

Viral Hemorrhagic Fever (VHF)

Including Ebola, Lassa, Marburg, and Crimean-Congo Viruses

Site Applicability

All PHC Acute Care Sites.

Practice Level

Basic with additional training: Physicians, NPs, Nursing, Clinical Nurse Leader, Clinical Site Coordinator, Bed Placement Coordinator, EVS, and Laboratory Staff

Standards

Prior to care for a patient with known or suspected VHF, healthcare workers (HCWs) must be trained in necessary infection control procedures, including specific donning/doffing procedures for personal protective equipment (PPE). Refer to the LearningHub course [Infection Control Precautions for High Threat Pathogens](#).

In addition to Routine Practices, [Airborne and Contact Precautions](#) plus [Droplet Precautions](#) (for eye protection) will be initiated for all patients with known or suspected viral hemorrhagic fever (VHF).

A private, negative pressure airborne infection isolation room (AIIR) with anteroom is required.

- At SPH ED the patient should be placed in Acute Care 1 - Room 3
- At MSJ ED the patient should be placed in Acute Care - Room 7
- If the patient is in a facility without an AIIR, then the patient will be transferred to a facility with the appropriate environmental controls.

Patients who present with suspected VHF should not have bloodwork or other diagnostic tests ordered in Cerner prior to assessment by IPAC/Medical Microbiologist on call.

A log book to record each individual/HCW who enters the room/has contact with the patient must be maintained.

Description of the Disease

VHFs are severe multisystem syndromes characterized by fever, malaise, myalgia, and coagulation problems often accompanied by bleeding. VHFs can rapidly progress to multi-organ failure, shock, and death. VHFs are mainly caused by members of four different families of RNA viruses – arenaviruses (e.g. Lassa fever, LCMV), filoviruses (e.g. Ebola, Marburg), bunyaviruses (e.g. Hantavirus, Crimean-Congo

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haemorrhagic fever), and flaviviruses (e.g. Yellow Fever, Kyasanur Forrest disease); as well as other viruses (e.g. Rift Valley fever, Hendra Virus disease, Nipah Virus encephalitis). Humans are not natural reservoirs for any of these viruses and all these diseases are zoonosis (animal host or arthropod vectors), however human-to-human & nosocomial transmission does occur, especially when in contact with infected blood or body fluids.

Between 2014 and 2016, the largest recorded outbreak of Ebola virus affected the Western African countries of Guinea, Liberia, Nigeria and Sierra Leone. The second largest outbreak took place between 2018 and 2020, mainly in the Democratic Republic of the Congo.

VHFs do not occur naturally in Canada. Individuals who present to PHC facilities with signs and symptoms of VHF will be travellers who have returned from countries with known VHF cases (within three weeks of returning to Canada) or contacts of these travellers. It is important to consider non-VHF co-diagnoses/alternative-diagnoses when approaching patients with potential VHF (e.g. malaria, meningococemia, DIC, etc.) as travellers who have returned from countries with known VHF cases are also endemic for non-VHF conditions.

Incubation Period

The incubation period varies with each type of VHF, from 2 to 21 days after contact with the virus, with an average of 8 to 10 days.

Period of Communicability

Cases are not considered communicable before the onset of symptoms. From the onset of symptoms, communicability increases as the severity of illness progresses, and the case remains infectious as long as blood and body fluids contain the virus or until all the symptoms resolve.

Routes of Transmission

Transmission of the virus occurs by direct or indirect contact with blood, body fluids, and respiratory secretions of the infected individual. The risk of exposure to blood or other body fluids and the opportunity for virus aerosolization increases as the patient's condition deteriorates. Parenteral exposure has been associated with a higher risk of transmission. Risk of transmission can be either:

- **Lower Transmission Risk** - Includes persons under investigation and confirmed VHF patients without diarrhea and vomiting - patient's body fluids are contained (usually early stage or convalescing stage of VHF; may be referred to as "dry").
- **Higher Transmission Risk** - Includes persons under investigation or confirmed VHF cases where copious body fluids are contaminating the environment (usually later stages of VHF; may be referred to as "wet").

Populations at Risk

Individuals who had recent contact with an individual with known or suspected VHF or who has travelled to an area where VHF transmission is active.

Assessment and Intervention

Case Definition

A possible case is defined as a patient presenting with following symptoms **and** risk factors:

- 1) Clinical criteria, which include fever of greater than 38 degrees Celsius **OR** at least one of 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, or erythematous maculopapular rash on the trunk; **AND**
- 2) Epidemiologic risk factors within the past 21 days before the onset of symptoms, such as contact with blood or other body fluids or human remains of a patient known to have or suspected to have VHF (e.g., individual who cared for a case of VHF, laboratory worker handling body fluids from a case of VHF, sexual contact of VHF case or a household contact); residence in or travel to an area where VHF person-to-person transmission is active; direct handling of bats, rodents, or primates from disease-endemic areas, or tick bites from disease endemic areas.

Triaging Patients Suspected of VHF and Initial Actions

Triage Nurse:

Assess if the patient meets the case definition:

In the last 21 days prior to symptom onset, has the patient been in a region with active VHF circulating (as of December 2022, includes: UGANDA)?

AND

Does the patient present with any of the following: fever, malaise, fatigue, headache, rash, abdominal pain, vomiting/diarrhea, bleeding, shortness of breath?

If YES:

- 1) Initiate **Airborne and Contact and Droplet** precautions. Provide patient with a medical mask.
- 2) Place patient in **Room 3 at SPH** or **Room 7 at MSJ** (if not available, then use an alternative airborne infection isolation room while preparing the designated room listed previously)
- 3) DO NOT ENTER BLOODWORK OR OTHER DIAGNOSTIC TESTS INTO CERNER**
- 4) Notify:
 - i. CNL/ED physician
 - ii. IPAC (69357). If after hours, call Medical Microbiologist on call through switchboard
 - iii. Stores (68130) to deliver "Ebola Cart". SPH: Page porter 34505 (7 am to 11 pm); MSJ: Page 78317 (7 am to 3 pm); After hours: call Security to help with access
- 5) Proceed with triage procedures only after appropriate PPE has been donned

Infection Control Practitioner:

- 1) Collect clinical and epidemiological risk factors from ED triage nurse and confirm that additional precautions are in place
- 2) Call IPAC physician
- 3) Notify IPAC team
- 4) Go to the ED to assist staff
- 5) Inform EVS of potential cleaning/disinfection needed:
 - SPH Supervisor: 604-817-2787
 - MSJ Supervisor: 604-817-3973

IPAC Physician/Medical Microbiologist On Call:

- 1) Verify with ED that patient meets criteria for investigation and confirm that additional precautions are in place
- 2) Gather clinical information and ensure Infectious Diseases consult is requested STAT
- 3) Initiate call with BCCDC Medical Microbiologist on call who will activate the first huddle with Public Health/Medical Health Officer
- 4) Work with IPAC team to coordinate in person supports. Pending ICP support, ED staff and any staff going into isolation room will follow PPE donning/doffing procedures with peer support
- 5) Notify laboratory **PRIOR TO** bloodwork being collected:
 - i. Call SPH Core Lab Supervisor directly (63222) or MSJ (78266) **AND** email PHC SPH LAB Urgent Notification: phcsphlaburgentnotification@providencehealth.bc.ca
 - ii. Lab diagnostics:
 - Phlebotomist collects blood at SPH. Blood is NOT collected at MSJ
 - Blood Cultures (2 sets, 4 bottles in one venipuncture), 1 Lithium and 1 EDTA whole blood tube for limited heme/biochemical panel (Malaria rapid test & thin smears, Hemoglobin, estimated WBC & Platelets; Electrolytes, Glucose, Urea, Creatinine, Calcium, ALT, AST, ALK, Bilirubin, Total Protein, Albumin)
 - 2 EDTA whole blood tubes for Ebola virus PCR test
- 6) Call SPH Clinical Coordinator (604-992-0547) or MSJ Clinical Coordinator (604-499-6935) to activate operational requirements if necessary

Note: Direct caregivers are to be limited to a small number of individuals familiar with the care and management of these patients. HCWs entering the room should be kept to a minimum, and a log book to record each individual who enters the room/has contact with the patient must be maintained. Students and trainees are not to be included in the care team.



Infection Control Precautions

- **Additional Precautions:** In addition to Routine Practices, [Airborne and Contact Precautions](#) plus [Droplet Precautions](#) (for eye protection) will be initiated for patients with known or suspected VHF. The most responsible nurse will ensure Airborne and Contact as well as Droplet Precautions are ordered in Cerner and post the appropriate signs on the door.

Precautions will remain in place until direction is given by IPAC and the VCH MHO to discontinue. See the [Recommendations for Isolation Precaution Step Down and Discharge of Persons Under Investigation or Confirmed Ebola Virus Disease Patients](#).

- **Personal Protective Equipment (PPE):** Prior to care of VHF patients, HCWs must be trained in infection control procedures, including specific VHF-related PPE donning/doffing procedures (see LearningHub course [Infection Control Precautions for High Threat Pathogens](#); hands on training should also be completed). If a HCW elects to go above the prescribed N95 respirator and chooses to wear a Powered Air Purifying Respirator (PAPR), they should complete [PAPR training](#) and also the [Infection Control Precautions for High Threat Pathogens \(PAPR\)](#) LearningHub course.

Disposable PPE should be used wherever possible. To reduce the risk of infection, HCWs working with suspected or known VHF patients should have no skin exposed. Selection of PPE may be guided by whether or not the risk of transmission is lower or higher (note that a fit-tested N95 respirator should always be used in place of a medical mask). Follow the [Donning and Doffing Recommendations](#) for the appropriate transmission risk category (see also the associated [Donning and Doffing Posters](#) for visual depiction of procedure). PPE must be donned prior to entering the patient's room and doffed in the exit room/space.

The PPE donning/doffing process involves three roles (see below), and each role will be located in different "zones" - the "cold" zone outside the main patient room (e.g., the entrance anteroom or hallway) used for PPE donning; the "hot" zone where the patient is located; and the "warm" zone at the exit room/space where PPE doffing occurs.

1. **Trained observer** - remains in the cold zone and guides the donning and doffing of PPE using [Donning and Doffing Checklist](#), reads aloud step-by-step instructions while filling in the checklist, and notes any breaches
2. **PPE donning/doffing assistant** - works in the cold and warm zones and provides hands on assistance to the HCW entering the room, communicates with trained observer, and participates in cleaning and decontamination
3. **HCW entering the patient room** - works in all three zones (cold, warm, and hot) and dons/doffs PPE per verbal instructions from the trained observer, accepts assistance from donning/doffing assistant, and reports any breaches



PPE will be stocked on designated “Ebola/VHF PPE carts”, which are to be requested from stores (carts available at SPH and MSJ). Ensure that cart equipment has not exceeded the manufacturer’s expiration date before use. PPE carts should include:

- Fluid-impermeable knee-high leg and foot coverings
 - Rubber boots
 - Fluid-impermeable long sleeved disposable gowns with length that reaches mid-calf
 - Bouffant caps
 - Fit-tested N95 respirators
 - PAPR equipment
 - Fluid-impermeable head coverings/hoods
 - Full face shields
 - Long cuff gloves
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- **Hand Hygiene:** An alcohol based hand rub is the preferred method of hand hygiene, unless hands are soiled in which case soap and water should be used. Hands must be cleaned before donning PPE. Hands must be cleaned frequently during the doffing procedure as per the Donning and Doffing Recommendations mentioned above.
 - **Patient Placement:** Patients with suspected or known VHF must be placed in an AIIR with an anteroom and ideally its own bathroom. At SPH ED, patients should be placed in Room 3. At MSJ ED, patients should be placed in Room 7. Ensure negative pressure is functioning properly. If the patient is in a facility without an AIIR, then the patient will be transferred to a facility with the appropriate environmental controls.
 - **Aerosol Generating Medical Procedures:** Whenever possible, avoid Aerosol Generating Medical Procedures (AGMP) for patients with suspected/confirmed VHF. The use of CPAP and BIPAP are strongly discouraged. In situations where an AGMP is absolutely required (e.g., intubation), the number of HCWs during the procedure should be minimized. Additional Precautions and use of PPE as outlined above must be followed. Environmental cleaning will be conducted 1 hour after the procedure, and trained personnel will collect equipment that are not disposable for appropriate disinfection as per PHC MDRD policies.
 - **Equipment:** Remove any unnecessary equipment prior to placing the patient in the room. Use single-use, disposable equipment whenever possible. Any reusable, non-critical equipment that is to be brought into the patient room must not leave the room again until VHF has been ruled out (in which case normal cleaning and disinfection is appropriate) or the patient with confirmed VHF has been moved out of the room. Consider bringing designated communication equipment into the patient room (e.g., white board and dry-erase marker or walkie-talkie with one device in the room and another outside).



- Before taking medical equipment into an isolation room, all devices should have a clearly visible tag attached. This tag should have a unique identification number that can be used at all stages to record significant events (e.g., contamination events, stages of cleaning, etc.). The tag identifies the device as having been used in an EVD isolation room and should not be removed until the device has been approved for return to general service.
- As there is a possibility the device may not be able to be adequately cleaned and disinfected, and therefore, never return to normal use, it is recommended that older devices (those nearing the end of the service lifespan) should be used where practical.
- All reasonable steps should be taken to avoid the possibility of the device or its peripheral components becoming contaminated while in service. These measures should be consistent with the requirements of the device for safe operation. Special attention is required for ventilation and heat dissipation, which can become critical, particularly under extended periods of use. Some examples of preventive measures include:
 - Locating devices away from the patient (bedside monitors should be above and behind the patient, ventilators should be as far behind the patient as practical, etc.)
 - Placing plastic bag(s) or shrouds around ultrasound transducers and imaging plates.
 - Placing protective plastic covers over devices and monitors.
- Cleaning and decontamination of equipment requires full PPE and should follow the procedure of cleaning, disinfection and interspersed quarantine stages outlined in the [Cleaning and Decontaminating Medical Equipment from Ebola Virus Disease Isolation Rooms Guideline](#). IPAC will inform Biomedical Engineering prior to equipment cleaning/disinfection when there was risk of VHF virus contamination. Any piece of equipment that cannot be adequately cleaned and decontaminated must be discarded.
- **Environment:** Environmental cleaning is to be a shared responsibility between nursing and environmental services (EVS) staff with a goal to minimize the number of staff entering the patient's room. See the [Environmental Services Guideline](#) and [Environmental Services SOP](#) for specific cleaning instructions.

Nursing staff will be required to perform daily environmental cleaning of the patient room and a second clean of high touch surfaces while the patient is admitted as well as the first clean after patient discharge/transfer. Any spills or contamination with blood or body fluids should be cleaned promptly. If a mop and bucket are used, they must be kept in the patient room and the contents of the bucket emptied into the hopper in a manner that minimizes aerosolization. Disposable mop heads and cleaning cloths are preferred.



EVS staff will clean the anteroom and exit room/space daily as well as a final terminal clean after the preliminary discharge/transfer clean is complete. IPAC will liaise with the EVS managers to ensure adherence to cleaning protocols and PPE for EVS staff.

- **Food:** All food must be delivered with disposable dishes and cutlery and brought into the room by trained clinical staff in full PPE.
- **Waste/Linen:** Prior to the patient entering the room, the regular garbage and waste receptacles should be replaced by two large blue drums lined with two red biohazard bags (one drum in the patient room and one in the exit room/space) and a sharps container. If a blue drum is not yet available, a large 20 litre red bucket can be used, which is then placed into the blue drum once available. Drums should be labelled and full drums stored in a secure, designated holding area.

Needles and other sharps should be used and disposed of in accordance with recommendations for safe sharps use into the puncture proof sharps container.

All medical waste and soiled linen from the patient room (including 3/4 full sealed sharps containers) should be handled with minimal agitation and will be placed in the blue drum. The blue drum in the exit room/space will be used for doffed PPE and disinfectant wipes/products. Once the blue drum is 3/4 full, do not compress the contents of the drum. The bags should be zip tied and lid placed on the drum and sealed. Follow the process for replacing the blue drums in the [Waste Management SOP](#) and see the full [Waste Management Guideline](#) for additional details.

Human waste such as urine, feces, or vomitus can be disposed of in the sanitary sewer (i.e., toilet in the patient room). Care should be taken to avoid splashing when disposing human waste. An alternative option would be to use disposable hygiene products that can be discarded into the blue drums. No human waste should be taken out of the patient room.

- **Visitors:** Visitors will be limited to family members, and need approval from attending physician and IPAC. In most cases, visitors should not enter the room of a patient with suspected/confirmed VHF and alternative communication methods should be provided. In exceptional circumstances where visitors do enter the patient care space, visitors must sign the log book. Education should be provided regarding hand hygiene and PPE. Assist visitors to wear PPE and how to remove/discard PPE. Visitors will be asked to follow-up with their local Public Health department regarding self-monitoring for symptoms on a daily basis until a predetermined number of days after their last contact with the patient. Visitors should be aware to minimize contact with others as directed by Public Health.



- **Patient Transport:** Transportation within the hospital is to be kept to a minimum, limited to essential purposes only, and done in a way to minimize exposure to patients and employees, (e.g., perform bedside imaging whenever possible and/or feasible). During transport, the patient will wear a procedure/surgical mask.

For inter-facility transfers, follow the [BC Ebola Virus Disease Transportation Policy](#). The decision to transfer to a higher level care facility will be made by the MHO and the IPAC physician/MRPs and coordinated by the BC Patient Transfer Network.

- **Management of Close Contacts:** All patient and HCW contacts will be identified and followed by IPAC and Workplace Health under the direction of the Vancouver Coastal Health. Persons with percutaneous or mucocutaneous exposure to body fluids should immediately wash the affected area with soap and water. Mucous membranes should be irrigated with copious amounts of water or eyewash solution. HCW with an unprotected exposure (e.g., patient contact without recommended PPE) should immediately stop working, and inform their supervisor and Occupational Health and Safety for evaluation and follow-up. Exposed persons should receive medical evaluation and follow-up care, including fever monitoring twice daily for 21 days after exposure. Consultation with an infectious disease expert and/or Medical Health Officer is recommended for exposed persons who develop fever within 21 days of exposure.
- **Handling of Human Remains:** Handling the body of a deceased patient with suspected or known VHF should be minimized. Full PPE for a higher transmission risk scenario should be used, and PPE should be changed as many times as needed if it has become contaminated with blood or body fluids (following full PPE donning/doffing procedures). Do not remove any lines/tubes/devices. Do not wash or clean the body. Sensitive communication to the family of the deceased that religious/ritual preparation of the body, washing, dressing, viewing, touching or kissing of the deceased are not allowed. No testing for VHF viruses should be conducted, and autopsies should not be performed. Once sealed, do not reopen the body bag. Follow the procedure below and see the [Guidelines for the Management of Human Remains](#).
 - At the site of death, wrap the body in the patient's linen. Leave all intravenous lines or endotracheal tubes in place. Do not wash or clean the body. Change PPE as many times as needed if it has become contaminated with blood or body fluids.
 - Place the body into a leak-proof body bag and close the zipper. Place the body into a second leak-proof body bag and close the zipper.
 - Perform surface decontamination of the outer body bag by removing any visible contamination using an approved hospital grade disinfectant wipe. Once clean, wipe down the outer body bag again with a new disinfectant wipe and allow to air dry.
 - Label outside of the bag with indication of "highly infectious material".
 - Do not open the body bag. The body should remain at the site of death pending coordination with the MHO and funeral home who will bring a casket to the site of the deceased (i.e., do not transfer to the morgue).

Lab Testing

Due to the potential risks associated with handling infectious materials, laboratory testing should be limited to the minimum necessary for essential diagnostic evaluation and patient care. The Laboratory Physician or Medical Microbiologist on-call will be responsible for designating responsible laboratory personnel, including trained phlebotomist.

All laboratory testing for patients with suspected VHF will be done at the St. Paul's Hospital laboratory. If the patient is admitted to Mount Saint Joseph Hospital, no bloodwork or laboratory tests should be collected. Consult with the Medical Microbiologist on call in this case.

IPAC physician to notify laboratory **PRIOR TO** bloodwork being collected:

- Call SPH Core Lab Supervisor directly (63222) or MSJ (78266) **AND** email PHC SPH LAB Urgent Notification: phcsphlaburgentnotification@providencehealth.bc.ca
- Lab diagnostics:
 - Phlebotomist collects blood at SPH. Blood is NOT collected at MSJ
 - Blood Cultures (2 sets, 4 bottles in one venipuncture), 1 Lithium and 1 EDTA whole blood tube for limited heme/biochemical panel (Malaria rapid test & thin smears, Hemoglobin, estimated WBC & Platelets; Electrolytes, Glucose, Urea, Creatinine, Calcium, ALT, AST, ALK, Bilirubin, Total Protein, Albumin)
 - 2 EDTA whole blood tubes for Ebola virus PCR test (testing performed at the National Microbiology Laboratory)

Specimen collection and handling must be performed by trained laboratory staff as per the current PHC Laboratory VHF/EVD SOP. Phlebotomists will follow required PPE donning/doffing procedures as listed previously.

Treatment

Treatment is largely supportive and will be directed by the MRP and consulting services.

Transfer/Discharge Planning

- The decision to transfer to a higher level care facility will be made by the MHO and the IPAC physician/MRPs. Follow the [BC Ebola Virus Disease Transportation Policy](#).
- Notify the BC Patient Transport Network and receiving facility/hospital involved in the patient's care of their status.
- For discharges, follow the [Isolation Precaution Step Down and Discharge of PUI or Confirmed Ebola Guideline](#).

Documentation

- Ensure orders for Airborne and Contact and Droplet Precautions are in patient's Cerner chart.
- Maintain a list of all HCWs and individuals who have contact with the patient in a log book.
- Trained PPE observers should record donning/doffing procedure of HCWs on a checklist.
- Equipment should be tagged with a unique identification number prior to being placed in the patient's room.

Related Documents

PHC Guidelines and Resources:

- [B-00-07-13084](#) - Airborne and Contact Precautions - Infection Control
- [B-00-07-13030](#) - Droplet Precautions - Infection Control
- [LearningHub Course 17683](#) - Infection Control Precautions for High Threat Pathogens
- [LearningHub Course 17945](#) - Infection Control Precautions for High Threat Pathogens (PAPR)
- [LearningHub Course 29984](#) - Fundamentals of Powered Air Purifying Respirators

Office of the Provincial Health Officer Ebola Guidelines:

Cleaning and Disinfection of the Equipment, Environment, and Food and Linen Management:

- [Cleaning and Decontaminating Medical Equipment from Ebola Virus Disease Isolation Rooms](#)
- [Environmental Services, Biohazardous Waste Management, and Food and Linen Management for Ebola Virus Disease \(EVD\)](#)
- [Environmental Services, Biohazardous Waste Management, and Food and Linen Management for Persons under Investigation and Confirmed Cases of Ebola Virus Disease: Standard Operating Procedures](#)

Transportation, Management of Human Remains, and Isolation Step Down:

- [Ebola Virus Disease Transportation Policy \(2020\)](#)
- [Ebola Virus Disease Guidelines for the Management of Human Remains \(2015\)](#)
- [Isolation Precaution Step Down and Discharge of Persons Under Investigation or Confirmed Ebola Virus Disease Patients \(2020\)](#)

Personal Protective Equipment:

- [Personal Protective Equipment Guidelines \(2016\)](#)
- [Donning and Doffing Checklist Higher Transmission Risk \(2016\)](#)
- [Donning and Doffing Checklist Lower Transmission Risk \(2016\)](#)
- [Donning and Doffing Recommendations Higher Transmission Risk \(2016\)](#)
- [Donning and Doffing Recommendations Lower Transmission Risk \(2016\)](#)



- [Donning and Doffing Training Poster: Higher Transmission Risk \(2014\)](#)
- [Donning and Doffing Training Poster: Lower Transmission Risk \(2014\)](#)

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First Released Date:	19-MAR-2003
Posted Date:	19-DEC-2022
Last Revised:	13-DEC-2022
Last Reviewed:	13-DEC-2022
Approved By: <i>(committee or position)</i>	PHC
	IPAC Standards Committee
Owners: <i>(optional)</i>	PHC
	IPAC