

# Ebola virus disease (EVD) – Key questions and answers concerning health care waste

## Introduction

Safe handling, treatment and disposal of health-care waste (HCW) are important tasks within the broader activities of stopping the Ebola outbreak. This is especially true considering the large amount of waste generated, including disposal Personal Protective Equipment (PPE). The main objective of this document is to highlight specific public health issues concerning HCW in the context of low-resource settings, particularly in West Africa. It is not a stand-alone document and should be read in conjunction with more comprehensive guidance on safe management of health care waste, infection control and water and sanitation (refer to References).

## What do we know about the risks associated with health-care waste from Ebola infected individuals?

Exposure to Ebola infected solid waste presents a risk and thus the waste generated from infected individuals should be carefully managed and destroyed. Sharps injuries often occur because of unsafe disposal of needles and other sharps. Studies from a past outbreak in Central Africa indicate that the case fatality rate associated with needle pricks was much higher (100%) compared to other routes of exposure (80%). In addition to medical staff and waste workers inside Ebola treatment facilities, individuals handling waste in communities where Ebola individuals reside are at risk.

## What are key considerations in managing health-care waste?

A detailed HCW management plan should be developed during the design of Ebola treatment facilities. This plan should detail written procedures for healthcare waste management, the number of staff required and their roles and responsibilities. The plan should also map the safe movement of waste from points of generation, internal transport routes, storage, treatment facility, and final disposal (burial) areas. In addition, the plan should detail supplies needed including personal protective equipment (PPE), sharps containers, waste bins and bags, cleaning supplies and type and capacity of waste treatment technology. In planning supplies it is important to calculate usage of consumables and re-stocking needs. Finally, the plan should consider weather conditions and protection of waste from rain to avoid run-off.

## What type of training should health-care waste workers receive?

All those handling health care waste, such as clinicians, cleaners and waste workers, should undergo training regarding waste flow within Ebola treatment facilities and waste separation and disposal. In addition, those tasked with transport, storage and destruction of waste should be trained in proper procedures and how to operate and maintain waste treatment technology. Waste workers should be trained in proper handwashing techniques and have access to alcohol based hand rubs or soap and water (WHO, 2014). Finally, waste workers should be protected by appropriate PPE and know how to correctly wear and remove such equipment (WHO, 2014). Following training, mentoring by an experienced worker including pairing of a waste worker with a trained observer will help ensure that proper precautions are applied consistently.

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### What health-care waste is considered highest risk and how should it be handled?

All waste generated in the isolation area or red zone of an Ebola facility is considered high risk. This includes any devices used in patient treatment, such as bandages and syringes. In addition, all non-reuseable PPE is considered infectious waste. Sharps should be segregated from other waste at point of generation and placed in puncture-resistant, biohazard labelled containers. Other waste from high risk areas should be put in covered waste bins which are lined with thick plastic bags (i.e. 75 microns). If thick bags are not available, double bagging within the bin is recommended to reduce tears and leaks. Sharp containers and waste bags should be filled only 3/4th full at which point they should be closed and transported as soon as possible to the waste storage and treatment area within the facility. Closing bags using a swan neck technique (twist firmly, double over and then seal with a plastic tie) will help prevent liquids from seeping out. Before replacing bags in waste bins, all surfaces of the bin should be disinfected with 0.5% chlorine solution. More details of a waste collection and handling can be found in *Safe management of wastes from health-care activities* (WHO, 2014).

Linens and clothes soiled with body fluids, such as blood, faeces and vomit, may be cleaned using procedures elaborated in the *Interim Infection Prevention and Control Guidance for Care of Patients with Suspected or Confirmed Filovirus Haemorrhagic Fever in Health Care Settings, with Focus on Ebola* (WHO 2014). At all times, care should be taken to avoid all direct contact with such fluids through safe behaviour and use of PPE. If linens cannot be cleaned they should be destroyed along with other high risk waste.

### How should health-care waste be transported and stored within health facilities?

Infectious solid waste should not be transported in bags by hand due to risk of accident or injury from infectious material or incorrectly disposed sharps. Utilization of a covered trolley will reduce the potential for exposure. In facilities where use of such items are difficult due to a lack of concrete or level flooring, a wheelbarrow may be used. If none of these is available, a labelled and lidded puncture resistant collection bin can be carried. After each use, all surfaces of the transport containers should be disinfected with 0.5 % chlorine solution.

Ideally, waste should not be stored more than 24 hours before being destroyed. If this is not possible, measures should be taken to provide sufficient staff and materials for regular (even basic) incineration. The storage area should be fenced and protected from rain and animals. The entrance door or gate should be lockable and marked with the international bio-hazard symbol.

### What are important items to consider in disinfection?

While the virus may remain on surfaces, it is relatively fragile and decreases over time. Ebola can be rapidly inactivated by various chemical disinfectants. In the current outbreak, 0.5% chlorine is the most commonly used disinfectant for waste containers, re-usable PPE and other supplies used in managing HCW. Disinfectants weaken with time and exposure to the sun and therefore should be stored in cool, dark places. In addition, disinfectants should be monitored regularly to ensure they have not degraded.

### What are the possible options for treating healthcare waste?

Several factors influence the selection of treatment technologies including: size needed to destroy the amount of waste generated, availability of electricity/fuel and water, operation and maintenance needs, cost, delivery and installation requirements, necessity to transport incinerators or autoclaves between facilities, acceptance by neighbouring communities and staff and environmental concerns. A brief summary of options is provided below. For more details refer to *Safe management of wastes from health-care activities* (WHO, 2014).

The most common type of waste destruction technology in resource scarce settings is incineration. The advantage of incineration is that it rapidly reduces the volume of waste while decontaminating materials by

burning at high temperatures. Different technologies are available and are generally categorized into low-level, medium-level and advanced incineration. It is **not recommended** to transport untreated infectious waste and therefore all waste should be treated on-site.

Low level incinerators, or burning within an open barrel or pit, serve the immediate need of destroying infectious waste and eliminating Ebola risks. However, such incinerators should be viewed as transitional as waste may not be fully burned and exposure to fumes from such incinerators has been linked to both immediate and chronic health risks as well as detrimental environmental impacts. In addition, exposure to naked flames places the operator at risk of burns and PPE catching fire. Therefore, extreme caution should be taken when conducting burning. Effective segregation of waste (i.e. not including food waste along with other items) will reduce the amount of waste that needs to be destroyed and potential burning impacts. Food waste can be composted in a separate pit and does not need to be burned.

Medium-level and advanced incineration reach higher temperatures for longer periods, thus ensuring complete burning and elimination of risks associated with waste. Such two chamber incinerators are also more environmentally friendly. However, they require a reliable power supply and fuel (petrol / diesel / gas) for the operation of the burners, temperature monitoring and possibly also air pollution control devices, the later important for meeting UN pollution control standards. The stack should reach higher than the highest point of the health facility to prevent direct air pollution. Thus, depending on the model, medium-level and advanced incineration are options only for well-resourced facilities.

A safer and more environmentally friendly alternative to incineration is autoclaving. WHO supports and recognizes the environmental health benefits of using autoclaves for destroying health care waste and has been calling for the phase out of incineration since 2004. Autoclaves represent a sustainable option for planned, longer-term operations of well-resourced treatment facilities as the technology depends on reliable water and electrical supplies. Within the context of the West Africa Ebola outbreak, several additional specific factors should also be considered. These include the large amount of waste generated from disposal PPE and that autoclaves, at most, only reduce the volume of waste by 50% (as opposed to incinerators which reduce waste volume by 90%). Therefore shredding or compaction post treatment is likely necessary which would require additional time and expertise. Finally, autoclaving alone will require additional space for burying compared to incineration.

### How should waste be disposed of after treatment?

All waste, including ashes from burned matter, should be disposed of in pits. The pits should be reinforced if there are sandy or unstable soils and, in general, allow at least 1.5 m between the pit bottom and the groundwater table. For ash pits in sandy soils, the pit bottom should be lined with a clay layer to limit percolation into the groundwater. The area around the pits should be fenced to prevent access by unauthorised persons or animals. After filling pits, a thin layer of soil should be added. When the level of the waste reaches 50 cm from the surface, the pit should be permanently closed with a thick layer of soil. Finally, a sign should be put on the top indicating it is infectious waste and the pit should not be opened.

### How should potentially infectious waste be managed in communities?

If a suspected Ebola case is being cared for at home, the waste generated from the time the person first displayed symptoms (fever, diarrhoea, vomiting) should be carefully managed. Community members should be informed of the risks associated with such waste and provided with the necessary items (i.e. leak-proof bags, protective equipment). All materials which came into contact with the infected person including washrags, clothing, etc. should be bagged (using two if necessary) and stored in a safe place away from children and animals until a waste collector can take the bag. It is NOT recommended to store the bag(s) for a long period and therefore if rapid collection is not possible, burying and/or burning, followed by covering with soil is recommended.

## Note on document development and background

The content in this document is based on literature searches of the survival of Ebola in waste and the most effective practices for handling and destroying infectious waste. It reflects input and advice from environmental engineers, health care waste experts and those with practical knowledge about infectious waste in health facilities, emergencies and disease outbreaks.

## Key references

WHO/ILO 2014. *Ebola Virus Disease: Occupational Safety and Health, WHO / ILO Briefing Note for Workers and Employers*. World Health Organization, Geneva.

[http://www.ilo.org/safework/info/publications/WCMS\\_301830/lang--en/index.htm](http://www.ilo.org/safework/info/publications/WCMS_301830/lang--en/index.htm).

WHO/UNICEF 2014. *Ebola Virus Disease- Key questions and answers concerning water, sanitation and hygiene*. World Health Organization, Geneva. [http://www.who.int/wate\\_sanitation\\_health/en/](http://www.who.int/wate_sanitation_health/en/)

WHO 2014. *Clinical management of patients with viral haemorrhagic fever. A pocket guide for the front-line health worker*. World Health Organization, Geneva.

<http://www.who.int/csr/resources/publications/clinical-management-patients/en/>.

WHO 2008. *Essential Environmental Health Standards in Health Care*. World Health Organization, Geneva.

[http://www.who.int/water\\_sanitation\\_health/hygiene/settings/ehs\\_hc/en/](http://www.who.int/water_sanitation_health/hygiene/settings/ehs_hc/en/).

WHO 2014. *How to conduct a safe and dignified burial of a person who has died from suspected or confirmed Ebola virus disease*. World Health Organization, Geneva.

<http://www.who.int/csr/resources/publications/ebola/safe-burial-protocol/en/>

WHO, 2014. *How to safely put on and remove personal protective equipment*. World Health Organization, Geneva.

[http://www.who.int/csr/disease/ebola/put\\_on\\_ppequipment.pdf?ua=1](http://www.who.int/csr/disease/ebola/put_on_ppequipment.pdf?ua=1)

[http://www.who.int/csr/disease/ebola/remove\\_ppequipment.pdf?ua=1](http://www.who.int/csr/disease/ebola/remove_ppequipment.pdf?ua=1)

WHO 2014. *Interim Infection prevention and control guidance for care of patients in health-care settings, with focus on Ebola*. World Health Organization, Geneva.

[http://www.who.int/csr/resources/publications/ebola/filovirus\\_infection\\_control/en/](http://www.who.int/csr/resources/publications/ebola/filovirus_infection_control/en/).

WHO 2014. *Safe management of wastes from healthcare activities*. Second edition. World Health Organization, Geneva. [http://www.who.int/water\\_sanitation\\_health/medicalwaste/wastemanag/en/](http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/).

WHO 2006. *Management of wastes from injection activities at district level*. World Health Organization.

[http://www.who.int/water\\_sanitation\\_health/medicalwaste/mwinjections/en/](http://www.who.int/water_sanitation_health/medicalwaste/mwinjections/en/)