Infection Prevention and Control Measures for

Prehospital Care and Ground Transport of Patients with Suspected or Confirmed Ebola Virus Disease

PROTECTING AND EMPOWERING CANADIANS TO IMPROVE THEIR HEALTH

Public Health Agency of Canada | Agence de la santé publique du Canada

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FOREWORD

This document provides infection prevention and control (IPC) guidance for safe prehospital[a] care and ground transport of suspected persons under investigation (PUI) or confirmed Ebola virus disease (EVD) cases[1]. Its use is intended for prehospital personnel including, but not limited to, medical first responders, paramedics, emergency ground transport personnel, firefighters, enforcement officers, and personnel within prehospital organizations responsible for education and training for occupational health and safety (OHS) and IPC. The term prehospital personnel when used in this document refer to these personnel.

The guidance is based on currently available scientific evidence, standards and regulations, and adopts a precautionary approach where the evidence is lacking or inconclusive. It is subject to review and change as new information becomes available.

The IPC measures provided in this guidance are based on the Public Health Agency of Canada's Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control for Ebola Virus Disease[2], Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings[3], and Hand Hygiene Practices in Healthcare Settings[4].

The guidance should be read in conjunction with relevant local, provincial, territorial and federal legislation, regulations, and policies, and **adapted to local requirements as necessary**.

For information related to risk of transmission and public health (PH) management of cases and contacts of EVD refer to Public Health Management of Cases and Contacts of Human Illness Associated with Ebola Virus Disease[5].

[a] Prehospital includes acute emergency patient assessment and care delivered in a variety of settings, such as during patient transport and in the community (e.g., on the street, in the home, and other settings) at the beginning of the continuum of care.

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ENGINEERING CONTROL MEASURES

Engineering controls are those elements of the organization's infrastructure that function to prevent exposure to and/or transmission of the infectious agent, such as the Ebola virus, at the source, or along the path of the hazard.

Examples of engineering controls related to prehospital care and transporting suspected/confirmed EVD patients include the following:

- Use of designated emergency vehicles dedicated to a single patient; ensure thorough cleaning and disinfection following use. Refer to Cleaning and Disinfection of Transport Vehicle section.
- Removal of nonessential equipment from designated vehicle as part of vehicle preparation. Avoid contamination of reusable porous surfaces not designated for single use[6].
- Cover the stretcher with an impermeable material. Use a stretcher mattress and pillow with plastic or other covering that fluids cannot penetrate[6].
- Method of isolation measures to prevent blood and body fluid exposure for transport dependent upon point-of-care risk assessment and source control. Refer to Point-of-Care Risk Assessment and Source Control sections.
- Performing aerosol-generating medical procedures (AGMPs) only when absolutely necessary, controlling the situation as much as possible, i.e., performed prior to transport. Refer to Source Control section.
- Safety-engineered needles and needleless systems.
- Point-of-use sharps containers.
- Sufficient IPC supplies (e.g., personal protective equipment (PPE), disinfectant, hand hygiene products including point-of-care alcohol based hand rub, separate dedicated biohazard waste and linen receptacles, blood and body fluid containment products such as disposable absorbent pads, continence products) and other essential supplies and equipment for the duration of the transport.
- Provide ready-to-use (non-spray) or commercially prepared wipes to use for immediate cleaning and disinfecting of surfaces that become potentially contaminated during transport. Refer to Cleaning and Disinfection of Transport Vehicle section.

ADMINISTRATIVE CONTROL MEASURES

Administrative controls include policies, procedures, education, training and patient care practices intended to prevent exposure to and/or transmission of an infectious agent during the provision of care and transport. To be effective in preventing transmission of EVD and/or detecting cases of EVD, administrative controls must be implemented from the first encounter with a suspected case and continue until the patient is accepted into a receiving hospital. Ineffective or inconsistent application of administrative controls may lead to unnecessary exposure.

Examples of administrative controls for prehospital care and transport of a patient with suspected or confirmed EVD include the following:

- Screening protocols for EVD risk factors and EVD compatible symptoms during prehospital call assessment.
- Prehospital response (type and scope) based on call assessment/triage to identify suspected or confirmed patients.
- Ongoing education and training about routine practices and additional precautions including but not limited to prehospital call assessment/triage, point-of-care risk assessment, use of PPE including enhanced PPE, notification/communication, source control, personnel recommendations, hand hygiene, patient movement, sharps safety, patient equipment, cleaning and disinfection of equipment and transport vehicle, and handling waste and linen.
- Protocols for prehospital care and safe transport of suspected or confirmed EVD patients including prompt initiation of isolation measures and appropriate selection and use of PPE, including enhanced PPE based on a risk assessment, as outlined in the Agency's Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control for Ebola Virus Disease[2] and organizational requirements.
- Assigning a trained monitor to coach and monitor proper use, putting on and removing PPE.
- Specialized training including drills in the selection, application, use, removal and disposal of PPE.
- Protocol for containing and disposing of body fluids, (e.g., urine, stool, emesis) including the use of disposable bedpan/urinal with the addition of a solidifier and disposed of as waste, during the transport of the patient. Refer to Appendix 1. Ebola Virus Disease: Management of Waste and Environmental Cleaning for Prehospital Care and Ground Transport.
- Respiratory Protection Program.
- Limiting the number of prehospital and transport personnel to the minimum required to safely provide care and transport.
- Monitoring and maintaining a log of all personnel involved in prehospital care and transport.
- Personnel recommendations, including protocols for determining personnel fitness to provide direct care to suspected or confirmed EVD patients and protocols for incident management (including breach in PPE, post exposure and first aid). Refer to Prehospital and Transport Personnel Recommendations section.

- A protocol to address vehicle breakdown during transport.
- A protocol to address critical interventions and/or issues such as need to stop the vehicle to manage breach of PPE, personnel exposure, or personnel requirements for bathroom breaks during extended transports.

ROUTINE PRACTICES

Routine practices are the IPC measures that should be applied in the routine care of all patients, at all times, in all healthcare settings, including prehospital care. Routine practices are determined by performing a risk assessment, taking into consideration the circumstances of the patient, the patient care environment and the task to be performed.

Routine practices outlined in this document include: call assessment/triage, point-of-care risk assessment, use of PPE including enhanced PPE, notification/communication, source control, personnel recommendations, hand hygiene, patient movement, sharps safety, patient equipment, cleaning and disinfection of transport vehicle, and handling waste and linen.

PREHOSPITAL CALL ASSESSMENT/TRIAGE

- When calls are assessed by a dispatcher from individuals concerned about Ebola, the following questions as per the Algorithm for Screening and Assessment for Ebola Virus Disease (EVD) in Persons Presenting to Healthcare Settings[7] should be asked to identify a suspected EVD case:

  1. Within the previous 21 days, has the person lived in or travelled to a country with widespread Ebola transmission OR had contact with a person suspected or confirmed to have EVD:

     ✓ **If YES, enquire about EVD compatible symptoms:**

     - Does the person have a fever: subjective or ≥38°C (if measured)

     OR

     - Does the person have at least one of the other EVD compatible symptoms: 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[1]

     If YES, to either enquiry about EVD compatible symptoms (i.e., person under investigation (PUI)/suspected patient) above, the dispatcher must inform prehospital personnel that an EVD response is required.

     ✓ **If NO to both symptom-based enquiries:**

     - Usual prehospital service/care should be provided.

POINT-OF-CARE RISK ASSESSMENT

- A point-of-care risk assessment (PCRA) should be performed prior to every interaction with a suspected or confirmed EVD patient (or contact with their care environment) to protect personnel from exposure to the Ebola virus (i.e., contact with or sprays of blood or other body fluids, respiratory tract or other secretions or excretions and used needles and other sharps). For details refer to the Agency's Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control for Ebola Virus Disease[2].
- A PCRA should also be performed to determine requirements for PPE and other IPC measures when responding to patients with EVD compatible symptoms (i.e., PUI/suspected EVD patient).
- Only one prehospital responder should approach the patient and perform the initial PCRA from at least one meter away from the patient. If EVD is suspected, PPE should be put on before entering the scene[6].
- Prehospital response to a suspected or confirmed EVD patient where patient's body fluids are contained (i.e., personnel who have no direct contact with body fluids) will require the following PPE: gloves, fluid-resistant or impermeable gown, fluid-resistant mask with eye goggles or fluid-resistant mask with face shield. Head and neck coverings and foot and leg coverings are not required.
- The need for enhanced PPE is determined by assessing the increased risk of exposure to blood and other body fluids (e.g., patient is vomiting, has diarrhea, and/or is bleeding). Note: In late stages of EVD, copious secretions and excretions should be anticipated. In this situation, enhanced PPE that will cover all exposed skin should be worn.
- Enhanced PPE **provides coverage to ALL exposed skin** and includes the following: double gloves, fluid-resistant or impermeable body coverings(including foot and leg coverings), head and neck coverings (such as surgeon's head covering), gown or hazardous material suit, fluid impermeable apron, facial protection (fluid-resistant mask with eye goggles or fluid-resistant mask with facial shield), and a respirator for AGMP. Note: When enhanced PPE is required to care for a patient with EVD, the preferred eye protection would be a face shield long enough to prevent splashing underneath.

PERSONAL PROTECTIVE EQUIPMENT

- For details on selection and use of PPE refer to Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control for Ebola Virus Disease[2].
- The type of PPE and the sequence for putting on and removing PPE may vary slightly depending on organizational needs and preferences. Each organization must develop comprehensive policies and procedures for putting on and removing PPE with a clear goal of reducing the possibility of self-contamination.
- Personnel must be trained in the principles of safe and effective PPE use, including safely putting on and removing PPE.
- PPE must be put on correctly before entering the patient care/isolation area. Refer to Source Control section.

- PPE must remain on and be worn correctly for the duration of prehospital patient care, transport or when in contact with the patient's potentially contaminated care environment.
- PPE should not be adjusted during patient care.
- If a breach in PPE occurs, personnel should immediately stop patient care, initiate PPE removal process with the assistance of the monitor and remove themselves from the patient care/isolation area. Refer to Prehospital and Transport Personnel Recommendations.
- Personnel must have sufficient and undisturbed time to put on and remove PPE correctly, observed by a monitor.
- Removal of PPE requires a structured and monitored process and must be done slowly and carefully. **Removal may present a high-risk for self-contamination if not done properly.**
- PPE must be provided and put on outside the patient care/isolation area. PPE should be put on and removed in separate areas.
- A trained, tested and drilled monitor must be assigned to coach, observe and monitor appropriate selection, application, removal and disposal of PPE, to avoid potential contamination of personnel and the area outside of the patient care/isolation area.
- Those who do not wear PPE must not have contact with the patient or the patient care/isolation area.
- Those involved with moving the patient into and out of the transport vehicles must wear PPE.
- The driver of the transport vehicle should only wear PPE when in contact with the patient or their designated care/isolation area. If PPE is worn it should be removed (as outlined above) prior to operating the vehicle, in order to prevent contamination of the vehicle. The the driver does not need to wear PPE to operate the vehicle.

NOTIFICATION/COMMUNICATION

- The receiving hospital and PH should be notified as soon as a need for patient transport is determined.
    - Upon arrival to the receiving hospital, and prior to entry, transport personnel must ensure that the emergency department is ready for the patient.
    - The receiving hospital should notify PH of the arrival of a symptomatic person compatible with EVD or confirmed EVD case.
- Prehospital personnel should inform household members who shared the residence to not have further contact with items contaminated with blood or body fluids of the patient, and to not leave the residence until PH has contacted them with further information and instruction.
    - Household members who shared the residence should be advised to perform hand hygiene (HH) if they had contact with the patient's blood or body fluids.

SOURCE CONTROL

- The transport vehicle should be dedicated to a single patient. The stretcher should be covered with impervious material.
- The patient should wear a mask, if tolerated, to contain droplets. If a mask is not tolerated, advise the patient to use tissues to contain respiratory secretions and to cover nose and mouth during coughing or sneezing, with prompt disposal into a plastic-lined biohazard waste receptacle.
- Patients should be instructed and/or assisted with performing HH after contact with blood or body fluids (e.g., after use of toilet, using tissues for respiratory secretions, vomiting).
- If AGMP are absolutely necessary (e.g., endotracheal intubation), the following strategies to reduce aerosol generation are recommended:
    - AGMP should be anticipated and performed prior to transport whenever possible.
    - Appropriate patient sedation should be used.
    - The number of personnel in the patient care/isolation area should be limited to those required to perform the AGMP and to those highly skilled in performing the required task.
    - Household members should not be in the patient care/isolation area during an AGMP.
    - Fit-tested, seal-checked respirators (NIOSH) approved N95 at a minimum should be worn by all personnel in the patient care/isolation area during an AGMP.
    - Closed endotracheal suction systems should be used wherever possible.
- If point-of-care risk assessment indicates the potential for blood and body fluid exposure during transport (i.e., patient is vomiting, has diarrhea, and/or is bleeding) use methods to contain fluids (i.e., use continence products and place absorbent pads under the patient) to prevent exposure of personnel and contamination of emergency vehicle.
    - If patient is vomiting, assist them by providing a biohazard receptacle to contain the emesis.
- A designated patient care/isolation area should be established in the back of the transport vehicle and patient movement and patient care is to be restricted to this area.
    - Personnel wearing PPE should remain in this area.
- A risk assessment approach should be used to determine the type of PPE to use. Refer to Point-of-Care Risk Assessment section.
- Only essential personnel with appropriate PPE should enter the patient care/isolation area.
- A log should be maintained to monitor all persons entering and exiting the patient care/isolation area.
- Supplies should be stored outside the patient care/ isolation area. Plastic-lined biohazard waste receptacle should be placed inside the isolation area.
- Clean PPE and supplies should be stored in a designated area outside of the EVD patient care/isolation area.

- Space in the patient care/isolation area should be provided to allow monitoring of personnel by a trained monitor during personnel-patient interaction.
- If a portable, single Patient Isolation Unit (PIU) is considered for use to isolate the patient during transport, the following measures are recommended:
    - The patient should be assessed to determine their suitability for transport in a PIU (i.e., consider body morphology, potential for patient vomiting, having diarrhea, and/or bleeding, intubation/ventilation needs, and psychological safety and comfort).
    - Method for management of body fluids (e.g., emesis, feces, urine, blood) should be determined.
    - The PIU should be large enough for the patient to turn to the side to protect their airway if there is a possibility of the patient vomiting during transport. As PIUs may use safety belts to secure patients, assessment should include patient's ability to turn on own or with the safe assistance of personnel.
    - The PIU should provide re-sealable portals for allowing personnel to assist the patient as needed, including airway management (i.e., intubation/ventilation).
    - Personnel should have specific education and training in assessing the patient's suitability for transport in a PIU and the appropriate use of PIU's according to manufacturer's instructions including measures to reduce the risk of contaminating the unit, self and patient care area.
    - Used PIUs should be disposed of into EVD waste following use rather than cleaning and disinfection for reuse due to high risk of exposure to personnel and the ineffectiveness of complete cleaning and disinfection related to the PIUs construction.

PREHOSPITAL AND TRANSPORT PERSONNEL RECOMMENDATIONS

- Personnel should consult with OHS or delegate or primary physician if there are concerns related to fitness of personnel to provide direct care. For details/examples of such conditions, refer to the Agency's Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control for Ebola Virus Disease[2].
- Personnel should be aware of countries with travel advisories for EVD, signs and symptoms of EVD, appropriate control measures, and the need to self-monitor while caring for suspected/confirmed cases of EVD and for 21 days following last contact with an EVD patient (including being available to PH). Refer to WHO Global Alert and Response[8] webpage for frequent updates.
- Personnel must inform OHS or delegate and PH if symptoms arise.
- Eating or drinking should not occur in areas where direct patient care is provided.
- Personnel should avoid touching the mucous membranes of their eyes, nose and mouth to prevent self-contamination.
- Personnel should report potential occupational/community exposure to EVD (i.e., direct exposure without appropriate PPE, a breach in safely removing PPE, percutaneous injuries) to immediate supervisor, OHS or delegate and PH.

- First aid should be performed immediately if there has been exposure to blood or other body fluids.
    - The exposure should be reported immediately to the manager/supervisor and OHS or delegate and immediate medical attention should be obtained.
    - The site of a percutaneous injury should be thoroughly rinsed with running water (e.g., using a water bottle) and any wound should be gently cleansed with soap and water.
    - Exposed mucous membranes of the eyes, nose or mouth should be flushed with copious running water (e.g., using a water bottle) if contaminated with blood, body fluids, secretions or excretions.
    - Exposed non-intact skin should be rinsed thoroughly with running water (e.g., using a water bottle) and gently cleansed with soap and water.
    - All appropriate follow-up for blood-borne pathogens as per organizational policy should be initiated.

HAND HYGIENE

- Frequent use of alcohol-based hand rub (60-90% alcohol concentration) (ABHR) or washing with soap and water (if hands are visibly soiled) including, but not limited to, the following recommended situations:
    - As outlined in the Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control for Ebola Virus Disease[2] and the organization's policy.
    - Before putting on PPE.
    - During and after removing PPE (e.g., gloves, gown, mask, facial shield, eye goggles, head and neck coverings, etc.).
    - Before putting on a clean pair of gloves for the removal of soiled PPE.
    - After contact with blood/body fluids.
- The following measures are recommended for the use of hand wipes:
    - Hand wipes may be used as an alternative to soap and water <u>when hands are visibly soiled</u> and a designated handwashing sink/facility is not immediately available or when the handwashing sink/facility is unsuitable (e.g., contaminated sink, no running water, no soap). In this instance, ABHR should be used after the use of hand wipes and hands should be washed with soap and water once an acceptable sink/facility is available.
    - Hand wipes may be used as an alternative to soap and water <u>when hands are not visibly soiled</u> and a designated handwashing sink/facility is not immediately available or when the handwashing sink/facility is unsuitable (e.g., contaminated sink/facility, no running water, no soap). In this instance, ABHR should be used after the use of hand wipes.

MOVING PATIENT INTO AND OUT OF TRANSPORT VEHICLE

- Personnel involved with moving the patient into and out of the transport vehicle should wear appropriate PPE.
- Appropriate care should be taken to avoid dislodging or tearing PPE and subsequent possible contamination during transfer of patient from stretcher to stretcher, as transfer requires close contact and physical manipulation of the patient.
- Emergency department personnel should meet the ambulance with a prepared stretcher to limit prehospital personnel movement within the facility.
- The patient must be taken directly to the receiving area in the hospital via the most direct route secured and monitored to avoid exposure of other individuals (e.g., patients, visitors) and HCWs who are not involved in the patient's care.

SHARPS SAFETY

- The following measures are recommended for the safe use of sharps:
    - The use of needles and other sharps should be limited as much as possible.
    - Needles should never be recapped.
    - Needles and other used single-use sharp items must be disposed of immediately into designated puncture-resistant containers that are easily accessible at the point-of-use.
    - Needles and other sharp instruments must be handled with care to avoid injuries during disposal.
    - Safety-engineered needles and needle-less systems should be made available and used.
- In the event of a percutaneous injury with an EVD-contaminated sharp, the following measures are recommended:
    - The worker or trained monitor should advise the immediate manager/supervisor, OHS or delegate and PH, as per usual organizational protocol. Refer to Prehospital and Transport Personnel Recommendations section.
    - The worker must immediately initiate and obtain first aid and notification as described in the Prehospital and Transport Personnel Recommendations section.

DEDICATED EQUIPMENT

- Disposable equipment is preferred (i.e., bedpan, urinal, with the use of a solidifier) and should be discarded into a plastic-lined biohazard waste receptacle after use.

- Non-critical reusable patient-care equipment (e.g., blood pressure cuff) should be dedicated to the patient for single-patient use. Immediately after use, equipment should be placed into biohazard bags and labeled for cleaning and disinfection according to manufacturer's instructions and organization's policy by trained personnel wearing correct PPE before reuse with another patient.

CLEANING AND DISINFECTION OF TRANSPORT VEHICLE

- Education, hands-on training, practice, and observation of ability to adhere to correct processes and procedures, and appropriate PPE should be provided to those responsible for environmental cleaning.
- Those responsible for cleaning and disinfection should wear the same level of protection as personnel providing care to the patient. Enhanced PPE should be determined by a risk assessment to exposure to blood and/or other body fluids.
- Responsibility and accountability for cleaning and disinfection of patient care/isolation area and vehicle should be assigned and monitored to ensure appropriate and consistent processes are followed.
- In selecting disinfectants that are expected to inactivate Ebola virus on non-critical hard surfaces and medical devices, Health Canada recommends products with the following approved criteria:
    - Registered in Canada with a Drug Identification Number (DIN);
    - The label should have a "broad spectrum virucide" claim and/or acknowledge effective testing against any of the following: Adenovirus type 5, Bovine Parvovirus, Canine Parvovirus or Poliovirus type 1[2].
- Following completed transfer of the patient to the emergency department stretcher or inpatient bed, cleaning and disinfection measures should be taken.
- The following surfaces, equipment and other items used during transport should be cleaned and disinfected using a disinfectant with a broad spectrum virucide claim with a DIN and used according to the manufacturer's instructions:
    - All surfaces or equipment the patient or their blood and other body fluids have potentially contacted (e.g., transport stretcher surfaces).
    - All exposed surfaces in the transport vehicle.
    - All non-contaminated areas of the vehicle as per regular protocol (i.e., areas where there was no cross contamination from equipment/items, personnel with PPE etc.).
    - All equipment and reusable containers prior to their return to transport vehicle.
- Blood or other body fluid-contaminated seat cushions or webbed seats should be removed and disposed of into plastic-lined biohazard waste receptacle, as disinfection is not appropriate for these items.
- Compressed air or sprayers for vehicle cleaning should not be used.

- For additional information on environmental cleaning and blood and other body fluid spills, refer to Appendix I. Ebola Virus Disease: Management of Waste and Environmental Cleaning for Prehospital Care and Ground Transport.

HANDLING WASTE AND LINEN

- Refer to Appendix I. Ebola Virus Disease: Management of Waste and Environmental Cleaning for Prehospital Care and Ground Transport.

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APPENDIX 1- EBOLA VIRUS DISEASE: MANAGEMENT OF WASTE AND ENVIRONMENTAL CLEANING FOR PREHOSPITAL CARE AND GROUND TRANSPORT

FOREWORD

The following guidance provides measures for the safe handling, containment, transport and disposal of waste (including linen and sharps) generated during prehospital care and ground transport from persons under investigation (PUI) and persons confirmed with Ebola virus disease (EVD)[a], along with measures for cleaning the environment contaminated or potentially contaminated with the Ebola virus. Its use is intended for prehospital personnel including, but not limited to, medical first responders, paramedics, emergency ground transport personnel, firefighters, and enforcement officers, along with personnel within prehospital organizations responsible for education and training in occupational health and safety (OHS), IPC and environmental cleaning.

The guidance is based on currently available scientific evidence, standards and regulations, and adopts a precautionary approach where the evidence is lacking or inconclusive. It is subject to review and change as new information becomes available.

The guidance should be read in conjunction with relevant federal, provincial, territorial and local legislation, regulations, and policies, and **adapted to local requirements as necessary**.

[a] Public Health Agency of Canada. National Case Definition: Ebola Virus Disease (EVD), available at: http://www.phac-aspc.gc.ca/id-mi/vhf-fvh/national-case-definition-nationale-cas-eng.php.

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EBOLA VIRUS DISEASE (EVD)

The Ebola virus is categorized as a Risk Group 4 agent, under the Public Health Agency of Canada's Human Pathogens and Toxins Act[b], as it is likely to cause serious disease, and effective treatment is not available. Waste contaminated with the Ebola virus requires special handling and disposal to prevent exposure to the virus[1].

All EVD-associated waste is considered as regulated biohazardous waste and includes items (including linen) contaminated with human blood and body fluids (i.e., respiratory secretions, saliva, emesis, feces, and urine) that warrants special handling and disposal as it may in certain situations present a risk of disease transmission[2]. EVD-associated waste that has been appropriately incinerated or autoclaved is not infectious and does not pose a health risk[3, 4].

The Ebola virus has been found to remain viable on solid surfaces (glass, steel, rubber) in the dark for up to six days[5]. Infectivity has been shown to drop by 90 percent in the first 36 hours[6], however, given the low infectious dose required for infection and the severity of the disease, the potential for environmental contamination with infected blood and/or body fluids should be considered[5].

RECOMMENDED MEASURES FOR PREHOSPITAL ORGANIZATIONS

The following measures are recommended for the safe management of EVD-associated waste and environmental cleaning.

- Implement a biohazardous waste management and environmental cleaning program with the development of policies and procedures to include the following:
  - protocols for the management of waste, on-site spills, and environmental cleaning,
  - protocols for adequate supplies of biohazard waste bags and containers/receptacles, cleaning supplies, disinfectants, hand hygiene products and personal protective equipment (PPE),
  - protocols for segregating, packaging, labelling, moving, storing and transporting EVD-associated waste (both on- and off-site),
  - methods for keeping records of the quantities of EVD-associated waste both generated and disposed of,
  - a list of all regulations and legislation concerning EVD-associated waste that are applicable within the organization's/company's jurisdiction,
  - protocols for wearing PPE when handling EVD-associated waste and/or providing cleaning measures that should include:
    - all personnel handling EVD-associated waste and/or providing cleaning services **should wear appropriate PPE**[7] (i.e., gloves, fluid-resistant or impermeable gown, fluid-resistant mask with eye goggles or fluid-resistant mask with face shield),

[b] Public Health Agency of Canada. Human Pathogens and Toxins Act (HPTA), Schedule 4, subsection 3, (S.C. 2009, c. 24), available at: http://www.phac-aspc.gc.ca/lab-bio/regul/hpta-lapht-eng.php.

  - **enhanced PPE**[7] (i.e., apron, hazardous material suit, double gloving, head and neck coverings, foot and leg coverings) should be selected and worn based on a risk assessment,
  - regular, ongoing training and education of personnel on proper handling and potential hazards of EVD-associated waste, type and quality of waste containers/receptacles, and PPE selection and use, including how to properly put on and remove PPE[7]. (For information on PPE selection, use, and safely putting on and removing PPE, refer to Infection Prevention and Control Expert Working Group: Advice on Infection Prevention and Control Measures for Ebola Virus Disease in Healthcare Settings[7].)

- provision for regular and ongoing education for Routine Practices[8], including Hand Hygiene[9] as per PPE protocol, according to organization/company policy, with alcohol-based hand rub (60-90% alcohol) or washing with soap and water, if hands are visibly soiled.

- Assign only personnel trained and educated in occupational health and safety, IPC practices and appropriate selection and use of PPE for the management of EVD-associated waste and environmental cleaning.
- Develop and implement a monitoring system, using a trained observer, for ensuring consistency in safely putting on and removing PPE when handling EVD-associated waste and performing environmental cleaning.
- Develop and implement protocols for the containment and storage of EVD-associated waste as per the organization's/company's biohazardous materials policies, and for off-site transport in accordance with Transport Canada's, Transportation of Dangerous Goods Regulations (TDGR)[c, 10].
- Determine capability for/availability of transporting EVD-associated waste within their municipality/region and ensure waste is disposed of in accordance with local, municipal or regional requirements and regulations and/or bylaws for regulated infectious waste.
- Provide education to personnel on steps to take when a breach in safe handling and containment occurs resulting in exposure or potential exposure to EVD, during the management of EVD-associated waste. This includes:
  - personnel to immediately stop work, safely remove PPE as per organization/company protocol and leave the area,
  - rinse the affected skin surface with soap and water OR for mucous membrane splashes (e.g., conjunctiva), irrigate with copious amounts of water or eyewash solution, according to the organization's/company's first aid protocol,

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[c] For off-site transport of large quantities of Ebola contaminated waste, a special permit, called an Equivalency Certificate, issued by Transport Canada will be required. For further information, organizations should consult Transport Canada, Transportation of Dangerous Goods Regulation (TDGR) i.e., Ebola[10]. http://www.tc.gc.ca/eng/tdg/clear-tofc-211.htm. Organizations should also consult their Provinces/Territorial Ministry of Transport to explore their capability to transport EVD-associated waste for disposal within their municipality/region. The TDGR define the labelling, packaging, and documentation requirements necessary for shipping biological material and infectious substances within Canada. These regulations also require that a person who handles in the course of packaging for shipment, offers for transport, transports, or receives infectious materials be trained in the TDGR and hold a valid certificate of training. Shippers of high-risk infectious materials may be required to have an Emergency Response Assistance Plan (ERAP) to respond to any shipping emergency within Canada. For more information on the TDGR, including exemptions that may exist based on the distance between properties, contact Transport Canada or visit its website.

- report immediately according to the organization's/company's exposure/injury protocol, including notification to Public Health authorities, and
- adhere to follow-up procedures[7, 11].

RECOMMENDED MEASURES FOR EVD-ASSOCIATED WASTE DURING GROUND TRANSPORT

EXAMPLES OF WASTE

1) Human waste – blood and other body fluids (urine, feces, emesis, respiratory secretions and saliva).
2) Linen – bedding, towels, washcloths, gowns.
3) Other non-sharps waste – PPE, disposable bedpans, disposable linen, dressings, sponges, pads, procedure drapes, incontinent products/diapers, cleaning cloths/wipes, mop cloths/wipes, spills, intravenous/gastrointestinal/urine catheters and bags, suctioning equipment/tubing, non-fluid-impermeable pillows or mattresses.
4) Sharps waste - syringes, needles, razors, scalpels.

HUMAN WASTE [5, 12-17]

- Human waste should only be handled in the care area where it is generated and by personnel wearing appropriate PPE
- Urine, feces and emesis may be disposed of through the normal sanitary sewer system, or in accordance with municipal/regional regulations[d].
- Where municipal regulatory restrictions exist on disposal through the normal sanitary sewer system, the use of a solidifier for liquid waste (with bedpans – disposable or with liners, and/or disposable emesis basins/receptacle) and disposed of as waste should be considered. (Refer to Other Non-Sharps Waste section)
- In settings where on-site septic sewage disposal systems are used (i.e., septic tanks), no specific measures are required providing the system is operating according to local regulations[e].

[d] The following factors increase the likelihood that pathogens will be inactivated in the disposal process: a) dilution of the discharged materials with water; b) inactivation of pathogens resulting from exposure to cleaning chemicals, disinfectants, and other chemicals in raw sewage; and c) effectiveness of sewage treatment in inactivating any residual pathogens that reach the treatment facility. Small amounts of urine, feces, blood, and other body fluids should not affect the functioning of a municipal sewer system. Under circumstances for large quantities of these fluids, with their high protein content that may interfere with the biological oxygen demand of the system, consult your local municipal authorities[13]. Organizations should consult their municipality on local regulations for disposal of EVD-associated human waste (urine, stool, emesis and other body fluids) in the sanitary sewer.

[e] Generally, septic systems rely on settling and pumping the tank to dispose of the waste. Containing the wastewater in the septic tank for a period of time (considered to be a number of days) allows for natural die-off of the Ebola virus, thus reducing the concentration of the Ebola virus that may be found in wastewater prior to pumping[17]. For concerns about a septic system not operating properly, local/jurisdictional public health officials should be consulted.

LINEN [2, 5, 10, 14, 16]

- **Disposable linen** should be used in a prehospital and ground transport setting.
- Handling and containing linen should occur in the care area by trained personnel wearing appropriate PPE.
- Consider all linen in the care area contaminated linen, regardless of whether it was used or not.
- The number of personnel handling linen should be limited.
- Linen should be folded inward and handled with a minimum of agitation and shaking to avoid contamination of air, surfaces and persons.
- For further information on managing and disposing of EVD-associated linen, follow recommended measures under Other Non-Sharps Waste in the next section below.

OTHER NON-SHARPS WASTE [2, 5, 10, 13-16]

- Handling, containing and removing waste should only occur in the care area by trained personnel wearing appropriate PPE.
- Consider all supplies taken into the care area contaminated, whether used or not.
- The number of personnel handling waste should be limited.
- The following measures are recommended for non-sharps waste:
  - contain waste at point of generation,
  - place waste immediately into a sturdy and leak resistant container lined with a leak and tear resistance plastic biohazard bag,
  - **do not** manually compact waste in the bags,
  - when the bag is **two-thirds full**, seal securely preventing tearing/puncturing the bag and ensuring no leaks,
  - remove the bag from the container (Note: this container should stay in the care area until patient discharge to receiving healthcare facility and relined with a new biohazard bag for next fill),
  - decontaminate the entire outside of the bag by wiping using a disinfectant with a broad spectrum virucide claim with a DIN[f] and used according to the manufacturer's instructions,
  - place the decontaminated bag into a second biohazard bag and seal securely, preventing tearing/puncturing the second bag and ensuring no leaks,
  - wipe the entire outside of the second bag using a disinfectant with a broad spectrum virucide claim with a DIN used according to the manufacturer's instructions, immediately before removing it from the area.

[f] In selecting disinfectants that are expected to inactivate Ebola virus on non-critical hard surfaces and medical devices, Health Canada recommends products with the following approved criteria: Registered in Canada with a Drug Identification Number (DIN); the label should have a "broad spectrum virucide" claim and/or acknowledge effective testing against any of: Adenovirus type 5, Bovine Parvovirus, Canine Parvovirus, and Poliovirus type 1[7].

- To move the double-bagged waste from the care area, (i.e., ground transport vehicle) personnel should place the double bagged waste in a leak-proof/impervious, puncture-resistant plastic or metal single-use container. The waste container should be:
  - located at the periphery/outside of the area for taking off PPE to avoid risk of recontamination of the container during PPE removal,
  - securely sealed, clearly labelled and identified as EVD-associated biohazardous material, by a second person wearing appropriate clean PPE,
  - decontaminated by wiping the entire outside of the container using a disinfectant with a broad spectrum virucide claim with a DIN and used according to the manufacturer's instructions, immediately before removing the container from the area,
  - not be re-opened once sealed.
- For moving large or heavy containers, carts with guard rails or raised edges should be used and loaded in a manner that will prevent items from tipping.
- Carts should be disinfected after each use using a disinfectant with a broad spectrum virucide claim with a DIN and used according to the manufacturer's instructions.
- Containers may be transferred to the receiving hospital if these arrangements have been made in advance OR taken immediately and directly to a designated locked holding area with restricted access and stored as per the organization's/company's biohazardous material policy until ready for transport to disposal site.
- EVD-associated waste storage areas should be clearly marked with a biohazard symbol and kept separate from other storage areas.
- Stored containers of waste should be packaged and transported separately in accordance with Transport Canada's TDGR, and disposed of in accordance with local, municipal or regional requirements and regulations and/or bylaws for regulated biohazardous waste.

SHARPS WASTE [14, 18]

- Sharps should be segregated from other waste and discarded:
  - at point of use,
  - directly into single-use containers, that are leak-proof/impervious, puncture resistant, fitted with securely closed lids and specifically designed for sharps waste.
- Sharps containers should **not be filled beyond two-thirds full**, to allow for safe closure.
- The following measures for sharps containers are recommended:
  - when the container is two-thirds full, securely close the lid,
  - wipe the outside of the container using a disinfectant with a broad spectrum virucide claim with a DIN and used according to the manufacturer's instructions.
  - place the sharps container into a second leak-proof/impervious, puncture resistant biohazard container,
  - securely seal, clearly label and identify the second container as EVD-biohazardous sharps material,

  - wipe the outside of the second container using a disinfectant with a broad spectrum virucide claim with a DIN and used according to the manufacturer's instructions.

- Containers may be transferred to the receiving hospital if these arrangements have been made in advance OR taken immediately and directly to a designated locked holding area with restricted access and stored as per the organization's/company's biohazardous material policies.
- EVD-associated sharps waste storage areas should be clearly marked with a biohazard symbol and kept separate from other storage areas.
- Stored containers of EVD-associated sharps waste should be packaged and transported separately off-site in accordance with Transport Canada's TDGR, and disposed of in accordance with local, municipal or regional requirements and regulations and/or bylaws for regulated biohazardous waste.

RECOMMENDED MEASURES FOR ON-SITE SPILLS AND ENVIRONMENTAL CLEANING RELATED TO EVD-ASSOCIATED BLOOD AND OTHER BODY FLUIDS[g, 5, 19-21]

- All personnel providing cleaning services should be managed by trained personnel wearing appropriate PPE.
- All major spill incidents should be documented, according to organization/company policy for any follow-up required.
- 'Spill kits' should be made available, according to organization/company policy, for use in designated areas.
- The spill area should be isolated from access to other individuals until cleaning and disinfection is completed.
- Special cleaning of upholstery and carpets is not indicated unless they are visibly soiled with blood or other body fluids.
  - items visibly soiled (e.g., upholstery, cloth chairs, cloth seats, seat covers or carpets covered in blood or other body fluids) that are difficult to clean should be removed and treated as waste.
- All surfaces, areas, items and objects visibly contaminated or potentially contaminated with blood or other body fluids should be cleaned and disinfected (e.g., walls, floors, locks, counters, door knobs, light switches, tables/work surfaces, other high contact surfaces and items/objects).
- Visible blood and other body fluids should be removed first with disposable damp cleaning cloths or wipes and regular detergent.

[g] The measures for spills in this section are for spills occurring on-site and do not refer to off-site spills on Canadian roads and highways involving commercial transport. Off-site spills are covered under Transport Canada's, Transportation of Dangerous Goods Regulatons[10]. If the EVD waste is no longer in transport and there is a spill (e.g., after it's arrived at the final destination) the TDGR would not apply.

- The following cleaning and disinfection measures are recommended:
    - allow fluid and droplets to settle, fluids should not be permitted to fully dry,
    - gently cover a spill with disposable absorbent paper towels, wipes or pads (a solidifier agent may be used); remove organic/bulk material, and place waste immediately into sturdy, leak and tear resistant biohazard plastic bag and securely seal (Refer to Other Non-Sharps Waste section for further details),
    - with disposable cleaning cloths or wipes, apply a disinfectant with a broad spectrum virucide claim with a DIN to the surface and allow sufficient contact time according to manufacturer's instructions,
    - spraying disinfectant or using wet vacuum should not be done in order to avoid any splashes and splatter; compressed air, pressurized water or similar procedures which might create droplets, should not be used; dry sweeping and dusting with a broom or cloth should not be done,
    - start at one end of the affected area and move in one direction until all surfaces have been disinfected; do not use a circular motion[19],
    - use cleaning cloths, wipes, etc., only once and after use, discard all cleaning items immediately into a biohazard bag located within reach (Refer to Other Non-Sharps Waste section).
- Patient's personal items visibly soiled with blood or other body fluids should be cleaned and disinfected as per above. If items cannot be properly clean and disinfected, they should be treated as waste.

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