



TERMINAL CLEANING FOR EBOLA VIRUS DISEASE CONTAMINATED PATIENT CARE AREAS

TECHNICAL INFORMATION PAPER No. 13-033-0119

PURPOSE.

To provide guidance for terminal disinfection and cleaning of patient care areas used to treat Ebola Virus Disease (EVD) patients. This document does not change any existing Department of Defense (DOD) directives, policies, or procedures related to normal waste management in DOD medical treatment facilities (MTFs).

APPLICABILITY.

This technical information paper (TIP) addresses room and area terminal cleaning procedures conducted in EVD patient treatment rooms after patient discharge in order to protect personnel and prepare the room for future patient care. The TIP distinguishes between areas used during initial entry into the MTF by patients under investigation for Ebola (such as emergency rooms, clinics, or transport vehicles) and isolation rooms used for prolonged EVD patient treatment. This information is applicable to garrison MTFs, clinics, and off-post clinics. Federal, state, or local public health authorities may establish additional requirements. This document is not a step-by-step instruction and requires personnel to read its contents entirely prior to beginning any onsite disinfection activities.

REFERENCES.

See Appendix A for complete reference information.

BACKGROUND.

The threat of EVD infection warrants stringent terminal cleaning procedures after an EVD patient is discharged from an MTF. Proper decontamination of the affected area and equipment, and safe disposal of contaminated materials, protect personnel and patients.

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DEFINITIONS.

a. Daily Cleaning. Daily cleaning tasks are tasks conducted in suspect or confirmed EVD areas where the patient is receiving care. Patient care staff will perform daily cleaning tasks to limit the number of people who enter patient care areas.

b. Terminal Cleaning. Personnel conduct terminal cleaning after the MTF discharges the EVD patient from the area in order to disinfect the treatment area and medical equipment for safe care of new patients. Only designated cleaning personnel will perform terminal cleaning.

DESIGNATED PERSONNEL.

The MTF Commander will determine whether in-house trained staff or contracted support personnel will conduct area disinfection. All designated cleaning personnel require training according to U.S. Army Medical Command (MEDCOM) and local infection control procedures on personal protective equipment (PPE) use and proper decontamination techniques.

PPE PROTOCOLS.

In all areas designated for terminal cleaning, select and use PPE that complies with hospital infection control standards and the Centers for Disease Control and Prevention (CDC) guidance for EVD treatment. Train personnel to understand and mitigate the risks and hazards associated with the process. Ensure that personnel use proper PPE for selected cleaning and decontamination methods discussed in TERMINAL CLEANING AND DECONTAMINATION. Provide personnel with functional, hands-on training that includes donning PPE, doffing PPE, and waste collection of contaminated PPE.

QUALITY ASSURANCE.

Few references exist on how long Ebola viruses survive on surfaces. Viruses survive longer in liquid, within solids such as dried blood, in darkness, and in cold environments. For this reason, personnel implement more rigorous cleaning protocols in EVD patient-care areas. Clinical staff will clean the patient care area, including high-touch surfaces like light switches, door knobs, and bed rails, regularly during patient treatment for their own protection.

a. Cleaning Goals. The goals of terminal EVD cleaning and disinfection are to: (1) dispose of any contaminated supplies and equipment; (2) dehydrate the room and remaining equipment; (3) manually clean and disinfect all applicable surfaces (directed by Infection Control) to remove all visible material; and (4) disinfect all surfaces and difficult to reach areas with ultraviolet light or gas encapsulation technology.

b. Infection Control. Infection Control personnel will assess and evaluate the decontamination procedures to ensure safety and effectiveness. Infection Control personnel will observe the decontamination process and provide oversight to ensure all items and areas are properly decontaminated and cleaned. Observation and oversight will include use of checklists, individual performance assessments, and necessary on-the-job corrections.

c. Disinfectants. Consult Infection Control to select an Environmental Protection Agency (EPA)-approved hospital disinfectant for use against the Ebola virus¹ or make a 1:10 solution of bleach (1 part bleach added to 9 parts water) for terminal cleaning. Reference to a 1:10 bleach solution in this document assumes use of a 5 percent or greater chlorine strength bleach product.

DEVELOPING LOCAL PROCEDURES.

Consider the following when developing local EVD terminal cleaning procedures:

a. MEDCOM Guidance. Seek clarification from Region and MEDCOM Logistics personnel about use of contract housekeepers for terminal cleaning tasks. Reference MEDCOM standing operating procedures and the CDC Environmental Checklist for Monitoring Terminal Cleaning² for cleaning and disinfection techniques to conduct the terminal cleaning steps defined in TERMINAL CLEANING AND DECONTAMINATION.

b. Proficiency in PPE Technique. Clinical staff involved in EVD patient care may be best-suited for initial cleaning and disinfecting because they are the most familiar with the PPE procedures and the cleaning procedures implemented while the EVD patient was in the area.

c. Contract Availability. Housekeeping contract language may not allow housekeeping personnel to clean medical equipment or isolation rooms contaminated with EVD. Purchase required technology or secure contract services in advance of need on a contingency basis.

¹<https://www.epa.gov/pesticide-registration/list-l-disinfectants-use-against-ebola-virus>

²<https://www.cdc.gov/hai/pdfs/toolkits/Environmental-Cleaning-Checklist-10-6-2010.pdf>

d. Personnel Willingness. Personnel may refuse to enter isolation rooms because they are concerned about EVD exposure. Use effective risk communication, supply provisions, plans/procedures, training, and Command support to alleviate exposure concerns and improve morale of tasked individuals.

e. Time. Rapid turnaround of isolation rooms may be required to treat other patients once the EVD patient treatment ends. Develop a local protocol to permit deviation from the recommendations below (criteria for deviation, who has authority to issue, reviewers, revised cleaning goals, etc.) when rapid turnaround of the treatment area is required.

f. Compatibility of Medical Equipment and Facilities (Ventilation, Water, Safety) with Decontamination Materials and Technologies. Consult with Medical Maintenance, Industrial Hygiene, Safety, Facilities, Engineering, and other applicable personnel to evaluate potential damage to all medical equipment and facilities when subjected to disinfection chemicals and ultraviolet germicidal irradiation (UVGI). Removal of non-essential items that are not easily decontaminated and/or use of plastic sheeting during pre-patient room preparation may prevent unnecessary contamination and damage to equipment.

g. Room Layout and Ventilation Compatibility with Gas Disinfection and UVGI Treatment Technology. Air must reach all room surfaces, including interiors of cabinets and drawers and the undersides of the bed and equipment, for effective gas treatment. To increase gas disinfection effectiveness, open cabinets and doors and otherwise ensure airflow to applicable surfaces. When equipment, furniture, and/or other items block the UV light, they reduce the effectiveness of UV disinfection. To increase UV disinfection effectiveness, perform UV disinfection multiple times until the UV light contacts all surfaces in the room. Reposition items in the room to ensure all contaminated surfaces are exposed to the treatment technology.

TERMINAL CLEANING AND DECONTAMINATION.

Begin these steps after patient discharge from the room. For areas used during initial entry into the MTF by patients under investigation for Ebola (such as emergency rooms, clinics, or transport vehicles), follow the steps a, c, d, e and j below for waste removal, floor cleaning, toilet cleaning, surface cleaning, and residual removal. For isolation rooms and areas used for extended patient care, follow all steps. Before terminal cleaning begins, remove any sheeting and coverings that were put into place using a step-by-step process to avoid unnecessary cross contamination (i.e., ceiling first, next walls, then equipment).

a. Remove Waste. Begin terminal cleaning by removing all waste, blood, feces, dirt, etc. as disinfection chemicals and UVGI are ineffective against EVD virus imbedded in organic matter. Remove and dispose as EVD waste all disposable equipment, supplies, linens, toiletries, food, and items in waste containers. Terminal cleaners will generate EVD waste (PPE and cleaning supplies) during the remaining terminal cleaning process. Designated waste handlers will remain on hand in the cold zone to move EVD waste from the hot and warm zones to the EVD waste storage facility or the autoclave. Follow established EVD waste management procedures for the MTF (see Ebola Virus Disease Waste Management in the Medical Treatment Facility at: <https://phc.amedd.army.mil/topics/discond/diseases/Pages/Ebola-Virus-Disease.aspx>.)

b. Initial Dehydration. Adjust the ventilation system to achieve high air flows of 15-19 high-efficiency particulate air (HEPA)-filtered air exchanges per hour to desiccate any remaining viruses. Open cabinets and doors and otherwise provide airflow access. Seal the area in an undisturbed condition for 48 hours. After the 48-hour period, adjust ventilation to normal air flows and commence with manual cleaning procedures below. If rapid turnaround of the treatment area is required, enact the local protocol prescribed in DEVELOPING LOCAL PROCEDURES and document the decision.

c. Surface Cleaning. Clean all equipment and surfaces with bleach or approved disinfectant wipes. Clean all exterior and interior surfaces of equipment, cabinets, drawers, and fixtures (bathroom) with a 1:10 bleach solution or an EPA-approved hospital disinfectant for use against the Ebola virus. Open cabinets and drawers, and clean the inside and outside surfaces. Treat all rooms and surfaces associated with EVD patient care regardless of the amount of visible contamination observed or time passed since the patient left the area. Conduct the surface cleaning procedure twice. Collect all wipes and cleaning supplies as EVD waste.

d. Toilet Cleaning. Apply an EPA-approved hospital disinfectant for use against the Ebola virus or 1 cup of straight bleach solution around the bowl in the same manner as liquid/gel toilet bowl cleaner (i.e., apply to the inside top of the bowl and allow to run down into the bowl). Use 1 cup of disinfectant (or bleach). Allow 15 minutes of contact time, close the lid or cover, then flush the toilet. After flushing, wipe the surfaces of the toilet (seat, handle, lid, inside bowl, outside of bowl, back, etc.) with the approved disinfectant or a 1:10 bleach solution.

e. Floor Cleaning. Mop the floors twice with an EPA-approved hospital disinfectant for use against the Ebola virus or a 1:10 bleach solution, starting with the cleanest areas (hallway) and ending with the most contaminated areas (patient room). When it is time to dispose of the mop water, add an additional cup of the same approved hospital disinfectant or bleach solution used during the floor-cleaning process and allow 15 minutes of contact time. [Note: be careful not to mix incompatible

disinfection chemicals during the cleaning process]. Pour treated mop water down the shower drain and pour an equivalent container size of water down the drain after the mop water. If a shower drain is not available, carefully pour into the toilet, close the lid or cover, and flush. Dispose of the mop heads, mop buckets, micro-fiber clothes, dusters, toilet brushes, and other cleaning devices as EVD waste. Dispose of mop and duster handles and frames as EVD waste. Mop handles and frames may be disinfected for reuse if: (1) personnel covered the mop handles and frames with plastic material prior to use, (2) personnel cleaned them with an EPA-approved hospital disinfectant for use against the Ebola virus or a 1:10 bleach, and (3) Infection Control personnel approved them for reuse.

f. Ultraviolet Germicidal Irradiation. Acquire an UVGI-treatment device for use in the final stage of terminal cleaning, and follow the manufacturer's instructions for use and safety warnings. Mercury or xenon gas lamps generate ultraviolet C (UV-C) light. The UV-C light deactivates bacteria, viruses, and spores. This treatment option is relatively quick, repetitious, and leaves no residue. Biosafety laboratories with built-in gas disinfection systems may activate the gas disinfection system instead.

(1) Ensure UV equipment operators use enough devices or conduct sufficient treatment cycles in the storage area to treat all exposed surfaces. Treat areas with a higher likelihood of contamination (entrance to the storage area) for a longer period to increase disinfectant exposure.

(2) Place treatment monitors under the equipment and at the darkest, furthest locations to ensure that the treatment reaches all areas.

(3) Assess the treatment area size to determine the appropriate amount of time to allow the by-products of the treatment process (ozone) to clear the area prior to re-entry. Activate the negative pressure system for the assessed time to remove any treatment bi-products.

g. Gas/Vapor Disinfection. MTFs that acquired gas/vapor disinfection technologies may use them instead of UVGI. Conduct encapsulated gas/vapor treatment of the area using the selected disinfectant and treatment method (e.g., hydrogen peroxide vapor, chlorine dioxide). The amount of time required to effectively decontaminate the area will depend on the concentration used, the contact time, environmental controls (maintaining the temperature and/or concentrations), the size of the space (this will be a factor for reaching the desired concentration), and the integrity of the encapsulation (maintained positive pressure, sealed, etc.). Personnel must validate the treatment process to demonstrate adequate disinfection of all locations within the enclosed area.

1. Seal the area from the outside using duct tape and plastic sheeting around doorways and potential leakage points to prevent gas/vapors from escaping the treatment area. Disinfection gases must not escape the area and impact patient or staff health.
2. Ensure that personnel utilize all required safe guards (ventilation, separation, monitors).

h. Terminal Cleaning Record. Mark hand receipts of equipment dedicated to the EVD treatment room with the terminal cleaning date, time, and method. Affix a label or a tag to all portable equipment (such as pumps and pump stands) in the room and annotate the date and time of surface cleaning (step c) and UVGI/gas disinfection (step f or g).

i. Repair Quarantine. Hold disinfected equipment that requires repair in a two week quarantine status from the date of the UVGI/Gas Vapor treatment before initiating repairs. Holding the equipment allows for additional dehydration time and a Quality Assurance/Quality Compliance evaluation of the terminal cleaning process to occur to ensure no residual viral contamination remains.

j. Clean to Remove Disinfectant Residue. After completing all EVD terminal cleaning steps (paragraphs a–i), don standard hospital cleaning PPE to enter the area. Thoroughly clean the area and all equipment to remove chemical residuals left during the area disinfection process. Medical maintenance and other functional groups may retrieve decontaminated equipment from the room if necessary.

k. Final Equipment Cleaning. Medical maintenance and other functional groups will clean and disinfect all medical equipment removed from the quarantine according to manufacturer's guidance and MTF policies by personnel wearing PPE. Select and manage cleaning supplies and PPE generated during this step according to routine housekeeping procedures.

USE OF PROFESSIONAL SUPPORT.

Numerous commercial companies specialize in hospital decontamination and offer the decontamination products/equipment and/or onsite decontamination support. If MTF personnel require outside decontamination products, equipment, and support, they should identify the procedures and products necessary and work with budget and contracting officials to coordinate acquisition and services in advance.

The table below identifies several professional organizations that identify certified local cleaning companies. State public health agencies may also regulate or recommend cleaning companies. Additional information obtained from MTFs and research organizations with experience in this subject are provided for reference. Entries in this table do not indicate an endorsement of a product or service by the U.S. Army.

Name	Geographic Area and/or Treatment Method	Contact Information
Institute of Inspection, Cleaning, and Restoration Certification (IICRC) Locate a Certified Professional listing	The IICRC is a certification and standard-setting non-profit organization for the inspection, cleaning and restoration industries. IICRC is developing an ANSI standard, BSR-IICRC S540 Crime Scene Cleanup.	http://www.iicrc.org/
American BioRecovery Association listing	Nationwide, certification organization	888-979-2272, http://americanbiorecovery.org/ , or https://www.americanbiorecovery.org/search/custom.asp?id=4705
National Institute of Health (NIH) Biocontainment Unit	NIH utilized a hydrogen peroxide vapour (HPV) system from Bioquell.	http://www.bioquell.com/en-uk/resources-and-support/product-support/sales-information-downloads/case-studies/case-study-all-categories/terminal-decontamination-biocontainment-unit-used-care-patient-ebola/
University of Nebraska Medical Center Biocontainment Unit	The University of Nebraska Biocontainment Unit utilized UV germicidal irradiation (UVGI) generators from ClorDiSys Solutions, Inc. of Lebanon, New Jersey.	http://www.clordisys.com/healthcareapp.php
United States Army Medical Research Institute of Infectious Diseases (USAMRIID)	USAMRIID provided a general recommendation for decontamination of an EVD patient care area with a combined approach of Chlorine Dioxide (CD) and Ultraviolet (UV) light products and services by a company like ClorDiSys.	http://www.clordisys.com/healthcareapp.php
Madigan Army Medical Center (MAMC)	MAMC acquired a Xenex Pulsed Xenon UV Disinfection System.	https://www.xenex.com/

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STAFF MONITORING.

Enforce proper monitoring of staff involved in terminal cleaning, handling, or management of contaminated waste, equipment, and materials. Maintain a list of the names and contact information for all crews or individual workers involved in terminal cleaning duties and provide to IC, OH, Safety and others as determined by local policy.

Prepared by: Environmental Health Sciences Division, Waste Management Branch at 410-436-3651 or DSN 584-3651.

APPENDIX A

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