



Office of the
Provincial Health Officer

Recommendations for Donning (putting on) and Doffing (taking off) Personal Protective Equipment for Health Care Workers during the Management of Confirmed Cases of Ebola Virus Disease **Higher Transmission Risk Scenario**

Provincial Ebola Expert Working Group

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This document provides expert guidance to those using personal protective equipment while providing care for patients who are being investigated or treated for Ebola virus disease (EVD), and to those training health care workers on the use of personal protective equipment (PPE). This document deals specifically with the necessary PPE for use in high transmission risk scenarios, defined as:

Caring for patients under investigation (PUI – defined as anyone with EVD-compatible symptoms not attributed to another medical condition **AND** a potential exposure to Ebola virus in the 21 days prior to symptom onset) or confirmed EVD patients, with copious body fluids contaminating the environment (usually in the later stages of EVD).

This document details what PPE a health care worker should wear when providing care in a higher transmission risk scenario, and how to put on (don) and take off (doff) PPE safely. It also details administrative and environmental considerations for preventing transmission. A companion document provides recommendations for lower transmission risk scenarios. An expert advisory team is available 24/7 for guidance in assessing transmission risk, and should be consulted if in doubt.

A. Preamble

While the probability of Ebola virus disease (EVD) in British Columbia is low, it is essential that health care workers are prepared to safely and effectively care for patients. Preparedness relies on clear algorithms and clinical process, appropriate personal protective equipment supply and deployment, and appropriate training for staff in the processes and equipment.

This guidance has been developed by infection control experts from across B.C. through the Expert Clinical Working Group under B.C.'s Provincial Ebola Taskforce. Guidance is aligned with the recommendations of the B.C. Provincial Health Officer, the Public Health Agency of Canada, and the US Centers for Disease Control and Prevention.

B. Guiding Principles

1. Along with the safety and care of patients, health care worker safety is of paramount importance.
2. To prevent the transmission of infection, personal protective equipment (PPE) represents one type of control, along with administrative controls and environmental/engineering controls. Each type of control is equally important and must act as complementary parts in a system.
3. To reduce the risk of infection, health care workers working with confirmed or suspected EVD patients should have no skin exposed.

These recommendations were developed based on the following evidence and best practices learned from other organizations and jurisdictions (World Health Organization, US Centers for Disease Control and Prevention, and from communication with Emory Hospital, Atlanta, Georgia).

1. Ebola is spread through direct contact (via broken skin or mucous membranes) with the blood/body fluids of an Ebola-infected person, or with items contaminated with blood/body fluids containing Ebola. Every effort should be made to avoid direct contact with infectious materials.
2. Disposable PPE should be used. In cases where disposable materials are not available, equipment should be cleaned in compliance with the manufacturer's recommendation, or discarded after one use.
3. Prior to patient care of confirmed or suspected EVD patients, health care workers should be trained in infection control procedures, including specific EVD-related donning/doffing procedures.
4. Donning and doffing PPE should be performed in a designated area and always under the direction of a trained observer. A doffing assistant must be used in any high risk transmission scenarios.
5. When doffing PPE, the most contaminated equipment should be removed first, working towards the least contaminated.
6. PPE should not be adjusted during patient care. If any breach in PPE occurs during patient care, the health care worker should move to the doffing area to investigate the breach, and follow the institutional exposure process.
7. If PPE become grossly contaminated during the provision of care, the health care worker should exit the room, follow the correct PPE doffing procedure, and don clean PPE before continuing care.
8. The highest risk of exposure exists while doffing the PPE, particularly around the mucous membranes of the face. Health care workers should remove the PPE slowly and follow the guidance of the trained observer. Assistants should don appropriate PPE prior to engaging.

C. Recommended Administrative and Environmental/ Engineering Controls to Support Safe PPE Use

Administrative Controls:

1. Designate personnel responsible for the implementation of PPE protocols and training in each care area.
 - a. Interim protocols and recommendations should be developed and regularly reviewed to reflect evolving knowledge and understanding.
 - b. Health care workers should be trained in appropriate institutional infection control protocols prior to caring for suspected patients, including but not limited to PPE donning/doffing.
 - c. Health care worker training must be documented.
 - d. A trained observer with a checklist to guide the health care worker through the donning and doffing process is required.
2. Staff Working with Suspect or Confirmed EVD Patients
 - a. Increased staffing will be required to meet the anticipated increase in workload.
 - b. Health care workers entering the room must be kept to an absolute minimum. Students, medical care teams and other personnel not essential to that patient's care must not enter the room. Repeated physical exams by medical staff are discouraged unless clinically warranted. One physician should examine the patient while the rest of the medical team remains outside the room. More information can be found in the Recommended Staffing for EVD Patients document. See the Provincial Health Officer's Ebola website at:
<http://www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/current-health-topics/ebola>.
 - c. Health care workers caring for patients under investigation (PUI) or confirmed EVD cases should self-monitor for symptoms on a daily basis, with direction from public health and workplace health. If caring for someone where EVD is subsequently ruled out, continued monitoring is no longer necessary.
 - d. Health authorities/hospitals must keep a daily record of all health care workers who enter the room of a PUI or confirmed EVD patient, or have any contact with waste generated by these patients.

3. Triage, Assessment and Disposition

- a. An algorithm for screening patients and immediately managing a PUI or confirmed EVD is available on the Provincial Health Officer's Ebola website at:
<http://www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/current-health-topics/ebola>.
- b. An assessment of risk should be performed when evaluating the level of preventive measures required for a given clinical situation in a given care area.

Environmental/Engineering Controls:

1. Patient Rooms and Antechambers

- a. Designate an isolation room with the following features for the assessment and management of PUI and confirmed EVD patients. It may not be feasible to have all of these features given institutional infrastructure.
 - i. A dedicated washroom is essential given the mode of transmission of Ebola.
 - ii. A negative pressure room with an antechamber is preferred. If this is not available, provide care in a room with the door closed.
 - iii. An intercom is ideal.
- b. Large observation windows are ideal
- c. Facilities Maintenance and Operations should assess HVAC systems in areas that may care for PUI or confirmed EVD patients. Air exchanges should be adjusted to their optimal level.
- d. There should be designated donning and doffing areas. These areas may vary based on institutional infrastructure.
- e. Ideally, designated donning areas should be different than designated doffing areas. If this is not possible, a clear separation of spaces is required.

D. Recommended Personal Protective Equipment (PPE)

For high transmission risk PPE, **two equally effective options** are included due to realities of supply and the comfort of health care workers wearing them over a prolonged period. However, high transmission risk PPE is more complex, and safe use of this PPE requires that health care workers have been well trained in donning and doffing.

Note to trainers: If Option 1 is available in your health authority, please train on this option. If not, please train on Option 2 until the supply of Option 1 is available.

Option 1:

1. Scrubs and socks (disposable if available, non-disposable scrubs will be discarded).
2. Provided rubber boots.
3. Long-sleeved, cuffed, fluid-impermeable gown (see Appendix A for definition of “fluid impermeable”).
4. Fluid impermeable surgical hood.
5. Face shields – full face shield.
6. Fit-tested N95 respirator.
7. Fluid-impermeable leg and foot covering for all exposed areas below the gown.
8. Double gloves – long cuff gloves, first pair under and second pair over gown.
9. Additional Supplies:
 - a. Alcohol-based hand rub.
 - b. Disinfectant wipes.
 - c. Shuffle pit with disinfectant fluid.
 - d. Absorbent pads.

Option 2:

1. Scrubs and socks (disposable if available, non-disposable scrubs will be discarded).
2. Provided rubber boots.
3. Powered Air Purifying Respirator (PAPR).
4. Fluid-impermeable coveralls.
5. Impermeable outer apron (optional).
6. Two pairs of long nitrile gloves (chemical resistant).
7. Additional supplies:
 - a. Alcohol-based hand rub.
 - b. Disinfectant wipes.
 - c. Shuffle pit with disinfectant fluid.
 - d. Absorbent pads.

E. Recommended Donning Procedures for PPE

Option 1

Prepare for donning PPE:

1. Remove personal clothing and all personal items. Eyeglasses may be worn.
2. Perform hand hygiene with alcohol-based hand rub.
3. Securely tie back hair if required.
4. Change into hospital scrubs and socks.

In designated donning area:

1. Engage trained observer. The trained observer may enter the anteroom and observe the health care worker donning process.
2. Inspect PPE prior to donning.
3. Put on fluid-impermeable knee-high leg and foot coverings.
4. Put on rubber boots.
5. Perform hand hygiene with alcohol-based hand rub and allow hands to dry.
6. Put on a fluid-impermeable long sleeved disposable gown of sufficient length to reach mid-calf.
7. Put on bouffant cap.
8. Put on N95 respirator (staff must have been fit tested within the past year to determine the appropriate size N95 respirator). Straps go over the bouffant cap. If prescription eyeglasses are worn, ensure that they do not interfere with the seal of the N95 on the face.
9. Put on fluid-impermeable head covering, ensuring it covers all of the hair and the ears, and that it extends past the neck to the shoulders.
10. Perform a N95 respirator seal check.
11. Put on full face-shield.
12. Perform hand hygiene with alcohol-based hand rub.
13. Put on a pair of long inner gloves. Ensure the inner gloves are under the cuff of the gown sleeve.
14. Put on a pair of long outer gloves. Pull the glove completely over the cuff of the gown sleeve.
15. You and the trained observer must agree that the PPE is on correctly, with no gaps that expose skin or mucous membranes.

Option 2 [Powered Air Purifying Respirator (PAPR) with Coveralls]:

Prepare for donning PPE:

1. Remove personal clothing and all personal items. Eyeglasses may be worn.
2. Perform hand hygiene with alcohol-based hand rub.
3. Securely tie back hair if required.
4. Change into hospital scrubs and socks.

In designated donning area:

1. Engage trained observer. The trained observer may enter the anteroom to observe the health care worker donning process.
2. Verify PAPR check has been performed as per manufacturers recommendations and training.
3. Inspect PPE prior to donning.
4. Put on coveralls up to the waist.
5. Put on rubber boots. Pull coveralls over top of boot so the boot is underneath the cuff of the leg of the coveralls.
6. Put on the top portion of the coveralls.
7. Zip the coveralls up. Remove the adhesive strip backing at the bottom portion of the coveralls and seal the coveralls completely.
8. Slide the belt of the PAPR through the clasp and secure. Ensure belt is snug and the blower unit is secure against the small of health care worker's back. Using the clip, secure the loose end of the belt.
9. Reaching behind, grasp the loose end of the breathing tube and insert fully into the hole on the headpiece until a click is heard.
10. Turn on the PAPR.
11. Put on PAPR hood, ensuring it fully drapes down over shoulders.
12. If applicable for the type of hood used, secure PAPR hood ties on both left and right side by tying into a bow.
13. Perform hand hygiene with alcohol-based hand rub and allow hands to dry before moving to the next step.
14. Put on a pair of inner gloves. The inner gloves must be underneath the cuff of the sleeve.
15. Put on outer gloves, pulling the glove over top of the cuff of the coverall sleeve.
16. You and the trained observer must agree that the PPE is on correctly, with no gaps that expose skin or mucous membranes.

Note on Aerosol Generating Medical Procedures (AGMPs)

Aerosol generating medical procedures pose a separate risk from the risk of EVD from exposure to blood or body fluids because of the risk of production of aerosols which may be inhaled. PPE required for AGMPs in higher transmission risk patients is the fit tested N95 respirator or Powered Air Purifying Respirator, which is already part of the higher risk PPE kit.

In addition, the following principles should be used for AGMPs.

- ▶ AGMPs should be avoided on patients suspected or confirmed to have EVD.
- ▶ If AGMPs are absolutely necessary (e.g., endotracheal intubation), implement strategies to reduce aerosol generation. These include:
 - AGMPs should be anticipated and planned for.
 - Appropriate patient sedation should be used.
 - The number of health care workers in the room should be limited to those required to perform the AGMP and those highly skilled in performing the required task.
 - AGMPs should be performed in an airborne infection isolation room (also referred to as a negative pressure room).
 - Appropriate ventilation (e.g., number of air changes, level of air filtration and correct direction of air flow) should be maintained.
 - Single rooms (with the door closed and away from other patients) should be used in settings where airborne infection isolation rooms are unavailable.
 - Fit tested, seal checked respirators (NIOSH approved N95 at minimum) should be worn by all health care workers in the room during an AGMP.
 - Closed endotracheal suction systems should be used wherever possible.

F. Recommended Doffing Procedure for PPE

Recommended PPE for Doffing Assistants:

A doffing assistant will be used during this stage, as this represents the highest risk of contamination. The person providing assistance should don the following PPE:

1. Fluid-impermeable gown.
2. Two pairs of long nitrile gloves (chemical resistant).
3. Surgical/procedure mask.
4. Full face-shield.
5. Fluid-impermeable foot coverings.
6. Bouffant cap is optional.

The assistant should doff selected PPE according to the same procedures outlined below. The assistant should disinfect their outer gloves with a disinfectant wipe or alcohol-based hand rub prior to doffing their PPE.

Recommended PPE Doffing Procedures:

Option 1

In patient room:

1. Engage trained observer. Trained observer to notify PPE doffing assistant. While observing the health care worker doffing procedure, the trained observer may not enter the doffing area and should observe from a designated room separated from the doffing area, but with good visual and voice contact. If this is not possible, the trained observer may be separated from the health care worker by an appropriate partition that provides the necessary physical separation.
2. Before entering the PPE removal area, inspect PPE.
3. Disinfect gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.
4. Stand in the shuffle pit. The shuffle pit will be located inside the patient room, adjacent to the door to the PPE removal area. Stand in the shuffle pit filled with disinfectant solution for one minute.
5. Step out of shuffle pit onto disposal absorbent mat.
6. Wipe door handle with a new disinfectant wipe and exit the patient room into the PPE doffing area.

In the designated PPE removal area:

1. Step onto disposable absorbent mat.
2. Wipe down external surface of boots. Remove boots and place boots in designated reprocessing bin.
3. Inspect the knee-high leg and foot covers to assess for visible contamination. If visibly contaminated, disinfect entire leg cover surface using a disinfectant wipe.
4. Inspect outer gloves' outer surfaces for cuts or tears. If outer gloves are cut or torn, notify trained observer.
5. Disinfect outer-gloved hands with a disinfectant wipe or alcohol-based hand rub and wait for one minute. Remove and discard outer gloves, taking care not to contaminate inner gloves during removal process.
6. Inspect and disinfect inner gloves. Inspect the inner gloves' outer surfaces for cuts or tears.
7. If an inner glove is cut or torn, remove the inner gloves and wash hands well with soap and water on bare hands, and don a clean pair of gloves. **This is a breach.**
8. If no cuts or tears are identified on the inner gloves, disinfect the inner gloved hands with a disinfectant wipe and wait for one minute.
9. Remove the face shield by tilting your head slightly forward and pulling it over the head using the rear strap. Allow the face shield to fall forward and discard in biohazardous waste container.
10. Disinfect inner gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.

11. Remove head covering. Carefully grasp outer surface of hood behind head and gently roll-up hood. Tilt head forward, close eyes and remove hood by pulling towards front of face. Place in biohazardous waste container.
12. Disinfect inner gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.
13. Untie side strap of gown. Do not reach behind neck to release the Velcro neck snap. Instead, remove gown by pulling away from the body, rolling inside out and being careful to avoid contaminating inner clothing. Place in biohazardous waste container.
14. Disinfect inner gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.
15. Remove knee-high leg and foot coverings. Place leg and foot coverings in biohazardous waste container.
16. Disinfect inner gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.
17. Remove inner gloves and dispose in biohazardous waste container.
18. Carefully perform hand hygiene with alcohol-based hand rub.
19. Put on a pair of new gloves (does not need to be long type).
20. Remove N95 respirator by straps. Do not touch the front of the respirator. Discard in biohazardous waste container.
21. Disinfect gloves with disinfectant wipe or alcohol-based hand rub and allow to dry.
22. Disinfect designated stool with disinfectant wipes.
23. Roll absorbent mat and discard in biohazardous waste container.
24. Disinfect gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.
25. Remove gloves and discard in biohazardous waste container.
26. Carefully perform hand hygiene with alcohol-based hand rub or clean sink.
27. If personal eyeglasses were worn into the room, put on a new set of gloves, and disinfect them with a disinfectant wipe.
28. Doffing assistant (if employed) to vacate PPE doffing area.
29. Perform a final inspection for any indication of contamination of the hospital scrubs or otherwise on the body.
 - a. If there **is** evidence of contamination in doffing area, remove scrubs and dispose in biohazardous waste. Put on a clean set of scrubs and walk to shower area. Discard these clean replacement scrubs in regular garbage. **This is a breach.**
 - b. If there **is not** any evidence of contamination, walk to changing area to remove scrubs, and place these in regular garbage. Don a new set of scrubs.
30. Shower facilities should be available for health care workers performing high-risk patient care.

Option 2 (PAPR with coveralls)

1. PPE doffing is performed in the PPE removal area (anteroom or enclosure).
2. Place all PPE waste in a biohazardous waste container.
3. A trained observer must be present to observe and provide direction to the staff during the doffing process by reading out and verifying each and every step.
4. The person providing assistance should don appropriate PPE prior to doing so.

In patient room:

1. Engage trained observer. Trained observer to notify PPE doffing assistant. While observing the health care worker doffing procedure, the trained observer may not enter the doffing area and should observe from a designated room separated from the doffing area, but with good visual and voice contact. If this is not possible, the trained observer may be separated from the health care worker by an appropriate partition that provides the necessary physical separation.
2. Before entering the PPE removal area, inspect PPE.
3. Disinfect outer gloves with disinfectant wipe or alcohol-based hand rub and allow to dry.
4. Stand in the shuffle pit located inside the patient room, adjacent to the door to the PPE removal area. Stand in the shuffle pit filled with disinfectant solution for at least one minute.
5. Step out of shuffle pit onto absorbent mat.
6. Wipe door handle with a new disinfectant wipe and exit the patient room into the PPE doffing area.

In PPE removal area (anteroom or enclosure):

1. Step onto disposable absorbent mat.
2. Remove and discard apron (if using), taking care to avoid contaminating gloves by rolling the apron from inside to outside.
3. Following apron removal, inspect the PPE ensemble to assess for cuts or tears.
4. Inspect the outer gloves' outer surfaces for cuts or tears. If outer gloves are cut or torn, notify trained observer.
5. Disinfect outer gloves with disinfectant wipe or alcohol-based hand rub and wait one minute. Remove and discard outer gloves, taking care not to contaminate inner glove during removal process.
6. Inspect and disinfect inner gloves: inspect the inner gloves' outer surfaces for cuts or tears.
7. If an inner glove is cut or torn, remove the inner gloves and wash hands well with soap and water on bare hands, and don a clean pair of gloves. **This is a breach.**
8. If no cuts or tears are identified on the inner gloves, disinfect the inner-gloved hands with a disinfectant wipe and wait one minute.
9. Turn off PAPR.
10. Disconnect breathing tube from hood.
11. Untie hood ties (if applicable). Untie both the left and right hood ties.
12. Remove hood. This step requires the health care worker to sit on the clean stool. Doffing assistant to carefully grasp the straps and pinch the outside surface of the hood at the back. With the other hand, doffing assistant to grasp the breathing tube connection on the back of the hood. With the health care worker leaning slightly forward, doffing assistant to pull hood forward and off the health care worker. Dispose hood in biohazardous waste container.

13. Remove and dispose of breathing tube cover (if used) in biohazardous waste container.
14. Unbuckle PAPR belt and place blower unit, breathing tube, belt and battery directly into designated reprocessing bin.
15. If stool was used, wipe entire surface with disinfectant wipe.
16. Disinfect inner gloves with disinfectant wipe or alcohol-based hand rub and allow to dry.
17. Remove coverall, with assistance if required. Remove zipper flap, unzip and slowly remove the coverall, rolling it downward and away from the health care worker (inside out) until it is below the top of the boot. Avoid contact of scrubs with outer surface of coverall during removal, touching only the inside of the coverall.
18. Step out of coverall and boots onto a clean surface. Discard coverall in biohazardous waste container. Place boots in designated reprocessing bin.
19. Disinfect inner-gloved hands with disinfectant wipe or alcohol-based hand rub and allow to dry.
20. Remove and discard gloves, taking care not to contaminate bare hands during removal process.
21. Perform hand hygiene with alcohol-based hand rub or a clean sink.
22. If personal eyeglasses were worn into the room, put on a new set of gloves and disinfect them with a disinfectant wipe
23. Doffing assistant to vacate PPE doffing area.
24. Perform a final inspection for any indication of contamination of the hospital scrubs or otherwise on the body.
 - a. If there **is** evidence of contamination in doffing area, remove scrubs and dispose in biohazardous waste. Put on a clean set of scrubs and walk to shower area. Discard these clean replacement scrubs in regular garbage. **This is a breach.**
 - b. If there **is not** any evidence of contamination, walk to changing area to remove scrubs, and place these in regular garbage. Don a new set of scrubs.
25. Shower facilities should be available for health care workers performing high-risk patient care.

G. Procedure for Suspected PPE Breach

1. If a breach in PPE is suspected and there has been exposure to a patient's body fluids, go to designated doffing area immediately. **Remain calm and work slowly through each step outlined in this document.**
2. Work with trained observer to remove PPE as per the step-by-step instructions above for doffing PPE, taking care to avoid any further self-contamination.
3. If exposed area is intact skin, wash the affected area well with soap and water.
4. If exposed area is a mucous membrane or eye, flush the area with generous amounts of water.
5. If a percutaneous injury occurs, do not promote bleeding by squeezing the wound and do not soak the wound in bleach or disinfectant. Wash the area with soap and water.
6. Immediately follow your health authority protocol for reporting exposure.

Note: In most regions, report the exposure immediately by calling workplace health. If it is after hours, call the medical health officer on call to report the breach and receive further instructions.

References

Centers for Disease Control and Prevention. Guidance on Protective Equipment to be used by Healthcare Workers During Management of Patients with Ebola Virus Disease in U.S. Hospitals, Including Procedures for Putting On (Donning) and Removing (Doffing). Available at:
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