

Autopsy in patients with confirmed or suspected Ebola virus disease (Ebola haemorrhagic fever)

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Contents

1	Introduction	3
2	Overview	3
3	Ebola virus as a Hazard Group 4 pathogen.....	3
4	Ebola virus as a notifiable disease.....	4
5	Clinical definition of Ebola virus disease.....	4
6	Patients with confirmed Ebola virus disease.....	5
7	Patients with suspected Ebola virus disease	6
8	Pre- and post-autopsy handling of bodies where Ebola virus disease is known or suspected ...	7
9	Personal protective equipment	7
10	References.....	7
11	Sources of further information.....	8
Appendix 1	Contact details for public health services	8
Appendix 2	Viral haemorrhagic fevers risk assessment.....	9
Appendix 3	Contact details for the College representative, Dr Michael Osborn.....	11
Appendix 4	Contact details for the Rare and Imported Pathogens Laboratory	12
Appendix 5	Handling bodies known or suspected of being infected with EVD.....	13

1 Introduction

This document has been produced in response to the 2014 outbreak of Ebola virus disease (EVD) in Western Africa (Guinea, Liberia, and Sierra Leone). It is possible that the disease may spread to other countries. This guidance is aimed intended to support the Coroner, deputy/assistant Coroners, autopsy pathologists and anatomical pathology technicians. It is based on the most recent available advice from Public Health England, the Advisory Committee on Dangerous Pathogens (UK)¹ and Centers for Disease Control and Prevention (USA).²

2 Overview

Ebola virus is one of the causes of viral haemorrhagic fever (VHF). Ebola virus belongs to the *Filoviridae* genus and was first discovered in the Democratic Republic of Congo in 1976. Viral haemorrhagic fever describes a severe, multi-organ disease in which the vascular system is damaged and the body's ability to regulate itself is impaired. VHFs are often accompanied by haemorrhages which can be life threatening. Viral haemorrhagic fevers are important because they can readily spread within a hospital or mortuary setting, there is no effective cure or vaccine, they have a high mortality rate and they are difficult to recognise and diagnose rapidly.

It must be emphasised that there have been no reported cases of person-to-person transmission of EVD within the UK. All recorded cases of EVD/VHF in the UK have been acquired abroad, with one exception of a laboratory worker who sustained a needle-stick injury.¹

In the United Kingdom, individuals are only at risk of contracting EVD if they have travelled to a part of the world where VHFs occur, have been exposed to a patient or animal that has been infected (including exposure to their blood, tissues or body fluids) and/or have handled specimens from a known or potentially infected individual or animal within a laboratory setting.¹

The risk of a patient with known or suspected EVD being encountered in the mortuary is very low indeed, but not zero. The virus is infectious only once symptoms develop, but symptoms may take up to 21 days to manifest following exposure to the virus. Because of modern air travel, it is possible that an infected patient may be transported to the UK, either asymptomatic or with known disease.

It is believed that the main routes of transmission of Ebola virus are direct contact (through broken skin or mucous membranes) with blood or body fluids, and indirect contact with environments contaminated with splashes or droplets of blood or body fluids; there is no evidence of aerosol spread¹

A variety of other infections can give rise to symptoms similar to those of EVD. The most commonly encountered of these is malaria.

3 Ebola virus as a Hazard Group 4 pathogen

Ebola virus is a Hazard Group 4 pathogen. The Health and Safety Executive defines a Hazard Group 4 pathogen as one that:

“causes severe human disease and is a serious hazard to employees; it is likely to spread to the community and there is usually no effective prophylaxis or treatment available.”^{3,4,5}

There is no preventative or curative treatment for Ebola virus disease. Patients are managed with supportive treatment.

There are potential risks of infection to laboratory staff associated with handling specimens from all types of patient. Patients suspected of having Ebola virus disease are clinically assessed as belonging to one of the following categories (see section 5, below):

- *“low possibility of VHF infection*
- *high possibility of VHF infection*
- *confirmed VHF infection*
- *VHF infection unlikely.”¹*

4 Ebola virus as a notifiable disease

In England, viral haemorrhagic fevers (including Ebola virus) are a notifiable disease under Schedule 1 of the Health Protection (Notifications) Regulations 2010, and notification of viral haemorrhagic fevers is classified as urgent. The registered medical practitioner attending the patient must therefore notify suspected cases by telephone to the local health protection team immediately and the proper officer of the local authority in which the patient currently resides, within 24 hours.(In the mortuary, this duty falls to the pathologist tasked with investigating the death.)The oral notification should be followed up with a written notification within three days.

Contact details for Health Protection England can be found in Appendix 1 of this document.

5 Clinical definition of Ebola virus disease

Early recognition of patients who may have died from Ebola virus disease(EVD) is critical for infection control.Healthcare workers (including mortuary staff) should be alert for and evaluate any patients suspected of having Ebola virus disease.

The European Centre for Disease Control (ECDC) has proposed the following definitions for suspecting and establishing the diagnosis of Ebola virus disease²

Clinical criteria

Any person currently presenting or having presented before death:

- Fever $\geq 38.6^{\circ}\text{C}$

AND any of the following:

- Severe headache
- Vomiting, diarrhoea, abdominal pain
- Unexplained haemorrhagic manifestations in various forms
- Multi-organ failure

OR a person who died suddenly and inexplicably

Laboratory criteria

Any of the following:

- Detection of Ebola virus nucleic acid in a clinical specimen and confirmation by sequencing or a second assay on different genomic targets.
- Isolation of Ebola virus from a clinical specimen.

Epidemiological criteria

In the 21 days before the onset of symptoms:

- having been in an affected area;

OR

- having had contact with a probable or confirmed EVD case.

High-risk exposure criteria

Any of the following:

- close face-to-face contact (e.g. within one metre) without appropriate personal protective equipment (including eye protection) with a probable or confirmed case who was coughing, vomiting, bleeding, or who had diarrhoea; or had unprotected sexual contact with a case up to three months after recovery;
- direct contact with any material soiled by bodily fluids from a probable or confirmed case;
- percutaneous injury (e.g. with needle) or mucosal exposure to bodily fluids, tissues or laboratory specimens of a probable or confirmed case;
- participation in funeral rites with direct exposure to human remains in or from an affected area without appropriate personal protective equipment;
- direct contact with bats, rodents, primates, living or dead, in or from affected areas, or bushmeat.

Person under investigation

A person

- meeting the clinical and the epidemiological criteria;

OR

- with high-risk exposure and any of the listed symptoms, including fever of any grade.

Probable case

- A person meeting the clinical and high-risk exposure criteria.

Confirmed case

- A person meeting the laboratory criteria.

6 Patients with confirmed Ebola virus disease

The majority of mortuaries do not have facilities to safely deal with Hazard Group 4 pathogens.

A post-mortem examination of a person known to have died of (or with) Ebola virus disease exposes staff to unwarranted risk and should not be performed.¹(In the exceptional circumstances of a suspected homicide,the necessity for conducting a post mortem and its extent should be carefully considered.)The death should be notified to Public Health England at the earliest opportunity.(This is the responsibility of the pathologist involved in the case.If the death has not been referred to a pathologist, it is the responsibility of the lead clinician dealing with the case or the Coroner's Officer who first has information about the death.)

Where doubt exists or where there is the possibility that a post mortem will be required for medico-legal reasons, advice can be obtained from The Royal College of Pathologists' representative, Dr Michael Osborn(see Appendix 1),or from Public Health England(see Appendix 3).

Guidance of management of accidental exposure to potentially infectious material can be found in Appendix 9 of the Advisory Committee on Dangerous Pathogens' guidance.¹

7 Patients with suspected Ebola virus disease

Any patient who has had a fever of $>38.6^{\circ}\text{C}$ or a history of fever in the 24 hours prior to death **and**who also has a history of travel from an Ebola virus disease area (Guinea, Liberia, Sierra Leone) within the 21 days prior to death or exposure to such an individual, a specimen from such an infected individual or an infected animal within 21 days prior to death should be considered to potentially have Ebola virus disease.

For such patients, follow the algorithm in Appendix 2 of this document.If in doubt, contact The Royal College of Pathologists' representative, Dr Michael Osborn (see Appendix 3), or Health Protection England (see Appendix 1) for advice.

When a person dies and a diagnosis of EVD is suspected, it may be necessary to embark on diagnostic testing on public health grounds to either confirm, or refute, the diagnosis or to provide an alternative diagnosis including, e.g. malaria.A risk assessment must be performed prior to any handling of such a body.

Consultation with appropriate specialists may help to determine the extent of the limited amount of sampling that will suffice such an assessment.

Any antemortem blood or other samples should be identified, as these may provide an alternative for diagnostic testing for EVD and negate the necessity for further invasive sampling of the body.

Prior to performing any investigation into the death of a patient suspected of dying from EVD,as part of conducting a risk assessment the pathologist **must**:

- liaise with HM Coroner and inform them that this may be a death due to Ebola virus disease
- ensure that they are familiar with the guidance from the Advisory Committee on Dangerous Pathogens, available on https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/343862/ACDP_VHF_guidance_12_08_20141.pdf
- discuss the case with the local consultant virologist on call
- discuss the case with Health Protection England (see Appendix 1)
- if it is determined from the above discussions that investigations should proceed, discuss sample collection and handling with Public Health England's Rare and Imported Pathogens Laboratory (see Appendix 4).

8 Pre- and post-autopsy handing of bodies where Ebola virus disease(EVD) is known or suspected

Patients who are known or suspected to have EVD pose a risk to anatomical pathology technicians, pathologists and funeral directors.

Where EVD is known or suspected, anatomical pathology technicians should first follow the guidance set out in sections 6 and 7 of this guidance. Advice should be sought from The Royal College of Pathologists' representative, Dr Michael Osborn, or Health Protection England (see Appendices 1 and 3) prior to handling the body.

Detailed advice regarding the handling of bodies of patients known or suspected of having EVD can be found in Appendix 5 of this document, and this advice should be consulted before releasing a body to a funeral director.

9 Personal protective equipment

Appropriate personal protective equipment (PPE) must be worn for all autopsies and whenever bodies are handled, in line with mortuary standard operating procedures.

Detailed guidance on PPE, its use, removal and disposal can be found in Appendix 8 of the Advisory Committee on Dangerous Pathogens.¹

10 References

- 1 Advisory Committee on Dangerous Pathogens. *Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence*. Department of Health: London, 2014.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/343862/ACDP_VHF_guidance_12_08_20141.pdf
- 2 Ebola virus disease case definition for reporting in EU 2014.
http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fever/EVDcase/definition/Pages/default.aspx
- 3 Health and Safety Executive. *Biological agents: managing the risks in laboratories and healthcare premises*. Health and Safety Executive: London, 2005. www.hse.gov.uk/biosafety/biologagents.pdf
- 4 Burton JL. Chapter 6. The safe and healthy autopsy. In: JL Burton, GN Rutt (editors). *The Hospital Autopsy: A manual of fundamental autopsy practice (3rd edition)*. Hodder-Arnold, London; 2010. pp59–70.
- 5 Lucas S. Chapter 7. Autopsies of people with high-risk infections. In: JL Burton, GN Rutt (editors). *The Hospital Autopsy: A manual of fundamental autopsy practice (3rd edition)*. Hodder-Arnold, London; 2010. pp 71–89.

11 Sources of further information

The information sources listed under Section 10 are the most up to date available at the time of writing. Additional information is also available from the following sources.

- Department of Health. *Health Technical Memorandum 07-01: Safe management of healthcare waste*. Department of Health: London, 2013.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/167976/HTM_07-01_Final.pdf
- Public Health England. Ebola virus disease: clinical management and guidance. Public Health England: London, 2014.
<https://www.gov.uk/government/collections/ebola-virus-disease-clinical-management-and-guidance>
- Public Health England Ebola virus disease epidemiological update: London, 2014.
<https://www.gov.uk/government/publications/ebola-virus-disease-epidemiological-update>

Appendix 1 Contact details for public health services

England

Public Health England

Centre for Infectious Disease Surveillance and Control www.gov.uk/phe
020 8200 4400 or 020 8200 6868

Contact details for PHE regions and local centres
<https://www.gov.uk/contacts-phe-regions-and-local-centres>

Northern Ireland

Public Health Agency
www.publichealth.hscni.net
0300 555 0114

Scotland

Health Protection Scotland
www.hps.scot.nhs.uk
0141 300 1100

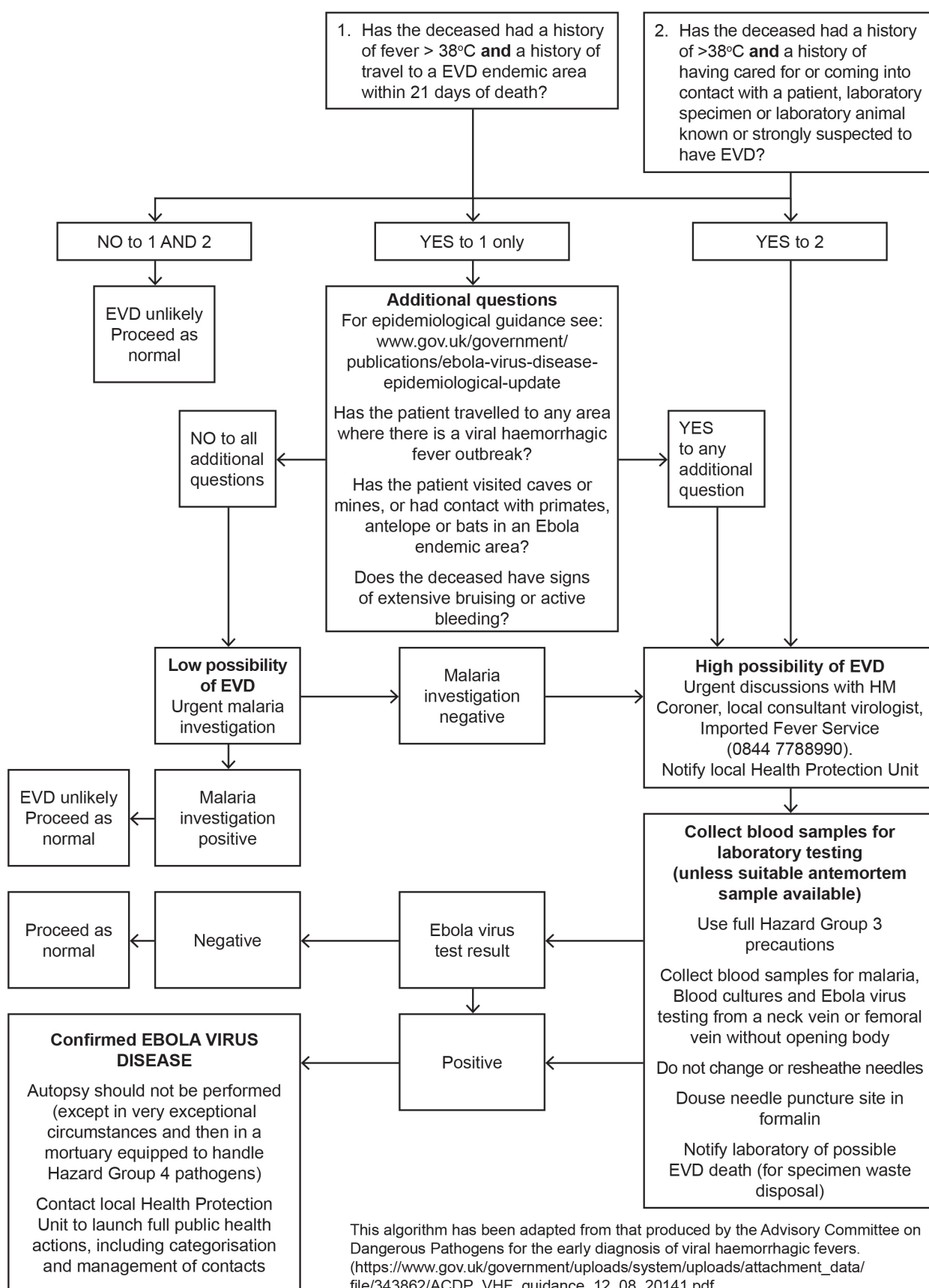
Wales

Public Health Wales
www.wales.nhs.uk/sitesplus/888/page/46753
029 2022 7744

Prior to contacting any of the above, you will need to have the following information to hand:

- name, address and date of birth of the deceased
- date of death
- if the deceased is known to have confirmed Ebola virus disease
- if the deceased is not known to have confirmed Ebola virus disease, whether they returned from Western Africa (Guinea, Liberia, Nigeria, Sierra Leone) within the 21 days prior to death
- the circumstances surrounding death as far as they are known.

Appendix 2 Viral haemorrhagic fevers risk assessment¹



Appendix 3 Contact details for The Royal College of Pathologists’ representative, Dr Michael Osborn

Dr Michael Osborn

07713257479

Prior to contacting Dr Osborn, you will need to have the following information to hand:

- name, address and date of birth of the deceased
- date of death
- if the deceased is known to have confirmed Ebola virus disease
- if the deceased is not known to have confirmed Ebola virus disease, whether they returned from Western Africa (Guinea, Liberia, Nigeria, Sierra Leone) within the 21 days prior to death
- the circumstances surrounding death as far as they are known.

Appendix 4 Contact details for the Rare and Imported Pathogens Laboratory

Prior to considering collection of samples from the body of an individual suspected of dying from Ebola virus disease, the pathologist **must** have discussion with staff at the Rare and Imported Pathogens Laboratory to seek guidance on what samples to collect and how these samples are to be handled and transported.

Rare and Imported Pathogens Laboratory (RIPL)

PHE Porton
Porton Down
Salisbury Wiltshire
SP4 0JG

24-hour telephone: 01980 612 100

Appendix 5 Handling bodies known or suspected of being infected with EVD

Post-mortem examination

1. **Autopsy examinations on those known to have died of VHF expose staff to unwarranted risk and should not be performed.**¹(In the exceptional circumstances of a suspected homicide the necessity for conducting a post mortem and its extent should be carefully considered).
2. Where a diagnosis of EVD is suspected but the patient has died before the diagnosis can be confirmed, it may be appropriate to undertake testing to confirm or refute the diagnosis or provide an alternative diagnosis such as malaria.

The local consultant virologist, public health services and the Rare and Imported Pathogens Laboratory will be able to advise on the nature of any sampling to be undertaken.

Any ante-mortem blood or other samples should be identified as these may provide an alternative for diagnostic testing for EVD and negate the necessity for further invasive sampling of the body.

If a sample from the body is required, in general:

- a. a blood sample has to be obtained – from any site, but most easily neck vein, subclavian, femoral veins or heart
- b. to take this, the precautions are straightforward:
 - one assistant is needed
 - face visors should be worn to prevent splashes
 - cut-resistant gloves should be worn
 - use a wide bore needle
 - have labelled specimen bottles ready
 - have a plastic specimen travel-box ready
 - do not resheath the needle/syringe but dispose of the whole set, etc.

This can be done in any mortuary capable of dealing with a Hazard group 3 post mortem. Transport-safe boxes must be available

- c. douse the needle site on the body with formalin and close the body bag(s)
 - d. before doing this, contact Microbiology and the relevant public health service to ensure that they provide a courier who will take the blood samples immediately to the appropriate regional or national laboratory.
3. Personnel undertaking diagnostic tests must wear appropriate personal protective equipment following the guidance for safe collection and transport of specimens.

If the deceased is in a Trexler isolator, the specimens should be taken before transferring the body to a leak-proof body bag. Where the results of such tests have found the deceased to be negative for VHF, a post mortem may be required.¹

Disposal of the deceased

4. **Bodies of those of those known or suspected to have died from or with Ebola or similar VHF should be cremated at the earliest opportunity if possible. If they cannot be cremated, for example if they have a pacemaker fitted, they should be buried at the earliest possible opportunity.**

Contact and exposure to the deceased should be kept to an absolute minimum with all post-mortem procedures adapted where possible to facilitate this (e.g. the body should be buried rather than cremated if a pacemaker, implanted defibrillator or implanted radioactive source is present to avoid the need to remove the device).

Anyone who must come into contact with the body of the deceased, or the body bag, coffin or other vessel carrying that body, must be made fully aware of the infection risk and infection control measures in place. This includes all funeral staff involved.¹

While the wishes of the relatives of the deceased must be taken into consideration when arranging disposal of the body, they should not detract from the infection-control procedures in place. Exposure of relatives to the deceased including touching, washing, kissing, etc. should be avoided. Discussion around these areas with the relatives must be conducted in a sensitive manner by an appropriate individual, in appropriate setting and with the appropriate amount of time set aside for the discussion.¹

Articles of clothing and similar items from the deceased should be safely disposed of if obviously contaminated. Other such items should be autoclaved prior to laundry. Jewellery and similar items should be autoclaved or decontaminated with a validated disinfectant. They can then be returned to relatives of the deceased. The relatives must be warned of possible damage to the items during decontamination.¹

Bodies of those of those known or suspected to have died from or with Ebola or similar VHF should not be repatriated or expatriated. However, following cremation, ashes may be safely transported.¹

Further information on handling of the deceased can be found in:

Advisory Committee on Dangerous Pathogens. *Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence*. Department of Health: London, 2014.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/343862/ACDP_VHF_guidance_12_08_20141.pdf