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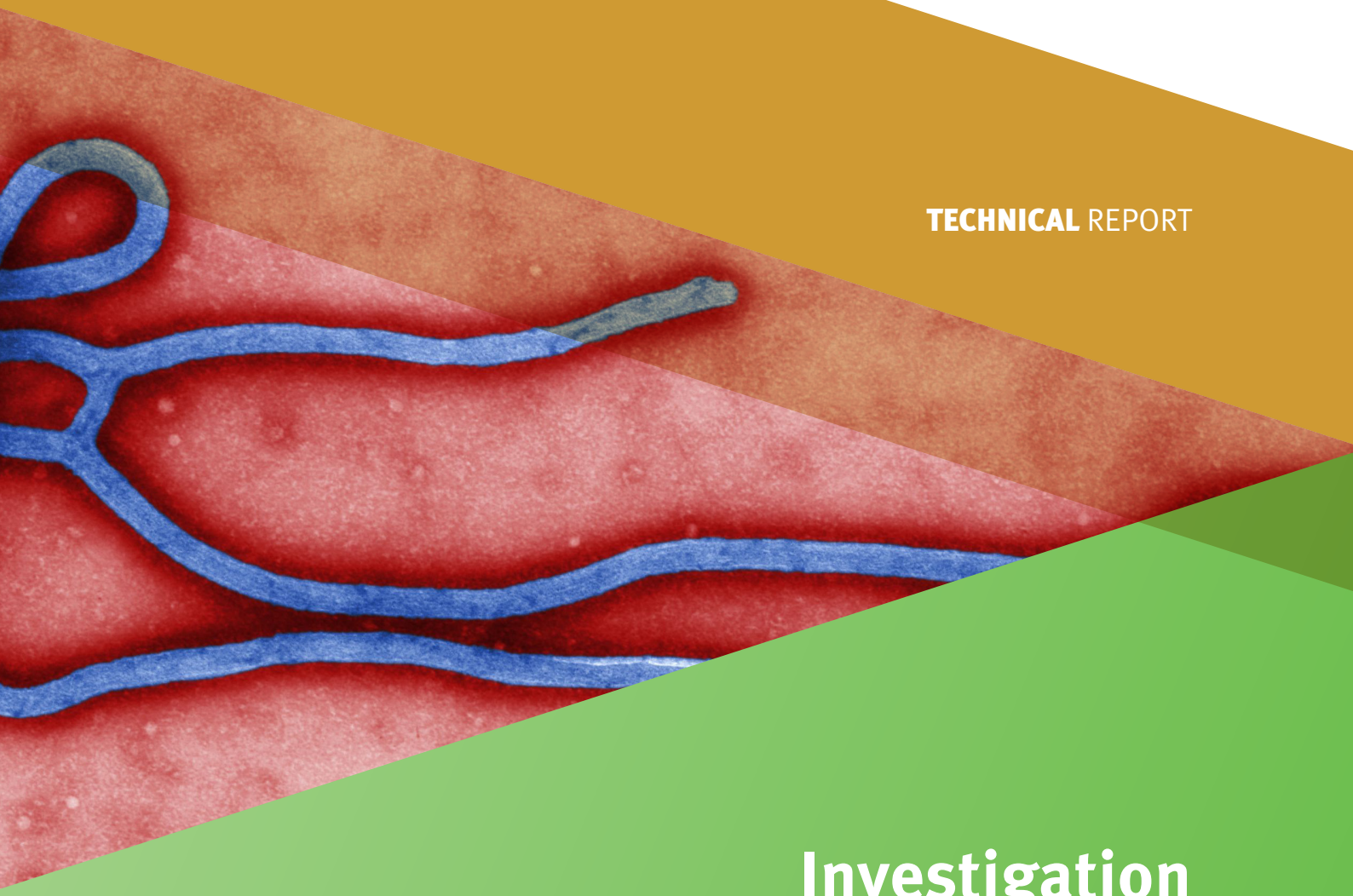

TECHNICAL REPORT

Investigation and public health management of people with possible Ebola virus disease infection

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Investigation and public health management of people with possible Ebola virus disease infection

Public health measures for healthcare workers returning to Europe from Ebola-affected areas

This report of the European Centre for Disease Prevention and Control (ECDC) was coordinated by Bertrand Sudre.

Authors (in alphabetical order): Agoritsa Baka, Orlando Cenciarelli, Joana Haussig, Otilia Sfetcu, Gianfranco Spiteri, Bertrand Sudre and Johanna Young.

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Contents

Figures

Tables

Abbreviations

CI	Confidence interval
DRC	Democratic Republic of the Congo
EVD	Ebola virus disease
IPC	Infection prevention and control
PPE	personal protective equipment
SAGE	Strategic Advisory Group of Experts on immunization, World Health Organization
WHO	World Health Organization

Scope

This document aims to provide guidance to EU/EEA public health authorities, public health professionals and healthcare practitioners for the management of persons having had contact with cases of Ebola virus disease (EVD) after visiting or working in an area that is affected by EVD; also covered is occupational exposure to the disease.

This document replaces technical documents produced during the EVD outbreak in West Africa (2014–2016), namely *Public health management of persons having had contact with Ebola virus disease cases in the EU* published on 23 October 2014, updated on 10 November 2014 [1,2], and *Infection prevention and control measures for Ebola virus disease, management of healthcare workers returning from Ebola-affected areas* published on 22 January 2015 [3].

As long as an EVD outbreak is active, a person who has travelled from, or worked in, an EVD-affected area might develop EVD after arriving in a non-affected country. Decreasing the risk of Ebola virus transmission predominantly depends on early detection and isolation of EVD cases as well as on timely detection of new cases among contacts through contact tracing and appropriate infection prevention and control (IPC) measures [4,5]. EVD ring vaccination is an additional response measure implemented during the recent EVD outbreaks aiming to prevent the spread of EVD in the community [4,5].

Contact management

Purpose of contact management

There is a risk of Ebola virus transmission in the period between the onset of the first symptoms of EVD, the recognition of the possibility of EVD infection by healthcare professionals, and the subsequent isolation of the patient. In light of the severity of EVD, a prompt public health response to identify and manage individuals who have had contact with confirmed and/or probable EVD cases is critical.

This will allow the identification of symptomatic, therefore infectious, individuals among such contacts as early as possible for isolation, laboratory testing and treatment according to individual risk assessment. Therefore, the risk of transmission of EVD in the period between the onset of the first symptoms and recognition of the disease by healthcare professionals is minimised, reducing further opportunities for transmission.

As of May 2019, a non-licenced recombinant vaccine (rVSVΔG-ZEBOV-GP vaccine) has been used in three EVD outbreak settings: in 2015 in Guinea and in two separate outbreaks in the Democratic Republic of the Congo (DRC) (Equateur and North Kivu provinces) in 2018–2019 [4,6]. In 2018, the WHO Strategic Advisory Group of Experts (SAGE) approved the compassionate use of the vaccine in outbreaks of EBOV-Zaire in DRC. Under this framework, vaccination covers the following high-risk groups: 1) contacts and contacts of contacts (i.e. ring vaccination), 2) local and international healthcare and frontline workers in affected areas, and 3) healthcare and frontline workers in areas at risk of outbreak expansion [4]. The vaccine is currently being offered in the DRC 2018–2019 outbreak under the Expanded Access framework, with informed consent and in compliance with good clinical practice [5]. On 7 May 2019, SAGE published additional interim recommendations on vaccination against EVD, proposing the implementation of innovative operational vaccination strategies for the EVD outbreak in the DRC (such as pop-up vaccination, targeted geographic vaccination, enlarging ring vaccination toward a second and third barrier of immunised individuals around each EVD case, and alternative dosing schedules for the rVSV-ZEBOV-GP vaccine) [7].

Although scientific data on the effectiveness of the rVSVΔG-ZEBOV-GP vaccine are limited (see more information online[1]: *Treatment and vaccines for Ebola virus disease*), WHO and the scientific community believe the vaccine is effective and presently useful to prevent EVD during an outbreak [6,8]. Preliminary results of an EVD vaccine study demonstrate an estimated efficacy of 97.5% (95% CI: 95.8–98.5%). The estimated vaccine efficacy for those with onset of illness 10 day or more post vaccination is 97.5% (95% CI: 92.4–99.1%); for those with EVD regardless of timing of onset of illness, vaccine efficacy is 88.1% (95% CI: 79.9–92.9%) [9].

The use of the EVD vaccine beyond the WHO SAGE recommendations in unaffected areas is not well documented. Therefore, the use of this non-licenced vaccine should be assessed by EU national authorities on an ad hoc basis, e.g. in the context of post-exposure prophylaxis of high-risk exposure or vaccination of high-risk contacts.

[1] https://ecdc.europa.eu/en/ebola-and-marburg-fevers/prevention-and-control/treatment-vaccines

Definition of contact persons

A contact person of an EVD case is a person not currently presenting symptoms, who has contact with, or may have been in contact with, a confirmed EVD case, bodily fluids from a case, or the contaminated environment, provided that exposure took place within 21 days before the identification as a contact. The associated probability of Ebola virus transmission depends on the type of exposure to the infectious agent (described below), which will also determine the monitoring scheme.

Definition of contact persons with 'low-risk' exposure:

- Physical contact (e.g. face-to-face; sharing a seating area or public transportation, including airplane transport; receptionist tasks; household, classroom or office contact, etc.) with a feverish or symptomatic but probable or confirmed[2] EVD case (not coughing, vomiting, bleeding, or having diarrhoea).

Definition of contact persons with 'high-risk' exposure [10-13]

- Close face-to-face contact (within one meter) without appropriate personal protective equipment (PPE) (including eye protection) with a probable or confirmed case who was coughing, vomiting, bleeding, or who had diarrhoea
- Unprotected sexual contact with an EVD case or an EVD survivor in the absence of evidence through RT-PCR testing of the survivor's semen being negative for the virus (two negative tests with at least one-week interval between tests)
- Direct contact without appropriate PPE with any material contaminated by bodily fluids from a probable or confirmed case
- Percutaneous injury (e.g. with needle) or mucosal exposure to bodily fluids of a probable or confirmed case
- Participation in burial rites with direct contact with human remains (including bodily fluids) of an EVD case without appropriate PPE.

Other types of 'high-risk' exposure are beyond the scope of this document, for example:

- Direct contact with bushmeat (e.g. eating raw bushmeat, carving up the animal, direct contact with the animal's blood or bodily fluids), bats, rodents, primates living or dead, in or from EVD-affected areas
- Breastfeeding an infant of an EVD case
- Percutaneous injury (e.g. with needle) or mucosal exposure to laboratory specimens suspected to contain Ebola virus.

Occupational exposure of healthcare workers

Occupational exposure of a healthcare worker [3] is defined as any exposure of a healthcare worker who cares for, treats, and otherwise interacts with patients who are a probable or confirmed EVD cases[3] (including laboratory workers), even when using appropriate PPE [2].

Prevention of exposure to laboratory specimens is usually covered by national occupational health guidelines and regulations.

'Low-risk' healthcare worker exposure:

- Appropriately protected contact with EVD patients, their bodily fluids, fomites (e.g. contaminated bed linen), or with Ebola virus samples (cultures, laboratory specimens, other infectious materials).

'High-risk' healthcare worker exposure:

- Unprotected or inappropriately protected contact with EVD patients, their bodily fluids, fomites (e.g. contaminated bed linen), or with Ebola virus samples (cultures, laboratory specimens, other infectious materials)

[2] A probable case is defined as a person meeting the clinical and high-risk exposure criteria; a confirmed case is defined as a person meeting the laboratory criteria for infection (for more information, see Ebola virus disease ad hoc case definition for reporting in the EU at https://ecdc.europa.eu/en/all-topics-zebola-and-marburg-feversthreats-and-outbreaksebola-outbreak-west-africa-2013-2016/ebola).

[3] A probable case is defined as a person meeting the clinical and high-risk exposure criteria; a confirmed case is defined as a person meeting the laboratory criteria for infection (for more information, see Ebola virus disease ad hoc case definition for reporting in the EU at https://ecdc.europa.eu/en/all-topics-zebola-and-marburg-feversthreats-and-outbreaksebola-outbreak-west-africa-2013-2016/ebola).

- Occupational exposure through percutaneous injury (e.g. with needle) or mucosal exposure to bodily fluids of a patient, tissues or laboratory specimens suspected to contain Ebola virus.

New WHO SAGE recommendations were published in December 2018 regarding the vaccination of local and international healthcare and frontline workers in the EVD outbreak in the DRC (North Kivu and Ituri Provinces) [5]. It is expected that international healthcare workers involved in outbreak response in the DRC will be vaccinated and protected against ZEBOV infection. However, due to the limited knowledge about the duration of the conferred immunity and the possibility of non-response to the vaccine, the proposed monitoring scheme for vaccinated healthcare worker remains the same as for unvaccinated healthcare workers.

Monitoring of contacts

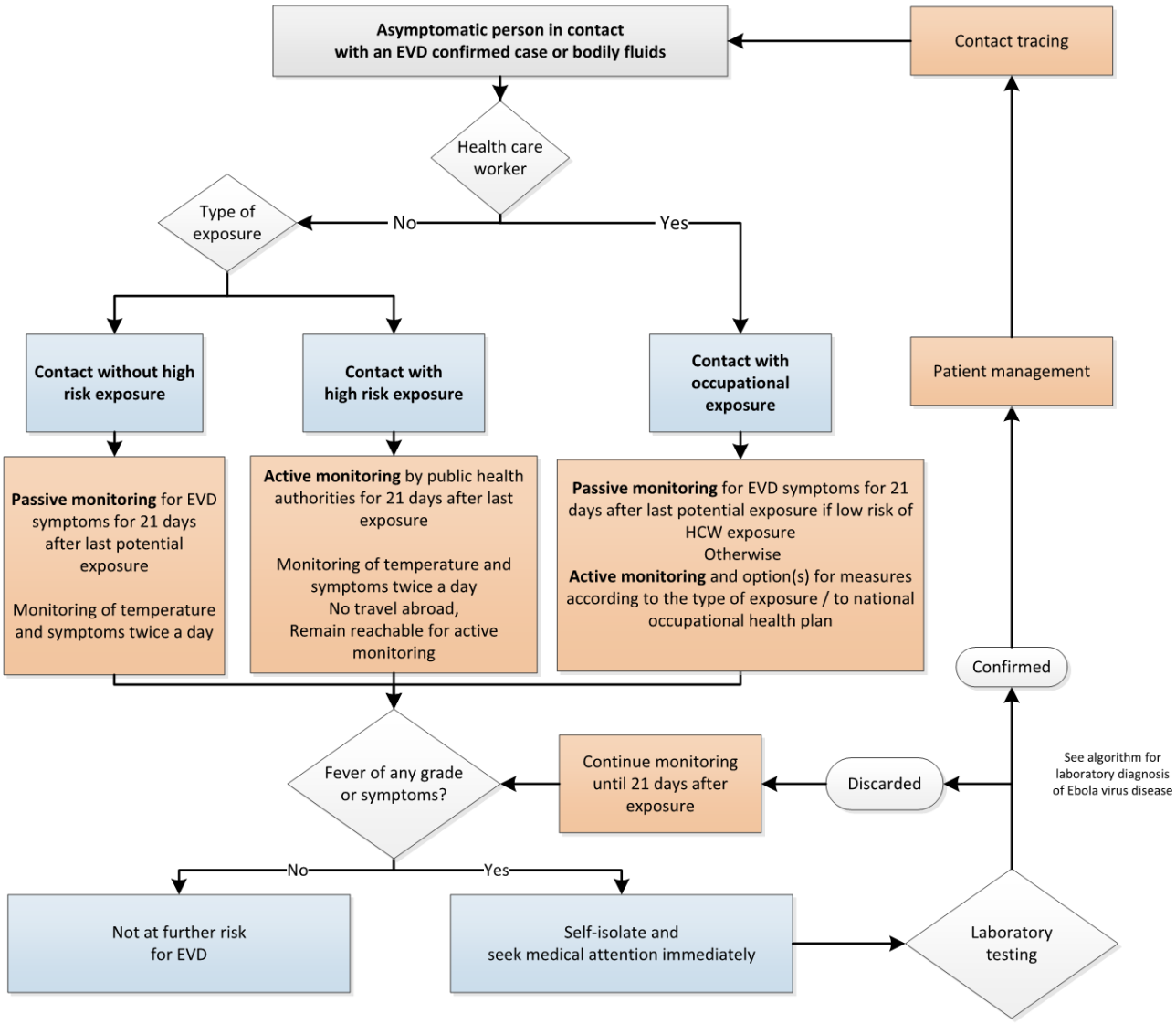
Contact tracing and management is based on the following current knowledge [14-19]:

- The time interval from infection with Ebola virus to onset of symptoms is 2 to 21 days, with a median incubation period of 9–10 days [6,10].
- Only symptomatic patients can transmit the infection. Infectiousness starts with the onset of symptoms.
- Transmission may occur through direct contact (via broken skin or mucous membranes) with the blood, secretions, other bodily fluids, or organs of infected EVD patients.
- Dead bodies and their blood and other bodily fluids remain infectious.
- There is no evidence of airborne transmission, but precautions are warranted if aerosol-generating symptoms (such as vomiting) occur or aerosol-producing high-risk procedures are performed (e.g. intubation).
- Transmission to sexual contacts of asymptomatic male EVD survivors has been reported with infectious virus isolated from semen 82 days after onset of symptoms; viral RNA has been isolated in semen more than 40 months after onset of symptoms [20].
- Transmission via inanimate objects (e.g. surfaces, bedding, clothing) contaminated with infectious bodily fluids is possible.
- If a person is symptomatic, rapidly isolating the person and applying appropriate infection prevention and control interventions can be effective to prevent further spread.
- The continued absence of evidence of infectiousness in the pre-symptomatic stage does not support any voluntary restriction of movements and social interactions during this stage.

Public health authorities can, depending on the specific situation, implement further restrictions. All EVD contacts should refrain from taking antipyretic medication during the 21-day period of fever monitoring so that fevers can be detected as early as possible. If an EVD contact returns from a malaria-endemic area, antimalarial chemoprophylaxis should be continued as advised by the relevant national/international guidelines and recommendations.

Figure 1 describes how to assess and monitor asymptomatic persons who had contact with a confirmed EVD case (or bodily fluids/Ebola virus samples); the graph also points out actions to be taken if a contact develops symptoms.

Figure 1. Algorithm: EVD contact management



See also algorithm for the laboratory diagnosis of Ebola virus disease: https://ecdc.europa.eu/en/publications-data/algorithm-initial-assessment-and-management-patients-ebola-virus-disease

Proposed options for contact persons

Public health authorities should ensure that every EVD contact receives appropriate information about EVD and possible symptoms. Contacts should also be given guidance on how to contact health authorities in accordance with national contact protocols.

Contacts with low-risk exposure:

- Self-monitoring for EVD symptoms twice a day for 21 days after last possible exposure, including fever of any grade.
- Public health authorities may indicate more actions, depending on the circumstances.

Contacts with high-risk exposure:

- Assess post-exposure prophylaxis options [16,21].
- Active monitoring by public health authorities for EVD symptoms for 21 days after last exposure, including fever of any grade.
- No travel abroad.
- Restriction of contacts (voluntary or imposed quarantine) for 21 days should be considered.

- If symptoms appear within 21 days, all contact persons should be instructed to immediately self-isolate and contact health services. If no symptoms appear within 21 days of last exposure, the contact person is no longer considered to be at risk of developing EVD.
- Maintain 21 days of active monitoring and social distancing etiquette even if there is history of vaccination with rVSVΔG-ZEBOV-GP vaccine; this may change as new scientific knowledge becomes available.
- As a precaution and due to the possible risk of sexual transmission before onset of symptoms, it is recommended to use condoms during the 21 days of monitoring.

Healthcare workers involved in the care of EVD patients

Before departure and after return, healthcare workers should be informed of the measures to be taken when they come back from affected areas.

Healthcare workers might have to be monitored for occupational exposure in the EU:

- after returning from affected areas where they were involved in caring for patients with EVD; or
- while caring for EVD patients in EU/EEA hospitals.

Contact with EVD patients using appropriate PPE is considered to be a low-risk exposure category. However, given the occupational nature of healthcare (repeated PPE use over time), such exposures might require specific monitoring.

National occupational health procedures/routines should contain provisions for the monitoring of healthcare workers exposed to EVD. This may involve registration, individual exposure assessment (type of care, vaccination status), passive/active monitoring of symptoms, and a prompt investigation if symptoms are detected that could be related to EVD.

Additional measures can be considered on the basis of the results of the individual exposure assessment, using the guidance in Table 1 below. For *Zaire ebolavirus* (ZEBOV), the proposed options in the Table and listed in Annex 1 can be modified according to ZEBOV vaccination status and the individual risk assessment. Measures for returning healthcare workers should be proportionate to the risk of further transmission and ensure the best possible management, while aiming to protect public health and respect the personal rights of healthcare workers.

Table 1. Contact management for healthcare workers returning from EVD-affected areas

Type of healthcare worker exposure	Proposed options
No direct contact with probable and confirmed EVD patients or their bodily fluids (e.g. only involved in training local healthcare workers)	Passive monitoring
Appropriately protected contact with bodily fluids of probable and confirmed EVD patients (e.g. laboratory workers), fomites (e.g. contaminated bed linen) or during clinical activities	Active monitoring
Unprotected/inappropriately protected contact or known breach of protection while caring for probable or confirmed EVD patients, handling fomites, or having contact with the bodily fluids of a patient	Active monitoring; consider post-exposure prophylaxis, including vaccination, along the lines of relevant national/international guidelines and recommendations. Restriction of movement and social interactions as a precautionary measure
Mucosal or parenteral direct contact with bodily fluids of a probable and confirmed EVD patient (e.g. needle stick with contaminated material or splash of bodily fluid in the eyes)	Active monitoring; post-exposure prophylaxis recommended along the lines of relevant national/international guidelines and recommendations. Restriction of movement and social interactions as a precautionary measure

Note: Adapted from ECDC's technical document 'Infection prevention and control measures for Ebola virus disease. Management of healthcare workers returning from Ebola-affected areas' published on 22 Jan 2015. Available from: https://ecdc.europa.eu/en/publications-data/infection-prevention-and-control-measures-ebola-virus-disease-management *[3].*
The WHO case definition of probable and confirmed cases is available from: https://apps.who.int/iris/bitstream/handle/10665/146397/WHO_EVD_CaseDef_14.1_eng.pdf [22].
Management of a contact who becomes symptomatic

Below are several critical steps that should be taken immediately if an EVD contact becomes symptomatic:

- Implement contact tracing, i.e. identify and follow-up with people who may have come into contact with a symptomatic EVD case.
- For each contact listed, perform an assessment of the contact (low-risk or high-risk exposure?) and inform him or her about monitoring procedures.
- Contacts should self-isolate.
- Protocols for the management of EVD cases should be implemented.

Annex 1. Possible measures for the management of healthcare workers returning from EVD-affected areas

This section summarises possible measures that should be considered for the management of asymptomatic healthcare workers returning from EVD-affected areas.

Registration

Establishing a register of healthcare worker engaged in providing care for EVD patients can facilitate communication and help with the monitoring of health status details upon return.

Information for returning healthcare workers

The information given to healthcare workers should include:

- general information on EVD: incubation period, clinical presentation, transmission (including sexual transmission), and options for post-exposure prophylaxis;
- advice on general protective measures for contacts, with specific attention to family and close friends as well as co-workers;
- advice on the monitoring regime recommended after deployment;
- general information and specific procedures on how to report symptoms and seek medical help;
- contact information for a designated public health office (24-hour service) if the healthcare worker experiences symptoms.

Healthcare workers should be advised to call their doctor or hospital should they develop symptoms within the 21-day period following their departure from an affected area before attending any healthcare facilities and inform them of their travel history and possible exposure.

Individual exposure assessment

This measure consists of an individual assessment of healthcare workers returning from affected areas. This assessment should take into account the following:

- Nature of activities in affected areas (clinical care, laboratory diagnostic, epidemiological investigations).
- ZEBOV vaccination status (type and date of vaccination).
- Possible exposure to EVD cases or bodily fluids from EVD patients despite using personal protection equipment and following PPE procedures.
- Use of personal protection equipment.
- Known breaches of PPE procedures.

The assessment should describe the healthcare worker's level of exposure. It should be used as the basis for determining any subsequent measures.

The assessment should be used as an opportunity to offer psychological support to returning healthcare workers. This is also a good time to propose post-exposure prophylaxis if relevant.

Monitoring of symptoms and body temperature

This measure consist of monitoring of symptoms and body temperature twice a day for 21 days after the last possible exposure. Monitoring can be:

- passive: self-monitoring by returning healthcare worker;
- active: the returning healthcare worker reports daily to a health authority or to the employer;
- direct and active: monitoring is done through direct observation of the healthcare worker by a health officer.

During monitoring, forms and checklists can be used to ensure consistency.

In case of fever of any grade or other symptoms compatible with EVD, the healthcare worker should immediately self-isolate and contact health services.

Restriction of engagement in clinical activities

Clinical activities are situations where transmission of disease can occur from a healthcare worker to a patient, because of the nature of the care provided and the status of the patient. This measure ensures that a healthcare worker does not perform activities that will involve contact with patients.

Restriction of social interaction

This measure imposes voluntary limitations in social interaction. It may be complemented by the healthcare worker keeping a register of contacts during the 21-day monitoring phase. This measure may include not presenting at work during the monitoring period.

Restriction of movement

This measure refers to limited or no use of public transportation; attendance at public events should also be limited or completely stopped. This may involve other measures, for example giving up trips abroad or that the healthcare worker remains within four hours of a health facility with isolation capacity.

Quarantine (self-imposed or mandatory)

This measure requires that the returning healthcare worker remain confined at home (self-quarantine) or in a dedicated facility (mandatory quarantine) for the duration of the monitoring. This measure results in a minimal number of interactions with contacts. This measure should be accompanied by psychosocial support and financial compensation should be considered.

Annex 2. Additional relevant information sources

Ebola virus disease case definition for reporting in the EU [10]. Available from: http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fevers/EVDcasedefinition/Pages/default.aspx

Algorithm for initial assessment and management of patients with Ebola virus disease [23]. Date: 26 September 2014. Available from: https://ecdc.europa.eu/en/publications-data/algorithm-initial-assessment-and-management-patients-ebola-virus-disease

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European Centre for Disease Prevention and Control (ECDC)

Gustav III:s Boulevard 40, 16973 Solna, Sweden

Tel. +46 858601000
Fax +46 858601001
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