Ebola Virus Disease (EVD)

Key questions and answers concerning health-care waste

Updated September 2021[1]

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, re-stocking needs and waste treatment volumes and schedules. For example, in EVD treatment centres in Sierra Leone during the West Africa EVD outbreak, 0.4 bags of health care waste were incinerated each day per patient (Mallow, et al., 2018). 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 the risk of infection, routes of transmission and the 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 hand hygiene techniques and have access to alcohol based hand rub, soap and water, or as an interim 0.05% chlorine rinse (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,

[1] This question and answer (Q & A) is an update from the original version published in 2014. It includes new operational research data on waste and EVD. The main recommendations remain the same as those included in the 2014 document. Furthermore, updates to WHO IPC guidance for Ebola Virus Disease are ongoing in 2021 and if any new evidence or recommendations regarding WASH emerge, this Q&A will be amended as needed.

mentoring by an experienced worker including pairing of a waste worker with a trained observer will help ensure that proper precautions are applied consistently.

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 the Ebola isolation area 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 of 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. 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. For EVD outbreaks, 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) and to *Overview of technologies for the treatment of infectious and sharp waste from health care facilities* (WHO, 2019).

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. In general, the decontamination of infectious and sharp waste by steam (e.g. by autoclaving) or other non-burn technology or high temperature incineration should preferably be used in the treatment of infectious and sharp waste.. However, in emergencies, also interim transitional methods like low level incinerators or barrel burning can be considered to minimize human health risks. The waste generated is very bulky due to the large amount of used PPE, therefore the chamber volume of the treatment equipment should be adequate. It is **not recommended** to transport untreated infectious waste and therefore all waste should be treated on-site. 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 air pollution in the immediate surroundings. 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 were also 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 may be necessary and/or a system for final waste disposal. A number of low-cost autoclaves are now available in low-resource settings and compared to previous models, they use less water and energy, and overtime save operational costs (compared to traditional incinerators) (HCWM, 2021).

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.

Where resources are limited and/or as a temporary measure, locally constructed incinerators could be considered. Several models exist, including the De Monfort, and care should be taken to build, maintain and use them properly (De Montfort, 2021). The ultimate aim of good incineration is to burn items with as high of a temperature as possible to ensure a complete burn and minimize particulate air pollution as well as minimize harms to the waste handler (e.g. burns, inhalation of smoke). This requires using heat resistant refractory bricks and mortar (can withstand temperatures up to 1200 C), constructing and using two combustion chambers to increase temperature and retention time of gases, cleaning ashes and debris before using, pre-heating the incinerator, use of organic burn/fuel material and incinerating infectious waste is batches as not to overload the incinerator (ACF, 2017).

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. In case of using autoclaves or other alternative treatment technologies, the waste can also be buried on a landfill, as it is classified as non-hazardous after treatment.

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), labelled as "potential infectious waste" 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.

References

Action Against Hunger (ACF), 2017. Medical waste management for WASH practicioners, incineration and sharps management. https://www.washinhcf.org/wp-content/uploads/2019/03/2017-ACF-Incinerators-and-Sharps-Management.pdf

De Montfort medical waste incinerators. Website. Accessed 11 June 2021 at: https://mw-incinerator.info/

Health Care Without Harm, 2021. Online health care waste technology catalogue. Accessed 27 July 2021. http://medwastetech.info/

Mallow M, Gary L, Jeng T, Bongomin B, Aschkenasy MT, et al., 2018. WASH activities at two Ebola treatment units in Sierra Leone. PLoS ONE 13(5): e0198234.

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.

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/

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/.

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/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/.

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/.

WHO 2006. *Management of wastes from injection activities at district level.* World Health Organization. http://www.who.int/water_sanitation_health/medicalwaste/mwinjections/en/

WHO 2019. Overview of technologies for the treatment of infectious and sharp waste from health care facilities. World Health Organization. https://www.who.int/water_sanitation_health/publications/technologies-for-the-treatment-of-infectious-and-sharp-waste/en/