

Infection prevention and control measures for Ebola and Marburg Virus disease: A series of rapid reviews

KQ11 Disinfection – Disinfection of hands or gloves - Initial Summary

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Competing interests: DM was involved in the 2015 rapid review by Hersi et al. [1] There are no other competing interests to acknowledge.

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Key Questions

Question (11)-(a): Should health workers providing direct or indirect care to patients with Ebola or Marburg disease in ETUs and healthcare facilities wash hands (soap & water) OR wash the glove (soap & water) between patients?

Question (11)-(b): Should health workers providing direct or indirect care to patients with Ebola or Marburg disease in ETUs and healthcare facilities disinfect hands with ABHR OR disinfect the glove with ABHR between patients?

Question (11)-(c): Should health workers providing direct or indirect care to patients with Ebola or Marburg disease in ETUs and healthcare facilities disinfect hands (with chlorine) OR disinfect the glove (with chlorine) between patients?

Methods Summary

This is one of a series of rapid reviews answering 12 key questions related to three themes on infection prevention and control measures for filoviruses: (i) transmission/exposure (n=3 questions), (ii) personal protective equipment (PPE) (n=5), and (iii) decontamination and disinfection (n=4). Data sources include Medline, Embase, bio/medRxiv pre-print servers, Global Medicus Index, Epistemonikos, China National Knowledge Infrastructure (CNKI) and Wangfang database. We used an automation tool (CAL® tool) for titles/abstracts screening for relevant systematic reviews and primary comparative studies. Full-text screening, data extraction, risk of bias assessment, and GRADE (Grading of Recommendations Assessment, Development and Evaluation) for the certainty of evidence were completed independently by two reviewers with any disagreements resolved by consensus, with arbitration by a third reviewer, when needed.

Findings

A total of 250 studies were screened in the CAL tool software and 39 studies were included for full-text screening. No studies met the eligibility criteria (Appendix 2) for any of the three key questions. A list of excluded studies with reasons for exclusion can be found in Appendix 1.

Although no studies met the eligibility criteria for appropriate interventions and comparators, we noted evidence that addressed hand hygiene protocols for health care workers handling highly infectious diseases. Suen and colleagues¹ performed a simulation study to compare contamination when hand washing with soap and water was performed before/after each PPE doffing step (outer gloves, inner gloves, and bare hands) versus when the removal of both gloves was followed by hand washing with soap and water. Other evidence in this area includes the 2020 Cochrane systematic review by Verbeek and colleagues² that included evidence on simulated contamination for ABHR for glove sanitization vs. no glove sanitization. Two excluded studies examined relevant outcomes for varying doffing protocols with ABHR before/after each stage of glove doffing (outer gloves, inner gloves)^{3,4}. Finally, several studies⁵⁻⁷ were found that compared the effectiveness of different types of disinfectant agents for disinfection, including soap and water vs. ABHR vs. chlorine solutions^{6,7}.

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3. Mumma JM, Durso FT, Ferguson AN, et al. Human Factors Risk Analyses of a Doffing Protocol for Ebola-Level Personal Protective Equipment: Mapping Errors to Contamination. *Clin Infect Dis*. 2018;66(6):950-958. doi:10.1093/cid/cix957
4. Casanova LM, Erukunuakpor K, Kraft CS, et al. Assessing Viral Transfer During Doffing of Ebola-Level Personal Protective Equipment in a Biocontainment Unit. *Clin Infect Dis*. 2018;66(6):945-949. doi:10.1093/cid/cix956
5. Casanova LM, Teal LJ, Sickbert-Bennett EE, et al. Assessment of Self-Contamination During Removal of Personal Protective Equipment for Ebola Patient Care. *Infect Control Hosp Epidemiol*. 2016;37(10):1156-1161. doi:10.1017/ice.2016.169
6. Wolfe MK, Gallandat K, Daniels K, Desmarais AM, Scheinman P, Lantagne D. Handwashing and Ebola virus disease outbreaks: A randomized comparison of soap, hand sanitizer, and 0.05% chlorine solutions on the inactivation and removal of model organisms Phi6 and E. coli from hands and persistence in rinse water. Cameron DW, ed. *PLOS ONE*. 2017;12(2):e0172734. doi:10.1371/journal.pone.0172734
7. Wolfe MK, Wells E, Mitro B, Desmarais AM, Scheinman P, Lantagne D. Seeking Clearer Recommendations for Hand Hygiene in Communities Facing Ebola: A Randomized Trial Investigating the Impact of Six Handwashing Methods on Skin Irritation and Dermatitis. Cameron DW, ed. *PLOS ONE*. 2016;11(12):e0167378. doi:10.1371/journal.pone.0167378

Appendix 1. Excluded Studies List – By Reason for Exclusion:

Not a relevant study (Neither Ebola, Marburg, nor a relevant surrogate outcome (COVID-19))

Haque M. Handwashing in averting infectious diseases: Relevance to COVID-19. *jptcp*. 2020;27(SP1):e37-e52. doi:[10.15586/jptcp.v27SP1.711](https://doi.org/10.15586/jptcp.v27SP1.711)

Omess S, Kaplow R, Green A, et al. Implementation of a Warm Zone Model During the COVID-19 Pandemic. *AJN, American Journal of Nursing*. 2021;121(1):48-54. doi:[10.1097/01.NAJ.0000731664.58705.c3](https://doi.org/10.1097/01.NAJ.0000731664.58705.c3)

No information on the type of hand hygiene method

Kwon JH, Burnham CAD, Reske KA, et al. Assessment of Healthcare Worker Protocol Deviations and Self-Contamination During Personal Protective Equipment Donning and Doffing. *Infect Control Hosp Epidemiol*. 2017;38(9):1077-1083. doi:[10.1017/ice.2017.121](https://doi.org/10.1017/ice.2017.121)

Ratnayake R, Ho LS, Ansumana R, et al. Improving Ebola infection prevention and control in primary healthcare facilities in Sierra Leone: a single-group pretest post-test, mixed-methods study. *BMJ Glob Health*. 2016;1(4):e000103. doi:[10.1136/bmjgh-2016-000103](https://doi.org/10.1136/bmjgh-2016-000103)

Population not of interest

Cook B, Cutts T, Nikiforuk A, et al. Evaluating Environmental Persistence and Disinfection of the Ebola Virus Makona Variant. *Viruses*. 2015;7(4):1975-1986. doi:[10.3390/v7041975](https://doi.org/10.3390/v7041975)

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Gallandat K, Lantagne D. Selection of a Biosafety Level 1 (BSL-1) surrogate to evaluate surface disinfection efficacy in Ebola outbreaks: Comparison of four bacteriophages. Galdiero M, ed. *PLoS ONE*. 2017;12(5):e0177943. doi:[10.1371/journal.pone.0177943](https://doi.org/10.1371/journal.pone.0177943)

Gidado S, Oladimeji AM, Roberts AA, et al. Public Knowledge, Perception and Source of Information on Ebola Virus Disease – Lagos, Nigeria; September, 2014. *PLoS Curr*. Published online 2015. doi:[10.1371/currents.outbreaks.0b805cac244d700a47d6a3713ef2d6db](https://doi.org/10.1371/currents.outbreaks.0b805cac244d700a47d6a3713ef2d6db)

Lantagne D, Wolfe M, Gallandat K, Opryszko M. Determining the Efficacy, Safety and Suitability of Disinfectants to Prevent Emerging Infectious Disease Transmission. *Water*. 2018;10(10):1397. doi:[10.3390/w10101397](https://doi.org/10.3390/w10101397)

Squire JS, Conteh I, Abrahamya A, et al. Gaps in Infection Prevention and Control in Public Health Facilities of Sierra Leone after the 2014–2015 Ebola Outbreak. *TropicalMed*. 2021;6(2):89. doi:[10.3390/tropicalmed6020089](https://doi.org/10.3390/tropicalmed6020089)

Irrelevant method of disinfection

Cutts TA, Ijaz MK, Nims RW, Rubino JR, Theriault SS. Effectiveness of Dettol Antiseptic Liquid for Inactivation of Ebola Virus in Suspension. *Sci Rep*. 2019;9(1):6590. doi:[10.1038/s41598-019-42386-5](https://doi.org/10.1038/s41598-019-42386-5)

Cutts TA, Nims RW, Theriault SS, Bruning E, Rubino JR, Ijaz MK. Hand hygiene: virucidal efficacy of a liquid hand wash product against Ebola virus. *Infection Prevention in Practice*. 2021;3(1):100122. doi:[10.1016/j.infpip.2021.100122](https://doi.org/10.1016/j.infpip.2021.100122)

Eggers M, Eickmann M, Kowalski K, Zorn J, Reimer K. Povidone-iodine hand wash and hand rub products demonstrated excellent in vitro virucidal efficacy against Ebola virus and modified vaccinia virus Ankara, the new European test virus for enveloped viruses. *BMC Infect Dis*. 2015;15(1):375. doi:[10.1186/s12879-015-1111-9](https://doi.org/10.1186/s12879-015-1111-9)

No comparator

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Reidy P, Fletcher T, Shieber C, et al. Personal protective equipment solution for UK military medical personnel working in an Ebola virus disease treatment unit in Sierra Leone. *J Hosp Infect*. Published online 2017.

No relevant comparisons

Abdulsalam M, Ibrahim A, Michael G, Mijinyawa A. Hand washing practices and techniques among health professionals in a tertiary hospital in Kano. 2015;10(1):5.

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Hopman J, Kubilay Z, Allen T, Edrees H, Pittet D, Allegranzi B. Efficacy of chlorine solutions used for hand hygiene and gloves disinfection in Ebola settings: a systematic review. *Antimicrob Resist Infect Control*. 2015;4(S1):O13. doi:[10.1186/2047-2994-4-S1-O13](https://doi.org/10.1186/2047-2994-4-S1-O13)

Jacqueroz Bausch FA, Heller O, Bengaly L, et al. Building Local Capacity in Hand-Rub Solution Production during the 2014-2016 Ebola Outbreak Disaster: The Case of Liberia and Guinea. *Prehosp Disaster med.* 2018;33(6):660-667. doi:[10.1017/S1049023X18000985](https://doi.org/10.1017/S1049023X18000985)

Kanagasabai U, Enriquez K, Gelting R, et al. The Impact of Water Sanitation and Hygiene (WASH) Improvements on Hand Hygiene at Two Liberian Hospitals during the Recovery Phase of an Ebola Epidemic. *IJERPH.* 2021;18(7):3409. doi:[10.3390/ijerph18073409](https://doi.org/10.3390/ijerph18073409)

Kubilay Z, Hopman J, Allen T, Edrees H, Allegranzi B. Skin side effects of chlorine solutions used for hand hygiene: a systematic review. *Antimicrob Resist Infect Control.* 2015;4(S1):P9, 2047-2994-4-S1-P9. doi:[10.1186/2047-2994-4-S1-P9](https://doi.org/10.1186/2047-2994-4-S1-P9)

Mallow M, Gary L, Jeng T, et al. WASH activities at two Ebola treatment units in Sierra Leone. Ikegami T, ed. *PLoS ONE.* 2018;13(5):e0198235. doi:[10.1371/journal.pone.0198235](https://doi.org/10.1371/journal.pone.0198235)

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Duplicate Study

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Appendix 2. Eligibility Criteria

Question (11)-(a): Should health workers providing direct or indirect care to patients with Ebola or Marburg disease in ETUs and healthcare facilities wash hands (soap & water) OR wash the glove (soap & water) between patients?

Setting	Health care facilities, ETU
Population	Health workers working in health care facilities, ETU
Background interventions (Standard of care)	1) Disinfect outer gloves before removing them and 2) keep inner gloves on and disinfect them before putting on a fresh outer pair.
Intervention	Hand hygiene (including glove disinfection) between patients
Comparator(s)	<ol style="list-style-type: none"> 1. Removal of outer glove and hand hygiene (inner glove) w/ soap and water 2. Removal of both gloves and hand hygiene w/ soap and water 3. Disinfecting outer glove w/ soap and water
Outcome	Dermatitis, PPE breaches/exposures, compliance, Ebola or Marburg virus infection, <i>human factors, health worker confidence</i>
Potential effect modifiers	May depend on the nature of the patient contact (e.g., if there was contact with blood/body fluids or if the outer glove is visibly dirty) Single-use versus reusable gloves <u>Type of gloves (e.g.: nitrile versus latex)</u> <u>Number of times inner / outer gloves are disinfected</u>

	<u>Health facility versus ETU Setting, vaccination</u>
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Question (11)-(b): Should health workers providing direct or indirect care to patients with Ebola or Marburg disease in ETUs and healthcare facilities disinfect hands with ABHR OR disinfect the glove with ABHR between patients?

Setting	Health care facilities, ETU
Population	Health workers working in health care facilities, ETU
Background interventions (Standard of care)	1) Disinfect outer gloves before removing them and 2) keep inner gloves on and disinfect them before putting on a fresh outer pair.
Intervention	Hand hygiene (including glove disinfection) between patients
Comparator(s)	<ol style="list-style-type: none"> 1. Removal of outer glove and hand hygiene (inner glove) w/ alcohol-based hand rub 2. Removal of both gloves and hand hygiene w/ alcohol-based hand rub 3. Disinfecting outer glove w/ alcohol-based hand rub
Outcome	Dermatitis, PPE breaches/exposures, compliance, Ebola or Marburg virus infection, <u>human factors, health worker confidence</u>
Potential effect modifiers	May depend on the nature of the patient contact (e.g., if there was contact with blood/body fluids or if the outer glove is visibly dirty) Single-use versus reusable gloves

	<u>Type of gloves (e.g.: nitrile versus latex)</u> <u>Number of times inner / outer gloves are disinfected</u> <u>Health facility versus ETU Setting, vaccination</u>
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Question (11)-(c): Should health workers providing direct or indirect care to patients with Ebola or Marburg disease in ETUs and healthcare facilities disinfect hands (with chlorine) OR disinfect the glove(with chlorine) between patients?

Setting	Health care facilities, ETU
Population	Health workers working in health care facilities, ETU
Background interventions (Standard of care)	1) Disinfect outer gloves before removing them and 2) keep inner gloves on and disinfect them before putting on a fresh outer pair.
Intervention	Hand hygiene (including glove disinfection) between patients
Comparator(s)	<ol style="list-style-type: none"> 1. Removal of outer glove and hand hygiene (inner glove) w/ chlorine 2. Removal of both gloves and hand hygiene w/ chlorine 3. Disinfecting outer glove w/ chlorine (concentration)
Outcome	Dermatitis, PPE breaches/exposures, compliance, Ebola or Marburg virus infection, <u>human factors, health worker confidence</u>
Potential effect modifiers	May depend on the nature of the patient contact (e.g., if there was

	<p>contact with blood/body fluids or if the outer glove is visibly dirty) Single-use versus reusable gloves <u>Type of gloves (e.g.: nitrile versus latex</u> <u>Number of times inner / outer gloves are disinfected</u> <u>Health facility versus ETU Setting, vaccination</u></p>
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