Superior Health Council

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Practical recommendations to the attention of healthcare professionals and health authorities regarding the identification of and care delivered to suspected or confirmed carriers of highly contagious viruses (of the Ebola or Marburg type) in the context of an epidemic outbreak in West Africa

Recommandations pratiques concernant l'identification et la prise en charge de patients suspectés ou avérés être porteurs de virus hautement contagieux (de type Ebola ou Marburg) dans le cadre d'une bouffée épidémique en Afrique de l'Ouest, à l'attention des professionnels de la santé et des autorités sanitaires.

Praktische aanbevelingen ter attentie van gezondheidswerkers en gezondheidsautoriteiten betreffende de identificatie en het beheer van vermoede of bevestigde dragers van zeer besmettelijke virussen (van het Ebola- of Marburg-type) in het kader van een uitbraak in West-Afrika.

4 July 2014

SUMMARY

This document provides guidance on the management of patients in whom an infection with Ebola or Marburg disease (EMD) is considered, suspected or confirmed. This guidance aims to eliminate or minimize the risk of transmission to healthcare workers and others coming into contact with an infected patient or their samples.
VHFs (Viral haemorrhagic fever) are severe and life-threatening viral diseases that have been reported in parts of Africa. VHFs are of particular public health importance because they can spread within a hospital setting; they have a high case-fatality rate; they are difficult to recognize and detect rapidly; and there is no effective treatment.

Evidence from outbreaks strongly indicates that the main routes of transmission of EMD infection are direct contact (through broken skin or mucous membrane) with blood or body fluids, and indirect contact with environments contaminated with splashes or droplets of blood or body fluids. Experts agree that there is no circumstantial or epidemiological evidence of an aerosol transmission risk from VHF patients. This guidance recommends control options for the isolation of EMD patients in Belgium.

Scientific support to the team delivering care to the patient will be provided by the "task group on travel-related diseases", which includes infectiologists with a broad experience on imported infections and who are affiliated with different Belgian academic institutions (see appendix 2).

KEYWORDS

Ebola disease, carrier, identification, care, Belgium.

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ABBREVIATIONS AND SYMBOLS

ACDP	Advisory Committee on Dangerous Pathogens
BNI	Bernard Nocht Institute
ECDC	European Centre for Disease Prevention and Control
EMD	Ebola or Marburg disease
EN	European standard
EUNID	European Network of Infectious Diseases
FFP3	Filtering facepiece type 3 (filtering efficiency of 99%)
HEPA	High efficiency particulate air
HSIDU	High security infectious disease unit
IATA	International Air Transport Association
ICU	Intensive care unit
IDU	Infectious disease unit
ITM	Institute of Tropical Medicine (*ITG-IMT*)
NaDCC	Sodium dichloroisocyanurate
NaOCl	Sodium hypochlorite
PCR	Polymerase chain reaction
ppm	parts per million
PPE	Personal protective equipment
PPE	Personal protective equipment
PROMED	Program for Monitoring Emerging Diseases
RPE	Respiratory protective equipment
SHC	Superior Health Council (*Conseil Supérieur de la Santé - Hoge Gezondheidraad*)
VHF	Viral haemorrhagic fever
UK	United Kingdom
UZA	Universitaire Ziekenhuis Antwerpen
WEL	Workplace exposure limit
WHO	World Health Organization

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1. INTRODUCTION AND ISSUES

Given current events in West Africa regarding the resurgence of the Ebola virus and the extremely rapid increase in the number of victims, people travelling away from the affected areas pose a risk to public health in the destination countries.

The Chairs of the SHC sub-areas of "Infection control during care" and "Vaccination" have therefore highlighted the need to draw up practical recommendations for the medical profession without delay. These recommendations will address the actions to be taken when dealing with a suspected case, how to manage the latter, as well as the specialized care to provide to confirmed cases.

The epidemic potential of the current Ebola virus may be different from what it was in the past. It is the reaction of the local West-African population concerned that in itself causes a real management problem (see editorial of The Lancet, 7 June 2014).

Suspected cases in less well-equipped local general healthcare facilities should be referred to a nearby tertiary hospital.

Ideally, microbiologically confirmed cases should be treated in an institution with a specialized high security infectious disease unit (HSIDU), as described by the experts of the "European Network of Infectious Diseases" (EUNID, 2009).

A proven case (that was confirmed abroad) should be referred to the operational sites that are already in place (such as London, Rome, Hamburg, ...).

Before implementing these applications in actual practice, it is essential that the competent health authorities concerned set up a cooperation agreement with the tertiary care institutions (university hospitals) in question.

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2. FURTHER DETAILS AND ARGUMENTATION

To respond to the need for recommendations within a tight deadline, an "*ad hoc"* working group was set up with experts on infectiology, medical microbiology, travel-related diseases, tropical diseases, vaccination and infection control during care (hospital hygiene).

These recommendations are a Belgian adaptation of the « *Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence* » (2012) that was prepared by the UK Advisory Committee on Dangerous Pathogens (ACDP), in conjunction with the Health and Safety Executive, with special thanks to the Health and Safety Laboratory; the Department of Health; the Devolved Administrations; and the National Health Service.

In particular, the SHC would like to draw the reader's attention to the fact that these recommendations are substantially based on this extensive and recent work and have been adapted to fit with the Belgian contingencies. This document does not address the global issue of haemorrhagic fevers, but only focusses on Marburg and Ebola fever.

An improved version of this document must be provided before the end of 2014.

The full version of the original document (from Great Britain) is available at the following address http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947382005 .
These recommendations specify on page 2 that « *You may re-use the text of this document (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit* www.nationalarchives.gov.uk/doc/open-government-licence/ ».

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3. RECOMMENDATIONS

Section 1 : Introduction

1. This document provides guidance on the management of patients in whom an infection with the Ebola or Marburg viruses is considered, suspected or confirmed.

2. This guidance aims to eliminate or minimize the risk of transmission to healthcare and other workers coming into contact with an infected patient or their body fluids during their stay in the hospital.

This guidance does not deal with contact definition and management.

3. VHFs are severe and life-threatening viral diseases that are endemic in parts of Africa. However, Ebola or Marburg usually appear in outbreaks, as is currently the case in West Africa. All recorded cases of EMD in industrialized countries were acquired abroad or were due to a needle-stick injury.

4. VHFs (EMD included) are of particular public health importance because:
- They can spread readily within a hospital setting without proper infection control measures;
- They have a high case-fatality rate;
- They require a high level of suspicion;
- Treatment is mainly supportive, no etiological treatment nor vaccine is available.

5. Evidence from outbreaks strongly indicates that the main routes of transmission of EMD infection are **direct contact** (through broken skin or mucous membrane) with blood or body fluids, **and indirect contact** with environments contaminated with splashes or droplets of blood or body fluids. Experts agree that there is no circumstantial or epidemiological evidence of an aerosol transmission risk from VHF patients.

6. This guidance only covers Ebola and Marburg diseases and doesn't cover other VHFs that are caused by pathogens classified as ACDP Hazard Group 4. Further information about the range of ACDP Hazard Group 4 viruses that cause viral haemorrhagic fever is included in Appendix 1.

Intended users of this guidance

7. This guidance focusses on the in-hospital management (including transport) of patients with a high possibility of Ebola or Marburg disease as defined in Section 2.

Section 2 : Patient assessment algorithm

The algorithm is not intended to be used as a case definition but rather as a tool to evaluate the probability that a febrile patient has Ebola disease and therefore as a means to enable decisions to be made about the actions needed to control the risk and prevent the spread of infection.

The level of staff protection, the diagnostic testing and the management of the patient depend of the latter's assessment.

In summary, in Belgium only the following individuals are considered at risk of infection from EMDs :
Those with **fever** (>38°C) or a history of fever during the previous 24h AND an **exposure history** during the previous **21 days**:
(i) individuals who have travelled to an area affected by an Ebola or Marburg outbreak ;
(ii) individuals who have been exposed to a patient or animal infected with EMD (including their blood, body fluids or tissues) or
(iii) individuals who have worked in a laboratory with the infectious agents of EMDs;

Because not all cases of EMD are confirmed and/or the patient under evaluation may not be able to give precise information about the clinical diagnosis of the contact person, contact with a feverish patient in an area affected by an Ebola outbreak will be considered sufficient grounds to suspect an exposure to a case of Ebola.
The risk level for Ebola virus transmission varies according to the type of contact with an infected person (ECDC, 08/04/2014).

Risk level	Type of contact
Very low or no recognised risk	Casual contact with a feverish, ambulant, self-caring patient. Examples: sharing a sitting area or public transportation, contact with a feverish, ambulant, self-caring patient; receptionist tasks.
Low risk	Close face-to-face contact with a feverish and ambulant patient. Example: physical examination, measuring temperature and blood pressures.
Moderate risk	Close face-to-face contact without appropriate personal protective equipment (including eye protection) with a patient who is coughing or vomiting, has nosebleeds or who has diarrhoea.
High risk	Percutaneous, needle-stick or mucosal exposure to virus-contaminated blood, bodily fluids, tissues or laboratory specimens in severely ill patients or patients known to have tested positive

How to conduct the patient clinical assessment

Initiating the patient clinical assessment algorithm is strongly advised in emergency departments or acute medical units for any patient who has had 1) a fever [> 38°C] or history of fever in the previous 24 hours and 2) a relevant travel history to an area affected by an Ebola outbreak or epidemiological exposure as defined above within 21 days.

The patient clinical assessment should be led by a senior member of the medical team responsible for the acute care of patients, for example the emergency care physician. The consultant microbiologist / infectiologist may also need to be involved.

Standard precautions and good infection control are paramount to ensure staff are not put at risk whilst the initial risk assessment is carried out. It is assumed throughout this guidance that staff will be using standard precautions as the norm.

The patient's EMD risk category can change depending on the patient's symptoms and/or the results of diagnostic tests and/or information from other sources. It is important to note that a patient with an EMD infection can deteriorate rapidly.

The risk of EMD in the patient should be reassessed if a patient with a relevant exposure history fails to improve or develops the following symptoms:
- Nosebleed;
- Bloody diarrhoea;
- Dramatic rise in transaminases;
- Sudden fall in platelets;
- Clinical shock;
- Rapidly increasing O_2 requirements in the absence of any other diagnosis.

Information on recent EMD outbreaks can be accessed on travel health websites such as the global alert and response system of the WHO (http://www.who.int/csr/en/) and ECDC (http://ecdc.europa.eu/en/Pages/home.aspx) and via daily global disease updates on ProMED-mail - the Program for Monitoring Emerging Diseases - is an Internet-based reporting system (http://www.promedmail.org/) dedicated to rapid global dissemination of information on outbreaks of infectious diseases.

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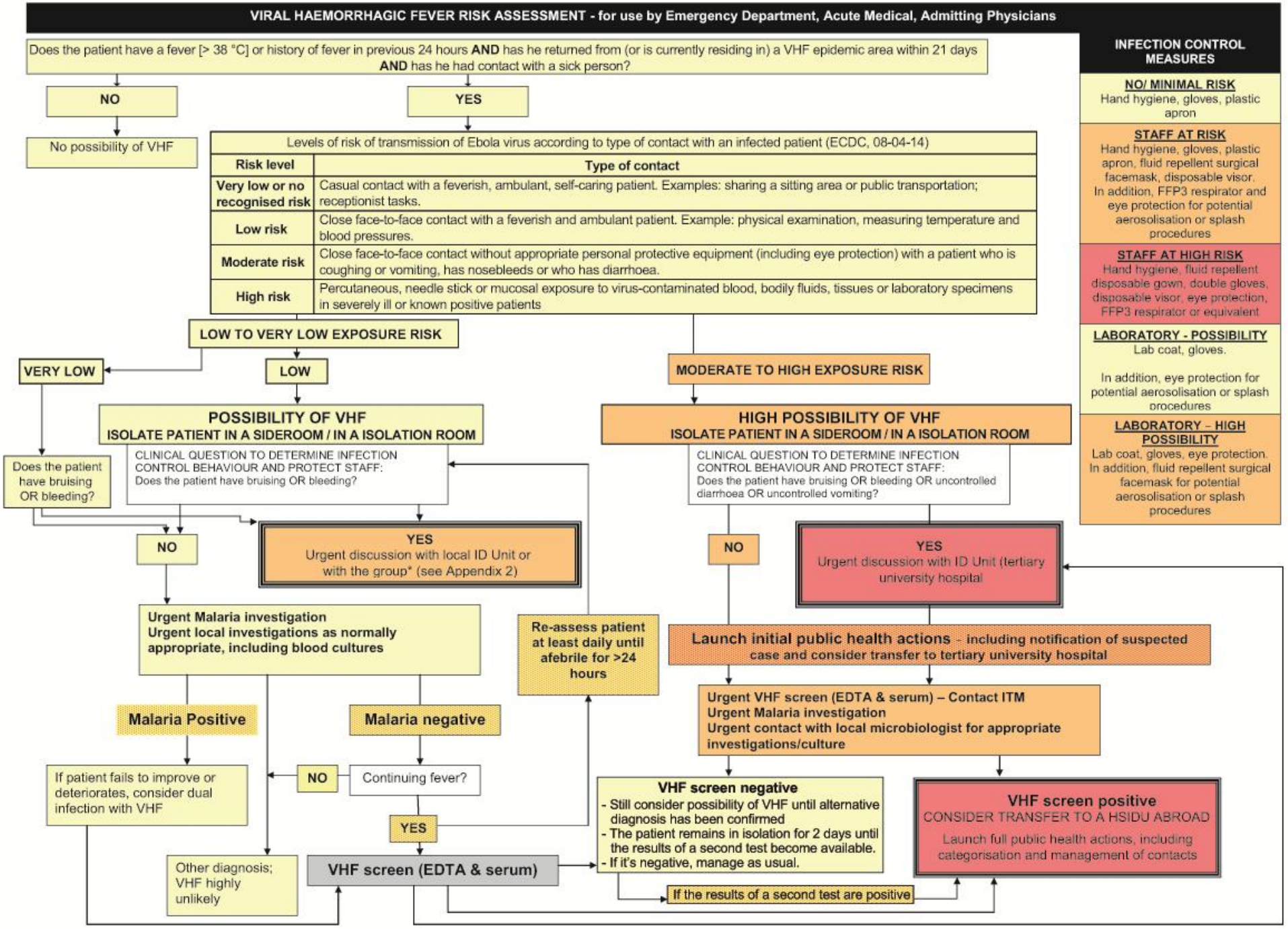
VIRAL HAEMORRHAGIC FEVER RISK ASSESSMENT - for use by Emergency Department, Acute Medical, Admitting Physicians
Does the patient have a fever [> 38 °C] or history of fever in previous 24 hours AND has he returned from (or is currently residing in) a VHF epidemic area within 21 days AND has he had contact with a sick person?
NO
No possibility of VHF
YES
Levels of risk of transmission of Ebola virus according to type of contact with an infected patient (ECDC, 08-04-14)
Risk level
Type of contact
Very low or no recognised risk
Casual contact with a feverish, ambulant, self-caring patient. Examples: sharing a sitting area or public transportation; receptionist tasks.
Low risk
Close face-to-face contact with a feverish and ambulant patient. Example: physical examination, measuring temperature and blood pressures.
Moderate risk
Close face-to-face contact without appropriate personal protective equipment (including eye protection) with a patient who is coughing or vomiting, has nosebleeds or who has diarrhoea.
High risk
Percutaneous, needle stick or mucosal exposure to virus-contaminated blood, bodily fluids, tissues or laboratory specimens in severely ill or known positive patients
LOW TO VERY LOW EXPOSURE RISK
VERY LOW
LOW
MODERATE TO HIGH EXPOSURE RISK
POSSIBILITY OF VHF
ISOLATE PATIENT IN A SIDEROOM / IN A ISOLATION ROOM
CLINICAL QUESTION TO DETERMINE INFECTION CONTROL BEHAVIOUR AND PROTECT STAFF:
Does the patient have bruising OR bleeding?
Does the patient have bruising OR bleeding?
NO
YES
Urgent discussion with local ID Unit or with the group* (see Appendix 2)
HIGH POSSIBILITY OF VHF
ISOLATE PATIENT IN A SIDEROOM / IN A ISOLATION ROOM
CLINICAL QUESTION TO DETERMINE INFECTION CONTROL BEHAVIOUR AND PROTECT STAFF:
Does the patient have bruising OR bleeding OR uncontrolled diarrhoea OR uncontrolled vomiting?
NO
YES
Urgent discussion with ID Unit (tertiary university hospital
Urgent Malaria investigation
Urgent local investigations as normally appropriate, including blood cultures
Re-assess patient at least daily until afebrile for >24 hours
Launch initial public health actions - including notification of suspected case and consider transfer to tertiary university hospital
Urgent VHF screen (EDTA & serum) – Contact ITM
Urgent Malaria investigation
Urgent contact with local microbiologist for appropriate investigations/culture
Malaria Positive
Malaria negative
If patient fails to improve or deteriorates, consider dual infection with VHF
NO
Continuing fever?
YES
Other diagnosis; VHF highly unlikely
VHF screen (EDTA & serum)
VHF screen negative
- Still consider possibility of VHF until alternative diagnosis has been confirmed
- The patient remains in isolation for 2 days until the results of a second test become available.
- If it's negative, manage as usual.
If the results of a second test are positive
VHF screen positive
CONSIDER TRANSFER TO A HSIDU ABROAD
Launch full public health actions, including categorisation and management of contacts
INFECTION CONTROL MEASURES
NO/ MINIMAL RISK
Hand hygiene, gloves, plastic apron
STAFF AT RISK
Hand hygiene, gloves, plastic apron, fluid repellent surgical facemask, disposable visor.
In addition, FFP3 respirator and eye protection for potential aerosolisation or splash procedures
STAFF AT HIGH RISK
Hand hygiene, fluid repellent disposable gown, double gloves, disposable visor, eye protection, FFP3 respirator or equivalent
LABORATORY - POSSIBILITY
Lab coat, gloves.
In addition, eye protection for potential aerosolisation or splash procedures
LABORATORY – HIGH POSSIBILITY
Lab coat, gloves, eye protection.
In addition, fluid repellent surgical facemask for potential aerosolisation or splash procedures

Section 3 : Management of a patient categorized as 'possible case of EMD'

NOTE: It is recommended that, if a patient is bruised or bleeding, the lead clinician should have an urgent discussion with the nearest tertiary university hospital Infectious Disease Unit or the local/regional Infectious Diseases Unit (IDU) concerning further management to assess whether the symptoms require switching the patient to a higher risk category.

See Appendix 2 for contact details.

Patient categorized as 'possibility of EMD':

- A senior member of the medical team who is responsible for the acute care of the patient should be the lead clinician;
- The patient should be isolated immediately;
- Notify the case to the health inspector;
- Instigate urgent malaria screen after contact with a microbiologist and continue with local diagnostic investigations as normal.

Infection control measures

1. A patient categorized as 'possibility of EMD' should immediately be isolated in a single side room to limit contact until the possibility of EMD has been ruled out. The side room should have an anteroom or at least a dedicated commode.

2. It is assumed that all staff will already be using standard precautions as appropriate. The level of any additional staff protection is as follows:

Infection control measures for 'possibility of VHF'	
	Staff protection
	Standard **plus** contact **plus** droplet precautions required: o gloves o long-sleeved gown and, if necessary, a plastic apron o fluid repellent surgical facemask **In addition, for potential aerosol- or splash-inducing procedures:** o FFP3 respirator or EN certified equivalent o eye protection

3. Potential aerosol-or splash-inducing procedures include for instance:

- Endotracheal intubation;
- Bronchoscopy;
- Airway suctioning;
- Positive pressure ventilation via face mask;
- High frequency oscillatory ventilation;
- Central line insertion;
- Aerosolized or nebulized medication administration;
- Diagnostic sputum induction.

4. Appendix 7 gives information on personal protective equipment including respiratory protection.

5. Single-use (disposable) equipment and supplies should be used. The use of a needle-free intravenous system to eliminate the risk of needle-stick injuries should also be considered.

6. The management of waste, laundry and environment cleaning and disinfection meets the usual guidelines for patients who are in a context of “contact precautions or “droplet precautions”.

7. Communication with staff about potential infection risks is paramount. Staff must be informed about and understand the risks associated with an EMD patient, for example:

- The severity of an EMD if infection is confirmed;

- That virus may be present:

o in blood;
o in body fluids, including urine;
o on contaminated instruments and equipment;
o in waste;
o on contaminated clothing;
o on contaminated surfaces.

That exposure to virus may occur:

o **directly**, through exposure (broken skin or mucous membranes) to blood and/or body fluids during invasive, aerosolizing or splash procedures;

o **indirectly**, through exposure (broken skin or mucous membranes) to environments, surfaces, equipment or clothing contaminated with splashes or droplets of blood or body fluids.

Diagnostic investigations

8. All samples from patients in the ‘possibility of EMD’ category can be treated as standard samples. Investigations required will include URGENT malaria investigations. Other investigations, as locally appropriate, may include urine, stool and blood cultures and chest x-ray. Sample containers contaminated with body fluids shall be disinfected on the outside with alcohol. Each element/tube has to be identified before entering patient’s room.

9. Malaria remains the most likely diagnosis and therefore screening for malaria is most urgent even if the patient has already had a malaria screen performed abroad with a negative result.

Diagnostic test results and subsequent patient management

Malaria investigation results

10. If the malaria result is positive, treatment for malaria can begin immediately. However, patients who fail to respond appropriately to antimalarial therapy, particularly if there is the development of further features suggestive of EMD, should be re-evaluated for the possibility of EMD and investigated accordingly.

11. If the malaria result is negative and the patient remains febrile (>38°C) and no diagnosis has been made, request an urgent EMD screen. Contact ITM (during working hours) or UZA (outside working hours; for more information, see Appendix 2) to organize the EMD screen and to assess the need to transfer the patient. The results are available within 36 hours of sampling. Until then, the patient should be classified as ’high possibility of Ebola disease’ and managed as such (see Section 4).

EMD screen results

12. **If the EMD screen is positive**, a number of urgent actions are required – see Section 5 for details.

13. **If the EMD screen is negative** and the patient doesn't show any haemorrhagic sign and isn't managed in an ICU, the diagnosis of EMD is dismissed.

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Section 4 : Management of a patient categorized as 'High possibility of EMD'

Patient categorized as 'high possibility of Ebola or Marburg disease'

- The lead clinician who is responsible for the acute care of the patient should be a senior member of the medical team;
- The patient should be isolated immediately;
- Enhanced infection control measures should be put in place;
- Carry out an urgent EMD and **malaria screen**, and continue local diagnostic investigations as appropriate and with additional laboratory precautions (see Appendix 6);
- Notify the case to the health inspector;
- If the patient's EMD screen is **positive**, consider urgent transfer to a HSIDU abroad after discussion with the sanitary authorities.

Infection control measures

1. The patient should be isolated in a single side room immediately to limit contact. The side room should have an anteroom or at least a dedicated commode (see appendix 3 for general principles).

2. The number of staff in contact with the patient should be restricted.

3. The level of staff protection required is set out in the table below:

Infection control measures for 'high possibility of EMD'	
	Staff protection
	Enhanced precautions required (contact plus droplet plus respiratory protection): o double gloves o double long-sleeved gown, the outer gown should be fluid repellent (disposable); o eye protection (ideally face shield) o FFP3 respirator o fluid repellent shoe cover (ideally "*overboots*" with shoe cover) o ideally, head covering

4. Appendix 7 gives further information on personal protective equipment including respiratory protection.

5. Single-use (disposable) equipment and supplies should be used. The use of a needle-free intravenous system to eliminate the risk of needle-stick injuries should also be considered.

6. Guidance on waste, laundry, decontamination and disinfection is provided in Appendices 9 and 10.

7. Communication with staff about the potential EMD risks and infection control measures is paramount. The important risks to make staff aware of are listed in the table in section 3.

Diagnostic investigations, including EMD screening

8. All samples from patients in the 'high possibility of EMD' category must be treated as 'high risk' samples (see Appendices 5 and 6). **Urgent EMD diagnostic testing** (as described in Section 4) should be requested through the local microbiology or virology laboratory, which should contact ITM (during working hours) or UZA (outside working hours, for more information, see Appendix 2). Laboratory results should be available within **36** hours following sampling of the specimen. See Appendix 2 for details of reference laboratory locations and contact numbers.

Investigations will additionally include URGENT malaria investigations. Other investigations, as appropriate, may include urine, stool and blood cultures, and chest x-ray (CXR). Sample containers contaminated with body fluids shall be disinfected on the outside with alcohol. Each element/tube has to be identified before entering patient's room.
In addition, the number of specimens taken for laboratory analysis should be kept to the minimum necessary for patient management and diagnostic evaluation. Specimens should be discussed in advance between clinicians and the appropriate specialist for each laboratory area.

Laboratory staff (e.g. clinical hematology, clinical biochemistry, or medical microbiology) should be notified prior to receipt of all specimens from patients with a 'high possibility of EMD' or with a positive EMD screen in order for them to be segregated and processed separately using dedicated equipment.

9. Appendix 5 provides guidance on obtaining specimens and Appendix 6 on the appropriate laboratory procedures for the processing of specimens from a patient categorized as 'high possibility of Ebola /Marburg disease'. It is highly advisable that the testing of specimens taken for patient management purposes be conducted at the very least in a biosafety level 2 containment laboratory with safety equipment, work practices and waste disposal management as in a biosafety level 3 laboratory or ideally, in a level 3 containment laboratory. See Appendix 6 for details.

EMD screen results and subsequent patient management

10. **If the EMD screen is positive, a number of urgent actions are required** – see Section 5 for details.

11. If the EMD screen is **negative**, an EMD infection in the patient should still be considered until either the patient has been afebrile for over 24 hours or an alternative diagnosis is confirmed. The patient should therefore remain isolated in a single side room and the infection control measures continued. If a second EMD screen result (two days later) is also negative, the isolation may be discontinued.

Section 5 : Management of a patient with a positive EMD screen

Patient with a positive EMD screen

- A patient who has had a positive EMD screen result should be transferred to a HSIDU abroad, unless exceptional circumstances prevent the patient's transfer ;
- The clinical management of a patient with a positive EMD screen is conducted on a case-by-case basis by the clinicians.

1. If a patient has a positive EMD screen result, the following **urgent** actions are required:

- **Restrict** the number of staff in contact with the patient and compile a list of all staff with exposure;
- **Inform** those in contact with the patient of the positive test, and emphasize infection control procedures to minimize risk of infection;
- If not already implemented, enhance levels of personal protection for those in contact with the patient:
    - double gloves,
    - double long-sleeved gown, the outer gown should be fluid repellent (disposable);
    - eye protection (ideally face shield),
    - FFP3 respirator,
    - fluid repellent shoe cover (ideally "*overboots*" with shoe cover),
    - head covering.

- Lead clinician should urgently discuss with the health inspector to arrange for the immediate transfer of the patient to the HSIDU (see Appendix 2 for contact details, Appendix 4 for transfer information). At the moment, there is no operational procedure or agreement regarding the transfer of patients to a European HSIDU.

Notify the infection control team and the health inspector of the positive EMD screen result.

2. If the condition of the patient is so serious (as judged by the lead clinician) that transfer to the HSIDU would adversely affect them, an immediate discussion with the lead for infection control should take place regarding enhanced risk assessment and control measures. Discussions with experts from the European HSIDU may be necessary (to contact them : http://www.eunid.eu/). The lead for infection control should also consult with intensivists and radiology.

3. The principles for the isolation of patients with a positive EMD screen are discussed in Appendix 3.

4. If the patient is unable to be transferred, testing of specimens should be carried out in accordance with Appendix 6.

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  Bijlage 1. Praktische uitwerking monitoring contacten patiënt met een ebola- of marburginfectie.
  Bijlage 2. Praktische uitwerking vervoer van thuis naar ziekenhuis van contacten patiënt ebola- marburgvirus en ziekenhuisopname.
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5. APPENDICES

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APPENDIX 1 : Overview of ACDP Hazard Group 4 VHFs

1. Viral hemorrhagic fever is a term used to describe a severe, multi-organ disease in which the overall vascular system is damaged and the body's ability to regulate itself is impaired. Disease is often accompanied by varying degrees of hemorrhage which can add greatly to the difficulties of patient management and be life-threatening for the patient.

2. Several viruses from the arenavirus, filovirus, bunyavirus and flavivirus families are known to cause hemorrhagic fevers. They are zoonotic or arboviral infections and dependent on an animal or insect host for transmission. The viruses are geographically restricted to the areas of their host species.

3. Humans are not the natural reservoirs of any of these viruses, but can become infected when they come into contact with infected hosts. In addition, many of these viruses are capable of person-to-person transmission, usually via direct contact with infected blood or body fluids, or indirectly via contact with environments contaminated with splashes or droplets of blood or body fluids.

4. The following table summarizes Hazard Group 4 hemorrhagic fever viruses, their diseases, geographies and transmission routes.

Source : http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947382005.

Virus	Disease	Geographical distribution	Transmission routes/vectors	Further information
ARENAVIRIDAE				
Old World arenaviruses				
Lassa	Lassa fever	**West and Central Africa** In particular: **Guinea, Liberia, Sierra Leone, Nigeria** Also consider: Central African Republic, Mali, Senegal, Burkina Faso, Cote D'Ivoire, Ghana, Gabon, Uganda	Contact with **excreta**, or materials contaminated with excreta, of infected multimammate **rat** (*Mastomys* spp). Inhalation of **aerosols of excreta** of multimammate rat. Contact with **blood** or **body fluids** from infected patients, or **sexual contact**.	http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/LassaFever/
Lujo	Unnamed	**Southern Africa** One outbreak to date (5 cases) in South Africa, ex-Zambia	Transmission to the index case unknown. Direct contact with **infected patient**, **blood** or **body fluids**.	First identified in October 2008 following a nosocomial outbreak in South Africa involving five people, four of whom died. Details of the outbreak and the virus are available here and here.

Virus	Disease	Geographical distribution	Transmission routes/vectors	Further information
New World arenaviruses (Tacaribe complex)				
Chapare	Unnamed	**Bolivia** One outbreak to date in Cochabamba, Bolivia	Direct contact (e.g. **bite**) with infected **rat** or **mouse**. Direct contact with **excreta** of infected rat or mouse. Contact with **materials** (e.g. **food**) **contaminated with excreta** from infected rat or mouse. Inhalation of **aerosols of excreta** (often in dust) of rat or mouse. Machupo and Guanarito	Details of the outbreak and genetic analysis are available here.
Guanarito	Venezuelan haemorrhagic fever	**Central Venezuela**		
Junín	Argentine haemorrhagic fever	**Argentina** **Pampas region**		
Machupo	Bolivian haemorrhagic fever	**North eastern Bolivia** **Beni department**		

Virus	Disease	Geographical distribution	Transmission routes/vectors	Further information
		(ex-Zimbabwe)		
FLAVIVIRIDAE				
Kyasanur forest disease	Kyasanur forest disease	**India** **Western districts of Karnataka state**	**Bite** of an infected **tick**, most commonly *Haemaphysalis spinigera*. Contact with an infected **animal**, most commonly **monkeys** or **rodents**.	Common in young adults exposed in the forests of western Karnataka – approximately 100-500 cases per year. Case fatality rate is estimated at 2-10%.
Alkhurma (Al Khumrah) haemorrhagic fever	Alkhurma haemorrhagic fever	**Saudi Arabia** **Makkah (Mecca), Jeddah, Jizan, Najran regions**	Contact with an infected **animal** (**sheep**, **camels**). **Bite** of an infected **tick** or **mosquito** (principal vector species not yet identified).	Cases have been reported outside Saudi Arabia, but have had contact with animals that likely originated in Saudi Arabia e.g. case in an Italian tourist in 2010 who visited a camel market in southern Egypt.
Omsk haemorrhagic fever	Omsk haemorrhagic fever	**Russian Federation** **Novosibirsk region of Siberia**	**Bite** of an infected **tick**, most commonly *Dermacentor reticulatus*. **Person-to-person**	Virus circulates in muskrats, and other animals, in the forest Steppe regions of Russia. Infection most common in farmers and their families.

Virus	Disease	Geographical distribution	Transmission routes/vectors	Further information
		and South Africa	**livestock**.	
FILOVIRIDAE				
Ebola - Ebola Zaïre - Ebola Sudan - Ebola Côte d'Ivoire - Ebola Bundibugyo - Ebola Reston and Siena	Ebola haemorrhagic fever	**Western, Central and Eastern Africa** Outbreaks have occurred in the Democratic Republic of the Congo, Sudan, Uganda, Gabon, Republic of Congo and Côte D'Ivoire	Transmission to the index case probably via contact with **infected animals**. Contact with infected **blood** or **body fluids**.	http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/Ebola/
Marburg	Marburg haemorrhagic fever	**Central and Eastern Africa** Outbreaks have occurred in Angola, the Democratic Republic of Congo, Kenya, Uganda and South Africa	Transmission to the index case probably via contact with **infected animals (?fruit bats)**. Contact with infected **blood** or **body fluids**.	http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/MarburgHaemorrhagicFever/

Virus	Disease	Geographical distribution	Transmission routes/vectors	Further information
Sabiá	Brazilian haemorrhagic fever	**Brazil** One case to date	only: Contact with **blood** or **body fluids** from infected patients.	
BUNYAVIRIDAE				
Nairoviruses				
Crimean Congo haemorrhagic fever	Crimean Congo haemorrhagic fever	**Central and Eastern Europe, Central Asia, the Middle East, East and West Africa.** Recent outbreaks in Russia, Turkey, Iran, Kazakhstan, Mauritania, Kosovo, Albania, Pakistan	**Bite** of an infected **tick** (most commonly *Hyalomma* ticks). Contact with infected **patients**, their **blood** or **body fluids**. Contact with **blood** or **tissues** from infected	http://www.hpa.org.uk/Topics/InfectiousDiseases/InfectionsAZ/CCHF/

APPENDIX 2 : Contact details

1/ Urgent diagnosis:

Once the IMT has been contacted *((1) the medical service department of the Institute of Tropical Medicine in Antwerp (24/24 – 7/7 during working hours 03/2476405 – outside working hours via the UZA phone number 03/8213000 and ask to be connected directly with the tropical disease specialist on duty (2) the tropical disease specialist on duty will consult with the clinical biologist on duty for the ITM*)the sample will be picked up by "World Courrier".
As per the current convention between the ITG (Antwerp) and the Bernhardt Nocht Institute (Hamburg), samples will be sent by the company "World courier" to BSL4 Bernard Nocht Institute in Hamburg for analysis.
A convention has been adopted between ITM (Antwerp) and BNI (Hamburg).

2/ Each university hospital is responsible for managing a possible/suspected, probable or a confirmed case seeking help :

IMT-UZ Antwerpen	The medical service department of the Institute of Tropical Medicine Antwerp (24/24 – 7/7 during working hours 03/2476405 – outside working hours via the UZA phone number 03/8213000 and ask to be connected directly with the tropical disease specialist on duty.
UZ Brussel	The Infectious Diseases Unit of the department of Internal Medicine of the UZ Brussel - an infectious diseases specialist can be reached 24/24 - 7/7 , during and outside working hours, via the telephone number +32 -2 -477 77 41
UZ Gent	The infectious disease specialist of the University Hospital Ghent can be reached at 09/332.21.11 (24/7), ask for the infectiologist on call.
UZ Leuven	De internisten-infectiologen zijn consulteerbaar via de wachtfunctie Algemene Interne Geneeskunde op spoedgevallen Gasthuisberg: 016/344024 (of via algemeen nummer dispatching spoedgevallen 016/343900). Deze ASO met permanentiewacht op spoedgevallen zal dan de supervisor infectioloog opbellen ofwel aan de aanvragende arts het nummer van de supervisor infectioloog doorgeven.
CHU-Erasme	The Infectious Diseases Department, Hôpital Erasme, 808 Route de Lennik, 1070 Bruxelles. During working hours 02/5556746 or 5554433 Outside working hours via the Erasme phone number 02/5553111 and ask to be connected directly with the infectious disease specialist on duty.
CHU-Liège	Infectiologue de garde du CHU Sart-Tilman (24/24 – 7/7 permanence téléphonique via les urgences de l'hôpital 04/3667711)
CHU-Saint-Pierre	Un avis d'infectiologue peut être obtenu 24h/24 tous les jours. Durant les heures de travail les jours ouvrables : au 02/535.50.09. Le soir, la nuit, week-ends et jours fériés, il est conseillé de passer par le Central téléphonique (au 02/535.31.11) qui transmettra.
CHU-Saint Luc	Un service de garde en Maladies infectieuses est assuré 24 heures sur 24, 7 jours sur 7, par le superviseur de garde en infectiologie. Contact via la Centrale des Cliniques : 02/764 11 11.
For military personnel in Guinea or others at risk	Center for Infectious Diseases, Military Hospital Brussels (24/24 – 7/7 during working hours 022644577 – outside working hours via phone number 022644848 or 4949".

3/ List and coordinates of the health inspectors in Belgium

3.1 French-speaking part:

Cellule de surveillance des maladies infectieuses

Responsable
Dr Carole Schirvel
Tél. 32.2.690.83.86
carole.schirvel(at)cfwb.be

Médecins-inspecteurs
- Dr Stéphanie Jacquinet
Tél. 32.2.413.35.21
stephanie.jacquinet(at)cfwb.be

- Dr Delphine Scory
Tél. 32.2.413.35.05
delphine.scory(at)cfwb.be

-Dr Véronique Zinnen
Tél.32.2.413.26.37
veronique.zinnen(at)cfwb.be

3.2 Flemish part

Team Infectieziektebestrijding Antwerpen	**Dr. Koen De Schrijver** VAC Anna Bijnsgebouw Lange Kievitstraat 111-113 bus 31 2018 Antwerpen tel. 03 224 62 04 - fax 03 224 62 01 koen.deschrijver@wvg.vlaanderen.be
Team Infectieziektebestrijding Limburg	**Dr. Annemie Forier** VAC Hendrik van Veldekegebouw Koningin Astridlaan 50 bus 7 3500 Hasselt tel. 011 74 22 40 -fax 011 74 22 59 anmarie.forier@wvg.vlaanderen.be

Team Infectieziektebestrijding Oost-Vlaanderen	**Dr. Wim Flipse** Elf Julistraat 45 9000 Gent tel. 09 244 83 60 - fax 09 244 83 70 wim.flipse@wvg.vlaanderen.be Opgelet nieuw adres, telefoon- en faxnummer vanaf 23 april 2014 **VAC Virginie Lovelinggebouw** Koningin Maria Hendrikaplein 70 bus 55 9000 Gent tel. 09 276 13 80 - fax 09 276 13 85 wim.flipse@wvg.vlaanderen.be
Team Infectieziektebestrijding Vlaams-Brabant	**Dr. Pia Cox** VAC Dirk Boutsgebouw Diestsepoort 6 bus 52 3000 Leuven tel. 016 66 63 50 - fax 016 66 63 55 pia.cox@wvg.vlaanderen.be
Team Infectieziektebestrijding West-Vlaanderen	**Dr. Valeska Laisnez** VAC Jacob van Maerlantgebouw Koning Albert I-laan 1-2 bus 53 8200 Brugge tel. 050 24 79 00 - fax 050 24 79 05 valeska.laisnez@wvg.vlaanderen.be
Team Infectieziektebestrijding en vaccinatie	**Dr. Ruud Mak** Ellipsgebouw Koning Albert II-laan 35 bus 33 1030 Brussel tel. 02 553 35 86 - fax 02 553 36 16 ruud.mak@wvg.vlaanderen.be **Dr. Geert Top** Ellipsgebouw Koning Albert II-laan 35 bus 33 1030 Brussel tel. 02 553 35 85 - fax 02 553 36 16 geert.top@wvg.vlaanderen.be

3.3 Brussels (Commission communautaire commune)

Dr J. BOTS - Dr J. WAEGENAERE – J.-M. TRÉMÉRIE
183 Avenue Louise 1050 Bruxelles
Tel : 02/502.60.01– Fax : 02/502.59.05 – GSM : 0478/77.77.08
jbots@ggc.irisnet.be ; jwaegenaere@ccc.irisnet.be ; jmtremerie@ccc.irisnet.be

APPENDIX 3 :
General principles for the isolation of patients with a high possibility of or confirmed EMD in the current Belgian context

Structural requirements

1. Patients with a high possibility of EMD may be managed in a non HSIDU environment in a tertiary hospital.
Patients with a confirmed EMD will be managed in a non HSIDU environment only in **exceptional** circumstances if it is impossible to transfer them to a HSIDU.

2. The patient must be housed in a single occupation side room with an anteroom and with en-suite sanitary facilities. If available, the patient will be housed in an airborne isolation room as described in the CDC Guidelines for Environmental Infection Control in Health-Care Facilities http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_hcf_03.pdf

3. There must be a clear segregation and gradation of clean and potentially contaminated areas in the room, with PPE changing nearest the door of the anteroom

4. A segregated holding area for contaminated material **must** be designated as near as possible to the side room, with procedures in place for transfer of material to that area with minimum potential for cross-contamination.

5. A segregated holding area for storing clean unused material needed for infection control purposes (PPE/RPE, disposable laundry, portable radiology equipment, waste container, disposable bed pans, eg….) **may** be designated.

Operational requirements

6. Procedures must be put in place for safe transfer of waste from the holding area to where it will be inactivated. See further details in Appendix 10.

7. Procedures must be put in place for disinfection, decontamination and terminal cleaning as soon as possible following transfer of the patient out of the isolation suite. See further details in Appendix 9.

8. An operational policy for the management of body fluid spillages must be available.

9. Procedures must be put in place for taking specimens and subsequently handling and transporting them to the laboratory (See further details in Appendix 5).

10. Procedures must be put in place to cover the arrangements for laundry (see Appendix 9 of this guidance);

11. Access to the room must be restricted to authorized personnel – students, relatives and visitors, should be excluded from the room. A register of all personnel including clinical, non-clinical and maintenance staff entering the unit must be kept as a means of tracking potential exposure to infection.

Patient containment requirements :

12. Experts agree that there is no circumstantial or epidemiological evidence of an aerosol transmission risk from EMD patients. A theoretical risk has been postulated. Evidence from

outbreaks in Africa strongly indicates that the main routes of transmission of Ebola infection are direct contact (through broken skin or mucous membrane) with blood or body fluids, and indirect contact with environments contaminated with splashes or droplets of blood or body fluids. Yet, due to the very limited experience with the Ebola virus in the modern intensive care environment, it is unclear whether the latter affect the risk factors for its transmission.

13. Avoiding contact with a patient's body fluids, minimizing contamination of the environment, and safely containing contaminated fluids and materials, is paramount to protecting staff and the wider public against infection risks.

14. Enhanced personal protective equipment (PPE), including respiratory protective equipment (RPE), is required for any contact with the patient or material or surfaces potentially contaminated by body fluids in spite of the fact that there is no strong link between inhalation and EMD transmissibility. Required PPE/RPE are as follows:

- FFP3 respirator or EN certified equivalent
- Face shield
- Double gown, the outer gown will be waterproof
- Waterproof boots and overshoes;
- Double gloves
- Head cover

15. Correct protocols for putting on and removing PPE and RPE must be strictly adhered to in order to maintain staff protection. More information on PPE, including RPE, is included in Appendix 7.

APPENDIX 4 : Transfer of a patient

Transfer of a patient with high possibility or confirmed EMD infection within Belgium

1. Transfer of a patient within Belgium to an tertiary university hospital will be necessary when either:
   - the patient has been categorized as 'high possibility of EMD and has bruising or bleeding or uncontrolled diarrhea or uncontrolled vomiting; or
   - the patient has had a positive EMD screen result.

2. In these cases, consider transfer to a HSIDU abroad

3. The decision to transfer a patient should be made by the senior clinician responsible for the patient's care, after consultation and agreement with the health inspector and senior clinicians at the tertiary university hospital to which the patient is to be transferred.

Transfer by road within Belgium

Transfer by road, in an ambulance, is the preferred option for all patients.

4. Patients categorized as 'possibility of EMD may be transported by standard means provided that there are no other high risk factors.

5. Transportation by ambulance will need to be carried out in accordance with a number of basic requirements for **communication**, **ambulance contents**, **PPE**, **decontamination** and **after care**. These are outlined below.

Communication

6. The ambulance crew and staff must be made aware of the patient's clinical condition, the possibility of deterioration on the journey and the routes of transmission of EMD.

7. During the journey, maintain close communication with:
- the tertiary university hospital, for example to give estimated time of arrival, clinical condition of the patient;
- others involved in the transfer, for example the escort, if applicable.

Ambulance contents

8. The minimum equipment and supplies necessary for the transfer should be retained on board – everything else should be removed to reduce risk of cross contamination. Consideration should also be given to the location of equipment on board to minimize the potential for contamination.

PPE

9. Appropriate PPE (Enhanced precautions required: contact plus droplet plus respiratory protection) are described in appendix 7.

Decontamination of ambulance and equipment

10. The ambulance should be driven to the decontamination area at the tertiary university hospital. All disposable ambulance equipment, blankets, linen, cloths etc., plus materials used in the decontamination procedure must be treated as Category A clinical infectious waste, secured and labeled 'infectious for incineration', the labels endorsed with the patient identifier and

disposed of by hospital staff.

For the decontamination of the ambulance, see Appendix 9

Decontamination of ambulance crew and staff, clothing

11. Decontamination of crew and staff should take place in the tertiary university hospital decontamination suite according to the following procedures :
- All PPE and disposable items must be treated as Category A clinical infectious waste, removed, bagged and labeled 'infectious for incineration' along with the patient identifier and disposed of by hospital staff;
- Any recoverable items (spectacles, monitoring cable,…) should be placed in a clear plastic bag and handed to tertiary university hospital staff for decontamination ;
- Crew members should take a shower including hair wash before entering the clean area.

After care of ambulance crew and staff

12. All ambulance staff and crew present in the ambulance during patient transfer should be identified and a record should be kept by the tertiary hospital and transmitted to the health inspector as a means of tracking potential exposure to infection.

13. If a member of ambulance crew or staff is accidentally exposed to potentially infectious material from the patient, this should be reported immediately. Hospital emergency procedures should be followed with additional advice from the tertiary university hospital. Appendix 8 also contains guidance on accidental exposures.

14. In extraordinary circumstances, transfer of a patient presenting an enhanced risk to crew and staff (due to bleeding, uncontrolled diarrhea, uncontrolled vomiting) could be requested. In such circumstances, transfer could be carried out using a transit isolator **if available** from the tertiary university hospital. Special instructions and guidance will be supplied by the tertiary university hospital staff.

Key points for ambulance crew and staff to remember before transferring an EMD patient

CHECK:

- that you have received full information about the condition of the patient and the possibility of sudden deterioration during the journey, and that you give this information to the receiving clinical team;
- the specific arrangements for the journey, including possible escort for long road journeys
- that you are aware of arrangements in case of an emergency.

ENSURE:

- that you are fully familiar with the procedures
- that you maintain close communication with the receiving clinical team at the tertiary university hospital at all times;
- that suitable PPE is worn by all members of ambulance crew and staff at all times;
- that under no circumstances should direct oral resuscitation be carried out – a disposable bag and mask should be used to resuscitate patients;
- that no members of staff who have been in contact with the patient leave the ambulance en route.

Transfer by air within Belgium or to a HSIDU abroad

15. Although road transfer is preferable, air transfer may be necessary in some circumstances. Following advice and contacts provided by the receiving tertiary university hospital, an ambulant and continent patient may be moved by air ambulance with a crew suitably trained for this level of transport.

APPENDIX 5 : Specimen collection and handling

Specimens from patients categorized as 'possibility of EMD

1. The risk of EMD from patients categorized as 'possibility of EMD' is low, as they are highly likely to be diagnosed with an alternative infection, for example malaria. There are therefore no additional precautions to be taken for these specimens, above those already in place under standard precautions. It is not necessary for the managing doctors to inform the laboratory, as the risk to laboratory staff is extremely low.

2. Healthcare waste generated as a result of specimen collection from patients categorized as 'possibility of EMD must be treated as Category B infectious waste.

Specimens from patients categorized as 'high possibility of EMD' or those with a positive EMD screen

3. There are potential risks of infection to the healthcare worker associated with collecting and handling specimens from patients categorized as high possibility of having an EMD infection, or those with a positive EMD screen. The main risk of infection when collecting and handling specimens is direct contact with blood or body fluids from the patient, for example by accidental inoculation (needle-stick) or contact with broken skin or mucous membranes.

4. In patients categorized as high possibility of having an EMD infection or those with a positive EMD screen, specimens taken for laboratory analysis should be kept to the minimum necessary for patient management and diagnostic evaluation. Specimens should be discussed in advance between clinicians and the appropriate specialist for each laboratory area. During specimen collection, universal infection control principles and practices should always be adopted. In addition, staff must select PPE in accordance with Sections 3 and 4 of this guidance and Appendix 7.

5. Healthcare waste generated as a result of specimen collection from patients categorized as 'high possibility of EMD and those with a positive EMD screen must be treated as Category A infectious waste. Waste should be dealt with according to the guidance set out in "Safe management of healthcare waste" (Version 1.0) i.e. autoclaved on site (if available) or incinerated (see Appendix 10).

6. The following principles should be followed to ensure safe transfer of these specimens to the laboratory:
- Laboratory staff should be notified prior to receipt of all specimens from patients with a 'high possibility of EMD' or with a positive EMD screen;
- Specimens should be transported in person i.e. not be sent on automatic transport systems (e.g. pneumatic transport systems) nor in standard mail;
- Specimens should be transported to the laboratory using appropriate precautions i.e. specimens should be double bagged and carried in suitably sealed containers;

- Policies for the transportation of specimens to a HSIDU laboratory should be agreed between sender and recipient e.g. hospital to HSIDU laboratory, or HSIDU laboratory to a Containment Level 4 laboratory.

If a member of staff is exposed to body fluids during specimen collection e.g. accidental percutaneous contamination, or requires information about decontamination of body fluid spillages, please refer to the main guidance and Appendices 8 and 9.

APPENDIX 6 : Laboratory procedures

1. There are potential risks of infection to laboratory staff associated with handling specimens from all types of patient. Patients suspected of EMD are clinically assessed as one of the following categories:

- Highly unlikely;
- Possibility of EMD
- High possibility of EMD infection;
- Confirmed.

2. For specimens from all patients in whom EMD is being considered, specific risk assessments must be developed alongside local codes of practice, which should be agreed between clinical and laboratory staff. This information can be used to ensure that the risks are effectively controlled and relevant facilities are in place and are managed properly. The risk assessment should include evaluation of the risks associated with each analytical technique and the application of appropriate control measures. These control measures should include where possible a method for inactivating a specimen i.e. a validated heat or chemical treatment step in order that any pathogens present no longer pose a health risk.

Specimens from a patient categorized as 'possibility of EMD

3. The majority of patients who are categorized as 'possibility of EMD are unlikely to have an EMD, clinical experience has shown that most patients will have infections other than EMD such as malaria. The overall risk to laboratory workers from specimens from these patients is therefore considered to be minimal, and specimens may be processed **using standard procedures** and practices at containment level 2 using the associated controls and PPE (Box 1).

Box 1 - Specimens from a patient categorized as 'possibility of EMD '
Routine laboratory tests should be carried out where possible in closed system analyzers at standard **containment level 2** conditions.

Specimens from a patient categorized as 'high possibility of EMD.

4. Few patients will be categorized as 'high possibility of EMD, and whilst many of these are likely to turn out to be negative for EMD ,there is an increased risk of infection to laboratory workers when analyzing specimens from patients in this category. Such specimens may be analyzed at least at **containment level 2 with some additional precautions or at containment level 3** (Box 2) and laboratory staff (e.g. clinical haematology, clinical biochemistry, or medical microbiology) will need to be informed **prior to receipt of specimens** in order for them to be segregated and processed separately using dedicated equipment. In addition, the number of specimens taken for laboratory analysis should be kept to the minimum necessary for patient management and diagnostic evaluation.

Box 2 - Specimens from a patient categorized as 'high possibility of EMD'
If specimens not inactivated, a sealed centrifuge bucket or rotor must be used for centrifugation procedures.

If specimens not inactivated, consideration should be given to using face protection for practices and procedures that have been assessed as likely to create splashes or aerosolization.

Specimen handling and storage should be kept to a minimum.

If not inactivated, specimens should be processed in a segregated area using a dedicated blood/gas analyzer or similar standalone machine. Protocols will need to be in place for safe processing, handling and disposal including waste from the analyzer

Where possible, specimens should be inactivated before they are tested (see Appendix 9). Where this is not possible or appropriate, the additional controls listed below are necessary.

If specimens not inactivated, suitable and sufficient disinfection and decontamination procedures validated as effective against VHF must be in place, including those for automated systems

Specimens must be handled at a minimum of **containment level 2. H**owever, a BSL-3 infrastructure is strongly recommended for handling these specimens.

Laboratory staff will need to be informed before specimens are sent for analysis to ensure experienced and senior members of staff are available to manage the coordination of testing, liaise with other laboratories i.e. HSIDU, HPA, and to supervise processing of the specimens

Specimens from a patient with a positive EMD screen

5. The number of patients with a positive EMD screen in Belgium is expected to be extremely low. In most cases, patients with a positive EMD screen will be transferred to an HSIDU and specimens will be analysed at the dedicated HSIDU laboratory (Box 3). However, where transfer is delayed or considered inadvisable, the **nearest containment level 3 laboratory, which will require enhanced precautions**, may undertake analysis of specimens for **emergency testing only**. The requirements outlined in Box 3 will need to be adhered to when processing specimens at containment level 3 in a standard laboratory, as the viral titres of specimens are likely to be high.

6. All work must be conducted in an enhanced **containment level 3** facility with the following enhanced precautions:

Box 3 - Specimens from a patient with a positive EMD screen

Appropriate laboratory staff members should be informed before specimens are sent for analysis to ensure senior staff are available to manage the coordination of testing, liaise with other laboratories and process specimens

The laboratory should not be used for any other purpose for the duration of handling and testing the patient's samples

Specimen handling and storage should be kept to a minimum

Where possible, specimens should be inactivated before they are tested (see Appendix 9).

Test protocols likely to result in the production of aerosols must be assessed and, where appropriate, carried out in a microbiological safety cabinet (MSC, class 1, 2 or 3) or other equipment providing a similar level of protection

All analytical equipment should be located in the laboratory

Consideration should be given to use of face protection to avoid risk of splash

The laboratory will need to have a dedicated blood/gas analyzer or similar stand-alone machine. Protocols should be in place for safe processing, handling and disposal including waste from the analyzer, which should remain within the laboratory throughout patient management testing

For centrifugation procedures, a sealed centrifuge bucket or rotor must be used

Patient material that is not for immediate disposal should be packed in rigid containers, which should be surface decontaminated and retained within the containment level 3 laboratory awaiting safe disposal

Suitable and sufficient disinfection and decontamination procedures, validated as effective against EMD, must be in place, including those for automated systems

Specific instructions for speciality areas

7. Automated instruments can be used to process blood cultures for microbiological analysis; however, care should be taken when sub-culturing potentially positive specimens and procedures should be undertaken in a microbiological safety cabinet by experienced staff.

8. Specimens from patients subsequently found to be positive for EMD should be retrieved, appropriately labeled and safely stored until disposed of by autoclaving or incineration.

9. If a member of staff is assessed as likely to have been exposed to EMD positive specimens, they should liaise with their occupational health provider about following health monitoring (see Appendix 8).

Malaria test

10. Experience has shown that most patients suspected of having an EMD infection will have malaria. Laboratory tests to exclude or confirm malaria should be carried out as soon as possible. Malaria is a serious infection that can be life threatening and prompt treatment can significantly affect the course of disease. It is essential that several blood films be examined to exclude this diagnosis, bearing in mind that false negative results occasionally occur. Treatment may need to be considered in the absence of a firm diagnosis. The WHO Malaria Microscopy Quality Assurance Manual (2009) states:

"*Laboratory diagnosis by microscopic examination of stained blood films continues to be the method of choice, or the common reference standard, for case management and epidemiological studies. Rapid Diagnostic Tests are also an important component of a diagnostic strategy for malaria and can be used to confirm the presence of parasites in certain circumstances, however, they cannot be considered as a gold standard*."

11. While following standard protocols, the **following additional precautions are recommended at enhanced containment level 2** ('high possibility of EMD' specimens):

Immediate and appropriate disposal of blood film slides is important as some infective virus may remain (see Appendix 10);

After use, the work surfaces should be treated following the recommendations in the Appendix 9.

APPENDIX 7 : PERSONAL PROTECTIVE EQUIPMENT (INCLUDING RESPIRATORY PROTECTIVE EQUIPMENT)

1. Control and containment when managing patients who may have EMD infection, or a positive EMD screen, is important to protect staff and the wider community. The isolation of the patient (described in the appendix 3 of this guidance), supplemented by appropriate PPE including RPE, or a physical barrier, are key risk control measures. To ensure the effectiveness of PPE and RPE, care will need to be taken in its initial selection and subsequent maintenance, storage and use, as described in this Appendix.

Criteria for appropriate selection of PPE

2. When selecting appropriate and practical PPE to control the infection risk, the tasks to be undertaken, the environment in which the PPE is being used and the person using the PPE must be considered.

3. When selecting PPE for protection of healthcare and laboratory staff the potential exposure routes to be considered are **direct contact** (through broken skin or mucous membrane) with blood or body fluids, and **indirect contact** with environments contaminated with splashes or droplets of blood or body fluids. Regarding EMD risk:

- transmission has usually been associated with patient care in the absence of appropriate barrier precautions to prevent exposure to blood and other body fluids;

- most staff acquiring infection in past outbreaks had multiple contacts with multiple body fluids;

- the risk for person-to-person transmission of EMD is highest during the latter stages of illness, when vomiting, diarrhoea, and often haemorrhage, may lead to splash and droplet generation.

4. In patient management, PPE selection should be proportionate to the likelihood of EMD as defined in the algorithm:

PPE during patient management

Patients categorized as 'possibility of EMD'

- Hand hygiene
- Gloves
- Disposable gown
- Fluid repellent surgical mask
- **For potential aerosol- or splash-inducing procedures:**
  - FFP3 respirator or EN certified equivalent
  - Eye protection

Patients categorized as 'high possibility' or 'confirmed EMD'

- Hand hygiene
- Double gloves
- Double long-sleeved gown, the outer gown should be fluid repellent (disposable)
- Disposable visor
- Fluid repellent shoe cover (ideally "overboots" with shoe cover)
- FFP3 respirator
- Eye protection
- Ideally, head covering

PPE when working with specimens in the laboratory

'Possibility of EMD'

- Lab coat (long-sleeved)
- Gloves
- Eye protection for potential aerosolization or splash procedures

Patients categorized as 'high possibility' or 'confirmed EMD'

- Disposable/dedicated lab coat (long-sleeved)
- Double gloves
- Eye protection
- Fluid repellent surgical facemask for potential aerosolization or splash procedures

PPE selection – further considerations for management of patients with a diagnosis of EMD

5. It is imperative that the PPE provides a barrier of adequate coverage and integrity to prevent staff contact (direct or indirect) with contamination. The barrier function will need to be maintained throughout all clinical/nursing procedures, and when following appropriate procedures for the removal and disposal or decontamination of potentially contaminated equipment by the wearer.

6. The PPE/RPE combination has to establish a barrier against contact with contaminated surfaces, splash, spray, bulk fluids and aerosol particles as follows:

- Should provide complete adequate coverage of all exposed skin, with sufficient integrity to prevent ingress or seepage of bulk liquids or airborne particles, under foreseeable conditions of usage;
- The materials from which the PPE is made should resist penetration of relevant liquids/suspensions and aerosols;
- The various components (body clothing, footwear, gloves, respiratory/face/eye protection) should be designed to interface sufficiently well to maintain a barrier, e.g. sleeves long enough to be adequately overlapped by glove cuffs.

Putting on and taking off PPE

7. As described above, PPE should be chosen to ensure an adequate barrier to exposure is created and maintained. This will need to be taken into consideration when putting on the various items of PPE. After use, it should be assumed that PPE may be contaminated and an inappropriate removal procedure therefore could expose the wearer. Consequently, a detailed and pre-defined sequence for putting on and taking off items should be developed, implemented and monitored.

8. PPE should be put on before starting procedures likely to cause exposure and only removed after moving away from a source of exposure. Where an anteroom is present, PPE should be put on and removed in there. Where an anteroom is not present, PPE should be put on and removed as far away from the source as possible.

9. PPE should not be a source of further contamination e.g. by being removed and left on environmental surfaces.

Disposal or decontamination

10. Following removal, disposable PPE will need to be placed into suitable disposal receptacles and treated as clinical infectious waste for incineration (Category A). If re-usable PPE is used, it must be decontaminated using an appropriate method prior to storage. The method should be validated as effective against EMD (see Appendix 9) and compatible with the PPE to ensure it is not damaged so that its effectiveness in subsequent use is not compromised.

Storage and Maintenance

11. PPE should be suitably stored to prevent accidental damage and contamination. Infrequently used PPE should be subject to stock selection and control procedures with regard to shelf-life to ensure it is available for use at short notice with no deterioration in protective qualities. RPE requiring powered respirator units should be thoroughly examined, tested and maintained at suitable intervals (at least once a month). Records of the tests must be kept for at least five years after the date of the test.

Staff training on the use of PPE

12. Staff should be trained in procedures to put on and especially to take off PPE, including the correct order to avoid cross contamination, and to check that the RPE with which they are provided fits properly. They must also receive clear instructions on when it is to be used and how it is to be disposed of or, as appropriate, decontaminated, maintained and stored. This training should be held regularly.
A poster illustrating the manner in which PPE should be donned and removed is provided by the CDC and can be accessed at the following web site:
http://www.cdc.gov/HAI/pdfs/ppe/ppeposter1322.pdf

Summary of good practice in the use of PPE/RPE

- PPE must be appropriate, fit for purpose and suitable for the person using/wearing it. A scheme for periodical repetition of face fit testing (either annually, due to change of facial features, or alteration to respiratory function) should be developed and implemented **if possible**;
- Training must be provided with consideration of susceptibility to human error;
- Effective communication between all members of the healthcare team is imperative for patient safety;
- A strategy for implementing and monitoring the correct use of PPE which could include visual check, cross check or supervision by responsible person should be developed;
- A detailed and pre-defined sequence for putting on and taking off items should be developed, implemented and monitored;
- PPE should be removed in the anteroom if present;
- PPE should be located close to the point of use;
- Hand washing should not be performed while wearing gloves, nor products such as alcohol based hand rub used to clean gloves as it may increase glove permeability;
- PPE should not be a source of further contamination e.g., by being removed and left on environmental surfaces, or by being removed inappropriately thus contaminating the wearers hands;
- The use of PPE such as gloves does not negate the need for hand hygiene;
- The integrity of PPE should not be compromised during nursing procedures. It might otherwise potentially lead to exposure to blood or body fluids. For example solvents or certain products such as hand creams, can affect integrity;
- There should be validated procedures for the disinfection of re-useable PPE;
- Stocks of PPE should be stored off the floor, e.g., on appropriate shelving in a designated, clean and dry storage area to ensure that they are not contaminated prior to use.

APPENDIX 8 : Management of staff accidentally exposed to potentially infectious material

1. Procedures must be in place to deal with any accidental exposure of staff to blood or body fluids from high possibility or confirmed cases of EMD.

2. Accidental exposures that need to be dealt with promptly are:

- percutaneous injury e.g. needlesticks or contact with broken skin:

Immediately wash the affected part with soap and water and disinfect:

- with hydro-alcoholic solution or gel, or if not available 70 alcohol until complete drying.
- with antiseptic solution (iodide polyvidone or chlorhexidine) in alcoholic solution (0,5 %) until complete drying.
- if neither is available, with a solution of bleach (at least 12°) diluted to 1/5 or to 1/10 during at least 5 minutes.

Encourage bleeding via squeezing.

- contact with mucous membranes (eyes, nose, or mouth):

Immediately irrigate the area with emergency wash bottles, which should be accessible in case of such an emergency, or with distribution water or physiological serum during at least 5 minutes.

3. In all cases, the incident will need to be reported and the individual urgently referred to the local senior clinical microbiologist or infectious disease physician, and their occupational health provider.

4.The individual should be followed up, as a minimum, as a “High risk” category contact.

Other risks of contamination should also be evaluated, in accordance with the Belgian guidelines:
FR: http://www.health.belgium.be/internet2Prd/groups/public/@public/@shc/documents/ie2divers/19070417_fr.pdf
NL: http://www.health.belgium.be/internet2Prd/groups/public/@public/@shc/documents/ie2divers/19070417.pdf

If necessary, antiretroviral post-exposure prophylaxis against HIV should be given.
Adequate follow-up for HIV and HCV is mandatory.

In case of a diagnosis other than EMD, follow-up or post-exposure prophylaxis is necessary due to potential contamination by another pathogen (*Neisseria, Leptospira, Rickettsia*, Dengue, *Plasmodium falciparum* …)

APPENDIX 9 : Decontamination, including treatment of laundry

1. For patients categorized as “possibility of EMD, standard cleaning precautions and decontamination procedures apply, including the treatment of laundry.

2. The information in this Appendix 9 applies to those patients who have been categorized as “ high possibility of EMD “or as a confirmed case of EMD.

3. Staff should ensure that areas and equipment used for the care of patients who have been categorized as “high possibility of EMD“ or in whom an EMD has been confirmed are decontaminated and cleaned according to the procedures in this Appendix. Decontamination and cleaning must be carried out wearing appropriate PPE (see Appendices 3 and 7) and supplies used for decontamination and cleaning must be disposed of as infectious waste (see Appendix 10).

4. It is important to ensure that products used in the decontamination procedure have been validated as effective against EMD agents. The Ebola virus is susceptible to sodium hypochlorite, lipid solvents, phenolic disinfectans, peracetic acid, methyl alcohol, ether, sodium desoxycholate, 2% glutaraldehyde, 0,25% Triton X-100, β-propiolactone, 3% acetic acid, formaldehyde and detergents such as SDS.

Chlorine releasing agents

The disinfectant that has been recommended in most protocols and guidances and with the widest experience in Africa are chlorine releasing agents.
To clarify:

- The most commonly used chlorine releasing agent is bleach. The active disinfectant component of bleach is sodium hypochlorite (NaOCl).
- Commercially available bleach has a chlorine content between 12 and 20° chlorometric and the available chlorine generally ranges between 30,000 ppm and 50,000 ppm. It is important to check the concentration in the formulation before use, as bleach requires dilution.

  An online convertor is available on the following web site:
  http://www.aly-abbara.com/utilitaires/calcul%20imc/calculatrice_degre_chlorometrique.html
- Hypochlorite is inactivated by organic material and is less useful for the decontamination of body fluid spillage.
- The chlorine solution must never be prepared with hot water.
- Sodium dichloroisocyanurate (NaDCC) may be used as an alternative to NaOCl and is available as tablets with different chlorine contents. Instructions should be provided for each tablet to ensure correct dosing depending of the weight of the tablet and the active chlorine %. NaDCC is also available in granular form: in this case, the NaDCC is incorporated into absorbent granules.
- NaDCC is a more efficient disinfectant for body fluids than hypochlorite. The absorbent granular form is particularly suited for the absorption of body fluid spillage.
- There is a minimum contact time for chlorine-based absorbent granules. This contact time is usually 2 minutes, but may vary from product to product.

- Typical in-use concentrations of chlorine releasing agent are 1.000-5.000 ppm (1: 50 to 1:10 bleach solution) for the disinfection of blood-spills and 500 ppm (1:100 bleach solution) for general environmental cleaning.
- Chlorine deteriorates over time, especially in liquid form. Liquid chlorine products should be used within 3 months of being manufactured. A freshly prepared solution should be used and then discarded, as dilutions are unstable and deteriorate quickly.
- Avoid using hypochlorite products on urine, as toxic chloric fumes can be released.
- Gloves used for handling chlorine solutions should be certified as suitable for chemical resistance and comply with the PPE directive 89/391/CEE and the Belgian Royal Decree of 16/01/2006.
- The most efficient way to deal with a body fluid spill is to absorb it.

Recommended procedure for management of body fluid spillage with NaDCC granules

- NaDCC granules should only be used on smaller blood spills (<30ml) to avoid excessive fume release.
- Granules should not be used on spills of substances other than blood for the same reason.
- Cover spillage with granules.
- Leave for a minimum of 3 minutes.
- Remove material by wrapping it in paper towels and dispose of it as clinical waste.
- Wash area with general purpose neutral detergent rinse and dry thoroughly.

Coates D, Wilson M. Use of Sodium dichloroisocyanurate granules for spillages of body fluids. *J Hosp Infection*. 1989; 13: 241 – 251

Recommended procedure for the management of large body fluid spills with NaOCl solution

- Cover spillage completely with paper towels to limit spread of fluid.
- Do not treat spillage directly with disinfectant solution as this will spread the spill further
- Prepare a 5.000 to 10.000 ppm chlorine solution
- Apply the chlorine solution to the towels.
- Leave for a minimum of 3 minutes.
- Remove and dispose of paper towels
- Rinse container thoroughly before preparing a fresh solution.
- Wash area with general purpose neutral detergent, rinse and dry thoroughly

Other freshly prepared disinfectant solutions that are effective against Ebola virus can be used.

Recommended procedures when there has been <u>no obvious contamination</u> by blood and/or body fluids

Validated standard cleaning and disinfection methods can adequately treat areas and equipment that have not been contaminated with blood, body fluids or laboratory specimens.

EMD viruses have been known to survive for two weeks or even longer on contaminated fabrics and equipment. Persons carrying out decontamination and cleaning procedures must wear appropriate PPE and use suitable disinfectant products determined by a robust risk assessment.

Crockery and cutlery

5. Disposable crockery and cutlery should be used where possible for patients categorized as “high possibility” or “confirmed EMD”. These items should be disposed of as “special waste” according to the regional legislation in force.

Treatment of Laundry

Use and treatment of disposable linen
The use of disposable linen should always be considered when appropriate, in particular when caring for a patient with a “high possibility” of or “confirmed” EMD infection. This linen must be treated and disposed of as “special waste” according to the regional legislation in force.

Use and treatment of non-disposable linen
All re-useable linen from patients with a “high possibility” of or “confirmed” EMD infection should not be returned to a laundry and must therefore be treated and disposed of as “special waste” according to the regional legislation in force.

Terminal disinfection of HSIDU or IDU wards
Once a patient who has tested positive for the EMD has been discharged, a terminal cleaning and disinfection procedure should be implemented.
All packed medical supplies stored in the room (syringes, catheters,..) should be disposed of as contaminated waste. Medical equipment that cannot be safely decontaminated should also be discarded.

It is recommended to decontaminate the room by fumigation. (see info box on room fumigation below). This will need to be carried out following a thorough risk assessment. Procedures for decontamination will be established in consultation with HSIDU staff.

Room fumigation

- In order to ensure successful room decontamination, gross contamination will need to be cleaned and disinfected appropriately prior to the fumigation process (refer to box above on spillages).
- The fumigant and fumigation process used should be validated for use.
- Service engineers / staff undertaking the fumigation process must be fully trained to do so and maintain infection control procedures when preparing the room for fumigation.
- Rooms to be fumigated must be suitably sealed so as to prevent leakage of fumigant into unwanted areas.
- It may be necessary to move nearby patients to a more suitable location during the fumigation procedure.
- Air outside the room being fumigated must not contain levels of fumigant above the Workplace Exposure Limit (WEL) and as such should be monitored to ensure the room has been adequately sealed.
- Post fumigation, levels of fumigant within the now decontaminated room must be below the WEL before re-entry. Where this is not possible e.g. where windows are required to be opened for ventilation purposes, suitable PPE including RPE must be worn following a risk assessment.
- Post fumigation, rooms should be cleaned following locally established protocols.

APPENDIX 10 : Waste treatment and disposal

Toilets

Urine, stool, and other biological liquids should not be eliminated in the toilet by patients categorized as “high possibility” or “confirmed” for EMD infection. This recommendation is made to avoid the exposure of patients and personnel to contaminated waste water in case of an incident with the complex sewage collection system in hospitals.

Commodes should be used instead of toilets. A dedicated commode should be used with either a disposable bowl or a reusable bowl covered with a disposable bag. After use, and before disposal in a rigid waste container, the contents are to be solidified with high-absorbency gel and decontaminated with an effective disinfectant prior to storage and final incineration. Toilets and commodes should be disinfected, i.e. with hypochlorite containing 5,000 to 10,000ppm available chlorine at least daily, preferably after each use, and upon patient discharge.
For non-ambulant patients, either disposable bedpans or a reusable bedpan covered with a disposable bag should be used and the contents solidified with high-absorbency gel and decontaminated with an effective disinfectant prior to storage and final incineration.

Reusable bedpans and bowls are considered contaminated equipment and should be decontaminated as such.

Because no hospitalization unit in Belgium has a dedicated autoclave on site, transporting unsealed containers with discarded biological fluids to the central autoclave for the inactivation of the Ebola virus prior to storage and final incineration has been considered unsafe practice.

Inactivation of waste on-site

1. As far as reasonably practicable “special waste” should be treated on-site prior to transport to a disposal facility.
   Because there are no on-site dedicated autoclaves available in hospitalization units in Belgium, another approach for on-site waste decontamination prior to central storage and terminal incineration will need to be developed.
2. An assessment will need to be made of reasonably practicable means for decontamination, safe storage and disposal depending upon factors such as:

- The volume of waste
- The level of waste contamination;
- The availability of secure storage;
- Safe methods of transfer off site –see below

3. If waste, with the exception of biological fluids waste, is transported to a remote validated autoclave, arrangements to coordinate transport should be put in place. Waste should be contained within two layers of containment with the secondary containment being robust, leak-proof containers with a secure lid, transported on a trolley where appropriate. Autoclavable bags should be used as the primary containment. Waste should be transported direct to the autoclave for immediate treatment, thus avoiding storage in the autoclave room or in communal areas.

4. After autoclaving, waste is no longer considered to be infectious and should be classed as “non-special waste”.

Inactivation of waste off-site

5. It is recognized that it may not always be reasonably practicable to autoclave on-site the large volumes of waste generated during the clinical care of a patient. Other exceptional circumstances could involve autoclave malfunction. In these circumstances, waste should be packaged for carriage and transferred to an incinerator as soon as possible. Waste (including sharps receptacles) must be placed in appropriate yellow approved packages for transport.

6. A reputable and licensed waste contractor must undertake transport to the incinerator. Adequate contingency arrangements should be made in advance with the contractor to ensure safe collection, transport and disposal demonstrably in full compliance with regional legislation.

7. Prior to collection by the contractor, waste must be stored securely and access restricted to authorized and trained personnel.

APPENDIX 11 : After death care

Post-mortem examination

1. A post-mortem examination on a person known to have died of VHF exposes staff to unwarranted risk and **should not be performed**.

2. Where a patient suspected of having EMD dies prior to a definitive diagnosis, it may be necessary on public health grounds to undertake some diagnostic tests to either establish or eliminate the diagnosis of EMD or to provide an alternative diagnosis including e.g. malaria. Consultation with appropriate specialists may help to determine the extent of the limited amount of sampling that will suffice such an assessment.

3. Personnel undertaking diagnostic tests must wear appropriate PPE following the guidance for safe collection and transport of specimens. Where 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 then a post mortem may be required.

Disposal of the deceased

4. An infection control notification sheet should be completed in readiness for the funeral directors. Once sealed as above, the coffin and body bag should not be opened. Only in exceptional circumstances should the coffin or body bag be opened and only then by a designated person after consultation and with the health inspector.

5. Staff wearing suitable PPE/RPE (see Appendix 7) should place the body of a confirmed or suspected VHF patient, in a double leak proof body bag. Absorbent material should be placed between each bag, and the bag sealed and disinfected with 1000 ppm available chlorine or other appropriate disinfectant. The bag should be labeled as high risk of infection and placed in a robust coffin with sealed joints. An infection control notification sheet should be completed in readiness for the funeral directors.

Public health and controlling the risk of exposure

6. Every person having the charge or control of premises in which is lying the body of a person who has died while suffering from a notifiable disease such as EMD must take such steps as may be reasonably practicable to prevent persons coming unnecessarily into contact with, or proximity to, the body.

Funeral directors and embalmers

8. Funeral directors will need to be consulted beforehand and provided with sufficient information of the infection risk normally provided by an infection control notification sheet.

9. It is recognized that in most other circumstances in this country, bodies often receive some form of hygienic preparation or are fully embalmed as a means of delaying putrefaction (e.g. when the funeral is delayed or for transportation over long distances within Belgium or internationally). However, in the case of confirmed EMD cases, embalming or hygienic preparation of bodies presents an unacceptably high risk and should not be undertaken.

Religious/ritual preparations, viewing of the deceased and funeral arrangements

10. Exceptions to the above include necessary preparation of bodies for other safety reasons. For example, it is a requirement to remove pacemakers and some other implants before cremation. In addition to the information provided on the infection control notification sheet, it is advised that the funeral director discusses appropriate infection control procedures, use of personal protective equipment and waste disposal arrangements with specialists.

11. As far as is reasonably practicable the needs and wishes of the deceased's family should be respected. However, the serious nature of this infection and the associated occupational and public health risks necessarily impose significant limitations and constraints, which aim to limit contact with the body by the next of kin. Due to the unusual circumstances, there will be a need to communicate sensitively that the following will need to be avoided: religious/ritual preparation of the body, washing, dressing, viewing, touching or kissing of the deceased.

Repatriation/expatriation of the deceased's remains

12. In general, the transportation of human remains to or from Belgium is governed by a number of authorities:

- The receiving country (normally regarded as being the body of law that controls how the remains should be handled as regards control of infection);

- The country of origin and

- The carrier – whose requirements will be governed by the " International Air Transport Association (IATA) Restricted Articles Regulations", under which human remains need to be accompanied by a notification of infection form or "free from infection" certificate.

13. EMD infected bodies should not be embalmed on grounds of risk (see above), and both for this reason and because of the consequent difficulty there would be in achieving full compliance with IATA requirements, the transportation of bodies out of the country is not recommended. However, following cremation, ashes may be safely transported.

14. In the unlikely event of a EMD infected body being embalmed abroad and transported back to Belgium, it would need to be contained within a sealed zinc lined transport coffin in accordance with IATA requirements. Upon arrival in Belgium a change of coffins is to be avoided and this may dictate the options for burial or cremation, which should be promptly arranged.

The return of the deceased's clothing and personal effects to relatives

15. The family of the deceased should be consulted and as far as is reasonably practicable their needs and wishes should be respected. In principle clothing, personal effects and valuables may be returned to relatives in accordance with normal health service procedure following decontamination.

16. However:

- Items of clothing visibly contaminated should be safely disposed of, other items of clothing should be autoclaved prior to laundering;

- Wedding rings, jewelry and other physical artifacts should either be autoclaved or decontaminated using a validated disinfectant.

17. With customary sensitivity and respect for the dignity of the bereaved, relatives should be alerted that some clothing fabrics and materials from which personal effects are made (e.g. plastics) may be adversely affected or even destroyed by autoclaving or disinfection (hypochlorite, the disinfectant of choice is a powerful bleach). In such cases, with the agreement of relatives, subsequent disposal may be the preferred option.

APPENDIX 12: Principles for the ideal organization of a HSIDU

Structural requirements

1. VHFs are severe and life-threatening diseases for which there is no proven treatment or prophylaxis. Therefore, patients in whom an EMD infection has been confirmed should **always** be managed in a specialist high-security infectious diseases unit (HSIDU).

2. The purpose of an HSIDU is the complete containment of patients infected with an ACDP Hazard Group 4 pathogen. In order to control and contain the possible spread of the pathogen to healthcare staff, other patients or the general public, there are a number of structural and operational requirements that the HSIDU must fulfill, as described in this Appendix.

3. In Belgium, there are currently no HSIDUs as described below, but such units do exist in other European countries.

4.This Appendix outlines the structural and operational requirements of HSIDUs. It does not give advice on the clinical management of such patients. The clinical management of a patient infected with a VHF should be undertaken by specialist infectious disease clinicians on a case-by-case basis, and cannot be prescribed here.

5. The unit should be part of a specialist infectious disease unit, sited in an area away from general circulation or form part of a separate isolation building. The aim is to:

- Achieve complete physical separation of EMD patients to mitigate against disease spread;
- Provide direct access for EMD patients to specialist infectious diseases clinical expertise;
- Ensure security against disruption and crime;
- Allow for secure and direct transfer of patients from ambulance to unit;
- Allow for building systems monitoring for the HSIDU as a whole;

Construct so as to avoid having walls adjacent to the outside for rooms in which care is provided or contaminated material is stored i.e. have walls that are internal to the main building to avoid accidental release.

6. The unit must be kept at negative pressure relative to the surrounding area, and patient isolation suites within the unit must also be at negative pressure relative to the rest of the unit. The direction of air circulating within the unit should follow a gradation of increased negative pressure and flow from clean through to contaminated areas, and be HEPA filtered before discharge to the atmosphere.

7. To provide flexibility in the isolation of a patient within an HSIDU, this guidance recommends two control options for the containment and isolation of VHF patients

Option 1: EMD patients can be completely isolated using a negative pressure patient isolator ("*Trexler*") within a negative pressure isolation suite. Exhaust air from the *Trexler* isolator is HEPA filtered, as is the exhaust air from the isolation suite, providing double HEPA protection. Staff are protected due to their physical separation from the patient by a flexible film barrier and an air barrier. Access to the patient is via built-in access portholes within the flexible film. The patient isolator will contain all body fluids so contamination of the isolation

suite is minimized. Staff will normally wear PPE (e.g. theatre blues) but should not require RPE if this option is used.

Option 2: EMD patients can be isolated within a negative pressure isolation suite that has an appropriately designed ventilation system **without** utilizing a *Trexler* isolator. Due to the potential for greater exposure to blood and body fluids, staff protection must be provided through the use of enhanced PPE, **including RPE,**

8. There must be clear segregation of clean and potentially contaminated areas of the unit. Clearly delineated and separate pathways through the unit for staff, patients, visitors, supplies and waste should be integrated into the structural design.

9. Changing rooms and showers for staff are required within the unit. Negative pressure ventilation is required within the changing rooms and showers relative to the surrounding area and must form part of the gradation of negative pressure within the suite.

10. All surfaces within the unit must be easy to clean. Floor, walls and other surfaces must be impervious to water and resistant to damage from disinfectants.

11. An autoclave should be installed within the unit.

Operational requirements

12. The unit should have in place detailed written operational policies covering all activities in the unit. These should include:

- Unit activation and deactivation;
- Roles and responsibilities of staff;
- Patient admittance and discharge;
- Staff entry and exit;
- Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE) use, disposal and storage;
- Management of body fluid spillages;
- Taking of specimens and subsequent handling;
- Ambulance and ambulance crew decontamination;
- Disinfection, decontamination and terminal cleaning of the unit (see Appendix 9 of this guidance);
- Special arrangements for waste handling, disinfection and disposal (see Appendix 10);
- Special arrangements for laundry (see Appendix 9 of this guidance);
- Emergencies, for example fire or flooding, including evacuation;
- Maintenance and repair.

13. If specialist services such as radiology are necessary, these should be carried out at the patient's bedside.

14. The unit should be staffed by individuals trained in the management of infectious disease. All staff must receive regular appropriate training and instruction in use of the high risk facility.

15. Access must be restricted to authorized personnel – the general public, including patients, relatives and visitors, should be excluded from the area when the unit is in use. A register of all personnel including clinical, non- clinical and maintenance staff entering the unit must be kept as a means of tracking potential exposure to infection.

Patient containment requirements :

16. Experts agree that there is no circumstantial or epidemiological evidence of an aerosol transmission risk from EMD patients. A theoretical risk has been postulated. Evidence from outbreaks strongly indicates that the main routes of transmission of EMD infection are direct contact (through broken skin or mucous membrane) with blood or body fluids, and indirect contact with environments contaminated with splashes or droplets of blood or body fluids.

17. Avoiding contact with a patient's body fluids, minimizing contamination of the environment, and safely containing contaminated fluids and materials, is paramount to protecting staff and the wider public against infection risks.

18. Enhanced personal protective equipment (PPE), including respiratory protective equipment (RPE), is required for any contact with the patient or material or surfaces potentially contaminated by body fluids in spite of the fact that there is no strong link between inhalation and EMD transmissibility.
Required PPE/RPE are as follows (see Appendix 7) :

- FFP3 respirator or EN certified equivalent
- Face shield
- Double gown, the outer gown will be waterproof
- Waterproof boots and over shoes;
- Double gloves
- Head cover

19. Correct protocols for putting on and removing PPE and RPE must be strictly adhered to in order to maintain staff protection. More information on PPE, including RPE, is provided in Appendix 7.

6. COMPOSITION OF THE WORKING GROUP

All experts joined the working group ***in a private capacity.*** The names of the members and experts of the Superior Health Council are indicated with an asterisk*.

The following experts were involved in drawing up the advisory report :

CALLENS Steven*	Internal medicine, infectiology	UZ Gent
DE MOL Patrick*	Medical microbiology	ULg
GERARD Michèle*	Infectioncontrol, Hosp. hyg.	CHU Saint-Pierre
GORDTS Bart*	Microbiology and Hosp. hyg.	ZNA
LEONARD Philippe*	Internal medicine & Tropical Medicine	ULg
VANDENBERG Olivier	Medical Microbiology	CHU. Saint-Pierre
VAN ESBROEK Marjan	Clinical Biology	ITG-IMT-ITM
VAN GOMPEL Fons*	Internal Medicine & Tropical Medicine	ITG-IMT-ITM
VAN LAETHEM Yves*	Infectiology, vaccination, travel clinic	CHU Saint-Pierre

The following individuals were heard:

DO THI Chuong Dai	Biosafety and Biotechnology	SBB (WIV-ISP)
JASINSKY Claudine	Pollution, GMO, Waste	IBGE
VAN RANST Marc	Virology	UZ Leuven

The working group was chaired by Patrick DE MOL and Yves VAN LAETHEM, the scientific secretary was Jean-Jacques DUBOIS.

About the Superior Health Council (SHC)

The Superior Health Council is a federal body that is part of the Federal Public Service Health, Food Chain Safety and Environment. It was founded in 1849 and provides scientific advisory reports on public health issues to the Ministers of Public Health and the Environment, their administration, and a few agencies. These advisory reports are drawn up on request or on the SHC's own initiative. The SHC takes no decisions on the policies to follow, nor does it implement them. It does, however, aim at giving guidance to political decision-makers on public health matters. It does this on the basis of the most recent scientific knowledge

Apart from its 25-member internal secretariat, the Council draws upon a vast network of over 500 experts (university professors, members of scientific institutions), 200 of whom are appointed experts of the Council. These experts meet in multidisciplinary working groups in order to write the advisory reports.

As an official body, the Superior Health Council takes the view that it is of key importance to guarantee that the scientific advisory reports it issues are neutral and impartial. In order to do so, it has provided itself with a structure, rules and procedures with which these requirements can be met efficiently at each stage of the coming into being of the advisory reports. The key stages in the latter process are: 1) the preliminary analysis of the request, 2) the appointing of the experts within the working groups, 3) the implementation of the procedures for managing potential conflicts of interest (based on the declaration of interest, the analysis of possible conflicts of interest, and a referring committee) and 4) the final endorsement of the advisory reports by the Board (ultimate decision-making body). This coherent set of procedures aims at allowing the SHC to issue advisory reports based on the highest level of scientific expertise available whilst maintaining all possible impartiality.

The advisory reports drawn up by the working groups are submitted to the Board. Once they have been endorsed, they are sent to those who requested them as well as to the Minister of Public Health and are subsequently published on the SHC website (www.shc-belgium.be), except as regards confidential advisory reports. Some of them are also communicated to the press and to target groups among healthcare professionals.

The SHC is also an active partner in developing the EuSANH network (European Science Advisory Network for Health), which aims at drawing up advisory reports at the European level.

In order to receive notification about the activities and publications of the SHC, you can send a mail to info.hgr-css@health.belgium.be .

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