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

KQ8 Personal Protective Equipment – Aprons - Initial Summary

(Version 1, 20 June 2022)

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Funding: Funding for this protocol and the subsequent reviews was provided by the World Health Organization (Funding # 202818287). The working group (WG) from the WHO/HQ Country Readiness Strengthening Health Care Readiness Unit will be consulted to develop and refine the scope, and review and approve the protocol. The WG will not be involved in the conduct of the review including selection of studies and data analysis but will advise as needed on priority population(s), interventions, and outcomes in an iterative process during the review process based on the available evidence. The WG will also comment on the draft report and provide input on interpretations of findings. AT is funded by a Tier 2 Canada Research Chair in Knowledge Synthesis. SM is funded by a Tier 2 Canada Research Chair in Mathematical Modeling and Program Science.

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

Acknowledgements: We thank Kaitryn Campbell, MLIS, MSc (St. Joseph's Healthcare Hamilton/McMaster University) for peer review of the Embase search strategy.

Key Question

KQ8: Should health workers using waterproof aprons to cover gowns or coveralls while providing direct or indirect care to patients with Ebola or Marburg virus disease, use disposable versus reusable versus biodegradable types of aprons?

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 120 studies were screened in the CAL tool software and 39 studies were included for full-text screening. No studies met the eligibility criteria. A list of excluded studies with reasons for exclusion can be found in Appendix 1.

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

Commentary (no outcome data)

Fischer WA, Weber DJ, Wohl DA. Personal Protective Equipment: Protecting Health Care Providers in an Ebola Outbreak. *Clinical Therapeutics*. 2015;37(11):2402-2410. doi:10.1016/j.clinthera.2015.07.007

Intervention not of interest

Bell T, Smoot J, Patterson J, Smalligan R, Jordan R. Ebola virus disease: The use of fluorescents as markers of contamination for personal protective equipment. *IDCases*. 2015;2(1):27-30. doi:10.1016/j.idcr.2014.12.003

Coca A, Quinn T, Kim JH, et al. Physiological Evaluation of Personal Protective Ensembles Recommended for Use in West Africa. *Disaster med public health prep*. 2017;11(5):580-586. doi:10.1017/dmp.2017.13

Drew JL, Turner J, Mugele J, et al. Beating the Spread: Developing a Simulation Analog for Contagious Body Fluids. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*. 2016;11(2):100-105. doi:10.1097/SIH.0000000000000157

Drews FA, Mulvey D, Stratford K, Samore MH, Mayer J. Evaluation of a Redesigned Personal Protective Equipment Gown. *Clinical Infectious Diseases*. 2019;69(Supplement_3):S199-S205. doi:10.1093/cid/ciz520

Eiras D, Echeverri A, Toale K, Tennill P, Evans L. Painting the Gown Red: Using a Colored Paint Quality Improvement Process to Evaluate Healthcare Worker Personal Protective Equipment for Highly Pathogenic Infections. *OFID*. 2017;4(Suppl 1).

Jinadatha C, Simmons S, Dale C, et al. Disinfecting personal protective equipment with pulsed xenon ultraviolet as a risk mitigation strategy for health care workers. *American Journal of Infection Control*. 2015;43(4):412-414. doi:10.1016/j.ajic.2015.01.013

Kilinc-Balci FS, Nwoko J, Hillam T. Evaluation of the Performance of Isolation Gowns. *American Journal of Infection Control*. 2015;43(6):S44. doi:10.1016/j.ajic.2015.04.112

Kilinc Balci FS. Isolation gowns in health care settings: Laboratory studies, regulations and standards, and potential barriers of gown selection and use. *American Journal of Infection Control*. 2016;44(1):104-111. doi:10.1016/j.ajic.2015.07.042

Koenig K, Majestic C, Burns M. Ebola Virus Disease: Essential Public Health Principles for Clinicians. *WestJEM*. 2014;15(7):728-731. doi:10.5811/westjem.2014.9.24011

Kogutt BK, Sheffield JS, Garibaldi BT. 680: Assessing effectiveness of PPE in a simulated SVD of a highly infectious disease patient. *American Journal of Obstetrics and Gynecology*. 2019;220(1):S451. doi:10.1016/j.ajog.2018.11.703

Poller B, Tunbridge A, Hall S, et al. A unified personal protective equipment ensemble for clinical response to possible high consequence infectious diseases: A consensus document on behalf of the HCID programme. *Journal of Infection*. 2018;77(6):496-502. doi:10.1016/j.jinf.2018.08.016

Poller B, Hall S, Bailey C, et al. 'VIOLET': a fluorescence-based simulation exercise for training healthcare workers in the use of personal protective equipment. *Journal of Hospital Infection*. 2018;99(2):229-235. doi:10.1016/j.jhin.2018.01.021

Raj D, Hornsey E, Perl TM. Personal protective equipment for viral hemorrhagic fevers: *Current Opinion in Infectious Diseases*. 2019;32(4):337-347. doi:10.1097/QCO.0000000000000562

No information on PPE

Huber K, Jones I, Dousa T, et al. An Evidence Based Approach to Testing PPE for Enhanced Isolation Precautions during Ebola Virus Disease Preparedness Planning. *American Journal of Infection Control*. 2015;43(6):S69. doi:10.1016/j.ajic.2015.04.170

Lee M a, Huh K, Jeong J, et al. Adherence to Protocols by Healthcare Workers and Self-Contamination During Doffing of Personal Protective Equipment. *American Journal of Infection Control*. 2018;46(6):S11. doi:10.1016/j.ajic.2018.04.024

Maynard SL, Kao R, Craig D. Impact of personal protective equipment on clinical output and perceived exertion. *J R Army Med Corps*. 2016;162(3):180-183. doi:10.1136/jramc-2015-000541

No relevant comparisons

Andonian J, Kazi S, Therkorn J, et al. Effect of an Intervention Package and Teamwork Training to Prevent Healthcare Personnel Self-contamination During Personal Protective Equipment Doffing. *Clinical Infectious Diseases*. 2019;69(Supplement_3):S248-S255. doi:10.1093/cid/ciz618
Casanova LM, Erukunuakpor K, Kraft CS, et al. Assessing Viral Transfer During Doffing of Ebola-Level Personal Protective Equipment in a Biocontainment Unit. *Clinical Infectious Diseases*. 2018;66(6):945-949. doi:10.1093/cid/cix956

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

Chughtai AA, Chen X, Macintyre CR. Risk of self-contamination during doffing of personal protective equipment. *American Journal of Infection Control*. 2018;46(12):1329-1334. doi:10.1016/j.ajic.2018.06.003

Den Boon S, Vallenas C, Ferri M, Norris SL. Incorporating health workers' perspectives into a WHO guideline on personal protective equipment developed during an Ebola virus disease outbreak. *F1000Research*. 2018;7(45).

Garibaldi BT, Ruparelia C, Shaw-Saliba K, et al. A novel personal protective equipment coverall was rated higher than standard Ebola virus personal protective equipment in terms of comfort, mobility and perception of safety when tested by health care workers in Liberia and in a United States biocontainment unit. *American Journal of Infection Control*. 2019;47(3):298-304. doi:10.1016/j.ajic.2018.08.014

Grélot L, Koulibaly F, Maugey N, et al. Moderate Thermal Strain in Healthcare Workers Wearing Personal Protective Equipment During Treatment and Care Activities in the Context of the 2014 Ebola Virus Disease Outbreak. *J Infect Dis*. 2016;213(9):1462-1465. doi:10.1093/infdis/jiv585

Hall S, Poller B, Bailey C, et al. Use of ultraviolet-fluorescence-based simulation in evaluation of personal protective equipment worn for first assessment and care of a patient with suspected high-consequence infectious disease. *Journal of Hospital Infection*. 2018;99(2):218-228. doi:10.1016/j.jhin.2018.01.002

Hersi M, Stevens A, Quach P, et al. Effectiveness of Personal Protective Equipment for Healthcare Workers Caring for Patients with Filovirus Disease: A Rapid Review. Kuhn JH, ed. *PLoS ONE*. 2015;10(10):e0140290. doi:10.1371/journal.pone.0140290

Jaques PA, Gao P, Kilinc-Balci S, et al. Evaluation of gowns and coveralls used by medical personnel working with Ebola patients against simulated bodily fluids using an Elbow Lean Test. *Journal of Occupational and Environmental Hygiene*. 2016;13(11):881-893. doi:10.1080/15459624.2016.1186279

Kilinc FS. A Review of Isolation Gowns in Healthcare: Fabric and Gown Properties. *Journal of Engineered Fibers and Fabrics*. 2015;10(3):155892501501000. doi:10.1177/155892501501000313

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

Kwon JH, Burnham CAD, Reske K, et al. Healthcare Worker Self-Contamination During Standard and Ebola Virus Disease Personal Protective Equipment Doffing. *Open Forum Infectious Diseases*. 2016;3(suppl_1):1387. doi:10.1093/ofid/ofw172.1090

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. *Clinical Infectious Diseases*. 2018;66(6):950-958. doi:10.1093/cid/cix957

Perpoint T, Valour F, Gerbier-Colomban S, et al. Knowledge Attitude and Practice (KAP) on Ebola Virus Disease (EVD) Among Health Care Workers (HCWs) From the Lyon Teaching Hospitals, France. *Open Forum Infectious Diseases*. 2016;3(suppl_1):602. doi:10.1093/ofid/ofw172.465

Polgreen PM, Santibanez S, Koonin LM, Rupp ME, Beekmann SE, del Rio C. Infectious Disease Physician Assessment of Hospital Preparedness for Ebola Virus Disease. *Open Forum Infectious Diseases*. 2015;2(3):ofv087. doi:10.1093/ofid/ofv087

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. *Journal of Hospital Infection*. 2017;96(1):42-48. doi:10.1016/j.jhin.2017.03.018

Suen LKP, Guo YP, Tong DWK, et al. Self-contamination during doffing of personal protective equipment by healthcare workers to prevent Ebola transmission. *Antimicrob Resist Infect Control*. 2018;7(1):157. doi:10.1186/s13756-018-0433-y

Verbeek JH, Rajamaki B, Ijaz S, et al. Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. Cochrane Work Group, ed. *Cochrane Database of Systematic Reviews*. Published online April 15, 2020. doi:10.1002/14651858.CD011621.pub4

PDF Unavailable

Drew J, Turner J, Cooper D, Zaiser R, Duncan T, Mugele J. Novel use of ultraviolet tracer contagion in multiple-patient simulation and the effect of personal protective equipment on contagion spread: A feasibility study. *Academic Emergency Medicine*. Published online 2015.

Somers Y, Verbiest M. Suspecting ebola: When the dress code becomes life saving! Personal protective equipment-a practical demonstration. *Anaesthesiology Intensive Therapy*. Published online 2014.

Appendix 2. Eligibility Criteria

Setting	Health care facilities, ETU
Population	Staff working in health care facilities, ETU
Background interventions (Standard of care)	The choice of apron should be, in order of preference: • a disposable, waterproof apron • if disposable aprons are not available, heavy duty, reusable waterproof aprons may be used provided that they are appropriately cleaned and disinfected between patients
Intervention	Wear a disposable waterproof apron
Comparator(s)	1) wear a reusable waterproof heavy-duty apron, 2) wear a biodegradable waterproof apron
Outcome	Environmental impact of single-use disposable PPE, exposures while cleaning and disinfecting aprons, breaches in cleaning and disinfection practice infection/transmission of EVD, *PPE breaches/exposures, ease of doffing PPE*
Potential effect modifiers	*The design of apron, vaccination*