Annex C

Care of the Adult Critically Ill Patient with Confirmed, Probable or Suspected Ebola Virus Disease (EVD)

Critical Care Strategic Clinical Network

Alberta Health Services

Note: This document adapts prior guidance in 'Care of the seriously or Critically Ill Patient with possible or proven Ebola Virus Disease (EVD)'. This document has been developed by the Provincial Critical Care Strategic Clinical Network.

Intention for use:

- To guide all providers of critical care in Alberta as to the basic care of adult critically ill patients with suspected, probable or confirmed EVD 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.
- This guideline is not meant to be applied to patient groups outside of critical care units.

Ebola webpage

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NOTE: The links in this document are updated regularly and should be periodically reviewed.

For general information visit the AHS VHF / Ebola webpage

Surveillance

Ebola Virus Disease (EVD)

Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness affecting humans and other primates.

The virus is transmitted to people from wild animals (such as fruit bats, porcupines and non-human primates) and then spreads in the human population through direct contact with the blood, secretions, organs or other bodily fluids of infected people, and with surfaces and materials (e.g. bedding, clothing) contaminated with these fluids (WHO Ebola virus disease1). Healthcare workers have been infected while treating patients with suspected or confirmed EVD when infection control precautions were not strictly practiced (2).

Ebola virus disease is caused by *ebolavirus* and is a member of the Filoviridae family. There are five species of *ebolavirus* based on where it was discovered (Alberta Health 2023):

- Zaire ebolavirus (EBOV),
- Sudan ebolavirus (SUDV),
- Tai Forest ebolavirus (TAFV),
- Bundibugyo ebolavirus (BDBV) and
- Reston ebolavirus (RESTV).

The average EVD case fatality rate is around 50%. Case fatality rates have varied from 25% to 90% in past outbreaks (WHO Ebola virus disease Key Facts2).

The first EVD outbreaks occurred in 1976 in remote villages in Central Africa, near tropical rainforests. The 2014–2016 outbreak in West Africa was the largest and most complex Ebola outbreak since the virus was first discovered. The majority of transmission events occurred between close contacts and family members, with an estimated 3.9% of cases occurring among healthcare workers. There were more cases and deaths in this outbreak than all others combined. It also spread between countries, starting in Guinea then moving across land borders to Sierra Leone and Liberia (WHO Ebola virus disease Key Facts2).

Clinical Presentation (3)

EVD is a severe, acute viral illness that is characterized by abrupt onset of fever, malaise, myalgia and headache followed by pharyngitis, vomiting, and diarrhea. Other symptoms that have been reported include chest pain, cough, lymphadenopathy, photophobia, and conjunctival injection. About 50% of cases develop a maculopapular rash on the trunk within five days of symptom onset. About five to seven days after symptoms onset, 40–50% of cases will develop bleeding manifestations (e.g., mucous membrane hemorrhages, hematemesis, bloody diarrhea, oozing of blood at puncture sites).

Central nervous system findings include psychosis, delirium, coma and seizures. Shock (with disseminated intravascular coagulation and end-organ failure) often ensues during second week of illness. In fatal cases, massive bleeding occurs late in the clinical course. Other complications include illness-induced abortion among pregnant women, hearing loss, orchitis,

pericarditis, suppurative parotitis, unilateral vision loss and migratory arthritis. If recovery doesn't occur death usually occurs in seven to 16 days due to multiple organ dysfunction syndrome.

If recovery occurs, convalescence may be complicated by the occurrence of myelitis, recurrent hepatitis, psychosis or uveitis.

The case fatality rate of EVD varies by species:
- Ebola-Zaire, 36–90%
- Ebola-Sudan, 41– 71%
- Ebola-Tai Forest, only one case who survived
- Ebola-Bundibugyo, 25– 51%
- Ebola-Reston, 0% (not known to cause clinical disease in humans)

Case Definition

Ebola Haemorrhagic Fever (alberta.ca) (3)

Public Health Agency of Canada Case Definition: Ebola virus disease outbreak - Canada.ca (4)

A person with EVD-compatible symptoms is defined as an individual presenting with fever (temperature ≥ 38.0 degrees Celsius) OR at least one of the following symptoms/signs:

- subjective fever
- malaise
- myalgia
- headache
- arthralgia
- fatigue
- loss of appetite
- conjunctival redness
- sore throat
- chest pain
- abdominal pain
- nausea
- vomiting
- diarrhea that can be bloody
- hemorrhage
- erythematous maculopapular rash on the trunk

Epidemiological Risk Factors

- Individual who cared for a case of Ebola Virus Disease (EVD)
- Laboratory worker handling Ebola virus or processing body fluids from a case of EVD
- Individual who spent time in a healthcare facility in an Ebola affected area where cases of EVD are being treated
- Sexual contact with an EVD case
- Close contact in households, healthcare facilities, or community settings with a person with Ebola while the person was symptomatic - close contact is defined as being for a prolonged period of time within approximately 2 meters (6 feet) of a person with Ebola
- Contact with any human remains of a case of EVD OR contact with human remains in an

Ebola affected area
- Contact with bats, primates or wild animal bush meat from Ebola affected areas
- A travel history to an Ebola affected area within 21 days

Notification

Ensure the Medical Officer of Health (MOH) is aware that a patient with probable or confirmed EVD is being admitted to the intensive care unit.

Contact the MOH on-call through RAAPID or through the hospital switchboard.

- It is important for clinicians to assess the epidemiologic risk for potential Ebola virus infection in travelers returning from high risk areas in the last 21 days prior to onset of symptoms. It is critical this assessment be done PRIOR TO ORDERING ANY LAB WORK. See routine lab testing section.
- In the process, obtaining information on exact dates of travels, cities and countries visited, and exposure to known or presumed cases of Ebola virus infection is highly advised.
- If there may be any potential epidemiologic risk in returning travelers, and concern for Ebola:
    - Immediately place the patient in a single room on contact and droplet precautions (put appropriate signage up).
    - It is CRITICAL that clinicians consult with the Medical Officer of Health (MOH) on-call PRIOR to ordering ANY blood work.
- Collection and or testing will only occur with the approval of the MOH and/or Microbiologist/Virologist on call following special VHF procedures and test menus. Taking these steps is crucial to avoiding inadvertent laboratory and healthcare worker exposures.
- Any and all laboratory testing of a suspected EVD case should be done in consultation with the MOH of the zone and the Virologist/Microbiologist on call.
- The decision for specimen collection and testing should be based on the epidemiological risk factor(s) and clinical status of the patient.
- The collection, handling, transport and analysis should strictly follow the procedures outlined in AHS Laboratory Services Ebola Laboratory Strategy. Viral haemorrhagic fever testing and outbreaks (albertahealthservices.ca)

Diagnosis

It is important for clinicians to assess the epidemiologic risk for potential Ebola virus infection in travelers returning from high risk areas in the last 21 days prior to onset of symptoms

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Currently PT-PCR is the first line test for diagnosing EVD (3).. However, the diagnosis of

EVD can be confirmed by one or more of the following diagnostic markers (3, 5):

- presence of virus-specific RNA by RT-PCR,
- isolation of virus, and/or
- presence of virus-specific antibodies.

As ebolavirus may not be detectable in blood within the first three days after the onset of fever, virus isolation and RT-PCR tests may be negative if testing is done before this three-day threshold. To reliably rule out EVD, repeat testing three days after onset of fever should be considered (3).

Similar to the Ebola RT-PCR and virus isolation tests, the antibody response in Ebola specific serology tests will likely not be present very early post-fever onset. However, detection of Ebola specific antibodies in an affected patient is considered to be a good prognostic indicator for successful recovery (3)

Ebola RT-PCR testing is available at the Public Health Laboratories (ProvLab: https://www.albertahealthservices.ca/lab/lab.aspx), a containment level 3 facility. Positive Ebola RT-PCR results from ProvLab require confirmation from the National Microbiology Laboratory (NML: https://www.canada.ca/en/public-health/programs/national-microbiology-laboratory.html). Negative Ebola RT-PCR results from ProvLab should be assessed in the overall clinical and epidemiologic context of a particular case for a decision as to whether the patient should be removed from isolation or not. The MOH-clinical-lab team may make this decision prior to receipt of a confirmatory Ebola negative result from the NML (3).

No virus culture should be attempted outside of NML, a containment level 4 laboratory (3).

Routine Laboratory Tests

All laboratory testing will be performed using the hospital laboratory point of care devices. The range of tests is currently available includes ABGs, lactate, hemoglobin, electrolytes, PTT, urea and creatinine. Other lab tests will likely become available in the future. Blood cultures using closed system technology and malaria testing using PCR technology will be available. Point of care testing will NOT be done using ICU blood gas analyzers on patients with potential or proven EVD.

An updated list of available laboratory tests for patients with EVD can be found at:

Calgary EVD Patient Lab Testing
Edmonton EVD Patient Lab Testing

Laboratories must be informed of any specimens that may contain EVD so that appropriate transport and handling can be arranged. Specimens should be carried by gloved hand in appropriate containers and should not be sent by pneumatic tube, tray or other similar systems.

Alberta Receiving Sites for Patients with Probable, Suspected or Confirmed EVD

Patients in Alberta with suspected or proven EVD will only receive care in the following centers:

Calgary: Alberta Children's Hospital
Calgary: South Health Campus
Edmonton: Special Isolation Unit - University of Alberta Hospital GSICU (regardless of age)

Patients presenting at other centers will be stabilized and transported utilizing appropriate infection control procedures following discussion with MOH. Refer to provincial guidelines for transport of EVD patients.

General ICU Care/Admission of Probable, Suspected or Confirmed EVD Patients

Assessment and accommodation

Assessment of patients with definite or suspect EVD, irrespective of location, must be performed using recommended infection precautions.

1. EVD patients admitted to critical care will be cared for using Modified Contact and Droplet precautions. Contact and Droplet Precautions Suspect/Confirmed Viral Hemorrhagic Fever (VHF)
2. While EVD is not an airborne illness, due to the higher risk of aerosol generation in critically ill patients, admit seriously ill EVD patients to negative pressure rooms. Verify negative pressure system is functioning normally.
3. Ensure appropriate equipment and supplies are available.
4. Notify supply management of increased usage of protective supplies. Ensure the next shift is well stocked.
5. Use manual bagging unit with HME filter attached to the patient's bedside.
   Place large biohazard receptacles within the patient room. Ebola Waste Management Recommendations
6. Do not use linen hampers; linen to be disposed of in biohazard receptacles. Ebola Waste Removal - POSTER
7. If patient is intubated, place ventilator in room.
   If patient is not intubated, prepare oxygen delivery as ordered; do not move a ventilator into the room until needed.
   a. In ICU rooms where ventilators are mounted to articulating arms, if the ventilator is not required, double bag the ventilator with large plastic covers.
8. Stock IPC approved disinfectant wipes for EVD in patient room for cleaning equipment
9. Place log book for tracking staff entering patient room outside door. Room Entry Log
10. Ready isolation precautions – see Infection, Prevention & Control section.

Medication Management

1. Supplies and equipment should not be moved between isolation rooms and other areas of the unit/health care facility whenever possible.
2. Consider stocking a predetermined amount (i.e., one shift worth) of medication supply inside the patient room to reduce the need to exit and re-enter for medication administration.
3. Automated dispensing cabinet on isolation unit will be stocked as per critical care stock if entire unit is in lock down/isolation. Otherwise the automated dispensing cabinet will be stocked as per regular quotas.
4. Emergency/resuscitation drugs will be stored within immediate proximity but outside the patient room with other emergency supplies. See Code Blue section.
5. Requests from inside the room for unanticipated medications will be made to the clean designated staff outside the room, who will obtain and deliver medications using strict isolation precautions while maintaining negative room pressure.
6. Avoid nebulized medications whenever possible.

General Principles

1. The number of staff entering the room should be limited.
2. The door to all rooms must remain tightly closed at all times except to allow staff to enter or exit. If the patient is not in a negative pressure room, it is still important to keep the door closed.

Patient Room Supplies

1. Use disposable supplies wherever possible.
2. Disposable tempadot thermometers will be used thermistor
3. Additional supplies should be delivered by the additional runner staff to the room at the request of the in-room nurse/RRT.
4. All equipment should be kept in the patient's room to avoid transmission via objects.
5. Dedicate equipment to isolation room as much as possible. When not possible, clean and disinfect with hospital grade disinfectant after use prior to returning to general circulation.

Viral Hemorrhagic Fever VHF (Ebola) Guidance for Acute Care Settings Infection Prevention and Control

Ebola Waste Management Recommendations

Ebola Waste Removal – POSTER

Charting

1. Do not take the chart or laboratory results into the patient room.
2. Ensure dedicated workstation in clean area outside the patient room is available for

charting. Additional staffing is required to facilitate.
3. When necessary mobile computer terminals may be moved into the room for accessing the electronic health record. Cleaning and decontamination time should be considered when making the decision to bring devices into the patient room.
4. Use code blue standardized charting sheets or code navigator when a computer terminal is accessible.

Family Visitation

1. Access to patients with suspected or proven EVD is strictly restricted. Visitation to patients hospitalized with Ebola should be discouraged.
2. Before allowing visitors, they must be screened for exposure to and symptoms of EVD. Close contacts must self-isolate for 21 days after exposure. Public Health guidelines and close contact definitions: Alberta Public Health Ebola Management Guidelines (3).
3. Visitors should be limited to one adult family member who must be trained in the donning and doffing of PPE.
4. Consideration should be given to communication by phone, Skype or FaceTime if patient not seriously or critically ill.

Media Attention

1. Information is not to be provided to the media.
2. Refer all media calls to Media Relations.

Patient Confidentiality

1. Patient confidentiality to be protected.
2. Do not discuss clinical issues outside of the ICU or within open areas of the unit. Privacy Protection and Information Access

Injection Safety

Each patient should have *exclusively dedicated injection and parenteral medication equipment* which should be disposed of at the point of care.

1. Safety engineered devices should be available and used.
2. Syringes, needles or similar equipment should never be reused.
3. Limit the use of needles and other sharp objects as much as possible.
4. Limit the use of phlebotomy and laboratory testing to the minimum necessary for essential diagnostic evaluation and patient care.

Management of Sharps

If the use of sharp objects cannot be avoided, ensure the following precautions are observed:

1. Never replace the cap on a used needle.
2. Never direct the point of a used needle towards any part of the body.
3. Do not remove used needles from disposable syringes by hand, and do not bend, break or otherwise manipulate used needles by hand.
4. Dispose of syringes, needles, scalpel blades and other sharp objects in appropriate, puncture-resistant containers.

5. Ensure that puncture-resistant containers for sharps objects are placed as close as possible to the immediate area where the objects are being used (“point of use”) to limit the distance between use and disposal, and ensure the containers remain upright at all times.
6. If the sharps container is far, never carry sharps in your hand but place them all in a kidney dish or similar to carry to the sharps container.
7. Ensure that the puncture-resistant containers are securely sealed with a lid and replaced when 3/4 full.
8. Ensure the containers are placed in an area that is not easily accessible by visitors, particularly children.

Communication Once Admitted

1. All services that may come in contact with patient, or patient environment or wastes should be notified by Clinician/Charge Nurse.
2. Laboratory services should be notified of possible or confirmed diagnosis before any samples are sent to lab.
3. Infection precautions and PPE requirements will be clearly visible on patient’s room and designated staff will be available at all times to communicate around isolation PPE needs when coming into contact.
4. Provide communication and education about signs and symptoms of disease, appropriate control measures and correct PPE donning and doffing.
5. ICU Nurse Clinician/Charge Nurse will ensure Modified Contact and Droplet Isolation signage is in place outside the room. Unit staff member will ensure all persons entering the room are aware of isolation precautions and don appropriate PPE prior to entering the room.

Clear communication of correct handling and process for disposal of waste from patient room.

Staffing Considerations

N95 fit-tested 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

1. The principle is to minimize the number of staff involved directly with the patient while providing quality care.
2. All staff providing care must be successfully N95 fit tested and fully educated in use of PPE for EVD patients. EVD PPE training modules have been created and are available on MyLearningLink for AHS employees. These modules are also available for non-AHS employees on the IPC Personal Protective Equipment page.
3. Individuals who are unable to competently adhere to the IP&C recommendations for EVD (e.g., skin condition that precludes proper hand hygiene practices) should not provide care to suspected, probable or confirmed EVD patients. Staff members who fail fit-testing or who are not N95 fit-tested must not enter room.
4. Names and times of all staff and visitors entering room must be entered into log-book by the PPE monitor.

5. An experienced health care professional should be available 24/7 as PPE monitor.
6. Extra staff over and above the usual unit complement will be required.
7. The nurse in charge and the respiratory therapy supervisor are responsible to determine patient assignments and will coordinate care of all patients in the unit with the principle in mind that the total number of staff caring for a EVD patient should be kept to a minimum. If possible, cohort staff so that RNs and RRTs caring for EVD patients are not caring for non–EVD patients.
8. For students (medical or otherwise) working within an ICU, please check with current educational institution guidelines for any restrictions to practice or exposures.
9. Staff assignment lengths need to be determined by how long staff can tolerate wearing the required PPE to prevent fatigue, dehydration or overheating.
10. Staff should receive education about self-monitoring and grouping care activities within patient room to reduce number of incidences of entering and exiting patient's room.
11. IPC at each site will collaborate with critical care staff and review appropriate isolation precautions with all health care providers (HCP) as required.
12. Place patient in room and enter order "Modified Contact and Droplet Precautions".
13. The doors to the room should remain tightly closed.

Transport of EVD Critical Care Patients

1. Any transport of EVD patients should be minimized.
2. Only take patient out of room if they are free of virus or for life saving investigations and avoid transport unless absolutely essential. Always weigh the risk/benefit of transport.
3. Transport of patient should be limited to essential diagnostic and therapeutic procedures that cannot be carried out in the patient's room.
4. Maximize use of portable imaging, investigations and procedures. Some operative procedures may occur at the bedside rather then in an operating room.
5. Receiving area should be notified early so they can implement appropriate measures as directed by infection control.
6. All health care providers involved in transport must wear required PPE.
7. Transport with minimum number of people necessary.
8. Wipe the handles of the bed before transport with disinfectant wipes.
9. Clear halls and corridors prior to transport to minimize transit time.
10. One transport member will be required to stay clean to open doors and operate the elevator.

Portable oxygen canisters are to be used for all patients dependent on oxygen therapy that require transport. Use of wall connections at receiving departments are not to be used with EVD patients.

If the patient is intubated:

1. Transport using an in-line filter, in-line suction catheter and heat moisture exchange filter (HMEF).
2. Use of transport ventilators (with filtering systems) is preferred to minimize the need for manual bagging. If use of a transport ventilator is not possible, use a manual bagging unit (with PEEP valve).

3. RRT will manage airway and oxygen requirements.
4. Clean and disinfect transport ventilator after use and discard breathing circuit.
5. Ensure O_2 cylinder(s) and transport stretcher are cleaned per IP&C policies before returning to general circulation.

If the patient is not intubated:

1. Transport with non-humidified (dry) oxygen supply; RRT to identify the most appropriate oxygen delivery mask.
2. Patients should wear a procedure mask if tolerated.
3. Ensure O_2 cylinder(s) and transport stretcher are cleaned with disinfectant wipes before returning to general circulation.

Infection, Prevention and Control

EVD transmission to health care providers has usually been associated with patient care in the absence of appropriate PPE to prevent exposure to blood and other body fluids. Most staff acquiring infection in previous outbreaks had multiple contacts with multiple body fluids. The risk for person-to-person transmission of EVD is highest when aerosolized medical generating procedures, vomiting, diarrhea, and often hemorrhage, may lead to splash and droplet generation.

When selecting PPE for protection of healthcare providers, the potential exposure routes to be considered are:

1. Direct contact (through broken skin or mucous membrane) with blood or body fluids.
2. Indirect contact with environments or PPE contaminated with splashes or droplets of blood or body fluids.

It is imperative that the PPE provides a barrier of adequate coverage and integrity to prevent contact (direct or indirect) with contaminates. PPE must be maintained throughout all clinical/nursing procedures and following appropriate procedures for the removal and disposal or decontamination of potentially contaminated equipment by the wearer.

Due to the unpredictability of AGMP's or sudden exposure to patient body fluids, "dry" PPE is not recommended in critically ill patients.

ICU Accommodation

1. Both confirmed and probable cases of EVD should be immediately placed on Modified Contact and Droplet precautions.
2. A patient categorized as having suspected, probable or confirmed EVD should be accommodated in a negative pressure isolation room until the possibility of EVD has been ruled out. Although negative pressure capability is not needed for most patients, having the patient in an isolation room avoids needing to relocate the patient in the event of an aerosol generating procedure being required.
3. The patient room should have a dedicated toilet. If this is not possible, a dedicated commode chair will be placed in the patient room.

Isolation Set up and Resources

1. Prepare isolation cart.
2. Stock isolation cart with adequate supply of all PPE requirements, ensuring all types of N95 masks and all sizes of PPE are available. PPE Requirements for Suspect/Confirmed Viral Hemorrhagic Fever (VHF) (Ebola) (albertahealthservices.ca)
3. Post references for use and application and removal sequences of PPE outside and inside patient's room. VHF Donning and Doffing Area Setup

    - Viral Hemorrhagic Fever (VHF) Suspected or Confirmed Personal Protective Equipment Donning COVERALLS
    - Viral Hemorrhagic Fever (VHF) Suspected or Confirmed Personal Protective Equipment Doffing COVERALLS
    - Viral Hemorrhagic Fever (VHF) Suspected or Confirmed Personal Protective Equipment Donning FLUID IMPERVIOUS GOWN
    - Viral Hemorrhagic Fever (VHF) Suspected or Confirmed Personal Protective Equipment Doffing FLUID IMPERVIOUS GOWN
    - Viral Hemorrhagic Fever (VHF) Personal Protective Equipment Donning for Buddy
    - Viral Hemorrhagic Fever (VHF) Personal Protective Equipment Doffing for Buddy

4. Donning and doffing of PPE should be performed in areas that are physically separated and designated as clean (donning) and contaminated (doffing). Donning should always be done outside the patient's room and ante-room (if present). Doffing may take place in a large ante-room or outside the room. Wherever it is located, the doffing area should be frequently cleaned and decontaminated.

    - CHECKLIST VHF Suspected or Confirmed PPE Donning COVERALLS
    - CHECKLIST VHF Suspected or Confirmed PPE Doffing COVERALLS
    - CHECKLIST VHF Suspected or Confirmed PPE Donning FLUID IMPERVIOUS GOWN
    - CHECKLIST VHF Suspected or Confirmed PPE Doffing FLUID IMPERVIOUS GOWN
    - CHECKLIST VHF Suspected or Confirmed PPE Donning BUDDY
    - CHECKLIST VHF Suspected or Confirmed PPE Doffing BUDDY

5. Ensure canisters of disinfectant wipes inside and outside the patient room are adequately full. Order additional supplies as needed.
6. Ensure products for cleaning blood and body fluid spills and solidifying waste are in room.
7. A trained individual should be available continuously to monitor appropriate selection and application, removal and disposal of PPE, to observe and ensure HCP not contaminating self and to monitor entry to room (i.e., limit entry to only essential HCPs). A PPE Buddy staff member will be present to observe and assist with HCP PPE donning and doffing. The Buddy remains on the clean side while observing and helping. Buddy PPE will be donned and doffed according to the Buddy PPE donning and doffing sequences

For all aerosol generating procedures (AGMP) a fit-tested N95 respirator MUST be worn by all

HCP in the room. A list of AGMPs may be found using the Aerosol-Generating Medical Procedure Guidance Tool. When AGMPs are absolutely necessary (e.g. intubation), implement strategies to reduce risk to HCP.

1. AGMPs should be anticipated and planned for.
2. A physician with the necessary experience and skill should perform the AGMP procedure. This should be the most senior responsible physician, and should follow the principle of minimizing the number of staff involved.
3. The number of personnel in the room should be limited to those required to perform the AGMP.
4. AGMPs should be performed in negative pressure isolation rooms.
5. Appropriate room ventilation (i.e. level of air filtration and direction of air flow) should be maintained.
6. Fit tested respirators (seal-checked NIOSH approved N95 at minimum) should be worn by all personnel in the room during the procedure.

Refer to Respiratory section for specific airway recommendations.

Discontinuation of Precautions

Precautions will not be discontinued until IPC consults with a Medical IPC officer to determine when it is appropriate to discontinue precautions.

Code Blue for the Suspected, Probable or Confirmed EVD Patient

There is no data available for survival following CPR in EVD since the disease has only occurred in developing countries with no or little critical care resources. Patients with late stage proven EVD and progressive multi-organ failure have minimal expectation of survival if cardiopulmonary arrest occurs. Withholding CPR may be appropriate to avoid unnecessary risk to healthcare professionals.

Guiding Principles:

1. Point of Care Risk Assessment (PCRA) should be completed by all health care workers before initiating any resuscitation.
2. Minimize number of participants in the resuscitation area during resuscitation.
3. Minimize equipment in the resuscitation area wherever possible.
4. Contact and droplet precautions (including a fit-tested N95 respirator) shall be donned by all response team members, even if there is a perceived delay in resuscitation efforts.
5. Routine practices, such as defibrillation are otherwise unchanged from non-EVD patients.

Communication:

- Current paging/notification processes should be followed.

- Clear identification of isolation requirements should be made to the response team on arrival.
- Clear communication of current GOC status should be made to the responding resuscitation team members on arrival, where available/known.
- Upon arrival to the code, team members should quickly clarify roles and which members will be working inside versus outside the room.

Arrival to Code Blue:

- Ensure that PPE is readily available for responding team members and that there is an available "safety/logistics officer' to monitor donning/doffing. Since the availability of suitable PPE in enough quantities at the site of the arrest may not be guaranteed, the use of PPE pre-made kits should be considered, to travel with the response team or to be stored with code carts (where possible).
- Donning should be carried out quickly but meticulously, even if there is a perceived delay to resuscitation. If multiple individuals arrive at the same time, priority for donning and entering the room should be given to the Code Blue team leader and/or airway expert physician, and to the ICU RN (assuming compressors are already in place with appropriate PPE).

Inside the room:

- Code cart with defibrillator and arrest drugs should be brought into the room if feasible and if enough clean carts are available on site. The code cart may be left just outside the resuscitation area and the defibrillator and medication drawer may be removed and passed into the patient's room upon the resuscitation team's arrival.
- Intubation equipment:
    - Video laryngoscopy is highly recommended for the first attempt at intubation (where available).
    - Priority should be placed on intubation and obtaining a secure airway with closed ventilation, especially in an unresponsive patient.
    - If the patient has a laryngeal Mask Airway (LMA) in situ, it should be swapped to a cuffed endotracheal tube as soon as possible.
    - If manual bagging of the patient is required because of unsuccessful initial intubation (see below), it should be provided via a bag valve mask with a Heat Moisture Exchange Filter (HMEF).
    - When intubation is successful and manual bagging is required, it should be provided via a bag valve mask with a HMEF filter, capnograph (where available) and include placement of inline suction.
- Suggested response team members:
    - Code Blue Team Leader.
    - Airway expert physician (if available).
    - RRT to assist with intubation and ventilation.
    - RN to administer medications, cardioversion/defibrillation and update code blue team leader regarding changes in cardiac rhythm (ICU RN).
    - Health Care Worker (HCW) to do CPR (1) – Usually first responder.
    - HCW to do CPR (2).
    - RN for documentation and time-keeping.

Outside the room

- RN/HCW “runner”, to assist with supply of equipment stored on the unit and the activation of other HCWs, if required.
- “Logistic/Safety Officer”, who should be a senior HCW, to regulate access to the patient’s room, monitor proper PPE donning and doffing, ensure that protocols and the opening and closing of doors is followed and communicate with the ICU prior to the initiation of patient transport.

Modifications to Advanced Cardiac Life Support (ACLS) in EVD Patients

- Intubate patients early and hold CPR during intubation to minimize aerosolization of particles and optimize intubation success.
- The best pharmacotherapy for induction and intubation 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 neuromuscular blockade when clinically appropriate (e.g. no signs predicting difficult intubation).
- Manual bagging of non-intubated patients using a BVM should be avoided if possible. If necessary because of unsuccessful initial intubation, use two experienced practitioners to establish an intact seal and minimize the risk of aerosolization.
- Avoid disconnections between the ETT and resuscitation bag. If required due to gas trapping, the plan to disconnect should be announced loudly in advance and the ETT should only be disconnected beyond the HMEF filter.

Post-Arrest

- PPE Doffing: DO NOT RUSH. BE METHODICAL. Remove PPE slowly and carefully to avoid inadvertent contamination of yourself or others, performing hand hygiene in between each step while doffing.
- Logistic/safety officer to monitor member PPE doffing.
- Team to decontaminate specialty equipment as per standard routines and IP&C guidelines.
- Discard any opened supplies or any that cannot be cleaned appropriately.

Charting Considerations:

- Computer code narrator may be utilized with existing computers within the room or immediately outside the resuscitation room.
- No portable computer devices should be brought into the room unless absolutely required.
- All efforts to maintain a clean paper chart should be taken.

Respiratory Care

Pulmonary involvement of Ebola is not a common feature of the disease, however respiratory failure may occur in these patients requiring mechanical ventilation. Secondary causes of respiratory failure may include (but are not limited to) shock, fatigue from prolonged compensation of metabolic acidosis, aspiration, and iatrogenic complications (e.g. transfusion-related lung injury or volume overload). Airway management may be required independent of respiratory failure for airway protection purposes, with situational examples including decreased level of consciousness or massive upper GI bleeding (6).

The basic principles are to always use appropriate isolation precautions and minimize aerosol-generating procedures.

For Non-Intubated Patients:

1. Provide O_2 as ordered with continuous SpO_2 monitoring.
2. Patients should be cared for with the head of bed elevated 30-45 degrees.
3. Minimize use of sedative and analgesic therapies (other than for palliative care).
4. No peak flow monitoring.
5. Nebulization should be avoided.
6. Bronchodilator delivery via MDI via spacer is preferred if patients can effectively utilize.
7. Heated humidified high flow (HHHF) oxygen therapy devices (AIRVO, Opti flow or Vapotherm) should not be employed in these patients.
8. Non-invasive mask ventilation (CPAP or BiPAP) should not be employed in these patients.

Pro-active intubation under less emergent conditions is the preferred strategy and should be considered.

Intubation Guidelines:

Moderate to severe hypoxemic respiratory failure/ARDS usually requires support with endotracheal intubation and 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.
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 for induction and intubation 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 neuromuscular blockade when clinically appropriate (e.g. no signs predicting difficult intubation).
8. Consider use of visual technological devices (e.g., video laryngoscope) for the initial attempt at intubation (to reduce the risk of aerosol contact by reducing the need to look directly down the airway); however, MRHP should use the technique most familiar to them that will ensure the greatest probability of successful intubation.
9. Place in-line suction catheter on in all patients. Use either HMEF or heated humidity systems (if they are fixed integral system of a particular ventilator).
10. 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.

For Intubated Patients:

1. Bronchodilator delivery should only be provided via MDI and spacer. Nebulizers should not be used.
2. Use in-line suction only for all ventilated patients. Avoid any open suctioning.
3. Bronchoscopy is to be avoided, if possible, as it is considered to be high risk for aerosolization of secretions and potential transmission of EVD. If it needs to be done, the patient should be in a negative pressure room with staff wearing full PPE including N95 respirator.
4. Humidity should be preferentially provided via in-line HME devices or via integral ventilator humidification systems. Avoid use of external active/heated humidity systems unless necessary

Extubation Guidelines:

Extubation of patients is an AGMP. Careful consideration should be given to the safety of HCWs during the extubation procedure and to reduced reintubation rates. Follow best practice.

Medical Care/Therapeutics

Consult the Ebola Clinical Care Guidelines: A Guide for Clinicians in Canada for more information (6).

The mainstay of treatment is supportive care, which includes careful attention to intravascular volume status and oral or intravenous fluid therapy, correction of electrolyte and metabolic abnormalities, correction of coagulation abnormalities, nutritional support, and antibiotics for

secondary bacterial infections. Although robust data are still lacking, anecdotal experience from EVD patients treated both Africa and 'Western' health care systems during the current outbreak suggests that the mortality rate associated with EVD can be significantly reduced through the provision of supportive care, and in particular critical care (6, 7).

There is currently no Health Canada approved treatment for EVD. A number of investigational therapeutics, namely antivirals and monoclonal antibodies, are currently under development. Additionally, limited trials have assessed existing medications for efficacy against Ebola viruses (6,7).

Although clinical trials for some of these investigational therapies have shown positive results, none have yet reached the point of application for approved use in Canada. These include the monoclonal antibody cocktails (e.g., ZMapp, REGN3470-3471-3479, mAb 114), as well as antiviral medications (e.g., Favipiravir, GS-5734) (6,7).

If a confirmed case occurs in Canada, the Public Health Agency of Canada (PHAC), in coordination with the province or territory, will provide guidance to the treating physician regarding the availability and access to investigational products, including monoclonal antibodies and vaccine, through the appropriate regulatory mechanism (6,7).

Handling of Patient Care Items and Equipment

Viral Hemorrhagic Fever VHF (Ebola) Guidance for Acute Care Settings Infection Prevention and Control

1. Equipment must be dedicated to the patient or, preferably, disposable/single use.
2. Any reusable equipment must be dedicated to the room for the duration of the patient stay. No equipment will be removed from the room until discharge/transfer.
3. Cleaning and disinfection, using an AHS approved disinfectant with a broad spectrum virucide claim (e.g., 0.5% accelerated hydrogen peroxide or 1000ppm bleach), will be done with the direction of IPC.
4. Handle soiled or used linens with minimal agitation and place directly in biomedical waste containers. All soiled linens will be disposed of in biomedical waste containers.
5. Bag and seal patient belongings on admission. These items are to remain with patient. Disposition of items will be determined on a case-by-case basis in consultation with IPC.
6. Use disposable dishes/cutlery if available; discard in biomedical waste container after use. Non-disposable dishes/cutlery if used must be discarded in biomedical waste container after use.
7. To minimize the removal of contaminated items from the patient room and limit the movement of support staff in and out of the patient room handling of linen, waste and dishes has been modified from the usual Contact and Droplet Precautions.

Environmental Cleaning

Contain biomedical waste (e.g., sponges, dressings and surgical drapes soaked with blood or secretions) in biomedical waste containers. Use solidifying powders along with disposable bedpans, urinals and emesis basins and dispose of solidified blood, suctioned fluids, excretions and secretions into biomedical waste containers.
Ebola Waste Management Recommendations
Ebola Waste Removal – POSTER

Care of the Deceased

Consult the MOH immediately upon death for detailed direction on the management of the deceased body. PPE Requirements for Suspect/Confirmed Viral Hemorrhagic Fever (VHF) must be maintained when handling and transporting the deceased. Body must be placed into an AHS approved body bag. Consult the MOH immediately upon death for detailed direction on the management of the deceased body.

Body Handling Protocol: EVD
Acute Care Deceased Body Algorithm

Care of the Deceased Patient with Potential / Proven Viral Hemorrhagic Fever: Calgary Department of Critical Care Medicine

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