invasive oxygen. Reserve use of bag-valve-mask ventilation via facemask to situations where non-invasive oxygen delivery is failing (to reduce aerosolization risks).
7. The best pharmacotherapy will be determined by the MRHP on a case-by-case basis but in general should include strategies that minimize chances of cough or aerosol generation via use of agents inducing deep sedation and often use of paralytics when clinically appropriate (eg no signs predicting difficult intubation).
8. Consider use of a video-laryngoscope for the initial attempts at intubation (in order to reduce the risk of aerosol contact by reducing the need to look directly down the airway).
9. Place in-line suction catheter and HME on in all patients. Avoid use of heated humidity systems other than when they are fixed integral systems of a particular ventilator.
10. If sputum samples have not already been collected, collect now while all infection control precautions for AGMP are in place for intubation.
11. If difficult airway cart or other stand-by equipment is brought to the area, do not bring entire cart/equipment into the room – bring in only the necessary equipment as it is needed.
12. Door to remain closed until appropriate amount of time has passed based on room exchange rate as per facility guidelines.

Tracheostomy care and management in the non-ventilated patient:

Patients spontaneously breathing via a tracheostomy and remaining on contact and droplet precautions for COVID-19 should:

1. Continue to be managed in single patient rooms using appropriate PPE.
2. Provide humidity as indicated and per current practice
3. Closed suction systems are recommended for these patients.

For Intubated Patients:

1. Critically ill COVID-19 patients frequently require advanced ventilator modes and patient management. The following strategies should be considered to support failing gas exchange in COVID-19 infected patients:
 - a. Deep sedation and paralysis
 - b. Elevation of head of bed to 30-45 degrees
 - c. Lung protective ventilator strategies that restrict tidal volumes to 6-8 mL/kg of Ideal Body Weight (IBW).
 - d. Limit plateau pressures to ≤ 30 cm H₂O (exceptions include conditions where there is additional pulmonary extra-parenchymal restrictive physiology such as large pleural effusions, severe obesity or abdominal compartment syndrome)
 - e. Allowing permissive hypercapnea
 - f. Optimal titration of PEEP
 - g. Recruitment maneuvers as tolerated
 - h. Prone positioning - refer to site specific policy and procedures.
 - i. Minimization of extra-vascular lung water via reduction of fluid intake and correction of fluid overload with consideration of diuresis or CRRT to achieve negative fluid balance
2. If refractory hypoxemia evolves (e.g. PaO₂/FiO₂ ratio < 150 after attempting all of the above strategies), consider the following additional strategies:
 - a. Non-conventional modes of ventilation such as APRV
 - b. Inhaled epoprostenol:
 - i. Provided per local policy. Dosing 10 – 50 ng/kg/min. An active humidification system is required to use this therapy.
 - ii. Use only in intubated patients.

- iii. Patients who do not demonstrate a physiological response (increase in PaO₂ of 20% from baseline) after 30 minutes should be discontinued from inhaled epoprostenol therapy.
 - iv. A daily assessment should be performed in an attempt to discontinue inhaled epoprostenol therapy.
3. If advanced ICU respiratory care (defined as the use of all of the above measures possible to apply) has failed to improve oxygenation or can only be accomplished by applying mechanical ventilation that is not lung protective, consider consulting the ECLS Team (Edmonton for Northern Alberta, Calgary for Southern Alberta).

To initiate a referral:

- a. For Calgary, Central and South Zones, page the on-call CVICU Intensivist at the Foothills Medical Centre (403) 944-1110
- b. For Edmonton (sites other than UAH) and North Zones, page the on-call Intensivist for the UAH General Systems ICU
- c. For the UAH site, page the on-call Mazankowski CVICU Intensivist

An early consultative process is recommended as ideally potential ECLS candidates should be first transferred to the ECLS referral centre and then be cannulated if deemed appropriate.

Consider referral to ECLS team when the following criteria are met:

- PaO₂:FIO₂ ratio < 120 mm Hg for > 3 hours **with inability to maintain lung protective ventilation (LPV)** as defined in section 1 above
 - PaO₂:FiO₂ < 100 mm Hg for > 6 hours **even with maintenance of lung protective ventilation**
 - an arterial blood pH of <7.25 with a partial pressure of arterial carbon dioxide [PaCO₂] of ≥60 mm Hg for >6 hours
 - endotracheal intubation and high pressure mechanical ventilation for **less** than 7 days
 - near maximization of conventional therapies
 - no severe life-limiting chronic illnesses. Expected life expectancy of at least 2 years of independent functioning, should the patient survive
4. If a patient is not deemed appropriate for ECLS support and continued care is pursued, consider:
- Permissive hypoxemia - accept SaO₂ 85-90%, PaO₂ 50-60
 - Target Hemoglobin >100 (maximize oxygen carrying capacity)
 - Target temperature <37.5 (reduce oxygen demand)
5. Bronchodilator delivery should only be provided via MDI and spacer. Nebulizers should not be used.
6. Humidity should be preferentially provided via in-line HME devices. Active/heated humidity systems should only be used when necessary (eg to manage difficult secretions or to provide inhaled epoprostenol) and only when such as system is part of a fixed integral part of a particular ventilator.
7. Use in-line suction only for all ventilated patients. Avoid open suctioning.
8. Post ventilation handling of ventilator: Strip ventilator of all disposable parts and place waste in biohazard bag and discard in room. Send reusable components for processing and mark as isolation. Clean the surfaces of unit with IPC approved disinfectant wipes.

J. Medical Care

At this time there are no specific treatments recommended for COVID-19 infections. Supportive and symptomatic care is important particularly for those with severe symptoms of COVID-19. For patients presenting with an ILI where SARS-CoV-2 is one possible etiology, it is critical to recognize the high likelihood of more common viral and bacterial pathogens to underlie the patients presentation, even in the presence of exposure to COVID-19 infected individuals or relevant travel exposures.

1. Microbial Testing

Even in patients with proven COVID-19 infection, particularly in patients with severe disease, bacterial and/or other viral co-pathogens may be present.

All patients evolving severe illness should be tested for the full spectrum of respiratory viruses (including SARS-CoV-2) and bacterial pathogens. This should include:

- In all patients, a nasopharyngeal swab for respiratory viruses (including SARS-CoV-2)
- Wherever possible and in addition to a nasopharyngeal swab, a sputum sample for respiratory viruses (including SARS-CoV-2) and bacterial culture.
For intubated patients, this is best sent as an endotracheal tube aspirate (ETA).
For non-intubated patients able to produce sputum, this is best sent as expectorated sputum.
Sputum induction is **not** recommended in non-intubated patients (to reduce exposure risks).
Sputum samples are important to send in addition to nasopharyngeal swabs given they have a higher sensitivity for the detection of viral pathogens (SARS-CoV-2 and most other viruses, including influenza).
- Blood cultures x 2 drawn from separate lines/sites
- Urine legionella antigen
- Sampling of pleural fluid as appropriate if present in significant quantities.

Bronchoscopy solely for the purposes of microbial sampling in otherwise uncomplicated patients is not recommended (unproven benefit; high risk procedure). If there is a clinical possibility of other more unusual pathogens (as in an immunosuppressed patient), consideration could be given to performing bronchoalveolar lavage (BAL) recognizing that bronchoscopy is a highly aerosolizing procedure. If necessary, bronchoscopy should be performed only in intubated patients and avoided in non-intubated patients with COVID-19 in order to minimize aerosolization.

2. Empiric Antimicrobial Therapy

All patients evolving severe illness should be empirically treated with intravenous antibacterials and oseltamivir (given current high levels of influenza infections) pending results of microbial testing. Appropriate antibacterials should take into consideration patient presentation (isolated respiratory vs more generalized illness), allergies, prior or high risk for colonization with ARO (esp MRSA), local microbial resistance patterns and comorbid disease that might influence antibiotic use (eg conduction delay). As per current guidelines for community-acquired pneumonia management, initial empiric antibacterial coverage should include an agent to cover atypical microbes (eg macrolide, respiratory quinolone or tetracycline) and typical bacterial species. Initial empiric therapy should be de-escalated as microbiology results return as appropriate.

3. COVID-19 Specific Antiviral Therapy

As of the date of this guideline, there are no approved or clinical trial informed therapies directed towards SARS-CoV-2 (the virus that causes COVID-19 infection). There are numerous clinical trials underway in many countries and one expects new treatment information to evolve over time. It is important to check the current status of directed anti-viral therapies via the following agencies:

- PHAC - <https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals.html>
- WHO - <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/patient-management>
- CDC - <https://www.cdc.gov/coronavirus/2019-ncov/hcp/index.html>

Consultation with the local infectious disease service is recommended.

4. Systemic Corticosteroids

Systemic corticosteroids for the treatment of viral pneumonia is NOT recommended. Studies thus far in patients with severe influenza, SARS, and MERS have revealed either harm or no benefit. Systemic steroids may be of value for other clinical indications such as severe septic shock.

5. Fluid Management

Use conservative fluid management in patients with COVID-19 when there is no evidence of shock. Patients with COVID-19 should be treated cautiously with intravenous fluids, because aggressive fluid resuscitation may worsen oxygenation. Hypotonic fluids, starches and albumin should generally be avoided.

6. Clinical Trials

Consideration should be given to enrollment in any locally active clinical trials (epidemiologic or treatment related) if available. Contact the local research coordinator or MRHP as appropriate.

K. Environmental Control

1. Environmental services/housekeeping staff should use the same precautions when cleaning the room as are used during care of any other patient on isolation but must wear the recommended PPE for staff and visitors. Daily cleaning of room is the same as non-isolation rooms with the following exceptions:
 - Floor Cleaning Solution is to be changed and pail and mop handles decontaminated before removal from the room. Each isolation room should have a dedicated mop head.
2. All waste is managed per routine procedures. Liquid waste should be eliminated via the flusher, not via the sink.
3. All linens are managed per routine procedures. Wet or soiled linen is wrapped in dry linen and placed in the laundry bag to ensure it does not leak through.
4. Sharps should be placed in sharps containers per usual practice.

When a COVID-19 patient is discharged or transferred, all disposable items in the room should be discarded. All re-usable items/equipment should be cleaned and disinfected in the room and then placed in clean storage area. All unused linen should be placed in a soiled hamper.


5. Privacy curtain is changed on discharge and if visibly soiled.
6. Room surfaces and equipment cleaning/disinfection is required on a daily basis or more frequently if directed by IPC using AHS approved products and procedures.
 - AHS approved products that have Health Canada broad spectrum virucidal claims are effective against SARS-CoV 2.0.
 - After discharge, transfer or discontinuation of contact and droplet precautions, clean room as per existing facility cleaning practices.
 - Replace privacy curtains.
 - Additional precaution signs should not be removed until both patient's personal hygiene and environmental cleaning have been completed.

Appendices

APPENDIX A

Putting on (Donning) Personal Protective Equipment (PPE)

1 HAND HYGIENE



A Using an alcohol-based hand rub is the preferred way to clean your hands.

B If your hands look or feel dirty, soap and water must be used to wash your hands.

2 Gown

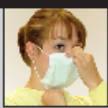


A Make sure the gown covers from neck to knees to wrist.

B Tie at the back of neck and waist.


3a Procedure/Surgical mask

- ◆ Secure the ties or elastic around your head so the mask stays in place.
- ◆ Fit the moldable band to the nose bridge. Fit snugly to your face and below chin.




3b N95 respirator

There are different styles of N95 respirators (pictured below). They include: a) molded cup, b) duckbill, c) flat-fold and d) v-fold



All styles have the same basic steps for donning; molded cup and duckbill are pictured below. Refer to the manufacturer for specific donning instructions.



A Pre-stretch both top and bottom straps before placing the respirator on your face.


B Cup the N95 respirator in your hand.

C Position the N95 respirator under your chin with the nose piece up. Secure the elastic band around your head so the N95 respirator stays in place.

D Use both hands to mold the metal band of the N95 respirator around the bridge of your nose.

E Fit check the N95 respirator.

4 Eye protection or face shields



- ◆ Place over the eyes (or face).
- ◆ Adjust to fit.

5 Gloves



- ◆ Pull the cuffs of the gloves over the cuffs of the gown.




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APPENDIX B

Taking off (Doffing) Personal Protective Equipment (PPE)

1 Gloves



A Grasp the outside edge of the glove near the wrist and peel away from the hand, turning the glove inside-out.

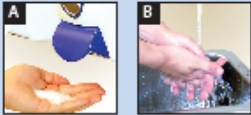
- ◆ Hold the glove in the opposite gloved hand.

B Slide an ungloved finger or thumb under the wrist of the remaining glove.

C Peel the glove off and over the first glove, making a bag for both gloves.

- ◆ Put the gloves in the garbage.


2 HAND HYGIENE



A Using an alcohol-based hand rub is the preferred way to clean your hands.

B If your hands look or feel dirty, soap and water must be used to wash your hands.

3 Gown




A Carefully unfasten ties.

B Grasp the outside of the gown at the back of the shoulders and pull the gown down over the arms.

C Turn the gown inside out during removal.


- ◆ Put in hamper or, if disposable, put in garbage.

4 HAND HYGIENE



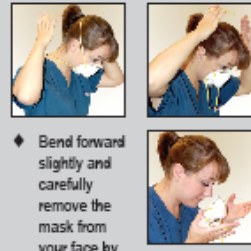
- ◆ Clean your hands. (See No. 2)
- ◆ Exit the patient room, close the door and clean your hands again.

5 Eye protection or face shield



- ◆ Handle only by headband or ear pieces.
- ◆ Carefully pull away from face.
- ◆ Put reusable items in appropriate area for cleaning.
- ◆ Put disposable items into garbage.

6 Mask or N95 respirator



- ◆ Bend forward slightly and carefully remove the mask from your face by touching only the ties or elastic bands.
- ◆ Start with the bottom tie, then remove the top tie.
- ◆ Throw the mask in the garbage.

There are different styles of N95 respirators but all styles have the same basic steps for doffing.

7 HAND HYGIENE







- ◆ Clean your hands. (See No. 2)

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APPENDIX C

COVID-19 (Novel Coronavirus, 2019-nCoV) Interim IPC Recommendations

In addition to Routine Practices

	<p>Recommendations</p> <p><u>Contact and Droplet Precautions</u></p> <p>For current case definitions of COVID-19</p> <ul style="list-style-type: none"> • https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-ncov-case-def.pdf • Refer to Public Health Agency of Canada for ongoing updates
	<p>Affected Areas</p> <ul style="list-style-type: none"> • Refer to World Health Organization for information on affected areas. https://www.who.int/emergencies/diseases/novel-coronavirus-2019
	<p>Accommodation</p> <ul style="list-style-type: none"> • As quickly as possible – place patient in a single room and implement <u>Contact and Droplet Precautions</u> <ul style="list-style-type: none"> ○ Single room with hard walls and door– contact Infection Prevention and Control if not available ○ Move to airborne isolation room/negative air pressure capable room if Aerosol Generating Medical Procedures is required. See the Respiratory (ILI) Algorithm for a list of AGMP • <u>Contact and Droplet Precautions sign</u> visible on entry to room or bed space. • If <u>Aerosol Generating Medical Procedures</u> are performed additional PPE is also required.
	<p>Medical Officer of Health Notification</p> <ul style="list-style-type: none"> • Contact Medical Officer of Health (MOH). • Contact tracing and follow-up will be done through MOH. • AHS Updates
	<p>Laboratory Testing</p> <ul style="list-style-type: none"> • MOH approval is no longer required prior to specimen collection or testing. • Refer to lab bulletin for testing, specimen handling and notification for laboratory testing. • Alberta Precision Laboratories will coordinate testing requests. • Only one swab needs to be collected for both routine respiratory panel testing and SARS-CoV 2.0 investigation.
	<p>Hand Hygiene</p> <ul style="list-style-type: none"> • Perform hand hygiene using alcohol-based hand rub (ABHR) or soap and water as described in <u>Routine Practices</u>. • Educate patients and visitors about how and when to use hand hygiene products.

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For more information, contact Infection Prevention and Control
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