World Health Organization

Rapid Guidance on the Decommissioning of Ebola Care Facilities

Final Draft, 27 March 2015

WHO/EVD/Guidance/Strategy/15.1

World Health Organization

Infection Control Africa Network

Contents

Acknowledgements

The World Health Organization (WHO) has developed this rapid guidance document in close collaboration with the Governments of Guinea, Liberia and Sierra Leone; the Centers for Disease Control and Prevention (CDC), Atlanta, USA; the Infection Control Africa Network (ICAN); and the United Nations Children's Fund (UNICEF). This document has been endorsed by the Governments of Liberia and Sierra Leone and is currently under review by the Government of Guinea. The information contained in this document is based on current evidence and expert opinion.

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WHO wishes to acknowledge the review of this document by the following external experts:

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- Patrick Okcoth (UNICEF, Liberia)
- Melissa Opryszko (United States Agency for International Development (USAID)/Office of US Foreign Disaster Assistance, Washington, D.C., United States of America)
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Acronyms

BAT	Best available technique
BSC	Biological safety cabinets
CDC	Centers for Disease Control and Prevention
DHMT	District health medical team
ECG	Electrocardiogram
FIPV	Feline infectious peritonitis virus
FMT	Foreign medical teams
GPS	Global positioning system
HIV	Human immunodeficiency virus
ICAN	Infection Control Africa Network
IPC	Infection prevention and control
IV	Intravenous
MHV	Mouse hepatitis virus
MoH	Ministry of Health
NGO	Non-governmental agency
PCBs	Polychlorinated biphenyls
PPE	Personal protective equipment
PVC	Polyvinyl chloride
RDT	Rapid diagnostic testing
RUP	Re-use prevention
SARS	Severe acute respiratory syndrome
SOP	Standard operating procedure
TGEV	Transmissible gastroenteritis coronavirus
USAID	United States Agency for International Development
UNICEF	United Nations Children's Fund
WASH	Water, sanitation and hygiene

1. Introduction

The 2014 Ebola outbreak, which has affected several countries in West Africa, is the largest in history. The three countries most affected by the outbreak – Guinea, Liberia and Sierra Leone –have reported almost 25,000 cases as of March 2015. In response to the urgent need for Ebola treatment beds, several facilities were reconfigured to admit, isolate, and treat patients. Many such facilities were constructed in existing hospitals, schools or buildings that provided other functions prior to the outbreak. New facilities were also constructed to deal with the epidemic.

In light of the decline in new Ebola cases, strategies are now needed to scale down the activities and bed capacities in Ebola care facilities. These facilities include Ebola treatment units, community care centres, Ebola treatment centres and isolation centres. Thus, the closure of such facilities or repurposing for other uses not related to the treatment of Ebola should be approached using evidence-based, best practices, while at the same time respecting the social and psychological impact of the outbreak on the affected populations.

One major challenge is decontamination. Decontamination renders an area, device, item or material safe to handle (i.e., safe in the context of being reasonably free from a risk of disease transmission) [1]. The primary objective is to reduce the level of microbial contamination so that subsequent infection and transmission are eliminated. The decontamination process to clean an instrument, device or area may range from using ordinary soap and water to sterilization [1].

The Governments of Guinea, Liberia and Sierra Leone; WHO; CDC; ICAN and UNICEF have jointly developed this rapid guidance to assist national governments and partners as they begin the process of decommissioning Ebola care facilities. This rapid guidance pertains to protecting the safety and repurposing of infrastructures and resources previously used for the Ebola outbreak. The guidelines in this document apply to facilities that cared for Ebola patients. The process should be conducted in a well-informed and coordinated manner in order to minimize the environmental, health, safety and social risks associated with it. The precautionary principle implies that a high degree of care should be taken during the process of decontaminating Ebola care facilities. Such attention will ensure the greatest possible degree of health and safety for the staff carrying out the exercise, as well as the individuals who may access the structures after decontamination. This guidance provides an overview of the measures for the planning, demolition and completion of the decontamination of Ebola care facilities.

2. Existing evidence on Ebola virus survival on surfaces and in water and sanitation infrastructures

This chapter summarizes the evidence concerning virus survival in the environment. It also highlights considerations regarding the additional treatment of faecal waste once it has been transferred from Ebola care facilities.

Ebola is not a faecal-oral pathogen and there is no reported transmission via water. The characteristics of the Ebola virus indicate that it is likely to be fragile in the environment; its infectivity and virulence will decline rapidly under conditions found in tropical climates.

Provision of water and sanitation plays an essential role in protecting human health during all disease outbreaks, including the current Ebola outbreak. The presence and continued operation and maintenance of water and sanitation services in health-care settings and the community are critical for infection prevention and control (IPC) practices. This is of particular importance to prevent other concurrent outbreaks of faecal-oral diseases occurring alongside the Ebola outbreak.

2.1 Ebola virus survival on surfaces

There are few studies that provide rigorous evidence on Ebola virus survival on surfaces. However, the existing evidence indicates relatively short survival times on surfaces at temperatures common in tropical settings (20^{o}C or greater). As such, the risk of transmission via surfaces seems low, except if there is blood or body fluid contamination.

In a laboratory-based study, no Ebola virus could be recovered from glass or plastic surfaces at the first test period (2 days) when incubated at room temperature [2]. This study found also that no virus could be recovered from a stainless steel surface at first test (2 days) when incubated at either 4°C or at room temperature [2]. In another study, there was a 1 log10 (90%) decline in Ebola virus infectivity after 35 hours on glass, plastic and aluminium held in the dark at 20-25°C [3]. In addition, the virus was found to be quite sensitive to inactivation by ultraviolet light and drying compared to other enveloped viruses [4]. It is important to note that under laboratory conditions favouring the survival of the virus (4°C, sterile media), viable virus remained detectable for up to 6 days [3].

In the field, survival on surfaces is similarly limited. In African hospitals handling cases of Ebola, all samples from areas devoid of visible contamination with blood were negative for the virus by either nucleic acid amplification or culture [5]. The virus was detected by nucleic acid amplification (but not by culture) in a blood stained glove and bloody intravenous insertion site [6].

2.2 Evidence of virus survival in faeces and urine

Available evidence related to risks of Ebola infection stemming from faeces and urine is based on three types of studies:

1. Detection of the presence of Ebola in the faeces and urine of infected persons.
2. Investigation of Ebola virus survival in faeces.
3. Evaluation of survival of a similarly structured (enveloped) virus in faeces or sewage.

The significance of this evidence suggests that Ebola virus is not frequently present in the excreta of infected patients and that it will decline rapidly under conditions found in tropical climates.

Infectious Ebola virus in monkey faeces was inactivated by at least 99.9% (to a non-detectable level) after 3 days [7]. Other viruses sharing the enveloped structure of the Ebola virus are fragile in the environment. One enveloped surrogate virus, Phi6, was reduced by 99.99% in sewage after 2 days at 30^{o}C [8]. Several studies have evaluated also the persistence of human immunodeficiency virus (HIV) in water and waste water [9-12]. The studies found 99.9% removal of HIV within 8 hours in dechlorinated tap water and greater than 99% within 3 days in distilled water at 25°C. Casson and others [10] reported similar findings (Table 1) in waste water to those of Moore [11] in dechlorinated tap water.

In summary, survival of an enveloped virus, such as Ebola, is much less in excreta compared to laboratory media or tap water. A >3 log10 (> 99.9%) reduction of Ebola can be expected in excreta at room

temperature in 3 days (or less). However, other pathogens in faeces, such as poliovirus and hepatitis A virus, are likely to persist for much longer time periods.

An ongoing review suggests that most of the faecal matter at Ebola care facilities did not contain any Ebola virus. Thirteen studies examined the presence and, in some cases, the infectivity of filoviruses (Ebola or Marburg) in the body fluids and stool samples of infected and symptomatic individuals [13]. On average, filovirus was detected in 8.4% of urine and 20.8% of stool samples using molecular methods, but in only 2.3% and 0%, respectively, by culture [13]. These proportions were essentially the same regardless of whether samples were taken at an early or late stage of the infection. As a comparison, 100% of breast milk and 40% of semen in samples taken from survivors contained the virus [13].

A summary of the survival of Ebola virus, enveloped viruses and, for comparison, non-enveloped viruses in sewage is provided in Table 1. Recent studies have documented the extent of virus survival in faecal swabs of dead (euthanized) experimentally-infected monkeys and in experimentally-contaminated human diarrhoeal faecal waste. In the faecal swabs of the experimentally-infected monkeys, the infectivity titre of Ebola virus decreased initially from 1000/mL to a non-detectable level (at least 99.9% inactivation) after 3 days at 27°C and 80% relative humidity [7].

In sewage, Ebola virus is subjected to a number of factors that can be expected to accelerate its decline in infectivity and virulence. These factors include microbial activity and higher temperatures that result during natural biodegradation of faecal waste. For example, a rapid virus inactivation will occur within minutes at 50°C [14]. In addition, pH levels below 3 or above 11.5 are likely to cause a rapid decline in virus concentrations [15]. This is due to the fact that the outer lipid membrane of enveloped viruses is a labile and sensitive structure that is susceptible to damage and alteration by a variety of physical, chemical and biological agents in the environment, thus causing a loss of virus infectivity or decreased survival.

One of the most important factors influencing survival of viruses is time. Based on recent evidence, coronaviruses, which are also enveloped, appear to provide conservative estimates of Ebola virus survival in sewage. As shown in Table 1, coronavirus declined rapidly by ≥2 log10 (≥ 99%) in 7 days, with ≥7 log10 (≥ 99.999995%) decline in 1 month. In one study, coronavirus was not recoverable after just 1 day [16].

In a recent study on the survival of the enveloped bacteriophage Phi6 in sewage held at 22°C or 30°C, virus infectivity declined relatively rapidly with 99.99% (4 log10) reduction by 2 days at 30°C, and 6 days at 22°C [8]. This virus is considered also as a suitable surrogate for the survival of enveloped human pathogens, such as Ebola virus, and its survival is relatively short. According to the authors, their "…results suggest that enveloped viruses can undergo 6–7 log10 inactivation in sewage in 3–7 days, depending on temperature". By comparison, the decline of poliovirus, a non-enveloped and faecal-oral pathogen, is much slower. In 1 week, a 1 log10 (90%) decline in poliovirus was measured, with a 2-3 log10 (99-99.9%) decline at 1 month. This equates to 3-5 log greater decline in Ebola virus than in poliovirus.

Several studies are currently being conducted on Ebola survival in faecal matter and one such study has been published recently [7]. These include laboratory studies on the actual virus, mutant forms of the virus and virus surrogates with characteristics similar to Ebola, e.g., coronavirus and bacteriophage Phi6). In addition, at least one field study is being conducted in West Africa to examine the presence and survival in faecal masses contained in pit latrines. As evidence becomes available, it will be shared and recommendations revised as necessary.

2.3 Susceptibility to disinfectants

A wide variety of disinfectants can be used for the rapid and complete inactivation of Ebola. Filoviruses in general and the Ebola virus specifically are highly susceptible to a wide variety of disinfectants and other chemical agents. Some of these include: 3% acetic acid (vinegar); 2% peracetic acid; 1% glutaraldehyde; quaternary ammonium compounds; phenolics; hydrogen peroxide; ethanol-based products; 0.5% and 0.05% chlorine-based products (e.g., domestic bleach, sodium hypochlorite, calcium hypochlorite); and organic solvents.

2.4 Precautionary principle

The precautionary principle implies that a high degree of care should be taken during the process of decontaminating Ebola care facilities. Where limited evidence is available for any activity, the precautionary principle has been used to ensure the safety of the decommissioning team and the public [21, 22].

Table 1: Survival of viruses in sewage*

Virus	Enveloped virus?	% removal at 7 days	% removal at 21 days	% removal at 1 month	References
Ebola virus (from rectal swab)	Yes	>99.9% *(in 3 days)*	*No data (only 9-day experiment)*	*No data (only 9-day experiment)*	Prescott et al., 2015[7]
Coronavirus TGEV	Yes	96.8	99.993	99.99994	Casanova et al., 2009 [17]
Coronavirus MHV	Yes	99.2	99.9998	>99.999999	Casanova et al., 2009 [17]
Feline coronavirus FIPV	Yes	~99.9%	*No data (detection limit reached)*	*No data (detection limit reached)*	Gundy et al., 2009 [18]
HIV	Yes	99.9 within 8 hours; dechlorinated tap water 25°C			Moore, 1993 [11]
HIV	Yes	> 99 in 3 days; distilled water 25°C			Casson et al., 1982 [10]
HIV	Yes	>99 in 3 days; distilled water 16°C			Slade et al., 1989 [12]
HIV in peripheral blood monocytes	Yes	90-99% in first 15 minutes; distilled water			Casson et al., 1997 [9]
HIV in peripheral blood monocytes	Yes	90-99.9% reduction in the first 15 minutes of exposure, then an additional 90% after 48 hours; non-chlorinated secondary effluent from waste water treatment plant			Casson et al., 1997 [9]
SARS coronavirus	Yes	No data (detection limit reached after first test at 1 day)			Lai et al., 2005 [16]
Bacteriophage Phi6	Yes	99.996	No data *(only 7 day expt.)*	No data (only 7 day expt)	Casanova and Weaver, 2015[8]
Poliovirus 1	No	~95	*No data (only 7-day expt.)**	*No data (only 7-day expt.)**	Sobsey and Cooper 1973[19]
Poliovirus 1	No	90	99	~99-99.9%	Gray et al., 1993[20]
Hepatitis A virus	No	70	90	99%	Gray et al., 1993[20]

* All inactivation rates are at 20-25°C.

TGEV: transmissible gastroenteritis coronavirus; MHV: mouse hepatitis virus; FIPV: feline infectious peritonitis virus; HIV: human immunodeficiency virus; SARS: severe acute respiratory syndrome.

3. Community engagement

Community engagement refers to the process, principles and techniques of community mobilization and participation. This involves recognizing the community, its leadership and culture (knowledge, beliefs and customs) and adopting the most appropriate approach in meeting, educating, interacting and working with them.

The community engagement process targets communities living in areas where Ebola care facilities are being decommissioned. Engaging the community and listening to its views and concerns are crucial. The process should be mindful of individual perceptions regarding the decommissioning exercise and particular attention must be given to conveying the right message.

Discussions with the community must include its opinions on the exercise, safety and health of the community and environment, including its role in supporting safe decommissioning of the facility and alternatives to the initial plan.

3.1 Step 1: Identify

- Learn more about the community, social and administrative structure; Ebola response structure; knowledge; Ebola situation/experience and challenges.
- Identify a contact person(s)/groups/task force leader whose support will help facilitate community engagement.

3.2 Step 2: Inform

- Inform the community representative about the intention of decommissioning the Ebola care facility and the reasons behind the decision.
- Explain the process emphasizing the importance of safety for the workers and the community.
- Explain how health workers and staff who have been working in the facility will be utilized.

3.3 Step 3: Consult

- Request feedback on the process and listen actively to any suggestions and alternatives proposed.
- Seek additional input on action required and key people to facilitate the smooth running of the process.
- Discuss and agree on the key principles to be included in the agreement with the community.

3.4 Step 4: Reassure

- Provide and/or re-emphasize clear information with regards to possible scenarios during the decommissioning process (e.g., where suspected Ebola cases should go).
- Provide information on the overall restoration of the health services plan.

4. Decommissioning and its practical application

This chapter outlines the implementation of the technical activities for the safe decommissioning of Ebola care facilities with particular reference to the process and the technical aspects, including the physical infrastructure, furnishings, equipment and supplies. The primary responsibility lies with the institutions in charge of the facilities under the supervision of the facility manager and relevant authority.

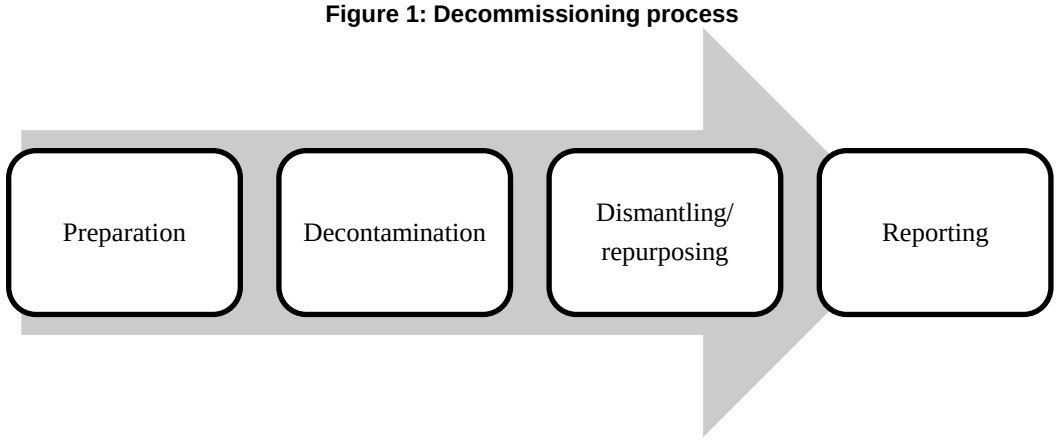
4.1 General considerations

"Decommissioning" is intended as the technical process in which Ebola care facilities are assessed, dismantled and/or repurposed after a proper decontamination phase aiming to prevent possible exposure to contaminated structures, equipment or material. Areas of an Ebola care facility can also be decommissioned during the operational phase when they are no longer required and/or their physical status is visibly deteriorated. Such areas should be cordoned off to prevent unauthorized re-entry in order to avoid recontamination.

4.2 Decommissioning process

The decommissioning process has been divided into four phases as illustrated in Figure 1. It covers only the physical structures and equipment as all the other related factors of the decommissioning process are outside the scope of this guidance. These phases should be strictly followed to ensure that operations are conducted in a safe manner.

Figure 1: Decommissioning process



4.2.1 Preparation

Preparation for decommissioning should be undertaken well in advance of the authorization for decontamination to ensure stakeholders' buy-in. This phase includes the planning of the required pre-and post-decontamination actions as follows:

- Access control should be maintained throughout the whole process to guarantee the smooth running of operations, safety of the staff involved and to manage the perception of the process within the local community.
  - Items (e.g., furniture, beds, tents, equipment, instruments) should only leave the site at the end of the process and with the permission of the site manager.
- The facility manager should brief the decommissioning team. The briefing should focus on infrastructures and method of construction, areas, and identification of a "clean zone" for the reception and temporary storage of disinfected material (Annex 1).
- Community engagement should aim to inform, consult, engage and reassure the surrounding community in regards to the decommissioning process.
- Infrastructure assessment refers to the visual inspection for signs of decay or breakdown.
- Logistical activities are divided into supply, inventory (or list) and storage.

- Supply: all items required to perform all the activities included in the process with particular reference to personal protective equipment (PPE), chlorine and detergent.
- Inventory (or list): all equipment should be revised during the preparation phase and agreement made about their future with particular reference to tents, medical equipment, generators, pumping devices and incinerators, based on the regulations and agreements stipulated at the time of opening the facility.
- Storage: refers to the identification and briefing of the team in charge of disassembling the tents and temporary infrastructures. This process includes also identification of the site for temporary storage of the material that can be reused (Annex 1).

- Risk analysis: refers to the revision of the associated hazards in each phase of the process and related mitigating measures already in place and/or to be established.
- Staff requirements: should be based on the size of the facility and timeline considered for the completion of the process.
- The team must include a former staff hygienist from an Ebola care facility. This decreases the time spent on retraining staff on the correct implementation of technical areas.
- More than one team can operate at the same time under supervision of their respective team lead/supervisor. However, their assigned area should be identified, marked and reviewed during the preparation phase (Annex 1).
- Training of the team: should comprise the preparation and safe use of cleaning and disinfectant solutions and the different types of PPE. Tetanus immunization should be offered to the team, if available.

4.2.2 Decontamination

The following precautions should be taken:

- Monitoring of the sectioned areas (Annex 1) during the whole decontamination phase.
- Use of tape or rope to demark the area during the operation and identify the disinfected areas if the work is conducted in phases.
- Creation of a dedicated space for the drying of equipment/materials during the cleaning phase.

The IPC officer and/or designee should observe the cleaning and disinfection process as a way to validate that the surfaces have been properly cleaned and disinfected.

Table 2 highlights the minimum requirements for safety during the decontamination phase. It is classified into four groups: equipment, human resources, personal protective equipment and consumables.

Table 2: Minimum requirements for safety during the decontamination phase

Equipment	Human resources	Personal protective equipment	Consumables
• See Section 5.1.1 • See Chapter 7	• Project officer • IPC officer • Hygienists • Water and sanitation officer • Occupational health and safety officer • Laundry staff (optional) • Waste handler • Security guards	• See Section 5.1.1	• Demarcation tape • Disposable plastic waste bag. • For other consumables, see relevant sections

4.2.3 Dismantling/repurposing

The dismantling phase refers to the disassembly of temporary infrastructures and the potential reuse and/or recycling of material or its disposal. It should start only after the validation of the proper cleaning and decontamination of the structures by the IPC officer/designee.

Creation of a well demarcated “clean” zone (e.g., fenced with plastic mesh) within the low-risk area where disinfected equipment and materials from the low-risk area can be temporary stored. The size of the area is dependent on the care facility. However, it is generally recommended to consider a large area due to the volume of items to be stored.

The process of dismantling can be conducted in different areas of the facility simultaneously. However, for larger facilities, it is recommended to proceed in phases in order to better monitor the safe implementation of the activities. Tents if not damaged (tent must be intact) and not made of absorbable material can be packed in storage for subsequent reuse. Wooden shelters and fencing built using tarpaulin can be dismantled and burnt due to their likely deteriorated condition. Concrete surfaces requiring break up should be left until the end of the process. This will allow for the safe use of the excavator. If break up of concrete is done manually, precautions should be taken to prevent health and safety hazards.

No equipment or material should be abandoned on site without the approval of the relevant regulatory authorities and affected landholders.

In the event that masonry or concrete structures are buried, it is recommended that the responsible agencies provide a site plan to the landowner and also explain to the landowner where the abandoned facilities are located. If buried and decommissioned latrine pits or septic tanks are present, it is recommended to conduct a simple risk assessment including soil type, water table, hydraulic gradient, and time since pit was buried, etc. This will ensure the safety of new installations, including possibly water pipes.

4.2.4 Repurposing principles

The key technical principles for the repurposing of an Ebola care facility are:

- Location and assigned purpose of the structure.
- Quality of the construction and the material used, in particular for temporary structures.
- Evaluation of the water system in terms of water quantity, in particular during the dry season, and water quality (especially for microbial containment).
- Quality of the construction and functioning of sanitation facilities.
- If the permanent structures are to be returned to their original condition, an assessment of the condition of the building should be performed and maintenance activities conducted before the re-opening of the facility. A fresh coat of paint is recommended as a reassuring measure for the community.

4.2.5 Reporting

A final report of the entire decommissioning process should provide records of all activities, final dispositions of waste and recycled products. This should be submitted within 2 weeks of completing the decommissioning process. It* should include:

- The completed checklist approved by an IPC officer and by the Ministry of Health (MOH) or relevant authority and facility manager.
- Listed material and equipment for reuse and donation.
- Organization and management of occupational health and safety during the decommissioning process.
- Site plans, including underground masonry or concrete structures, water points and location of waste disposal areas (burn pits, latrine pits, etc.).
- Waste management process.
- Photo journal.
- Conclusions and recommendations.

* This checklist is a tool recommended for use by the intended user and the information collected is not being used for CDC data collection instrument. CDC does not intend on collecting this information.

- Strategy for after action review.

5. Infection prevention and control principles for terminal cleaning and decontamination procedures

The evidence on Ebola virus survival in the environment or in solid or liquid waste (see Chapter 2) is crucial in developing strategies for terminal cleaning and decontamination of facilities where cases of Ebola were admitted. Data from experimental and field studies, as well as the absence of any evidence of virus spread from environmental vehicles, support the view that the virus is relatively fragile with its infectivity rapidly declining outside its hosts.

Therefore, the proposed guidance principles and protocols for decontamination of Ebola care facilities are based on the premise that the Ebola virus loses its infectivity within hours to days in the environment due to its enveloped nature, and also that it is highly susceptible to several disinfectants (including chlorine and ethanol) and ultraviolet light.

There are a number of guiding IPC principles to be followed and key actions needed in preparation for the safe and effective terminal cleaning and decontamination of Ebola care facilities.

- A trained IPC officer should be identified for the inspection of the facility before and after terminal cleaning and decontamination and for supervision of the process.
- Ideally, the IPC officer(s) should inspect the facility also during the decontamination procedures.
- A checklist of the necessary steps for the cleaning and decontamination processes of the environment, furniture, equipment and waste management should be developed and used.
- Appropriate hand hygiene stations and areas for PPE donning and doffing and areas for decontamination should be set up.
- Cleaners who worked in the Ebola care facilities and have been trained to perform the cleaning duty safely should be identified and given a thorough briefing before starting. Staff health and safety should be monitored and injuries/illness should be reported. An occupational health and safety officer should ideally work in collaboration with the IPC officer for the initial assessment and monitoring of the decommissioning process (see Chapter 9).
- The facility should not be opened for repurposing until the safe completion of the process, documented by use of the checklist and signed off by the IPC officer(s) completing the final inspection.

With respect to the potential social and psychological impact of resuming the use of former Ebola care facilities for their original purpose, such as schools and community centres, district authorities and social mobilization officers should develop appropriate communications to reassure health workers and the population about the safe conditions of the facilities once the decontamination process has been completed. If possible, visual improvements (repainting walls, landscaping, refreshing furniture, etc.) may be considered and planned to enhance the acceptability and appeal of the new purpose/use of facility.

5.1 Procedures for terminal cleaning and decontamination of Ebola care facilities

5.1.1 PPE to be used by cleaners to undertake terminal cleaning and decontamination

- In the red (high risk, where suspected or confirmed Ebola patients were cared for) zone, cleaners should wear full PPE according to WHO recommendations [23][†]. While cleaning the green (low risk, where PPE is donned or office space around the treatment unit) zone, lower level PPE can be used (disposable gown, heavy duty gloves, mask, face shield and boots). If no clear distinction between the red and the green zone of the Ebola care facility is possible, cleaners should wear full PPE at all times during the procedures.
- Standard procedures for donning and doffing PPE should be followed carefully as in normal working conditions during the operational phase of an Ebola facility.

Full PPE includes:

- Double gloves (non-sterile examination gloves and heavy duty gloves).

[†] CDC does not provide PPE guidance for West Africa."

- A disposable gown or coverall made of fabric that is tested for resistance to penetration by blood or body fluids or to bloodborne pathogens to cover clothing and exposed skin.
- A disposable waterproof apron worn over the gown or coverall. If disposable aprons are not available, heavy duty reusable waterproof aprons can be used. If appropriate, cleaning and disinfection is performed.
- A fluid-resistant medical/surgical mask with a structured design that does not collapse against the mouth (e.g., duckbill, cup shape).
- Eye protection (either goggles or face shield) in order to have the mucous membranes of the eyes, mouth and nose completely covered by PPE and prevent virus exposure.
- Waterproof boots (e.g., rubber/gum boots). If boots are not available, health workers must wear closed shoes (slip-ons without shoelaces and fully covering the dorsum of the foot and ankles) and overshoes.

5.1.2 Selection and actions prior to cleaning and disinfection

- Visually inspect surfaces for signs of wear and tear, decay or overall disrepair (e.g., mattresses, furniture and equipment).
- Safely remove, dispose and incinerate all non-intact objects/equipment.
- Safely remove, dispose and incinerate all objects/equipment made of porous/absorbable material (e.g., linen, wooden benches, mattresses or pillows not protected by a plastic impermeable cover).
- If preferable, intact linen that is free of visible soiling could be soaked in 5000 ppm (0.5%) chlorine solution for 10 minutes and then laundered in a normal manner.
- Washable tent materials (e.g., tarpaulin, canvas) that can be cleaned and decontaminated with water, detergents and disinfectants should undergo the same procedures as concrete buildings. If tent surfaces show visible signs of wear or are soiled and cannot be appropriately decontaminated, they should be demolished, safely disposed and incinerated.
- Surfaces that are intact and can withstand rigorous cleaning may undergo cleaning and disinfection.
- Keep a careful record of all items to be decontaminated, label them and keep such documentation with items after they have been safely decontaminated.
- All solid waste collected or produced during the procedures (including all dirty cloths/towels, PPE, etc.) should be disposed of in leak-proof plastic bags, collected in covered bins designated as infectious waste and incinerated.
- Sharp objects and clinical equipment should be placed inside puncture-resistant waste containers and then incinerated.

5.2 Procedures for environmental cleaning and disinfection

5.2.1 General instructions

- To prevent inactivation of disinfectants by organic matter, cleaning should precede application of disinfectants [5, 24].
- If locally prepared, cleaning and disinfectant stock solutions should be freshly prepared every day.
- Cleaning/disinfectant solutions and equipment should be changed and refreshed frequently (every 2-3 hours) while being used during the day as they may quickly become contaminated.
- Cleaning should always be carried out from “clean” areas to “dirty” areas in order to avoid contaminant transfer. The area where PPE is removed should be the last area to be cleaned.
- Dry sweeping with a broom should never be done. Rags holding dust should not be shaken out and surfaces should not be cleaned with dry rags. Use moistened cloths to prevent spread of virus particles in the air and to other surfaces.
- Place all dirty cloths/towels and solid waste in leak-proof plastic bags to be collected in covered bins designated as infectious waste and incinerate.
- Sharp objects and clinical equipment remaining in the Ebola care facility should be placed inside puncture-resistant waste containers and then incinerated.

- Spraying rooms with disinfectants (e.g., chlorine solutions) is not recommended [23]. It is a potentially dangerous practice for health workers and has no proven disease control benefit as the disinfectant may not reach all desired surfaces. When wiping down items, consider natural ventilation that can be achieved through opening windows and doors to minimize irritation inhalation exposure.
- Spraying may be accepted outdoors when it is the only feasible option. When spraying is used, cleaning with water and detergent to mechanically remove the contaminants and organic matter should precede it. After spraying of disinfectant, it may be necessary to ensure also that it is properly distributed on the surfaces. Cleaners undertaking spraying should wear full PPE.

5.2.2 How to clean and decontaminate environmental surfaces and spills of organic materials (blood, bodily fluids, etc.)

- If there are spills or liquid biological waste in the room, the cleaner should clean up the spill before cleaning other surfaces; cloths or towels used to clean a spill should not be used to clean surfaces that do not have liquid biological waste on them.
- Spills or liquid biological waste including blood, other body fluids, secretions or excretions should be removed, cleaned and decontaminated as follows [23]:
  - Cover the soiled area with a rag or paper towel to avoid splashes or dispersion of fluids.
  - Wipe up the spill and dispose of the rags or towel into a laundry container for laundering or a waste bucket designated as infectious waste for disposal.
  - Clean the area with a detergent diluted with water and then disinfect using a 0.5% chlorine solution (i.e., a solution containing 5000 ppm available free chlorine) or another suitable disinfectant. Moistened cloths and wipes should be used.
- All environmental surfaces (including furniture, walls, doors, etc.) or objects should be cleaned with detergent diluted with water and allowed to dry, and then disinfected using a 0.5% chlorine solution (i.e., a solution containing 5000 ppm available free chlorine) or another suitable disinfectant. Moistened cloths and wipes should be used [23].
- Allow surfaces to dry naturally.
- If surfaces are rinsed with a lot of water during the cleaning process, they should be dried with rags before applying the disinfectant to avoid diluting the recommended concentration.
- The procedure should be very meticulous and thorough and special attention should be paid to high-touch surfaces (e.g., beds).
- If available, solid waste and objects covered under solid waste could be disinfected by autoclaving. Shredding or compaction post-treatment is necessary.
- Reusable materials can be decontaminated by thorough cleaning and disinfection (see Chapters 7 and 8 and Annex 3). Non-reusable articles should be safely disposed and not reused.
- Clean reusable items with detergent diluted with water while wearing appropriate PPE to remove organic matter, then let them soak in 0.5% chlorine for at least 10 minutes and finally rinse items off with cold water.
  - When chlorine cannot be used because of its corrosive action, alcohol (e.g., ethanol) at a minimum concentration of 70-80% (v/v) can be used to decontaminate hard, non-porous environmental surfaces.

6. Water and sanitation facility principles for terminal cleaning and decontamination procedures

The following chapter highlights the key considerations in the decontamination of water and sanitation facilities and provides technical recommendations on the safe decommissioning of water and sanitation infrastructures. As stated in Chapter 5, trained and supervised staff using a checklist and following health and safety procedures should perform all procedures. In addition, some information is provided on the further treatment of waste water. The importance of properly treating and disposing of waste water, especially in high-burden disease settings such as in West Africa, cannot be emphasized enough. There is a risk that faecal-oral pathogens, such as cholera or poliovirus, could trigger a concurrent outbreak. A useful reference for waste water treatment options in low-resource settings is "*Linking technology choice with operation and maintenance in water supply and sanitation*" [25].

For all activities mentioned in this chapter, cleaners should wear full PPE in red (high risk) zones. While cleaning the green (low risk) zone, lower level PPE can be used (disposable gown, heavy duty gloves, mask, face shield, boots). A water, sanitation and hygiene (WASH) expert should be an integral member of the decommissioning team.

6.1 Latrines

6.1.1 Temporary latrines

This section covers the decommissioning of temporary latrines. Decommissioning should start no sooner than 7 days (see Table 1) after discharging the last Ebola case.

Superstructure

- For latrine superstructures made of temporary plastic sheeting, it is recommended to disinfect, dismantle, and dispose by proper incineration[‡], burning or deep burial[§].
- Ensure that materials used (e.g., timber, vent pipes, corrugated sheets, plastic slabs) are properly decontaminated (soap and water followed by 0.5% chlorine solution) before removal from the site.

Substructure

- The pit must be properly backfilled with packed soil or other solid debris such as gravel. Consider a minimum of 0.5 metres of soil or other solid debris.
- The pit should be demarcated with signage and global positioning system (GPS) coordinates recorded if possible.

6.1.2 Permanent latrines

This section covers latrines that are intended for reuse. Decontamination should start no sooner than 7 days (see Table 1) after discharging the last Ebola case.

Superstructure

- Clean and disinfect the superstructure (floor, door, wall, etc.) in the same manner as the care facility and as detailed in Section 5.2.
- The slab used for the latrine, or in the case of the toilet, the bowl, handle, etc., should also be thoroughly cleaned and disinfected (as detailed in Section 5.2)
- Once the latrine superstructure and/or toilet has been cleaned and disinfected, the MoH or a designated authority has to verify the process and formally approve that it is safe to use again.

Sub-structure (below floor level)

- Reusable latrines should only be emptied if they are more than two-thirds full

[‡] If possible, the Best Available Technique (BAT) guidelines under the Stockholm Convention and the European norm 1948 or the United States Environmental Protection Agency Method 23, should be considered.
[§] 1.5 metres wide and 2 metres deep into the ground

- If faecal waste has to be removed, desludging should be carried out according to the national guidelines. If national guidelines do not exist, the transportation and disposal site for the sludge should be assessed by the agency in charge and risks have to be minimized to as close to zero as possible.
- Practitioners should refer also to IPC guidelines during this process (see Section 5.1.1).

- If the pits are less than two-thirds full, there is no need to empty.
- Once the superstructure of the latrine has been decontaminated (as mentioned above), the latrine is safe to use again.

6.2 Septic/holding tanks

This refers to any sealed receptacle – underground or above ground – used to collect human waste.

Temporary facility

- The tank must be properly sealed and backfilled with packed soil or other solid debris such as gravel. Consider a minimum of 0.5 metres of soil or other solid debris.
- The tank should be demarcated with signage and GPS coordinates recorded if possible.

Permanent facility

- If the tank is to be reused, empty it only if it is more than two-thirds full.
  - If faecal waste has to be removed, desludging and disposal should be carried out according to the national guidelines. If national guidelines do not exist, the transportation and disposal site for the sludge should be assessed by the agency in charge and risks have to be minimized to as close to zero as possible. It should be noted also that standard waste stabilization pond designs used in higher-income countries are designed for use with sewage. Pond systems used for treatment of septic or holding tank waste, which is much more highly concentrated waste, may need to be modified to ensure effective treatment.
  - Practitioners should refer also to IPC guidelines during this process (see Chapter 5).
  - The transport and disposal site for the sludge should be assessed by the agency in charge and risks have to be minimized to as close to zero as possible.
- If the tanks are less than two-thirds full, there is no need to empty.

Inspection chamber

- If the tank is to be dismantled, the inspection chamber should be sealed with concrete.

Down pipes

- If the septic tank is to remain operational, the down pipes used to convey faecal matter from latrines/toilets to septic/holding tanks can remain intact and undisturbed if the same sanitation system will be used for the repurposed facility.
- If the tanks are to be dismantled, waiting one week after the last user is recommended before rinsing with water and then disinfecting the pipes with 0.5% chlorine solution.

6.3 Grey water facilities

This refers to water from showers, laundry, cooking, drainage, etc., which is not laden with faecal waste.

- Temporary showers should be treated in a similar way to latrines.
  - Disinfect and then burn or bury the superstructure.
  - The concrete floor should be disinfected and buried on site. If necessary, it can be broken into pieces to facilitate burial.
  - The shower pit should be backfilled to ground level.
  - The soakaway and shower drainage channels should be disinfected with chlorine solution (0.5%) and backfilled.

- Surface drainage channels.
  - Disinfect with 0.5% chlorine solution.
  - Where possible, remove drainage channels, foundations and holes made when removing other structures. If these depressions are deep, they can first be filled with fine rubble and then covered with soil and sand.
  - Level with the ground, taking care to remove as much rubble and debris as possible.

6.4 Lime and chlorine advisory

- Hydrated lime should be added to dry out the waste prior to backfilling. Please refer to Annex 2.
- Chlorine is an ineffective means to disinfect media containing large amounts of solid and dissolved organic matter as the organic matter (i.e., human waste) will very rapidly inactivate the chlorine. Therefore, it is not recommended for use in treating faecal matter.

6.5 Water infrastructure

Dismantling of water points

- Piping can be reused. For pipes that served as conduits of chlorinated water, no additional disinfection is needed. For piping of non-chlorinated water, it is recommended to rinse the pipes with chlorinated water (0.5%) before reusing. Once disinfected, piping can be used immediately.

For the reuse of water points

- Conduct a sanitary survey specific to the type of water sources and according to national or WHO guidelines.
- Recommend microbiological testing according to WHO standards.
- Use 1% (shock) chlorination for shallow wells and hand-dug wells. It is acknowledged that the effects of the chlorine residual will only last a few a days, but it may provide peace of mind for local communities.
- Inform the community that decontamination has been done utilizing the guidance from Section 4.

6.6 Solid waste

- As the volume of items to be burnt is likely to be significant, the burning pits should be designed accordingly.
- Items that cannot be burnt should be deep-buried at an approved site.
- Prior to the disposal, all items have to be decontaminated.
- Safety measures have to be taken into account to avoid contamination of environment (i.e., water sources) and exposure risks to health workers who burn the waste.
- If a burning pit is used, it should be closed with one metre of soil when all procedures are concluded.
- All final waste disposal sites coordinates should be taken and logged with the MoH.
- Incinerator drums should be emptied into the waste pit and, if reusable, sterilized by igniting a fuel (such as kerosene) and allowed to burn for 10-15 minutes.
- Sharps' pits and organic pits. Backfill and compact before covering with concrete (minimum 5 cm) for permanent closure.
- Ash pits. There would be limited risk from ash; therefore, backfill the pit with soil and compact and mark off this area for future reference.

7. Decontamination principles for medical devices and equipment

Procedures for the cleaning, disinfection and/or sterilization of medical devices (including medical equipment, single-use devices and surgical instruments) and medical furniture vary in complexity depending on the type of medical device. Decontamination standard operating procedures (SOPs) should be specified by the manufacturers as part of the general use, care, cleaning and maintenance of the medical device and should be followed when available. In the absence of manufacturer's instructions for the specific type, brand and model of medical device, please follow the generic SOPs in Annex 3.

Three types of risks are associated with the reuse of a medical device.

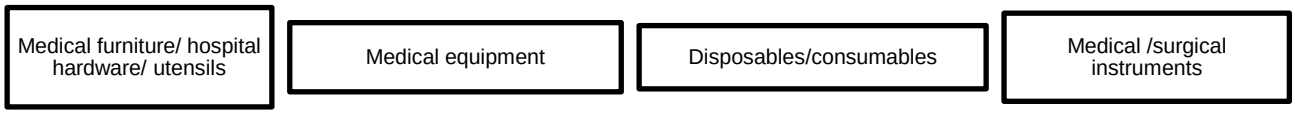
- The risk of disease transmission from one patient to another or from environmental sources to a patient.
- The risk of inadequate or unacceptable device performance following reprocessing.
- The risk of occupational exposure to bloodborne pathogens and other potentially infectious materials.

7.1 Categories of medical assets

Medical devices for the purposes of cleaning and decontaminating for the safe handling, transportation, redistribution and disposal of the medical assets can be categorized by design and complexity of the device.

For the purposes of this rapid guidance, there are four general categories with related sub-categories. If available, medical devices should be decontaminated according to the manufacturer's decontamination SOP.

Figure 2: Categories of medical assets



7.1.1 Medical furniture/hospital hardware/utensils

Medical furniture includes beds, examination bed (non-electrical), bedpans, tables, jars, basins, bowls, trolleys, intravenous poles, footstools, etc. Generally, this category of medical asset requires individual screening before a decontamination procedure can be specified.

7.1.2 Medical equipment

Four types of medical equipment fit under this category.

- Non-electro mechanical hospital equipment: cotton or latex tourniquets, measuring tape (plastic, wood, fiberglass).
- Electro-mechanical hospital equipment describes medical equipment utilizing electrical and/or mechanical processes. This includes lamps, ophthalmoscopes, infrared thermometers, pulse oximetry, defibrillators, electrocardiographs and clinical laboratory equipment.
- Electro-mechanical respiratory equipment describes medical equipment for the purposes of respiratory support. This includes oxygen concentrators, ventilators, suction systems and anaesthesia machines.
- Mechanical hospital equipment or accessories, i.e., sphygmomanometers, stethoscopes, etc.

7.1.3 Disposables/consumables

All are single-use devices

- With sharp edges: syringes, needles, etc.
- Without sharp edges: catheter, catheter extensions, bags (intravenous bags) and cannulae.
- Consumables for electro-medical equipment: reagents, test paper, etc.
- For laboratory accessories: pipettes, glass, blood collection tube, etc.

7.1.4 Medical/surgical instruments

This includes stainless steel material, e.g., forceps, scalpels, scissors, etc.

7.2 Planning for decontamination of medical assets

- Take an inventory of medical assets using WHO guidance on medical devices [26].
- Categorize medical assets (see Table 3) with special attention to those with sharp edges and electro-mechanical components.
  - Furniture (Table 3, see SOP1).
  - Medical equipment.
  - Disposal or non-disposable equipment
    - Non-electro-mechanical hospital equipment (Table 3, see SOP 1).
    - Mechanical hospital equipment or accessories (Table 3, see SOP 2).
    - Electro-mechanical hospital equipment: determine the location of the electrical components within the device and isolate if possible. Cleaning solutions may corrode the electrical components (Table 3, see SOP 2).
    - Electro-mechanical respiratory equipment (Table 3, see SOP 3).
  - Single use.
  - Non-sharp edged tools (Table 3, see SOP 4).
  - Sharp-edged tools (Table 3, see SOP 5).
  - Surgical instruments (Table 3, see SOP 6).
- Follow the SOPs (see Annex 3).
- Determine which assets are to be repurposed locally, returned to the donor or discarded safely.
- Allocate space for contaminated items and decontamination activities. Ensure that full PPE is available to staff (see Section 5.1.1). If medical devices are clean, use light PPE. If items are contaminated use full PPE.
- Determine the cleaning agents and disinfectants available for the decontamination of the medical assets.
- Determine if these agents are in accordance with the manufacturer's instructions (if available) as well as for cleaning and disinfection. Any chemical disinfectant including soap and water, 0.5% chlorine solution or another suitable disinfectant, such as 70% ethanol, can be used as appropriate disinfectants. Note: the manufacturer's procedures may not apply specifically to Ebola virus decontamination. Therefore, a suitable surrogate pathogen may be taken as worst-case scenario and the related cleaning procedure can be the equivalent.
- Ensure that consumables, such as plastic bags and sheets, are available to protect cleaned equipment from inadvertently getting soiled again.

Table 3: Generic standard operating protocols for equipment decontamination

Asset main category	Asset sub-category	Examples	Reference SOP and short summary
1. Medical furniture/ hospital hardware / utensils		• Bed frames and stretchers • Polypropylene buckets • Chair with plastic sheet • Autoclave • Bedpan with handle, polypropylene • Sheets, mattress • Urinal with plastic lid • Intravenous poles	**SOP 1** Decontaminate surfaces as soon as possible, clean and then use standard hospital disinfectant (e.g., a 0.5% chlorine solution or a solution containing 5000 ppm available free chlorine).
2. Medical equipment	Non-electro-mechanical medical devices	• Tourniquets (for blood testing), latex rubber • Measuring tape/ ruler	**SOP 1** See above
	Mechanical medical equipment	• Blood pressure cuffs • Stethoscopes • Sphygmomanometer, aneroid • Mechanical scales	**SOP 2** If possible, dismantle the devices to enable thorough cleaning. Devices should be wiped with alcohol (or chlorine) solution
	Electro-mechanical hospital equipment	• Infrared thermometer • Electrocardiogram (ECG) and monitor cables • Pulse oximeter • Laboratory clinical diagnostic equipment (refer to Chapter 7)	**SOP 2**: If possible, dismantle the devices to enable thorough cleaning. If battery operated, remove battery. Devices should be wiped with alcohol (or chlorine) solution
	Electro-mechanical respiratory equipment	• Oxygen concentrators • Flow splitter for oxygen concentrator • Suction system, general purpose • General anaesthesia machine • Ventilators	**SOP 3** Respiratory and anaesthesia equipment should be disassembled, filters discarded, cleaned and disinfected
3. Disposables / consumables	Single-use devices without sharp edges	• Single-use PPE • Cannula, peripheral intravenous, sterile, disposable, with needle stick prevention • Catheter, intravenous, extension • Film/sheet, dressing, transparent, sterile, adhesive • Infusion-giving set • 3-way stopcocks with extension tubing, sterile • Wrap, self-adherent, disposable • Lock/cap/stopper, intravenous • Gauze • Catheter, Foley, sterile, disposable • Oxygen prongs, nasal, non-sterile • Oxygen tube, extension • Tube, aspirating/feeding • Tube, feeding sterile • Swab, cotton-tip, tube, sterile • Triple packaging boxes for specimen transport • Tube, blood collection, sterile	**SOP 4** Immediately dispose of in a safe, sturdy and clearly labelled bag after use as they pose cross-infection risks. Items with intact packages found in storage may be returned to donor or redistributed to be used.

		• Tube, blood collection, serum • Tube, blood collection, plain/dry • Pipettes	
	Single-use devices with sharp edges	• Syringe, reuse prevention feature • Sharps' container (containing used sharps) • Needles and scalp vein needles • Intra-osseous infusion system • Syringe and needle, insulin type, sterile	**SOP 5** Must be immediately disposed of in puncture-resistant, fluid impermeable sharps' containers after use as they pose cross-infection risks. Final disposal includes incineration.
4. Medical/surgical instruments		• Scissors • Forceps • Scalpels • Retractors • Clamps	**SOP 6** Combined protocol that includes physical contaminant removal (manual or ultrasound cleaning) and either physical or chemical disinfection or sterilization

7.3 General steps for decontamination of medical assets

- Use full PPE according to IPC guidelines. In the red zone (high risk), cleaners should wear full PPE according to WHO recommendations [23]. While cleaning the green zone (low risk), lower level PPE can be used (disposable gown, heavy duty gloves, mask, face shield and boots boots). If no clear distinction between the red and the green zone of the Ebola care facility is possible, cleaners should wear full PPE at all times during the procedures (see Annex 4).
- Designate trained, supervised and responsible people to work in the decontamination area where contaminated items are received and cleaned.
- Designate a space for the items once they are cleaned, which is separate from the area where cleaning will occur (see Annex 4).
- Proceed with the specific SOPs for decontamination as instructed by the manufacturer; if this is not available, please follow the generic SOPs listed in Annex 3. Once the health care facility manager and the district health medical teams (DHMT) have accepted the SOP, steps should be taken to verify the cleaning process once implemented.
- Once cleaned and disinfected, ensure that each medical device or part of the medical device is covered in plastic or enclosed in a plastic bag to prevent accidental soiling prior to re-use.

7.4 Waste management

- Because of the hazardous nature of incineration of plastics, it is recommended that these be deep buried along with medical devices made of metal and ceramics that are damaged beyond repair. If deep burial (1.5 metres wide and 2 metres deep into the ground) is not possible on site, then the decontaminated plastic items need to be transported offsite for deep burial.

7.5 Medication

- Expired medicine should be disposed of according to WHO existing guidelines [27] or national recommendations for the disposal of pharmaceuticals. Incinerate when relevant.
- Non-expired and unopened medicine can be redirected by the MoH to other health facilities only if it has been stored under proper conditions and in accordance with good storage practices. If this was not the case, dispose of as for expired medicine.

8. Laboratory equipment principles for terminal cleaning and decontamination procedures of laboratory equipment

This chapter covers the terminal cleaning and decontamination procedures of laboratory equipment (e.g., clinical analyzers; shakers, centrifuges) used for Ebola testing in the context of decommissioning Ebola care facilities. In laboratory settings, decontamination of items, spent laboratory materials, and regulated laboratory waste are often accomplished by a sterilization procedure, such as steam autoclaving, which is perhaps the most cost-effective and reliable way of decontaminating waste or an autoclavable item [1]. The overall responsibility lies with the institutions and laboratories who constructed the field laboratory facilities under the supervision of the DHMT.

8.1 General considerations

Based on the level of contamination and wear, and dependent on whether items are to be destroyed or kept for future use, the following steps can be followed to decontaminate laboratory equipment in Ebola care facilities and mobile field laboratories. For general environmental cleaning and disinfection of other laboratory areas, please refer to Section 5.2.

8.1.1 Field laboratories using a disposable glove box

- To decontaminate the glove box in which viable specimens have been handled before inactivation, thoroughly cover all surfaces with 0.5% chlorine solution or another suitable disinfectant, such as 70% ethanol, for 5 minutes or longer.
- The portable glove box can be collapsed once decontamination is completed and incinerated in a burn pit.

8.1.2 Field laboratories using biological safety cabinets

- Regularly decontaminate the inside of the biological safety cabinet (BSC) with 0.5% chlorine solution or another suitable disinfectant, such as 70% ethanol, when using it to handle viable specimens before inactivation.
- If BSCs are to be decommissioned, it is necessary to decontaminate these properly. As the process requires fumigation and expertise in BSC engineering, it is recommended to ask qualified staff to carry it out.
- Donation: if equipment is being donated to national laboratories, decontaminate surfaces with 0.5% chlorine solution by thoroughly covering all surfaces and properly fumigate the cabinet only by qualified staff. It is important also to recertify the BSC before being repurposed.

8.1.3 Other laboratory equipment and laboratory work space

- Immerse in 70% ethanol for 10 minutes.
- Decontaminate equipment placed inside the glove box, e.g., piccolo, pipettes and centrifuge. Wipe down equipment with 0.5% chlorine solution or suitable disinfectant, such as 70% ethanol, with proper contact time maintained (e.g., 5 minutes).
- While local and specific risk analysis is indispensable, automated analyzers used for processing and measuring characteristics of samples relating to Ebola are generally thought to present no greater risk than what is normally found in handling samples of common bloodborne viruses, such as HIV and viral hepatitis.
- The analyzers should be decontaminated after use and before maintenance as recommended by the manufacturer or by using an appropriate disinfectant of proper concentration. Additional care should be paid to liquid and solid waste as well as the waste bag/box of the analyzer, which are potentially biohazardous.
- Decontaminate the outside of all laboratory chemical containers before donating.
- Follow national procedures for disposal of expired chemicals.
- To decontaminate work surfaces, see Chapter 5.

9. Occupational health and safety risk principles: decommissioning procedures to reduce risks and ensure the safety of workers

The chapter covers occupation health and safety risks and ensuring the safety of workers involved in the decommissioning process. The primary target audience includes people in charge of organizing and supervising occupational health and safety in the area of Ebola care facility decommissioning, such as ministries of health and labour, district environmental health/public health officers, labour inspectors, international organizations, non-governmental organizations, humanitarian, public and private companies, including demolition companies and their sub-contractors, employers and workers' representatives. All work should follow strict procedures for assessing and preventing the risks to the health and safety of workers and the community and should comply with the relevant national health standards.

Ebola care facility decommissioning may involve risks to the health and safety of workers. The risk of infection with the Ebola virus is key in planning and carrying out the decommissioning. In addition, there are other occupational health and safety risks of infectious, biological, physical, mechanical, chemical, ergonomic and psychosocial origin. Measures for their prevention and control should be planned in coherence with the measures for IPC.

- Biological hazards
  - Ebola virus.
  - Other pathogens: hepatitis virus, bacteria, etc., in sewage and fomites.
  - Hazardous insects – mosquitoes, bees, wasps, scorpions, ants, etc.
  - Venomous snakes.
- Ergonomic hazards
  - Lifting and moving heavy and unwieldy objects can result in musculoskeletal injuries.
  - Fatigue resulting from long work hours in hot and humid environments.
- Psychosocial hazards
  - Fear of contamination with Ebola virus.
  - Working under pressure and short deadlines.
- Mechanical hazards
  - Slips and falls associated with poor housekeeping, excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground.
  - Work in heights: working with ladders, scaffolding, and partially built or demolished structures.
  - Struck by objects: potential fall of materials or tools, ejection of solid particles from abrasive or other types of power tools, which may result in injury to the head, eyes and extremities.
- Electrical hazards
  - Contact with live electrical lines, use of electrical saws, drills or any power tools.
- Chemical hazards
  - Mineral and organic dust from soil or building structures, such as lead-based paint.
  - Toxic fumes from burning objects, particularly those containing plastics.
  - Chlorine and disinfectants causing respiratory irritation and skin problems.
  - Organic solvents used for degreasing or in paints.
  - Splashes of hazardous chemicals during the mixing and application of detergents causing irritation and burns to eyes and skin.
- Physical hazards
  - Heat stress, particularly working in a hot climate with full PPE.
  - Excessive noise from cutting tools and equipment.
  - Exposure to hand vibration from tools.
  -

9.1 Measures for the protection of occupational health and safety

9.1.1 During preparation

- Carry out risk assessment of the individual project for decommissioning and plan adequate preventive measures.
- Conduct a walk-through survey of the site to assess potential risks for occupational health and safety.
- Develop a list of preventive measures, PPE, and equipment and tools and discuss with the decontamination team.
- Create a plan for security during decommissioning.
- Carry out training of decommissioning workers to heighten the awareness and importance of occupational health and safety, including infectious and non-infectious risks of disease and injury.

9.1.2 During decontamination

- See Chapter 5 on IPC regarding cleaning and disinfecting in the different zones and including the use of PPE.
- Provide sufficient quantities of cold (if feasible) and safe drinking water and organize a rest zone in the shade to prevent heat stress from working with full PPE.
- Provide PPE according to the hazard assessment.

9.1.3 During dismantling and repurposing

- Ideally, ensure that a person trained in occupational safety and health supervises the process.
- All staff with access/entry to the decontamination site should be briefed about occupational health and safety requirements, protective measures and the use of PPE.
- Carry out daily safety briefings.
- Provide tetanus prophylaxis if available.
- Use safe hand tools or machines for sub-dividing /breaking down into small parts.
- Provide forklift trucks, trolleys and other lifting and moving devices for manipulating heavy objects.
- Implement good housekeeping practices, such as the sorting and placing of loose construction materials or demolition debris in established areas away from footpaths.
- Clean up excessive waste debris and liquid spills regularly.
- Locate electrical cords and ropes in common areas and marked corridors.
- Organize a designated and restricted waste drop or discharge zones and/or a chute for safe movement of waste from upper to lower levels.
- Conduct sawing, cutting, grinding, sanding, chipping or chiselling with proper guards and anchoring as applicable and use appropriate PPE.
- Provide PPE according to the hazard assessment.
- Provide first aid boxes and ensure that an individual trained in first aid is always present at the site when decontamination work is carried out.
- Have a plan for medical care beyond first aid, if needed.

9.1.4 Completion and confirmation of decommissioning operations

Review site to confirm:

- Safe environment.
- Ensure that there are no left-over hazards, such as glass, ashes, nails and waste (include in checklist).
- Document lessons learned for future operations.

9.1.5 During reporting

Reporting should include data on any problems related to health and safety experienced by workers during the decontamination process, such as:

- Injury, disease, health conditions related to the decontamination work.
- Hazardous exposure, particularly to heavy metals, asbestos, hazardous chemicals, electrical power, etc.
- Hazardous materials and equipment that are left on site.
- Any problems in the organization and management of occupational health and safety during the process.
- Occupational health surveillance (i.e., respiratory issues, physical injuries) should continue for 30 days after the completion of the process.

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12. Slade JS et al. The survival of human immunodeficiency virus in water, sewage and sea water. *Water, Science and Technology*, 1989, **2**:55-59.
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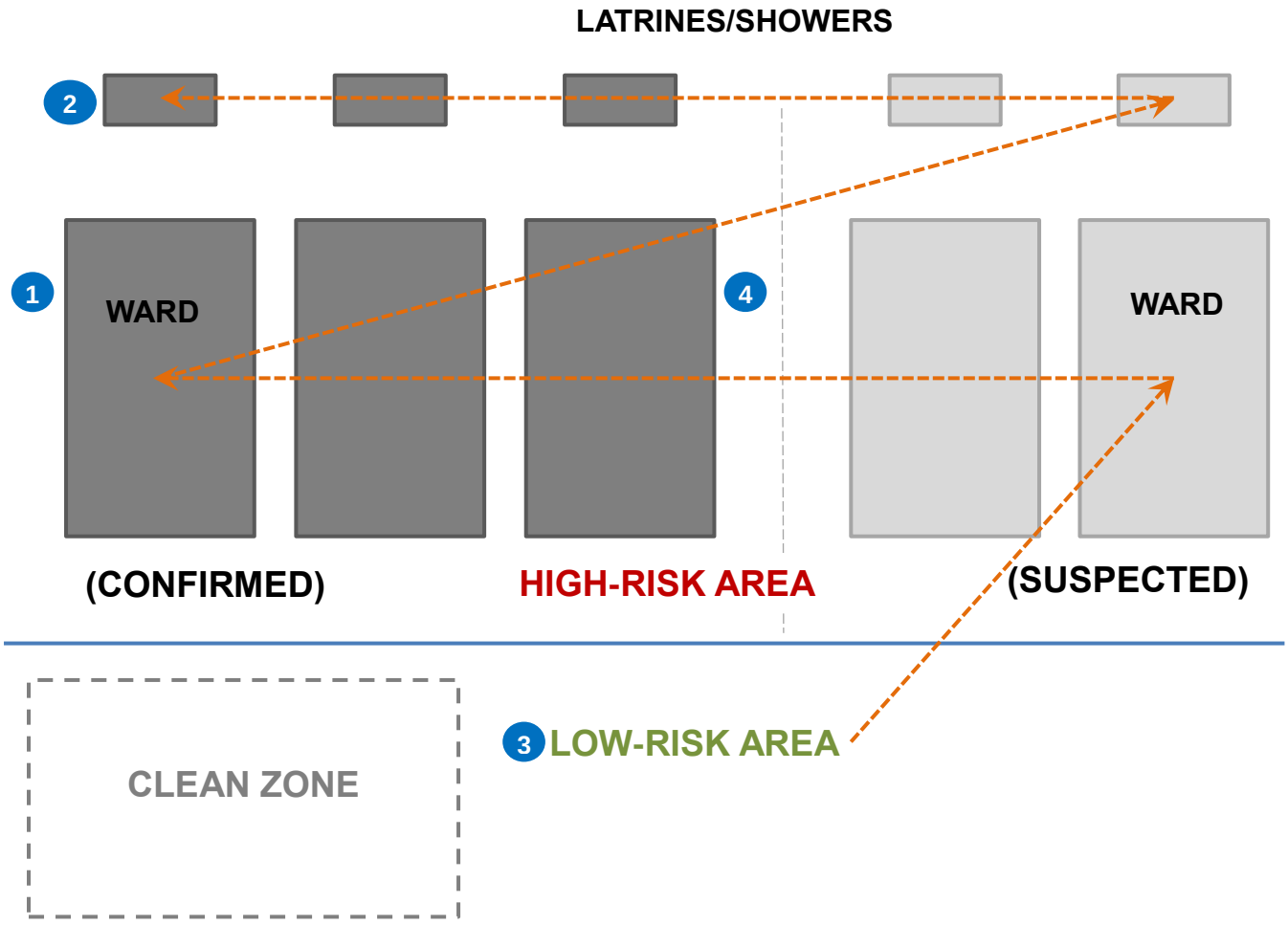
25. *Linking technology choice with operation and maintenance in water supply and sanitation.* Geneva, World Health Organization, 2003.
26. *Introduction to medical equipment inventory management.* Geneva, World Health Organization, 2011.
27. *WHO guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies*. Geneva, World Health Organization, 1999.

11. Annexes

Annex 1: Decommissioning process



Decontamination flow

1. Dismantling temporary structures (confirmed and suspected area)
2. Dismantling latrines/showers
3. Dismantling low-risk area
4. Mechanical break up of concrete surfaces and levelling of the area

Annex 2: Hydrated lime

Using hydrated lime as an agent to reduce volume of water in septic tanks

Lime is used as a sanitation aid in sewage treatment. It may be used in the form of quicklime – calcium oxide (CaO) or hydrated lime – calcium hydroxide (Ca[OH]2). Lime application is often used in septic tanks and pit latrines to remove the stench and reduce flies. It is effective for speeding up the natural decomposition process, neutralising odours and drying biosludge material. When added to the septage, lime increases the pH of the septage, increasing the rate of inactivation of pathogens, including Ebola. The reaction also generates a lot of heat that reduces the quantity of liquid in the septage. For the purposes of decommissioning of the Ebola care facilities, hydrated lime is intended to be used to reduce the water content of the septage before backfilling.

Application

To achieve the reduction, a dosage of 2.4-3 kg of lime per 1000 litres (20–25 lbs of lime per 1000 gallons) of septage is recommended[**].

Safety in lime application

Lower-level PPE (consisting of a disposable gown, heavy duty gloves, mask, goggles and boots) is recommended during lime application. It is highly recommended to have an emergency eye-washing station located nearby. Add lime slowly to the contents, especially when full as heat is liberated. If this is done manually, caution should be used to prevent exposure to the waste, lime dust and heat.

1. Hydrated lime is irritating to the eyes and skin: wear lower-level PPE. Contact lenses should not be worn when working with lime. As lime can cause severe irritation or burning, including permanent damage, eye protection such as goggles or safety glasses should be worn. In the case of contact with eyes, wash immediately with water and seek medical help. Wash off any hydrated lime adhering to the skin with water.
2. Do not inhale hydrated lime dust. Wear a dust mask (if available) to prevent inhaling hydrated lime dust. In the case of inhalation, wash nose and throat with water. Seek medical attention if discomfort continues.
3. In the event of ingestion, do not induce vomiting, wash mouth with water and drink large amounts of water. Seek medical attention if feelings of discomfort and uneasiness persist.
4. In case of spillage or release, first contain the spillage. Keep the material dry. Remove material mechanically where possible, taking care not to inhale dust. Avoid contamination of water courses and drains.
5. Lime must be stored in dry areas in sealed containers; minimize contact with atmospheric moisture and other materials.

[**] Bowker RPG. *Guide to septage treatment and disposal, EPA/625/R-94/002*. Washington, DC: United States Environmental Protection Agency Office of Research and Development, 1994.

Annex 3: Generic standard operating procedures for cleaning and decontamination of medical devices and hospital furniture

SOP 1: Hospital hardware/medical furniture/utensils

This section relates to beds (mattresses, bedding, covers and frames), stretchers, intravenous poles, trays and polypropylene devices.

Summary indication of SOPs: clean contaminated surfaces as soon as possible and remove visible dirt by wiping with water and a detergent. Use standardized hospital disinfectant. For example, a 0.5% chlorine solution containing 5000 ppm free available chlorine.

Procedure

- Cleaners should wear full PPE. Note: spraying occupied or unoccupied clinical areas with disinfectant should not be performed because it is a potentially dangerous practice with no proven disease control benefit.
- Waste should be segregated at the point of generation to enable appropriate and safe handling. All solid, non-sharp, infectious waste should be collected in leak-proof waste bags and covered bins.
    - Linen
        - Soiled linen should be placed in clearly labelled, leak-proof bags and then incinerated. Intact linen that is free of visible soiling could also be soaked in 0.5% chlorine solution for 10 minutes and then laundered in the normal manner.
        - Linen should then be dried according to routine standards and procedures.
    - Mattresses and covers (beds and stretchers)
        - Soiled mattresses should be evaluated for potential disposal. If the mattress is not soiled and has an intact plastic protective coating, clean and disinfect as soon as possible using standard hospital detergents and disinfectant (e.g., a 0.5% chlorine solution).
        - If the mattress is not protected by an impermeable protective layer, it should be treated as infectious waste and incinerated using the pit incinerator method to control the burn.
    - Frames (stretchers and beds), trays, intravenous poles, metal furniture
        - All bed and stretcher frames or associated features should be cleaned with water and a detergent and then disinfected as soon as possible using standard hospital disinfectants (e.g., a 0.5% chlorine solution). Whenever possible, disassemble frames prior to cleaning. Take extra care when cleaning any monitoring interfaces or electrical components to avoid damage or the potential inability to reassemble.
        - Chairs should be disinfected in a method similar to stretchers and beds. Any chairs with fabric components that cannot be disinfected as described above should be incinerated.
    - Polypropylene items, including buckets and bedpans
        - Polypropylene items should be cleaned with water and a detergent, then disinfected using standard hospital disinfectants (e.g., a 0.5% chlorine solution) and left to air dry.

Further information

Consult the following documents for more information on hospital hardware, medical furniture, utensils and health-care facility products and adaptations:

1. *Safe management of waste from health-care activities.* Chartier Y et al., eds. 2nd ed. Geneva, World Health Organization, 2014. Available from: http://apps.who.int/iris/bitstream/10665/85349/1/9789241548564_eng.pdf?ua=1
2. *Infection prevention and control guidance for care of patients in healthcare settings, with focus on Ebola.* Geneva, World Health Organization, 2014. Available from: http://apps.who.int/iris/bitstream/10665/130596/1/WHO_HIS_SDS_2014.4_eng.pdf?ua=1&ua=1&ua=1
3. *Prevention of hospital-acquired infections.* Geneva, World Health Organization, 2002. Available from: http://www.who.int/csr/resources/publications/whocdscsreph200212.pdf
4. Centers for Disease Control and Prevention. *Guideline for disinfection and sterilization in healthcare facilities.* Atlanta, GA, CDC, 2008. Available from: http://www.cdc.gov/hicpac/Disinfection_Sterilization/17_00Recommendations.html

SOP 2: Medical equipment (excluding respiratory equipment)

This section outlines SOPs for medical equipment, e.g., sphygmomanometer (including cuff), stethoscope, infrared thermometers, pulse oximeter. Note: as mercury thermometers are banned from health services, the following SOPs do not account for these. Stethoscopes are also not recommended for care facilities, but may still be available and must be decontaminated in any of the Ebola care facilities.

Summary indication of SOPs: devices should be wiped with alcohol (or chlorine) solution.

Procedure

- Ensure you have access to a decontamination solution. Alcohol (70% isopropyl or ethanol) is recommended - any alcohol solution should be changed at least once a week. Chlorine-based solutions may corrode stainless steel and thus shorten the usable life span of devices.
- Turn off and if possible, carefully disassemble multi-component devices:
    - Stethoscopes: depending on the model, the stethoscope may at this point be disassembled into the ear tips, ear tubes, plastic tubing and chest piece. The diaphragm of the chest piece should also be removed for cleaning where possible.
    - Sphygmomanometers should be disassembled into the manometer and cuff. Do not disassemble the manometer.
    - Pulse oximeter and other electro-medical equipment: depending on the model, the pulse oximeter may be disassembled into monitor, cable, lens, detector and probe. If battery-operated, remove the batteries.
    - Infrared thermometers: depending on the model, they may be disassembled to be cleaned. If battery-operated, remove batteries.
- Pour the disinfectant solution onto a paper towel (do not immerse the towel in the solution).
- Carefully wipe all surfaces of the individual stethoscope, sphygmomanometer parts, pulse oximeter or infrared thermometer with a moist paper towel. Hold the paper towel against each surface for 30 seconds. Do not immerse the devices in the decontamination solution.
- Discard the paper towels in the bucket for waste to be burned. If a cloth was used, incinerate.
- Let all individual device parts air dry in a safe decontaminated area.

The sphygmomanometer cuffs may be cleaned with low temperature steam, if available. Mercury-gravity type sphygmomanometers should be handled with care. Regular checks should be made to ensure that there are no air leaks in the inflation system or that the manometer has not been damaged so as to cause a loss of mercury.

Further information

Consult the following materials for more information on diagnostic devices:

1. Pulse oximetry training manual. Geneva, World Health Organization, 2011. Available from: http://www.who.int/patientsafety/safesurgery/pulse_oximetry/who_ps_pulse_oxymetry_training_manual_en.pdf
2. 3M. *Stethoscope care & cleaning.* 2015. Available from: http://www.littmann.com/wps/portal/3M/en_US/3M-Littmann/stethoscope/littmann-learning-institute/about-stethoscopes/stethoscope-cleaning/
3. American Diagnostic Corporation (ADC). *Learning center website on sphygmomanometer*. New York, ADC, 2015. Available from: http://adctoday.com/learning-center/about-sphygmomanometers/care-and-maintenance

SOP 3: Respiration-related devices

This section outlines standard operating procedures related to:

- Oxygen concentrators.
- Flow splitter for oxygen concentrator.
- Suction system, general purpose.
- General anaesthesia machine.

Summary indication of SOPs: respiratory and anaesthesia equipment should be disassembled, cleaned and disinfected, with single-use accessories discarded.

Procedure

- Oxygen concentrator: flow splitter, patient mask and tubing are single patient use devices. They must be cleaned with warm water and detergent during usage and then discarded as per SOP 4 (single-use devices/disposable)
- Suction system, general purpose
    - The suction bottle of a suctioning machine is a single-use disposable unit and its potential to be highly infectious must be recognized. It should be properly disposed of following SOP 4, which includes isolation of the single-use device and transport in infectious waste bags for incineration or deep burial.
    - Dispose of filters by incineration or deep burial.
- General anaesthesia/ventilator machine
    - Cleaning: as these are complex devices, we recommend decontaminating according to the manufacturer's instructions. In addition, dismantled parts must be washed with detergent to remove physical contamination, such as soil, blood tissue or body fluids, followed by rinsing and drying. The water temperature should not exceed 45°C. Articles or devices with a lumen should be double-checked to prevent drying of material inside it.
    - Disinfect cleaned surfaces with IPC-recommended disinfectant solutions and avoid exposing electrical components to this solution.

Further information

Consult the following materials for more information on respiratory related devices:

1. Andersen BM et Al. Cleaning and decontamination of reusable medical equipment, including the use of hydrogen peroxide gas decontamination. *Microbial & Biochemical Technology*, 2012, 4:2. Available from: http://dx.doi.org/10.4172/1948-5948.1000072
2. Association of Anaesthetists of Great Britain and Ireland (AAGBI). *Infection control in anaesthesia.* London, AAGBI, 2008. Accessible from: http://www.aagbi.org/sites/default/files/infection_control_08.pdf
3. Juwarkar CS. Cleaning and sterilisation of anaesthetic equipment. *Indian Journal of Anaesthesia*, 2013, 57: 541-550. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3821272/
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SOP 4: Single use devices not including those with sharp edges

Single-use devices are generally made of polymers. Without a metal component, these devices should be disposed of according to a waste management SOP.

Summary indication of SOPs: single-use medical devices must be immediately disposed of in a safe, sturdy and clearly labelled bag after use as they pose cross-infection risks. Final disposal may include incineration or deep burial.

Procedure

- Ensure that there is a safe waste container available for the disposal of single-use devices within each working space (room).
- Containers should have well-fitting lids, either removable by hand or preferably operated by a foot pedal. They should be sturdy and leak-proof. Containers should be placed in areas easy for staff to access, but not accessible to the public.
- The waste container should contain a waste disposal bag. Both the container and bag should be yellow and marked highly infectious with a clearly visible biohazard symbol.
    - Colour coding and marking is helpful as it assists with recognizing the infection risk.
    - The recommended technical specifications for bags for infectious waste is a tear resistance of minimum 480 grams in parallel and perpendicular planes (ISO 6383-2, ASTM D1922 or equivalent) and impact resistance of minimum 165 grams (ISO 7765-1, ASTM D1709 or equivalent). Plastics used for either containers or bags should be chlorine-free.
- Isolate single-use devices without metal components immediately after use on patients and place within the above-described bag and container. Do not include sharps or metals in this bag.
- If the disposable device is connected to another device/equipment, please disconnect before isolating. Follow the instructions for decontaminating the other equipment as appropriate.
- On a daily basis, remove the bag of disposable single-use medical devices and dispose as directed within your facility waste management plan. Incineration is the most common course of action for the disposal of contaminated single-use devices.

Further information

Consult the following material for more information on single-use devices not including those with sharp edges:

1. *Safe management of wastes from health-care activities.* Chartier Y et al., eds. 2nd ed. Geneva, World Health Organization, 2014. Available from: http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/

SOP 5: Single-use devices including those with sharp edges

Improper disposal of devices with sharp-edged waste poses a high risk of disease transmission among health workers and the general public.

Examples of single-use devices with sharps include:

- Syringe, reuse prevention feature.
- Sharps' container (containing used sharps).
- Needles and scalp vein needles.
- Intravenous infusion system, syringe and needle, insulin type, sterile.

Summary indication of SOPs: single-use devices with sharps must be immediately disposed of in puncture-resistant fluid-impermeable sharps' containers after use as they pose cross-infection risks. Final disposal may include incineration.

Procedure

- Sharp-edged devices should be placed immediately in puncture-resistant fluid-impermeable sharps' containers.
- Ensure that the containers are securely sealed with a lid.
- Eliminate sharps' containers through incineration or deep burial.

Note: Incineration or deep burial is recommended also for the disposal of needles and syringes.

Further information

Consult the following materials for more information on single use devices including those with sharp edges:

1. *Safe management of wastes from health-care activities.* Chartier Y et al, eds. 2nd ed. Geneva, World Health Organization, 2014. Available from: http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/
2. *H4+ interagency list of essential medical devices for maternal and newborn health, and other medical devices projects*. Geneva, World Health Organization, 2014. Available from: http://www.who.int/medicines/areas/policy/IPC_dec2012_Velazquez_medical_devices.pdf
3. Centers for Disease Control and Prevention (CDC)/WHO. *Infection control for viral haemorrhagic fevers in the African health care setting.* Atlanta, GA, CDC, 1998:1-198. Available from: http://www.who.int/csr/resources/publications/ebola/whoemcesr982sec1-4.pdf
4. *WHO best practices for injections and related procedures toolkit.* Geneva, World Health Organization, 2010. Available from: http://www.who.int/injection_safety/toolbox/9789241599252/en/

SOP 6: Medical instruments

Removal of physical containment

- Manual cleaning
  - Instruments used in a procedure should be submerged in cold water (<40°C) and detergent immediately after use to remove gross soiling and debris.
  - Instruments with lumens should be flushed with a water-filled syringe (50 ml) to remove blood and debris and prevent drying of the gross oil.
  - Instruments should be soaked in detergent or cleaning agents appropriate for their alloy, any detergent can be used. Do not use fixation detergent or hot water; this may cause fixation of the blood contaminants on the instrument. In situations where enzymatic detergent is not available, IPC-recommended disinfectant solutions containing chlorine may be used with a shortened soaking time and immediate rinse with water to minimize corrosion pitting.
  - For micro-instruments, a special syringe with a silicone cover must be used to flush the micro-instrument thoroughly before subjecting it to a pathogen deactivation process.
  - After soaking, brush under the surface of the fluid.
  - Rinse with clean water and then air dry.
  - Disinfect using the routine method previously used on site.

Further information

Consult the following materials for more information on medical instruments

1. *ASICO instrument care & cleaning guide 4.1.1,* 2011. Salt Lake City, UT, ASICO, 2011. Available from: http://www.asico.com/system/user_files/Files/ASICO_Cleaning_Booklet_10_31_2011.pdf
2. Association of Surgical Technologies (AST). *Standards of practice for the decontamination of surgical instruments.* AST, 2009. Accessible from: http://www.ast.org/uploadedFiles/Main_Site/Content/About_Us/Standard_Decontamination_%20Surgical_Instruments_.pdf
3. *Decontamination procedure.* National Health Service Central Lancashire, United Kingdom, 2011. Available from: http://www.westlancashireccg.nhs.uk/wp-content/uploads/sites/4/2013/04/Decontamination.pdf

Annex 4: Decommissioning process for medical devices

Planning

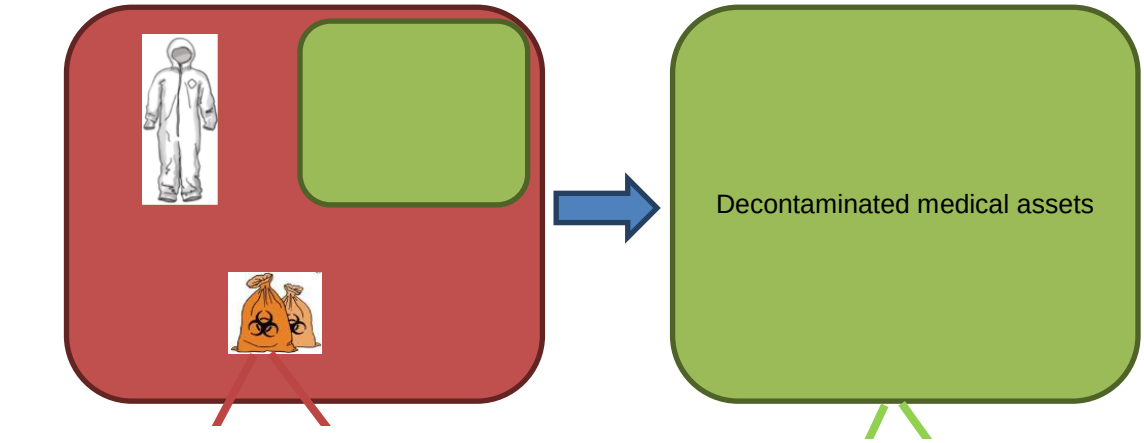
- Take an inventory of medical devices
- Separate according to SOP table
- Determine appropriate SOP
- Designate a cleaning/decontamination room
- Designate storage area or room for decontaminated items
- Designate staff to clean, decontaminate, package and transport to green-zoned storage
- Prepare full and light PPE sets, cleaning materials, packaging
- Prepare cleaning solutions

Red zone

- Wear full PPE
- Separate waste (non-reusable, damaged devices)
- Prepare cleaning solutions
- Clean and decontaminate according to SOP
- Cover with plastic
- Move to green zone

Green zone

- Wear lower-level PPE
- Store cleaned/disinfected medical devices
- Prepare for transport



Waste management

Incinerate: Paper/cardboard/ wood/ polypropylene and polyethylene items

Deep burial for metals, polyvinyl chloride (PVC), glass/ceramics or complex devices, which cannot be reused/recycled

Transport

Return to donor: Package and return

Redistribute to other health-care facilities: Request consumables, filters, power adapters, sterilize before use

Annex 5: Collection of lessons learned on decontamination

Item	Recommendation
Used scrubs, boots, rubber gloves, heavy aprons, etc.	Follow standard laundry SOP then donate. If damaged incinerate or landfill.
Washing machines and dryers	Decontaminate all outer surfaces; run twice the machines on empty at the hottest cycle; donate.
All wooden shelves and items, including footbaths in low- and high-risk zones	Decontaminate according to the SOP, dry in the sun. Can be reused if not damaged. Otherwise, incinerate.
Office furniture in a low-risk zone	Decontaminate according to the SOP and leave in the sun to dry. Can be reused, if not damaged (furniture must be intact) and not in an absorbable material. Otherwise, incinerate.
Chain-link fence materials in both zones Plastic fencing (cyclone fence)	Decontaminate according to the SOP and landfill – especially the chain-link fence from the high-risk zone. Decontaminate then incinerate.
All cleaning materials (mops, buckets, brushes, etc.)	Soak for 30 minutes to disinfect, then incinerate and/or landfill.
Tents (wards)	Decontaminate according to the SOP inside and outside. Can be reused if not damaged (tents must be intact) and not in an absorbable material. Otherwise, incinerate.
Bed frames, stretchers, etc.	Decontaminate according to the SOP and leave in the sun to dry. Donate if in good condition. Otherwise, landfill.
Mattresses	If with an outer cloth, incinerate. If the plastic cover is intact, decontaminate according to SOP and reuse. If plastic cover is not intact, decontaminate and incinerate.
Medical equipment	See Chapter 7, Annex 3 and Annex 4.
Hand washing facilities in low- and high-risk zones	Decontaminate according to SOP, leave to dry in the sun. Reuse if in good repair. If not in good condition, landfill.
Concrete surfaces of showers, latrines, tent bases, tap stands, etc.	Decontaminate according to SOP, leave to dry in the sun. Remove from site unless stakeholder requests to be left on site.
Toilet, shower and all wood superstructures in both high- and low-risk zones.	Decontaminate inside and out, leave to dry. Use full PPE suit for high-risk areas. If the superstructure of the latrine/toilet is composed of sheets or canvas, safely dispose and incinerate. If superstructure of latrine/toilet is composed of material that can be reused, clean and disinfect in the same manner as the care facility.
Bucket and tap stands for various chlorine solutions	Decontaminate and leave to dry before inspecting for any damage. If damaged or has heavy wear and tear, remove to the landfill. If still in working condition, they can be reused.
Water tank/bladder	Decontaminate according to the SOP and leave in the sun to dry. Can be reused if not damaged (must be intact).
Exterior plastic pipes	Decontaminate according to the SOP. Reuse if intact.
Infiltration trenches in high-risk zones	Decontaminate according to SOP, backfill with soil, compact and level surfaces.
Incinerators	Decontaminate the external surfaces according to the decontamination SOP. Reuse if intact.
Sharps' pits	If the pit is less than two-thirds full, cap with concrete layer and backfill and compact to permanently close.
Ash pits	There would be limited "risk" from ash; therefore, backfill the pit with soil and compact. It may be prudent to mark off this area for future reference.
Organic pits	If the pit is less than two-thirds full, cap with concrete layer and full backfill and compact to permanently close.