

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

**KQ6 Eye Protection and Head/Neck Covering- 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**

KQ6: Should health workers providing direct care or indirect care to patients with Ebola or Virus Marburg disease and using eye protection (goggles /face shield) wear them under versus over the head and neck covering?

### **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.

### **Initial findings**

We present study characteristics in Table 1 and a summary of findings in Table 2 and 3.

Initially, 122 studies were screened in the CAL tool software and 33 studies were included for full-text screening. Two studies met the eligibility criteria and were included (Appendix 2). A list of excluded studies with reasons for exclusion can be found in Appendix 1.

No studies provided direct information on the transmission or incidence of Ebola virus disease (EVD) or Marburg virus disease related to the order in which eye protection and head/neck covering was worn. We included two crossover randomized controlled trials that simulated contamination events for health care workers (HCWs). Contamination was recorded during the donning/doffing of Ebola personal protective equipment (PPE) ensembles with differing equipment and orders in which the eye protection (face shields) and head/neck covering (hoods) was worn. Deviation rates from the donning/doffing protocols were also noted.

**Table 1. Characteristics of Included Studies**

Citation [Author, Year]	Study Design	Funding Source	Virus Species	Setting	# Total Health Workers	# Health Care Facilities	Description of Health Worker Care/contact with patients	Study Objectives [as reported by study authors]
Chughtai, 2018, [1]	Crossover randomized controlled trial (simulation study)	Public university funded	Fluorescent solution <sup>a</sup> on the PPE surface to simulate Ebola virus	Healthcare simulation room	10 participants (5 staff and 5 students from University of New South Wales)	N/A; one simulation room	Fluorescent lotion applied on external PPE to simulate contamination and sprayed (1 metre) to mimic droplet infection	The aim of this study was to quantify and describe the risk of self-contamination associated with doffing in different PPE protocols.
Suen, 2018, [2]	Crossover randomized controlled trial (simulation study)	Public university funded	Fluorescent solution <sup>b</sup> on the PPE surface to simulate Ebola virus	Air-conditioned room with an average temperature of 23 °C ± 2 °C and a relative humidity of 60% ± 3%	59 HCWs	N/A; one air-conditioned room	Fluorescent solution sprayed on PPE at the length of a stethoscope to simulate usual working distance between a patient and an HCW <sup>c</sup> ; contamination events	Compare the efficacy of three PPE ensembles for routine patient care and performing aerosol-generating procedures to prevent EVD transmission by measuring the degree of

							monitored during doffing	contamination of HCWs and the environment.
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Abbreviations: HCW, health care workers, PPE, personal protective equipment

- a. GlitterBug. Glitterbug kits. Available from: <https://glitterbug.net.au/products/>
- b. UV GERM Hygiene Spray, Glow Tec Ltd., London, England
- c. Three strokes of fluorescent solution were sprayed onto the face shield, two upper limb/ gloves and anterior surfaces of the gown at a distance of 60 cm from the participants (total 12 strokes per case). There was an average of 1.99 g fluorescent solution/per stroke.

**Table 2. Summary of Findings: Contamination during doffing of PPE**

<i>Study details</i>	<i>Intervention</i> (Wearing goggles /face shield) under the head/neck covering)	<i>Comparator(s)</i> (Wearing eye protection (goggles/face shield) over the head /neck covering)	<i>Outcome in intervention group</i>	<i>Outcome in control group</i>	<i>Quality Assessment<sup>a</sup></i>	<i>GRADE</i>	<i>Notes</i>
<b><i>Number of participants (n/N, %) with small fluorescent patches after various personal protective equipment (PPE) protocols</i></b>							
Chughtai, 2018, [1]	WHO, coverall and N95 <sup>b</sup>	CDC, coverall and PAPR <sup>c</sup>	0/3	0/3	Some risk	⊕○○○ Very low	The hood used in the WHO (coverall, N95) protocol is donned after the face shield. In all other doffing sequences, the face shield is donned after the hood and removed first.
		CDC, coverall and N95 <sup>d</sup>		1/3 (33%)			
		ECDC, coverall and N95 <sup>e</sup>		0/3			
		Health Canada, gown and N95 <sup>f</sup>		1/3 (33%)			
		NC, coverall and N95 <sup>g</sup>		0/3			
		NSW DoH CEC, gown and PAPR <sup>h</sup>		0/3			
		NSW DoH CEC, gown and N95 <sup>i</sup>		0/3			
		MSF, coverall and N95 <sup>j</sup>		0/3			
WHO, gown and N95 <sup>k</sup>		0/3					
<b><i>Number of participants (n/N, %) with large fluorescent patches after various personal protective equipment (PPE) protocols</i></b>							
Chughtai, 2018, [1]	WHO, coverall and N95 <sup>b</sup>	CDC, coverall and PAPR <sup>c</sup>	1/3 (33%)	0/3	Some risk	⊕○○○ Very low	The hood used in the WHO (coverall, N95) protocol is donned after the face shield. In all other doffing sequences, the face shield is
		CDC, coverall and N95 <sup>d</sup>		0/3			
		ECDC, coverall and N95 <sup>e</sup>		0/3			
		Health Canada, gown and N95 <sup>f</sup>		0/3			
		NC, coverall and N95 <sup>g</sup>		1/3 (33%)			

<b>Study details</b>	<b>Intervention</b> (Wearing goggles / face shield) under the head/neck covering)	<b>Comparator(s)</b> (Wearing eye protection (goggles/face shield) over the head / neck covering)	<b>Outcome in intervention group</b>	<b>Outcome in control group</b>	<b>Quality Assessment<sup>a</sup></b>	<b>GRADE</b>	<b>Notes</b>
		NSW DoH CEC, gown and PAPR <sup>h</sup>		0/3			donned after the hood and removed first.
		NSW DoH CEC, gown and N95 <sup>i</sup>		0/3			
		MSF, coverall and N95 <sup>j</sup>		0/3			
		WHO, gown and N95 <sup>k</sup>		0/3			
<b>Overall contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>							
Suen, 2018, [3]	PPE2 <sup>l</sup> - DuPont <sup>TM</sup> Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	7.00	5.00	Low risk of bias	⊕⊕○○ Low	None
<b>Hair and head contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>							
Suen, 2018, [3]	PPE2 <sup>l</sup> - DuPont <sup>TM</sup> Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	2.00	1.00	Low risk of bias	⊕⊕○○ Low	None
<b>Neck (anterior) contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>							
Suen, 2018, [3]	PPE2 <sup>l</sup> - DuPont <sup>TM</sup> Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	5.00	2.50	Low risk of bias	⊕⊕○○ Low	None
<b>Neck (posterior) contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>							
Suen, 2018,	PPE2 <sup>l</sup> - DuPont <sup>TM</sup> Tyvek®,	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	1.00	2.00	Low risk of bias	⊕⊕○○ Low	None

<b>Study details</b>	<b>Intervention</b> (Wearing goggles / face shield) under the head/neck covering)	<b>Comparator(s)</b> (Wearing eye protection (goggles/face shield) over the head / neck covering)	<b>Outcome in intervention group</b>	<b>Outcome in control group</b>	<b>Quality Assessment<sup>a</sup></b>	<b>GRADE</b>	<b>Notes</b>
[3]	Model 1422A						
<b>Overall contamination during doffing of PPE: Extra large sized contaminated patches (<math>\geq 5\text{cm}^2</math>), median</b>							
Suen, 2018, [3]	PPE2 <sup>1</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	43.00	39.00	Low risk of bias	⊕⊕○○ Low	None
<b>Hair and head contamination during doffing of PPE: Extra large sized contaminated patches (<math>\geq 5\text{cm}^2</math>), median</b>							
Suen, 2018, [3]	PPE2 <sup>1</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	17.00	0.00	Low risk of bias	⊕⊕○○ Low	None
<b>Neck (anterior) contamination during doffing of PPE: Extra large sized contaminated patches (<math>\geq 5\text{cm}^2</math>), median</b>							
Suen, 2018, [3]	PPE2 <sup>1</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	0.00	0.00	Low risk of bias	⊕⊕○○ Low	None
<b>Neck (posterior) contamination during doffing of PPE: Extra large sized contaminated patches (<math>\geq 5\text{cm}^2</math>), median</b>							
Suen, 2018, [3]	PPE2 <sup>1</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>m</sup> - Hospital Authority Standard Ebola PPE set	0.00	0.00	Low risk of bias	⊕⊕○○ Low	None

a. Quality assessment of studies was completed using the Cochrane RoB 2 for randomized trials.



- b. World Health Organization (WHO) recommended protocol from 2014 rapid advice guideline (with coverall). This protocol is different than the others, as it recommends wearing the face shield before the hood and removing the hood before the face shield. Other notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using coveralls/face shields, trained observer only for doffing instructions.
- c. Centers for Disease Control and Prevention (CDC), coverall and PAPR. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using coveralls/face shields, trained observer with partial assisted doffing.
- d. Centers for Disease Control and Prevention (CDC), coverall and N95. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using coveralls/face shields, trained observer with partial assisted doffing.
- e. European Centre for Disease Prevention and Control (ECDC), coverall and N95. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using coveralls/face shields, assisted doffing by active assistant.
- f. Health Canada, gown and N95. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using gowns, face shields, removing gown/coverall before face shield, trained observer with partial assisted doffing.
- g. North Carolina (NC), coverall and N95. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using coveralls/face shields, removing outer gloves before apron, removing gown/coverall before face shield, trained observer only for doffing instructions.
- h. New South Wales (NSW), Clinical Excellence Commission (CEC), gown and PAPR. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using gowns/face shields, removing shoe covers after apron and before all other PPE, trained observer only for doffing instructions.
- i. New South Wales (NSW), Clinical Excellence Commission (CEC), gown and N95. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using gowns/face shields, removing shoe covers after apron and before all other PPE, trained observer only for doffing instructions.
- j. Médecins Sans Frontières (MSF), coverall and N95. Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using coveralls/face shields/goggles, removing outer gloves before apron, trained observer only for doffing instructions.
- k. World Health Organization (WHO) recommended protocol from 2014 rapid advice guideline (with gown): Notable differences in this personal protective equipment (PPE) donning/ doffing protocol tested include: using gowns/face shields, trained observer only for doffing instructions.
- l. DuPont™ Tyvek®, Model 1422A (PPE2): head-to-ankle overall with a zipper on the front. The whole outfit includes double gloves, boots, disposable face shield and an N95 respirator. A plastic apron was used to cover up the front zipper before use. Order of doffing: apron, hood, coverall/outer gloves, face shield, N95 respirator, boots, inner gloves.

- m.** Hospital Authority Standard Ebola PPE set (PPE 1): a neck-to-ankle overall with an overlying water-resistant gown double and long nitrile gloves, boots, hood, disposable face shield and N95 respirator. Order of doffing: gloves, gown, boots, hood, N95.

**Table 3. Summary of Findings: Human factors: Deviation rate (%) during donning and doffing of personal protective equipment**

<i>Study details</i>	<i>Intervention</i> (Wearing (goggles /face shield) under the head/neck covering)	<i>Comparator</i> (Wearing eye protection (goggles/face shield) over the head /neck covering)	<i>Outcome in intervention group</i>	<i>Outcome in control group</i>	<i>Quality Assessment<sup>a</sup></i>	<i>GRADE</i>	<i>Notes</i>
<b><i>Overall deviation rate (%) during donning of PPE</i></b>							
Suen, 2018, [3]	PPE2 <sup>b</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>c</sup> - Hospital Authority Standard Ebola PPE set	6.00	6.06	Low risk of bias	⊕⊕○○ Low	None
<b><i>Deviation rate (%) during donning of hood</i></b>							
Suen, 2018, [3]	PPE2 <sup>b</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>c</sup> - Hospital Authority Standard Ebola PPE set	3.33	20.00	Low risk of bias	⊕⊕○○ Low	None
<b><i>Deviation rate (%) during donning of faceshield</i></b>							
Suen, 2018, [3]	PPE2 <sup>b</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>c</sup> - Hospital Authority Standard Ebola PPE set	15.00	11.67	Low risk of bias	⊕⊕○○ Low	None
<b><i>Overall deviation rate (%) during doffing of PPE</i></b>							
Suen, 2018, [3]	PPE2 <sup>b</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>c</sup> - Hospital Authority Standard Ebola PPE set	9.48	2.95	Low risk of bias	⊕⊕○○ Low	None
<b><i>Deviation rate (%) during doffing of hood</i></b>							
Suen, 2018, [3]	PPE2 <sup>b</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>c</sup> - Hospital Authority Standard Ebola PPE set	8.33	5.00	Low risk of bias	⊕⊕○○ Low	None
<b><i>Deviation rate (%) during doffing of faceshield</i></b>							

<i>Study details</i>	<i>Intervention</i> (Wearing (goggles /face shield) under the head/neck covering)	<i>Comparator</i> (Wearing eye protection (goggles/face shield) over the head /neck covering)	<i>Outcome in intervention group</i>	<i>Outcome in control group</i>	<i>Quality Assessment<sup>a</sup></i>	<i>GRADE</i>	<i>Notes</i>
Suen, 2018, [3]	PPE2 <sup>b</sup> - DuPont™ Tyvek®, Model 1422A	PPE1 <sup>c</sup> - Hospital Authority Standard Ebola PPE set	11.67	6.67	Low risk of bias	⊕⊕○○ Low	None

- a. Quality assessment of studies was completed using the Cochrane RoB 2 for randomized trials.
- b. DuPont™ Tyvek®, Model 1422A (PPE2): head-to-ankle overall with a zipper on the front. The whole outfit includes double gloves, boots, disposable face shield and an N95 respirator. A plastic apron was used to cover up the front zipper before use. Order of doffing: apron, hood, coverall/outer gloves, face shield, N95 respirator, boots, inner gloves
- c. Hospital Authority Standard Ebola PPE set (PPE 1): a neck-to-ankle overall with an overlying water-resistant gown double and long nitrate gloves, boots, hood, disposable face shield and N95 respirator. Order of doffing: gloves, gown, boots, hood, N95

**Citations:**

1. Chughtai AA, Chen X, Macintyre CR. Risk of self-contamination during doffing of personal protective equipment. *Am J Infect Control*. 2018;46(12):1329-1334. doi:10.1016/j.ajic.2018.06.003
2. 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

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

### **Intervention not of interest**

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](https://doi.org/10.1093/cid/ciz618)

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](https://doi.org/10.1016/j.idcr.2014.12.003)

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](https://doi.org/10.1017/ice.2016.169)

Cummings KJ, Choi MJ, Esswein EJ, et al. Addressing Infection Prevention and Control in the First U.S. Community Hospital to Care for Patients With Ebola Virus Disease: Context for National Recommendations and Future Strategies. *Ann Intern Med*. 2016;165(1):41. doi:[10.7326/M15-2944](https://doi.org/10.7326/M15-2944)

Ho L, Ratnayake R, Brown H, et al. Precious. Lifesaving but not without problems; a mixed-methods study examining barriers and facilitators to infection prevention and control in health facilities during the ebola virus disease epidemic in Sierra Leone. Published online 2015.

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](https://doi.org/10.1016/j.ajog.2018.11.703)

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](https://doi.org/10.1093/ofid/ofw172.1090)

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](https://doi.org/10.1016/j.ajic.2018.04.024)

Roberts R. To PAPR or not to PAPR? *Can J respir ther*. 2014;50(3):87-90.

### **No relevant comparisons**

Abela N, Bonnici ET, Parascandalo A, Borg M. Lessons learnt and challenges in adopting the ECDC and who Ebola guidelines at Mater Dei Hospital. *Antimicrob Resist Infect Control*. 2015;4(S1):P5, 2047-2994-4-S1-P5. doi:[10.1186/2047-2994-4-S1-P5](https://doi.org/10.1186/2047-2994-4-S1-P5)

Adeke AS, Onoh RC, Umeokonkwo CD, Azuogu BN, Ogah EO. Knowledge, attitude and practice of infection prevention and control among healthcare workers: one year after an outbreak of nosocomial Lassa fever in a tertiary hospital in southeast Nigeria Knowledge, attitude and practice of infection prevention and con. *AfJ Clin Exp Micro*. 2021;22(4):457-464. doi:[10.4314/ajcem.v22i4.5](https://doi.org/10.4314/ajcem.v22i4.5)

Coca A, DiLeo T, Kim JH, Roberge R, Shaffer R. Baseline Evaluation With a Sweating Thermal Manikin of Personal Protective Ensembles Recommended for Use in West Africa. *Disaster med public health prep.* 2015;9(5):536-542. doi:[10.1017/dmp.2015.97](https://doi.org/10.1017/dmp.2015.97)

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](https://doi.org/10.1017/dmp.2017.13)

Dan-Nwafor CC, Ipadeola O, Smout E, et al. A cluster of nosocomial Lassa fever cases in a tertiary health facility in Nigeria: Description and lessons learned, 2018. *International Journal of Infectious Diseases.* 2019;83:88-94. doi:[10.1016/j.ijid.2019.03.030](https://doi.org/10.1016/j.ijid.2019.03.030)

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](https://doi.org/10.1016/j.clinthera.2015.07.007)

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](https://doi.org/10.1016/j.jhin.2018.01.002)

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Ijarotimi IT, Ilesanmi OS, Aderinwale A, Abiodun-Adewusi O. Knowledge of Lassa fever and use of infection prevention and control facilities among health care workers during Lassa fever outbreak in Ondo State, Nigeria. :13.

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## Appendix 2. Eligibility Criteria

**Question (6): Should health workers providing direct care or indirect care to patients with Ebola or Virus Marburg disease and using eye protection (goggles /face shield) wear them under versus over the head and neck covering?**

Setting	Health care facilities, ETU, community (e.g., burial teams)
Population	Health workers in health care facilities, ETU and community
Background interventions (Standard of care)	Wearing eye protection (goggles /face shield) and head & neck covering.
Intervention	Wearing (goggles /face shield) under the head/neck covering,
Comparator(s)	Wearing eye protection (goggles/face shield) over the head /neck covering
Outcome	Infection with Ebola or Marburg, PPE breaches (exposures), <i>comfort, visibility and communication, human factors</i>  <b>Indirect evidence:</b> Lassa fever
Potential effect modifiers	PPE design  Doffing procedure employed during doffing  PPE supply (goggles versus face shields)  <i>Spraying vs. not spraying, vaccination</i>

### Appendix 3. GRADE Assessment: Contamination during doffing of PPE

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention (Wearing (goggles /face shield) under the head/neck covering)	Comparator (Wearing eye protection (goggles/face shield) over the head /neck covering)	Relative (95% CI)	Absolute (95% CI)		
<b>Number of participants (n/N, %) with small fluorescent patches after various personal protective equipment (PPE) protocols</b>												
1	randomised trials	serious <sup>a</sup>	not serious	serious <sup>b</sup>	serious <sup>c</sup>	none	3	3	-	-	⊕○○○ Very low	
<b>Number of participants (n/N, %) with large fluorescent patches after various personal protective equipment (PPE) protocols</b>												
1	randomised trials	serious <sup>a</sup>	not serious	serious <sup>b</sup>	serious <sup>c</sup>	none	3	3	-	-	⊕○○○ Very low	
<b>Overall contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Hair and head contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Neck (anterior) contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Neck (posterior) contamination during doffing of PPE: Small sized contaminated patches (&lt; 1 cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Overall contamination during doffing of PPE: Extra large sized contaminated patches (≥ 5cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Hair and head contamination during doffing of PPE: Extra large sized contaminated patches (≥ 5cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Neck (anterior) contamination during doffing of PPE: Extra large sized contaminated patches (≥ 5cm<sup>2</sup>), median</b>												
1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	

Certainty assessment							N° of patients		Effect		Certainty	Importance
N° of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention (Wearing (goggles /face shield) under the head/neck covering)	Comparator (Wearing eye protection (goggles/face shield) over the head /neck covering)	Relative (95% CI)	Absolute (95% CI)		

Neck (posterior) contamination during doffing of PPE: Extra large sized contaminated patches (≥ 5cm<sup>2</sup>), median

1	randomised trials	not serious	not serious	serious <sup>d</sup>	serious <sup>c</sup>	none	59	59	-	-	⊕⊕○○ Low	
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CI: confidence interval

## Explanations

a. Chughtai et al., 2018 was rated to have a high risk of bias as there is no information on randomization, allocation concealment and blinding of participants and outcome assessors. Additionally, the domains' effect of assignment to intervention (Domain 2) and Risk of bias in the measurement of the outcome (Domain 4) were rated to have a high risk of bias.

b. Downrated due to simulation study: Fluorescent contamination as a surrogate outcome for EVD/Marburg Virus Disease, other differences in evaluated PPE equipment beyond order of face cover and hood.

c. Few participants and optimal information size (OIS) threshold not met.

d. Downrated due to simulation study: Fluorescent contamination as a surrogate outcome for EVD/Marburg Virus Disease, other differences in evaluated PPE equipment beyond order of face cover and hood.

## Appendix 4. GRADE Assessment: Deviation rate (%) during donning and doffing of personal protective equipment

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Intervention (Wearing (goggles /face shield) under the head/neck covering)	Comparator (Wearing eye protection (goggles/face shield) over the head /neck covering)	Relative (95% CI)	Absolute (95% CI)		
<b>Overall deviation rate (%) during donning of PPE</b>												
1	randomised trials	not serious	not serious	serious <sup>a</sup>	serious <sup>b</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Deviation rate (%) during donning of hood</b>												
1	randomised trials	not serious	not serious	serious <sup>a</sup>	serious <sup>b</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Deviation rate (%) during donning of faceshield</b>												
1	randomised trials	not serious	not serious	serious <sup>a</sup>	serious <sup>b</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Overall deviation rate (%) during donning of PPE</b>												
1	randomised trials	not serious	not serious	serious <sup>a</sup>	serious <sup>b</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Deviation rate (%) during doffing of hood</b>												
1	randomised trials	not serious	not serious	serious <sup>a</sup>	serious <sup>b</sup>	none	59	59	-	-	⊕⊕○○ Low	
<b>Deviation rate (%) during donning of faceshield</b>												
1	randomised trials	not serious	not serious	serious <sup>a</sup>	serious <sup>b</sup>	none	59	59	-	-	⊕⊕○○ Low	

CI: confidence interval

### Explanations

- a. Downrated due to simulation study: Fluorescent contamination as a surrogate outcome for EVD/Marburg Virus Disease, other differences in evaluated PPE equipment beyond order of face cover and hood.  
b. Few participants and optimal information size (OIS) threshold not met.