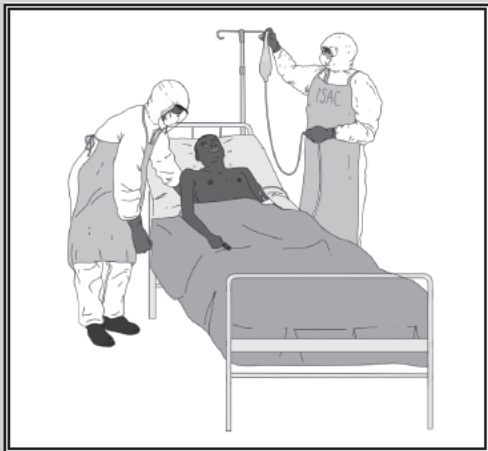


# Clinical management of patients in the Ebola Treatment Centres and other care centres in Sierra Leone

DECEMBER 2014



Interim emergency guidelines





**Clinical Management  
of Patients  
in the Ebola Treatment  
Centres and other care  
centres in Sierra Leone:  
A Pocket Guide  
4 December 2014**

Interim emergency guidelines-  
Sierra Leone adaptation of the  
WHO generic

Clinical management of patients with viral  
haemorrhagic fever: A pocket guide for front-  
line health workers. Interim emergency  
guidance for West Africa- for country  
adaptation. March 2014<sup>1</sup>

## Foreword from Ministry of Health and Sanitation

This pocket guide presents interim guidance on clinical care which is now being delivered in a range of facilities in Sierra Leone: Ebola Treatment Centres (ETC) as well as Ebola Holding Centres (EHC), Ebola Holding Units (EHU), and Ebola Community Care Centres (CCC) in Sierra Leone.

These interim guidelines are being urgently produced as many new Ebola care facilities are being opened this month. Our most urgent priority is to increase the availability of more beds to isolate patients with Ebola to prevent further household and community transmission. We also want to provide a standard clinical care approach, ensuring quality care for all patients. We are working to overcome any limitations in staffing and staff skills and preparation through clinical and IPC training.

Ebola Holding Centres (facilities dedicated to Ebola suspects), Ebola Holding Units (units within existing facilities) and Ebola Community Care Centers (CCCs) should all support rapid collection of samples for laboratory testing for Ebola. While waiting laboratory results, they should provide good quality clinical care. IV fluids and IV/IM medications may be used according to the guidelines in this pocket guide and according to the cadres of staff available and their competencies. These facilities should immediately transfer confirmed Ebola patients to an ETC which can provide the full range of care described in this guide.

These adapted guidelines have been produced rapidly, building on the WHO VHF pocket guide and the experience of MOHS and partners in the provision of clinical care to thousands of Ebola patients in Sierra Leone. The guidelines will be updated by the MOHS and partners early next year, after further experience in Ebola case management in Sierra Leone.

Although these guidelines concentrate on Ebola, they also address Lassa fever which is an endemic problem in Sierra Leone, as well as two other viral haemorrhagic fevers with person-to-person transmission, Marburg and Crimean-Congo Haemorrhagic fever, which have not yet occurred in Sierra Leone.

**Dr Brima Kargbo**  
Chief Medical Officer, MOHS



## Introduction

The huge and continuing increase in the number of Ebola cases, with many cases remaining in the home due to lack of ETC beds, and the current large scale up in training and mentoring to prepare health workers to staff the new ETCs under construction, requires an efficient and effective approaches to case management. Much has been learned during this epidemic on clinical presentation and management.

The predominant clinical syndrome in this Ebola epidemic is a severe gastrointestinal illness with vomiting and large volume diarrhea, leading to volume depletion, metabolic abnormalities, and hypovolemic shock.<sup>2, 3</sup>

“When patients can no longer drink, placement of an intravenous catheter and delivery of appropriate replacement solutions are required, but we have seen many critically ill patients die without adequate intravenous fluid resuscitation.”<sup>2</sup>

It is apparent that the case fatality rate could be substantially reduced with more intensive supportive care, particularly adequate fluid resuscitation and prevention and correction of electrolyte abnormalities, and that many patients are not receiving adequate fluids. The absence of reports of fluid overload and pulmonary oedema in the ETCs, whereas these have occurred in a few patients receiving ICU care, also suggest that inadequate fluid resuscitation is common in ETCs.

While providing guidelines to support improved fluid resuscitation and the use of a few laboratory tests, it should be emphasized that this level of care may not be possible when there are severe limitations in staff to patient ratios or in staff qualifications. Priority must be given to admitting and providing safe, basic care to as many Ebola patients as possible, to stop transmission in the home and community, then striving to provide better care as staffing permit.

This pocket guide provides strong support for the practical application of key lifesaving interventions which are feasible within an ETC, as well as interventions which relieve pain and other symptoms. Providing good

supportive care while in PPE, which limits the time for patient care within the ETU and can impair vision and dexterity, is a challenge. Practical approaches to improving the volume of fluids administered are discussed—both ORS and IV fluids.

Dr Alie H. Wurie  
Case Management Pillar Lead, MOHS

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**Sources** This manual draws heavily on:

- WHO: Clinical management of patients with viral haemorrhagic fever: A pocket guide for front-line health workers. Interim emergency guidance for West Africa- for country adaptation. March 2014<sup>1</sup>
- WHO IMAI District Clinician Manual<sup>4</sup>
- WHO: Child Pocket Book of Hospital Care for Children<sup>5</sup>
- MSF guidelines for the management of Viral Haemorrhagic Fevers<sup>6</sup>
- WHO Infection Prevention and Control (IPC) guidelines<sup>7</sup>
- Sierra Leone MOHS, MSF, other NGO and MOH/WHO experience in this and other countries in running Ebola treatment centres and holding units and their discharge policies
- WHO July 21-22 informal review on clinical experience of patients with Ebola Virus Disease in the context of the ongoing outbreak in West Africa
- Expert review and recent clinical publications
- Input from MOHS and partners through the Sierra Leone Case Management pillar, including standard operating procedures

# 1. Introduction

Viral haemorrhagic fever (VHF) is a general term for a severe illness, sometimes associated with bleeding, that may be caused by a number of viruses.

The term is usually applied to disease caused by:

1. *Arenaviridae* (Lassa, Lujo, Junin, Guanarito, Sabia and Machupo)
2. *Bunyaviridae* (*Crimean-Congo Haemorrhagic Fever - CCHF*)
3. *Filoviridae* (*Ebola and Marburg*)
4. *Flaviviridae* (*Omsk haemorrhagic fever, Kyasanur forest disease and Alkurma haemorrhagic fever*)

This Guide is focused on specific VHFs-- Ebola, Marburg, CCHF, Lassa fever [and Lujo]-- that occur in Africa and have risk of person-to-person transmission. This Guide does not address the management of other viral infections, such as dengue, Rift Valley Fever and yellow fever, that also have haemorrhagic manifestations, but do not have direct person-to-person transmission.

## Purpose:

The purpose of this pocketbook is to provide clear guidance on current best management practices for VHF across health-care facilities.

## Objectives:

1. To establish a systematic approach to comprehensive clinical management of VHF cases
2. To build capacity in health workers to use current practices in managing VHFs
3. To build confidence in health workers in managing VHFs through training and skills transfer

VHFs are severe and life-threatening viral diseases that are of particular public health importance because they can spread within a hospital setting, have a high case-fatality rate and are difficult to recognize and detect rapidly. There is also a lack of effective and proven treatment options, apart from supportive care, for Ebola and Marburg. Although

ribavirin can be used in Lassa fever and CCHF, the case-fatality rate remains high.

The death of health workers is often the first sign that a VHF outbreak has begun, and early recognition and implementation of measures to protect health workers is one of the main objectives of early outbreak management.

- Ebola and Marburg are both Filoviruses with transmission to the index case probably occurring via contact with infected animals, and subsequent transmission via contact with such patient's infected blood and body fluids.
- The causative agent of CCHF is a Nairovirus, a group of related viruses in the *Bunyaviridae* family. CCHF is transmitted via a tick from infected domestic or wild animals (such as deer, cattle, goats, and sheep etc), but it can also be transmitted by contact with blood or body fluids from infected animals or humans.
- Lassa and Lujo are in the *Arenaviridae* family. Humans become infected by exposure to the excreta of its reservoir *Mastomys natalensis*, also known as the "multimammate rat." Secondary person-to-person transmission of the Lassa virus also occurs through direct contact with infected blood or bodily secretions.

Ebola, Marburg and CCHF outbreaks occur periodically, but unpredictably. Only one small outbreak of Lujo has been reported (in Zambia and South Africa). Unlike most VHFs, which are recognized only when outbreaks occur, Lassa fever is endemic in West Africa, with an estimated tens of thousands of cases annually, with highest incidence in the Kenema and Bo districts of Sierra Leone, but also in Nigeria, Guinea, Liberia and other districts in Sierra Leone. In the 2014 epidemic of Ebola in Guinea, Liberia and Sierra Leone, it is necessary to distinguish between Ebola and Lassa fever by laboratory testing, since only the latter should be treated with ribavirin. Other than this specific treatment difference, the clinical management and infection prevention and control efforts in health facilities are the same for Ebola, Marburg, Lassa fever and CCHF.

VHFs can be encountered at any time and require associated preparedness and planning. While VHF outbreaks begin in the community, patients with VHF ultimately present to their local health facility for care and treatment. In the initial stages of an outbreak (before the outbreak has been recognized), patients with VHF present to their local health facility with a constellation of symptoms difficult to differentiate from other common infections (e.g., malaria, typhoid, bacterial sepsis). Thus, without maintaining standard infection prevention and control precautions at all time, and a high level of suspicion for VHF in the differential diagnosis, health staff and other patients are at risk for acquiring infection.

The provision of medical care to critically ill patients can be challenging in any setting, particularly resource-limited (including health personnel, medical supplies and equipment) remote environments where VHFs tend to occur. During a VHF outbreak, resource limitations along with the inadequate knowledge and skills for minimizing the risks of transmission to the health workers can lead to the de-prioritization of patient care.

Health workers have an obligation to provide the best medical care to improve patient survival, but also to provide symptom relief and palliation when required. In the context of patients with VHF, clinical care must be strengthened whilst minimizing the risk of onwards transmission to others, including health workers. Accordingly, it is critical that health workers improve their understanding of VHF and adhere to best practices of infection control at all times (i.e. during and outside of outbreaks). Importantly, inadequate care for VHF patients may also lead to increased reluctance on the part of individuals from the community to identify and isolate possible patients. This downstream effect makes case finding through community triage difficult and can seriously affect outbreak infection control.

The application of appropriate skills and case management protocols makes the care of a patient with VHF less daunting. The optimal approach depends upon several factors including: a clear understanding of the likely means of transmission in a healthcare environment (and therefore real risks to health workers' trust in the efficacy of protective measures and prudence in their use); and an approach to patient care that minimizes hazard while maximizing worker safety and effectiveness.

The purpose of this pocketbook is to provide clear guidance on current best practices for VHF, including both clinical management and infection control and prevention. Throughout this pocket manual, guidance is provided for the front-line health worker focusing on triage and case definition, early and ongoing case management, infection control and subsequent hospital discharge. Recommendations are drawn predominantly from existing published VHF guidelines (primarily consensus-based), and also draw from algorithms for sepsis management from the WHO Integrated Management of Adolescent and Adult Illness (IMAI) and Childhood Illness (IMCI) guidelines. The rationale for including these sepsis algorithms is that the suspected pathophysiology and final common pathway of severely ill patients with VHF is often severe sepsis, with manifestations of increased vascular permeability, vasodilatation, multiple organ failure, and shock. In addition, guidance is provided on infection control and common clinical manifestations of VHF to help the front-line health worker increase his or her level of suspicion for VHF, particularly before an epidemic is recognized in the community. Finally, we provide specific contact information for the front-line provider to facilitate the reporting process to the appropriate public health authorities.

Importantly, this document does not cover how to create a VHF treatment unit (i.e. isolation ward), and it also does not address community interventions to control transmission or respond to disease outbreaks. It is hoped that this manual will be a welcome and complementary addition to such guidance and strengthen the overall response to VHF outbreaks in Africa, fulfilling the Integrated Disease Surveillance and Response activities necessary for International Health Regulations compliance.



## 2. Principles of VHF management

### 2.1 Case identification/detection

The diagnosis of VHF is based on 3 components:

1. History of exposure
2. Detailed clinical assessment
3. Laboratory investigations

Health workers should consider VHF in any patient with an unknown etiology as part of the differential diagnosis with more common causes of fever in that setting. Standard case definitions for VHF have been developed to identify 'alert', 'suspect', 'probable' and 'confirmed' cases before and during an outbreak (SEE APPENDIX A1 for Ebola/Marburg). Once 'alert' cases present to the medical personnel, however, the 'alert' label should be discarded and a determination made as to whether the person falls into the category of a 'suspect', 'probable' or 'confirmed' case. These case definitions may need further refinement to reflect clinical and epidemiologic features associated with a particular outbreak.

#### 2.1.1 History of exposure to Ebola/Marburg, Lassa fever, or CCHF

##### Ebola/Marburg:

One of the most important aids in making the diagnosis is eliciting a history of exposure within 2 to 21 days prior to the patient's onset of symptoms – i.e. within the potential incubation period for Ebola and Marburg.

- The most common exposure is to blood or any other body fluid (e.g. excreta, vomit, sweat) from a known or suspected Marburg or Ebola case (dead or alive), usually in providing care or attending a funeral. Prior to an outbreak being identified, the first clue will often be a history of exposure to contacts who have been severely ill or who have died suddenly.
  - People typically most at risk are family members, caretakers, traditional healers, religious leaders (especially imams) and those participating in traditional burial rituals. Health workers are a recognized high-risk group who should be questioned about recent patient contact and unwell colleagues. Also inquire about their exposure from family and



friends, in the community, and in private clinics or other private care-giving.

Other exposures are:

- Contact with infected animals, usually monkeys, chimpanzees and bats, alive or dead, e.g. via handling or consumption of infected bush meat, by going into caves (Marburg), or fields close to fruit trees (Ebola) where infected bats roost, or eating fruits that have been partially eaten by bats.
  - ◆ Note: the virus is easy to destroy by heating so well cooked meat is considered virus free.
- Being breastfed by a woman with Ebola or Marburg is considered an exposure as Ebola virus has been shown to be present in breast-milk.<sup>5</sup> As it is unclear how long it remains present, being breastfed by a convalescent patient is also considered a risk.
- Being the sexual partner of a known or suspected male case, as the virus remains present in semen up to 3 months after clinical recovery.
- Coming into contact with contaminated items, e.g. medical material, eating utensils, linens from infected patients.<sup>8</sup>
  - ◆ Note: the virus cannot survive very long in non-organic material, but can be present in material contaminated with body fluids (like needles or other medical material that is reused, dirty bed sheets...)
- Receiving healthcare from a provider who is also treating Ebola or Marburg patients and who is not taking appropriate infection control measures.

**Community spread mostly occurs through a social network: when friends and relatives are taking care of a patient or when participating in funeral activities.**

Any acutely ill person arriving with the history of such an exposure should be considered a suspect case (see Appendix A case definitions). Unfortunately an exposure history is not always clear (e.g. poor recollection of interpersonal contacts, reluctance to discuss animal contacts).

## History of exposure to Lassa fever

- ▶ The multimammate rats breed frequently and are a common rodent, most common in rural areas and in dwellings more often than in the countryside<sup>9</sup>. Rats infected with the virus shed virus in their excreta. Humans are infected by contact with rats or their excreta or, in some areas, by eating them. The rodent species which carry the virus are found throughout West Africa, so the actual geographic range of the disease may extend to other countries in the region beyond Sierra Leone, Guinea, Liberia and Nigeria.
- ▶ In Sierra Leone, the highest incidence is documented in the dry season (November through April/May).
- ▶ People of all ages are susceptible. Pregnant women are more likely to develop severe disease, especially in the third trimester.
- ▶ In addition to possible exposure to infected rats at home, other possible modes of exposure include:
  - Close contacts of a Lassa fever patient within 3 weeks of start of their illness. People typically most at risk are family members, caretakers, traditional healers, and those participating in traditional burial rituals.
  - Receiving health care from a provider who is also treating Lassa patients and who is not taking appropriate infection control measures. Health workers are a recognized high-risk group who should be questioned about recent patient contact and unwell colleagues. This group includes both those caring for patients and those testing laboratory specimens from patients in the 3 weeks after the onset of illness.
  - Being the sexual partner of a known or suspected male case, as the virus remains present in semen up to 3 months after clinical recovery.
  - Coming into contact with contaminated items, e.g. medical material, eating utensils, linens from infected patients.  
(Note: the virus cannot survive very long in non-organic material, but can be present in material contaminated with body fluids (like needles or other medical material that is reused, dirty bed sheets, etc.)

## History of exposure to CCHF <sup>10, 11</sup>

- ▶ Farmers, abattoir workers, veterinarians, and health workers are included in the occupational risk groups.
- ▶ Transmission of the CCHF virus can occur to humans in several ways:
  - Bite from an infected tick or crushing a tick against the skin. Ixodid (hard) ticks, especially those of the genus, *Hyalomma*, are both a reservoir and a vector for the CCHF virus. Numerous wild and domestic animals, such as cattle, goats, sheep and hares, serve as amplifying hosts for the virus.
  - Contact with the blood of an infected animal. Animal herders, livestock workers, and slaughterhouse workers in endemic areas are at risk of CCHF.
  - Human-to-human transmission through contact with infectious blood or body fluids, in the community or in hospitals.
  - Documented spread of CCHF has also occurred in hospitals due to improper sterilization of medical equipment, re-use of injection needles, and contamination of medical supplies
  - Possible horizontal transmission from a mother to child has been reported. The risk of exposure during breast feeding, however, is unclear<sup>12</sup>

## 2.1.2 Detailed clinical assessment and natural history

### Common clinical features of Ebola, Marburg, Lassa fever and CCHF infections

The initial clinical manifestations of Ebola, Marburg, Lassa fever and CCHF infections are non-specific and mimic many common infections making them difficult to diagnose early. Thus, it is important to understand the case definition and expand your differential diagnosis to include other causes of fever and non-specific symptoms (e.g., malaria, typhoid, upper respiratory infections and urinary tract infections). Also, despite being called a viral haemorrhagic fever, the clinical presentation of VHF only includes haemorrhage in less than half of confirmed Ebola/Marburg cases in earlier outbreaks and less than 20% in confirmed Lassa cases. It is critical that health workers make themselves aware of other common signs and symptoms of VHF, to allow early identification of VHF cases that do not include haemorrhage. In the current West African outbreak, significant haemorrhage is less common.

In addition, while there is distinction between early and late clinical signs of VHF, it is important to remember that patients may present at different times in the course of their illness. Severity of illness may depend on a number of factors including the body's natural immune response, mode of transmission, duration of exposure, infecting dose, phase of illness of the case, and possibly even the virus strain. Thus, front-line health workers should have a high level of suspicion for VHF in patients who follow the case definitions, even when their clinical presentation is mild.

## Clinical features of Ebola/Marburg <sup>13,14</sup>

The Ebola and Marburg viruses are both part of the family of *Filoviridae*. The incubation period for these viruses (i.e., the period when the patient remains asymptomatic after exposure to a contact) can range from 2 to 21 days. Marburg is typically 5-9 days and Ebola 3-12 days.

Ebola and Marburg virus diseases usually begin with a flu-like syndrome with fever and profound weakness, often accompanied by arthralgia, myalgia, headache, anorexia and hiccups. These are usually followed by gastrointestinal symptoms: nausea, vomiting, and diarrhoea.

Patients may also complain of dysphagia. See Table 2.

Despite a common belief that haemorrhage is a defining feature of filovirus disease, visible bleeding is not universal. When present, bleeding is not an early presenting feature, but often only appears in the later stages of filovirus disease. It may manifest as overt bleeding or a combination of major and minor bleeding signs, but is frequently only minimal and sometimes solely internal (and therefore frequently missed).

TABLE 2

### Early and late clinical features of Ebola/Marburg infection

#### Early clinical features of Ebola/Marburg<sup>14</sup>

- |   |   |
|---|---|
| • Intense tiredness, weakness, malaise                | • Conjunctivitis                          |
| • Sudden onset of fever (defined as 38.0°C axillary)* | • Nausea and loss of appetite             |
| • Headache  | • Throat pain and difficulty swallowing   |
| • Myalgia (muscle pain)                               | • Abdominal pain                          |
| • Arthralgia (joint pain)                             | • Diarrhoea (can be bloody or non-bloody) |
| • Hiccups   |   |

Note: There is often an overlap of early and late symptoms. Patients often do not develop all the signs and symptoms.

## Late clinical features

- Confusion and irritability
- Seizures
- Chest pain
- Diarrhoea (watery or bloody)
- Vomiting (sometimes bloody)
- Skin rash
- Internal and/or external bleeding including:
  - oozing from puncture sites
  - rashes suggestive of easy bleeding  
ecchymoses, petechiae,  
purpura
  - bleeding from the gums
  - conjunctival haemorrhage  
(bleeding from the eyes)
  - epistaxis (bleeding from the nose)
  - haematemesis (blood in vomitus) (e.g.,
  - haemoptysis (blood in sputum)
  - dark blood in stool (melena, hematochezia)
  - unexplained vaginal bleeding in  
women
  - haematuria (blood in urine)
- Miscarriage in pregnant woman\*\*
- Respiratory distress
- Shock (see definition  
of shock in section 4)

\*Fever may be absent in late stages

\*\* Pregnant patients with VHF often miscarry. However, vaginal bleeding and miscarriage can occur in any pregnancy. During an Ebola/Marburg or CCHF outbreak, fever with miscarriage or abnormal vaginal bleeding (other than normal menstruation) should prompt a PCR test to rule out VHF.

Common natural history of Ebola- combined Sierra Leone<sup>15</sup>, Liberia<sup>3</sup> 2014

TIME SINCE SYMPTOM ONSET	PHASE OF ILLNESS	CLINICAL FEATURES
0-3 days	Undifferentiated febrile illness (90%)	Mild fever (37.5-38.5°C) Body and joint pain (occasionally back pain), progressive weakness, loss of appetite, sore throat, headache, fatigue.
4-10 days	Gastrointestinal (60- 80%)	Lower chest/epigastric pain, nausea and vomiting, hiccups, diarrhoea (occasionally with mucus), cramps or diffuse abdominal pain (sometimes right upper quadrant abdominal pain: liver tenderness) Conjunctival injection. Hypovolemia and dehydration may occur.
10-14 days	Hypovolemic shock/ dehydration  Neurological complications  Haemorrhagic complications (<25%)	Oligoanuria, dry mucosa, hypoglycemia, tachypnoea, tachycardia, diminished consciousness or coma.  Fever, confusion and disorientation, agitation (constant falling on the floor), bradypsichia (unable to keep attention), extreme weakness (unable to stand up and walk), death may occur in 24-48 hours after the neurological abnormalities Gums bleeding, melena, haematemesis, epistaxis, bleeding from puncture and IV line sites.
>14 days	Recovery  Late complications	Resolution of gastrointestinal symptoms and fever, increased appetite, increased energy. Convalescent weakness. Secondary infections (including candidiasis, oral ulcers), multiorgan failure, tachypnoea (Kussmaul breathing more than respiratory), seizures, DEATH. Probably electrolyte abnormalities in patients with previous good outcome.

## Clinical features of Lassa fever

The incubation period is 6-21 days.

Clinical distinction between VHF is difficult, emphasizing the importance of prompt laboratory testing to identify Lassa fever early enough for ribavirin to be effective. Swollen face and neck are classic signs in Lassa fever but only occur in about 10% of cases; these are not seen in Ebola/Marburg. Sore throat occurs in both but exudative pharyngitis and convalescent hearing loss suggest Lassa fever. Tenderness over the liver suggests Ebola/Marburg. Only about 20% of Lassa fever patients develop haemorrhage, as opposed to 50 to 60% of Ebola (depending on the subtype). Lassa fever typically has a more indolent presentation with patients feeling fatigued and "feverish" for a few days, whereas significant illness in Ebola/Marburg begins more abruptly and evolves more rapidly.

Lassa fever is mild or has no observable symptoms in about 80% of people infected and unapparent infection, diagnosed serologically, is common in endemic areas. Because of these frequent mild infections, the overall case fatality rate can be quite low; hospital studies in symptomatic patients report the case fatality rate as 15 to 25%<sup>16, 17</sup>. Severe multisystem disease is seen in a subset of patients, however, and in the case of some epidemics, the mortality has been reported as high as 80%. There may be viral strain differences between Lassa fever in Nigeria and Sierra Leone. Moreover, disease seems to be more severe in pregnancy with frequent maternal mortality, particularly in the third trimester, and 80% fetal loss.

The virus is excreted in urine for 3 – 9 weeks after infection and in semen for 3 months<sup>18</sup>. The extent of sexual transmission is unknown.



Clinical stages of severe Lassa fever (adapted from McCarthy 2002 <sup>19</sup> )	
Stage	Symptoms
1 (days 1-3)	General weakness and malaise. High fever, >39°C, constant with peaks of 40-41°C
2 (days 4-7)	Sore throat (with white exudative patches) very common Headache; back, chest, side, or abdominal pain Conjunctivitis Nausea and vomiting Diarrhoea Productive cough Proteinuria Low blood pressure (systolic <100 mm Hg) Anaemia
3 (after 7 days)	Oedema of the face and neck Convulsions Mucosal bleeding (mouth, nose, eyes) Internal bleeding Encephalopathy with confusion or disorientation
4 (after 14 days)	Coma Death

During convalescence, transient alopecia and ataxia may occur. Sensorineural hearing deficit (eighth cranial nerve) is common (29% of confirmed cases compared with none of febrile controls in hospital inpatients)<sup>20</sup>, with no relationship to severity of viral illness. Only about half recover some function.

Laboratory features include early lymphopenia which may be followed by late neutrophilia. Platelet counts are moderately depressed, and platelet function is abnormal. Aspartate amino-transferase (AST) levels above 150 and high viremia are poor prognosis indicators for the patient. Severe disease may be accompanied by albuminuria and haemoconcentration.

## Clinical features of Crimean-Congo Haemorrhagic Fever<sup>21, 22, 23, 24</sup>

For CCHF, the incubation period depends on the mode of acquisition, but is usually 3-7 days. The documented maximum after a tick bite is reported as 9 days and after contact with infected blood or tissues 13 days. The clinical characteristics of patients with CCHF infection present a wide spectrum of disease severity from mild to fatal outcome (case fatality rate 5–30%).

The onset of CCHF is sudden, with initial signs and symptoms including headache, high fever, back pain, joint pain, abdominal pain, and vomiting. Red eyes, flushed face, red throat, and petechiae (red spots) on the palate are common. Symptoms may also include jaundice, and in severe cases, changes in mood and sensory perception.

The haemorrhagic period is short (usually 2–3 days, but up to 2 weeks), develops rapidly, and usually begins between the third to fifth days of disease. Haemorrhagic manifestations of CCHF are common and range from petechiae to large haematomas appearing on the mucous membranes and skin. The most common bleeding sites are the nose (epistaxis), gastrointestinal system (haematemesis, melena, and intra-abdominal bleeding), uterus (menorrhagia—excessive menstrual bleeding; other vaginal bleeding), urinary tract (haematuria), and the respiratory tract (haemoptysis). Uncontrolled bleeding at injection sites can also be seen and bleeding from other sites, including cerebral haemorrhage have been reported. In approximately 30% of the patients, hepatosplenomegaly can also be found.

Laboratory features of CCHF are thrombocytopenia, leukopenia, elevated liver enzymes, and prolonged bleeding times. Laboratory tests return to normal levels within approximately 5–9 days among surviving patients. Most of the early clinical signs of CCHF are non-specific and can also be seen with Ebola/Marburg and Lassa fever, so differentiation often relies on exposure history and laboratory testing.

**Any acute illness, especially febrile illness, not clearly due to a common pathogen or which is unresponsive to initial empirical therapy, should raise concern for VHF. This is especially true if there is unexplained bleeding or rapid deterioration of the patient's condition.**

## 2.1.3 Screening at the ETC, for ETCs with a suspect ward, Ebola holding centers, or CCCs

### Precautions during Screening

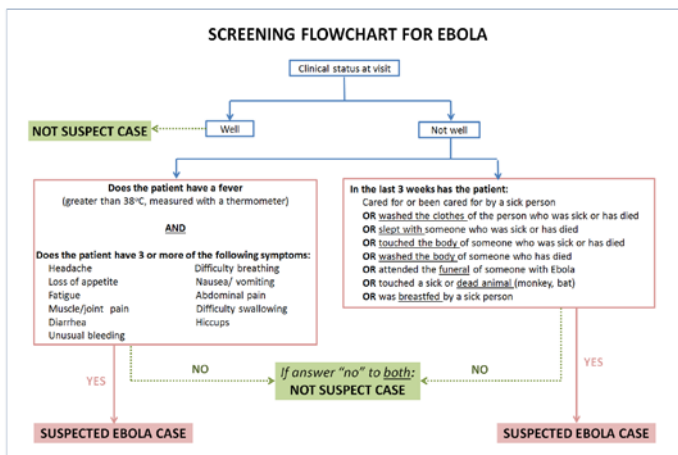
- Do the screening within an arrangement that assures 1.5 meter distance from the patient at all times
- Off set positioning of patient during interview (not face-to-face)
- Use face shield and clean rubber gloves; if no face shield is available, substitute mask and goggles.
- Several approaches can be used to measuring temperature (which should be taken after talking with the patient):
  - giving the patient a digital thermometer, demonstrating how it is used, patient measures own axillary temperature and reads numbers OR uses an infrared thermometer
  - infrared thermometer (requires coming within 1 m of patient; clean with 0.5% chlorine if any contact with patient)
- The screening flowchart below incorporates the case definition and is used by surveillance officers. The symptom screen is oriented to adults.
- Screening by a clinician in light PPE should seek additional information to aid in the decision of whether to admit the patient as a suspect or probable case
  - An unwell patient with a clear contact history can be quickly prioritized for admission.
  - History of fever – within last 48 hours or during this acute illness is a valid indication of fever. They may have taken paracetamol.
  - Patient may say they are well now but may be recently ill or in denial about symptoms. A careful history of the patient, family, and referring health worker or surveillance officer are important.
  - Clarification of contact history:

- If attended funeral of someone with Ebola- a contact is someone who touched the body. Attendance at a safe burial (Ebola corpse in body bag and buried according to protocol) or attendance without contact with the body or contact with those who touched the body do not count.
- Occupying the same house as a known Ebola patient or death

<b>Consider these symptoms in children (rather than adult list)</b>	
<p>In children <b>under 5 years</b> ask for</p> <ul style="list-style-type: none"> <li>• Fever or history fever within last 48 hours</li> <li>• vomiting</li> <li>• loss of appetite</li> <li>• diarrhoea</li> <li>• prostration</li> <li>• difficulty breathing</li> <li>• excessive crying</li> <li>• bleeding (gums, nose, GI or other unexplained bleeding)</li> <li>• Red eyes and/or rash</li> </ul> <p>If fever (or history of fever) and at least one of the other symptoms are present the child should be isolated</p>	<p>In children <b>over 5 years</b> ask for</p> <ul style="list-style-type: none"> <li>• fever or history fever within last 48 hours</li> <li>• headache</li> <li>• vomiting or nausea</li> <li>• loss of appetite</li> <li>• diarrhoea</li> <li>• weakness or severe fatigue</li> <li>• abdominal pain</li> <li>• generalized muscular or articular pain</li> <li>• difficulty in swallowing or breathing</li> <li>• bleeding (gums, nose, GI or other unexplained bleeding)</li> <li>• Red eyes and/or rash</li> </ul> <p>If fever (or history of fever) and at least two of the other symptoms are present the child should be isolated.</p>

For an infant under 1 year, the maternal history is very important. If there is no Ebola history from the mother or family and there has been no visitor handling the infant, Ebola is very unlikely.

Note this flowchart is for surveillance; expand for clinical screening



- If the patient fulfills the case definition,
  - Isolate the patient- call for staff in full PPE to accompany patient to the ward
  - Educate the patient on what is happening
  - Encourage ORS
  - Do not perform physical exam
  - Do not perform rapid diagnostic test for malaria

See Appendix A1 for definitions suspect, probable and confirmed cases.

## 2.1.5 Surveillance: fill the case investigation form

- Facilities should have a surveillance officer working with the clinician doing the screening to fill the forms.
- If not, the clinician should fill out the case investigation form and laboratory form; give the patient the unique identification number; or use the bar code forms and stickers. Then notify surveillance system.

## 2.1.6 Laboratory investigations & specimen collection

All samples should be considered as highly infectious. Early recognition of VHF depends on a high index of clinical suspicion by the attending health worker. The ability to confirm the diagnosis of Ebola and other VHF requires highly specialized reference laboratories. In Sierra Leone, the following laboratories can perform PCR for Ebola\*:

Bo, CDC LABORATORY

Lakka, SOUTH AFRICAN (NICD MLU) LABORATORY

Kailahun, CANADIAN LABORATORY

Kerry Town, Public Health England LABORATORY

Jui, CHINESE LABORATORY [which also do Lassa PCR]

Port Loko, Public Health England LABORATORY

\*as of printing December 2014. Note that Kenema General Hospital currently performs Lassa PCR.

Setting up a system of sample collection and transport within each country that is able to adjust to the evolving situation (increase or decrease in hospital beds, new mobile laboratories being established etc.) is required. Personnel that collect samples (laboratory personnel, technician level or above) and nurses for blood samples; surveillance officers for swabs) who have been trained in safe blood sampling, on how to put PPE on and off, and safe shipment of highly infectious biological substances should work according to locally-developed SOPs which ensure the following procedures are followed for

investigations:

1. Ensure all specimen collection containers and materials are available (SEE TABLE 4). Ensure that you have all the equipment together. Ideally use needle safe devices if available and always have a sharps box present. Ideally invasive procedures in suspect cases should be undertaken by two health workers.
2. Collect samples taking necessary protective precautions and ensure samples are appropriately labeled, including three unique patient identifiers (name, age, unique identification number).
3. Package samples according to standard guidelines.
4. Send the samples immediately to the appropriate reference laboratory marked urgent. There may be a country wide network of laboratories where samples for transportation to the national reference laboratory (or laboratory in a neighboring country) are gathered. Usually the regional centres have means to pick samples from lower health units within their prescribed areas of operation, where they are ultimately picked and dispatched to the appropriate laboratory.
5. If packaging materials are not available keep the sample in a refrigerator or in a freezer at -20° C or colder.

Consider other causes of fever in your differential diagnosis and if available exclude through appropriate investigations. Refer to the IMAI District Clinician Manual differential diagnosis tables for adults<sup>4</sup> and to the Child Pocket Book for children<sup>5</sup>.

TABLE 3

### Interpretation of VHF laboratory results from acute symptomatic patients

Lab confirmation of:	Result
Acute infection	PCR and/or IgM positive
Recent infection (within previous couple of months, i.e. in current outbreak)	IgM and IgG positive
Older infection (within the last couple of years)	High IgG positive only (no IgM)
Past infection (not associated with current outbreak)	Lower IgG positive only (no IgM)

*\*\*\*If a specific diagnosis in addition to VHF is made (e.g. pneumonia), use established principles and guidelines for treating those conditions. It is important that identifying the source of infection should not delay delivery of supportive treatments and empirical antibiotics*

### Malaria testing

There are several approaches: empirical treatment, testing for malaria with RDT at bedside, or having the on-site lab perform the RDT. If a RDT or malaria smear is negative, the patient does not have malaria.

- ▶ It is dangerous to attribute fever to malaria when it is not present because the patient does not get the right case management if they are incorrectly diagnosed as having malaria.
- ▶ If the malaria test is positive but the patient is considered to be a suspected case during a Filovirus, Lassa fever or CCHF outbreak, or at any time in a Lassa endemic area, await confirmation from Filovirus, Lassa fever and/or CCHF virus testing (or response to anti-malarial treatment) before discharging the patient from the isolation ward.



TABLE 4

## Specimen collection for viral haemorrhagic fevers

Specimen	<p><i>For PCR:</i> Whole blood or blood clot, serum/plasma or tissue; oral swab for corpses</p> <p><i>For ELISA:</i> Whole blood, serum or plasma</p> <p><i>For immunohistochemistry:</i> Skin or tissue specimens from fatal cases.</p>
When and how to collect	<p>Collect specimen from the first suspected case.</p> <p>If more than one suspected case, collect specimens from every suspected case.</p> <p>All specimens should be regarded as potentially infectious, and health workers who collect or transport clinical specimens should adhere rigorously to Standard Precautions (SEE SECTION 7) to minimize the possibility of exposure to pathogens.</p>
How to prepare, store, and transport	<p><b>HANDLE AND TRANSPORT SPECIMENS FROM SUSPECTED VHF PATIENTS WITH EXTREME CAUTION. WEAR PROTECTIVE CLOTHING AND USE BARRIER PRECAUTIONS.</b></p> <p><i>For ELISA or PCR:</i></p> <p>Refrigerate whole blood, serum or clot and oral swabs</p> <p>Freeze (-20° C or colder) tissue specimens for virus isolation</p> <p><i>For immunohistochemistry:</i></p> <p>Fix skin snip specimen in formalin. Specimen can be stored up to 6 weeks. The specimen is not infectious once it is in formalin. Store at room temperature. Formalin-fixed specimens may be transported at room temperature.</p> <p><b>NOTE:</b></p> <p><b>ALL SPECIMENS MUST BE PACKAGED USING TRIPLE PACKAGING SYSTEM</b></p> <p><b>SPECIMENS MUST BE APPROPRIATELY LABELLED AND ACCOMPANIED WITH COMPLETE DOCUMENTATION (INCLUDING CASE INVESTIGATION FORM)</b></p>

## Other investigations

Due to the potential risk of transmission to laboratory workers, additional blood tests are not to be sent to the routine laboratory until the results of the VHF screen are known and negative. An exception to this is the use of RDT for malaria and other point of care equipment (such as the i-STAT® System) by appropriately trained personnel in full PPE within the red zone. The latter, however, is unlikely to be available until an outbreak is declared and additional support is provided.

## Laboratory diagnosis of Ebola/Marburg, Lassa fever or CCHF

Laboratory diagnosis can be difficult depending on the phase/time of presentation, duration of symptoms and previous exposure. The ability to confirm the diagnosis of VHF usually requires highly specialized (with high biosafety infrastructure) reference laboratories that are centrally located. In this large Ebola epidemic, it has been essential to have mobile labs able to perform PCR near the hotspots rather than centrally located. If other blood tests have been performed (which is not advisable in routine laboratories due to the risk of transmission), the following laboratory findings (in combination with the clinical presentation) are suggestive of VHF but not conclusive: thrombocytopenia; elevated hematocrit; and marked leukopenia.

To confirm a VHF case, three laboratory tests can be run on blood samples (blood, serum or plasma) collected in patients suspected of having VHF, depending on the time of sample collection relative to the date of disease onset.

- 1) Polymerase chain reaction (PCR) provides evidence of the virus in the blood or tissues during the acute phase of the clinical disease and is the preferred method of confirmation, both for blood samples and for oral swabs from corpses. In certain circumstances, this test can be replaced by an antigen detection ELISA (it is less sensitive and more broadly cross-reactive);
- 2) IgM (antibody showing recent infection) during the early convalescence phase of disease (until approximately 8-12 weeks post onset of disease)
- 3) IgG (antibody showing past infection) persists for several months/ years after the acute phase of the clinical disease. This alone is not suggestive of recent or ongoing infection but can be utilized to confirm acute infection with paired samples showing IgG seroconversion.

The levels of virus increase during the first days of symptoms and this increase correlates with the patient's degree of infectiousness. Viral levels are both dependent on the patient's immune response and the amount of infecting dose. If the patient produces a good immune response to the virus, antibodies (IgM and IgG) will start to be produced and can be measured. Conversely, a weak immune response to the virus correlates with high levels of virus in the blood and is associated with a high mortality.

For patients who have died, immunohistochemistry testing has also been used to detect some VHF (e.g., Ebola or Marburg) from post-mortem skin necropsy. In the current outbreak in West Africa, oral swabs taken from corpses and tested by PCR are the preferred method.

All samples for clinical laboratory tests from patients with possible VHF should be considered highly infectious and processed accordingly (i.e. sent to pre-designated laboratories which have been notified that samples are on the way or which receive samples at a pre-determined time each day from the transport service). Essential investigations should be undertaken in laboratories dedicated solely to testing of VHF to avoid unnecessary exposure of laboratory staff conducting routine testing.

### **Pitfalls in laboratory results interpretation**

- ▶ False negative results are likely to occur in samples taken in early phases of the infection. A negative PCR result on whole blood, plasma or serum in samples taken less than three days post symptom onset will require collection of a new sample for re-testing. Particularly in the early stages of infection, PCR on oral swabs is less sensitive than PCR on blood. In the current outbreak, oral swabs are taken only from corpses in which the viral load is high.
- ▶ Patients who present late in their illness course or have mild disease may already have cleared viraemia and be PCR negative. Other sites such as urine can be sampled if there is a high clinical suspicion and serology can also be utilised.
- ▶ New VHF strains/virus can occur (e.g., Lujo virus)
- ▶ IgG alone is not diagnostic of acute or recent infection except if evaluating rising titres in paired samples.
- ▶ Cross-reaction of IgG/IgM with other pathogens is possible.

## 2.2 Notification

In this Ebola outbreak, immediate notification in the following order of priority: lab notifies the clinician who requested the test; lab sends at least daily results to the MoHS – depending on response structures, the national and district level may receive the lab results at the same time by email or other modalities.

In a new outbreak, once VHF is suspected, immediate notification to the next level and district should be done using the appropriate and quickest available means, especially telephone and other modalities such as mTRAC. The event also needs documentation using the appropriate reporting form (HMIS 033a). All subsequent suspected cases should be reported and recorded on a line list for further action (refer to the IDSR 2010 guidelines<sup>25</sup> for details).

## 2.3 Isolation

One of the key guiding principles in the management of VHFs is the triaging of cases and ensuring isolation of suspected and confirmed cases to mitigate further spread of disease. Ideally an isolation area should already be available to admit patients requiring isolation. If an isolation area is not available or if advance preparations have not been done, and VHF is suspected, immediately identify and set aside a single room. This room should have an adjoining toilet or latrine, good ventilation, screened windows and restricted access. Details on how to set up the isolation unit as part of the VHF treatment centre are explained elsewhere.

### 3. Management of suspected and confirmed Ebola patients (also if Lassa fever, Marburg or CCHF)

The clinical management of VHF is predominantly supportive and should focus on early recognition of severe disease and complications, in combination with appropriate symptom management. The level of care and interventions required varies across the spectrum of disease severity, including complex management of septic shock and palliation when indicated. Control of pain and management of anxiety are particularly important and all patients need careful monitoring, as well as psychological support (see section 6).

Health workers should pay careful attention to standard precautions and wear PPE (see section 7) while providing careful clinical care.

Injectable medications that require drawing up from a vial should be from either a non-glass vial or, if glass, one with a rubber stopper. Avoid vials that require breaking glass which is both difficult and dangerous within the ETU in PPE and has resulted in several medical evacuations for (low risk) exposures. In some ETUs, medications are being drawn up outside of the facility to reduce the risk of sharps exposure. However, some medications cannot be drawn up and prepared far in advance and some need to be decided on and drawn up inside the facility.

Always start each patient assessment with the Quick Check (in adolescents and adults) or the ETAT (in children) for emergency signs and respond with emergency treatments. If patient has signs of severity, use section 4. The wall charts for these should be posted in the isolation wards. The IMAI District Clinician Manual<sup>4</sup> (IMAI DCM) and the Pocket Book of Hospital Care for Children<sup>5</sup> should be available for consultation for further details on care.

### 3.1 Treatments and considerations for all patients with suspected or confirmed Ebola or other VHF

- **Antimalarial treatment:** if RDT available, treat if positive. Otherwise give antimalarials empirically to all patients with fever or history of fever (see page 19).
- **Give ORS** (if significant vomiting and diarrhea or any sign of dehydration, start IV fluids- see sections 3.3 and 4.2). See section 3.3 for approaches to optimizing intake of ORS.

Make ORS available for all patients- check supply regularly.

- **Antibiotics:** Systematic empiric oral (e.g. ciprofloxacin or cefixime) or IV (e.g. ceftriaxone) antibiotics should be given to sick patients due to the concern of high-risk of secondary infection, including GI translocation of bacteria with EVD. Give directed antibiotics for specific indications and to all severely ill patients or if any signs of sepsis (see section 4).

For children: Signs and symptoms of sepsis in children are non-specific so it is recommended that all children admitted with suspected Ebola receive broad spectrum antibiotics IV or IM (ceftriaxone 80mg/kg IV/IM once daily for those >1 week old, max 2 grams. Under 1 week 150 mg IV/IM. If co-administering with Ringer's Lactate a flush of 10ml 0.9% saline should be given to avoid calcium deposition.

- **Antiparasitics:** Systematic treatment of all patients with ivermectin or albendazole can be considered.

**Albendazole** 400mg oral once for adults, children > 2 years; 200 mg oral once for children <2 years.

**Ivermectin** 3 mg tablet:

15 kg =1 tablet DAILY for 2 DAYS

30 kg = 2 tablets DAILY for 2 DAYS

45 kg = 3 tablets DAILY for 2 DAYS

60 kg = 4 tablets DAILY for 2 DAYS

72 kg = 5 tablets DAILY for 2 DAYS

\*DO NOT GIVE TO PREGNANT WOMEN or <15 kg

In a woman of childbearing age, ask if she is pregnant.

Consider the differential diagnosis in the patient. Remember to think about possible **comorbidities**: pneumonia, typhoid fever, HIV, TB, sickle cell disease, malnutrition, other tropical infections endemic in west Africa e.g. amoebiasis, schistosomiasis, filariasis, trypanosomiasis, intestinal helminthiasis, giardiasis, etc..

Patient on antiretroviral and TB treatment or medicines for diabetes mellitus or hypertension need to have their treatment continued (with attention to possible modifications in dose for certain medicines if the patient is severely ill with renal or liver impairment or hypotensive).

## 3.2. Manage symptoms/signs

Specific management of signs and symptoms <sup>1,5,3</sup>	
Symptom/Sign	Treatment
Fever (>38.0 °C)	<p>Manage fever with paracetamol (see Appendix C for dosing). Avoid diclofenac, ibuprofen or aspirin due to platelet effects.</p> <p><i>Further details in IMAI DCM: Section 10.1; in Child pocket book p. 305</i></p>
Acute significant bleeding/ severe pallor	<p>Transfuse fresh whole blood (not for diffuse coagulopathy or ongoing DIC)</p> <p><i>Further details in IMAI DCM: Section 10.18; in Child pocket book pages 161, 218, 308-312.</i></p>
Pain	<p>1st line: Paracetamol (PO, PR, IV)</p> <p>2nd line: Tramadol (po, IV)</p> <p>3rd line: Morphine po, (IV)</p> <p>Avoid diclofenac, ibuprofen, aspirin or other NSAIDs due to platelet effects.</p> <p><i>Paracetamol, tramadol and morphine doses are in Appendix C. Further details in IMAI DCM: Section 20; in Child pocket book Section 10.4, p. 306</i></p>
Difficulty breathing/ respiratory distress	<p>Oxygen: titrate to SpO<sub>2</sub> ≥90%</p> <p>If SpO<sub>2</sub> &lt; 90%, start adult on 5 litres/minute (nasal prongs); start child at 1-2 litres/minute (nasal prongs)</p> <p>Evaluate for pneumonia, wheezing, fluid overload, congestive heart failure and manage accordingly. (Do not share nasal prongs -once used by a patient, dispose.)</p> <p><i>Further details in IMAI DCM: See Section 3.2 for management respiratory distress, CHF, and pneumonia; in Child pocket book Pages 11,82,312-315</i></p>
Diarrhoea, vomiting, signs of dehydration	<p>Provide ORS. Monitor signs of dehydration. If no, some or severe dehydration, use Fluid Plans A, B and C, respectively (see sections 4.2, adult, 4.3 child). Nausea and vomiting are common- anti-emetic medications may provide some relief and facilitate oral rehydration.</p> <p>Preferred: <b>ondansetron 4 mg tablet</b>:</p> <p>2 to 4 years: ½ tab once</p> <p>4 – 12 years 1 tab twice daily</p> <p>12 years up, adults: 1-2 tablets twice daily</p> <p>Ondansetron injection &gt;6months – adult 0.15mg/kg three time daily</p> <p>Or for adult, give chlorpromazine 25-50 mg, 4 times daily IM or orally or metoclopramide 10 mg IV/ orally 3 times daily until vomiting stops.</p> <p>Or for children &gt; 2 years, promethazine 12.5 mg IM. Monitor for extrapyramidal signs.</p> <p>Beware of oversedation.</p> <p>Diarrhoea with blood – consider adding metronidazole or tinidazole for amoebiasis (+/- ciprofloxacin if not on ceftriaxone).</p>



## Specific management of signs and symptoms *continued*

<p><b>Dyspepsia</b> (i.e., "heartburn")</p>	<p>In adults and children <math>\geq 10</math> years, give omeprazole 20 mg orally daily or magnesium trisilicate, 2 tabs every 8 hours until symptoms resolved. In children 5-12 years, give magnesium trisilicate: 5-10 mls, 3 times daily</p> <p><i>Further details in IMAI DCM: Section 10.7c</i></p> <p>Or liquid gaviscon or peptobismol if available</p>
<p><b>Convulsions/fitting</b></p>	<p>Approach convulsing patients with caution, call for assistance, give treatment only if safe to do so.</p> <p>Remember: hypoglycaemia, hyperpyrexia and other reversible causes of convulsions</p> <p>Give diazepam to abort seizure if prolonged (rectally if there is not an IV already in place- adult 20 mg (4 ml of 10 mg/2ml solution); child 0.5 mg/kg), then control with phenobarbital loading dose (child: 15 mg/kg over 15 minutes- IM or IV; adult: 10 mg/kg).</p>
<p><b>Signs of hypoglycaemia</b></p>	<p>Test glucose (and monitor regularly)</p> <p>If low, give IV D50 1 ml/kg in child or 5 ml/kg of D10; 25 to 50 ml of D50 in adult.</p> <p>Provide food- nutritional support (see Section 3.8)</p> <p><i>Further details in IMAI DCM: Quick Check page 42; in Child pocket book page 16</i></p>
<p><b>Anxiety</b></p>	<p>Psychological support (see section 6 of this manual) Diazepam – adults: 5-15 mg/day in 3 divided doses</p> <p><i>Further details in IMAI DCM: Section 10.11</i></p>
<p><b>Confusion in cooperative patient</b></p>	<p>Reason with patient in calm and non-aggressive fashion. Keep lighting on at night.</p> <p>Consider diazepam 5 mg at night (adult)</p>
<p><b>Agitation, confusion and aggression in non-cooperative adult patient</b></p>	<p>Give sedation-haloperidol 2.5 to 5 mg IM – depending on size of adult</p> <p>Approach patient with caution, call for assistance, and give treatment only if safe to do so.</p> <p><i>Further details in IMAI DCM: Quick Check page 60</i></p>
<p><b>Shock</b></p>	<p>See diagnosis and management of shock from large GI loss in section 4.1 and septic shock below. <i>Further details in IMAI DCM: Section 3.1</i></p>

### 3.3 Manage mild and moderate cases

Clinical manifestations of Ebola can be variable and, particularly early in the disease course, patients may present with only mild or moderate illness. Despite symptoms such as fever, headache, and/or fatigue, these patients may be:

- Ambulating
  - Not vomiting or having large volume diarrhoea
  - Eating and drinking
- 
- All should be given ORS and encouraged to drink it.
  - Provide symptomatic management (section 3.2)
  - Monitor twice daily to detect development of severe illness (go to section 4)
  - No lab after initial RDT malaria if stable
  - If no fever for 72 hours, send new PCR to plan for disposition

Approaches to optimizing intake of ORS:

- Patients need to be actively encouraged to take frequent sips. In the confirmed ward, have mildly ill patients help support ORS intake in sicker patients
- If nausea or vomiting, give antiemetic medication. Particularly in children early use of an antiemetic such as ondansetron should be considered.
- Give flavored ORS or mix in some fruit juice.
- Use a container patient can easily handle while lying in bed (make straw available or 'sippy mug' if possible)
- Provide bedside table or shelf at height so easily accessible.
- Provide plastic covered wedge pillow to help weak patients into semi-recumbent position to facilitate drinking.
- For children who may be alone or with a sick parent, keeping up adequate fluid intake may be difficult. In the confirmed ward, mildly ill patients could help. In suspect wards, consideration should be given to employing an Ebola survivor with the responsibility of supervising adequate fluid intake in the admitted children.

## To assess if the patient is able to rely on ORS for hydration, rather than IV fluids:

If patient has vomiting and/or has much diarrhea, it is important to assess the adequacy of the patient's intake of ORS. ORS depends on patient self-administration. Check the following:

- Is the patient too weak to lift the container?
- How much remains in the container since the last time you assessed the patient? (Monitor input)
- Can the patient get out of bed and ambulate?
- Does the patient have signs of shock and dehydration?
- Is the patient a moderately unwell child with no caregiver available?

If patient is too weak or lethargic or nauseated to take ORS, is vomiting or has large volume diarrhoea, begin IV administration:

- If signs of shock or dehydration, give fluid resuscitation as in section 4.2.
- If NO signs of shock or dehydration, give Lactated Ringers, at least 3 liters/day for adults.

Monitoring output—and add more fluids accordingly. Recheck frequently for signs of shock or dehydration and increase the fluid rate if any signs occur, using section 4.2.

Continue drinking ORS.

Staff using IV catheters must adhere rigorously to standard precautions (see section 7) to avoid needlestick injury and exposure to pathogens. Approaches to optimize the safety of IV catheters for staff and patients include:

- **Staff requirements:**
  - Ensure staff are experienced and trained in IV catheter insertion.
  - Adequate time and staff availability (in some situations, due to staffing and time limitations, safe IV catheter insertion and monitoring may not be possible)
  - Ensure an additional staff member is available to assist in the IV catheter insertion
  - In high volume ETCs, consider use of a dedicated IV start team
  - Consider clinical staffing patterns that “stagger” entry to the ETC to assist with completion or continuation of IV fluids that often cannot be administered in the duration of a single team rounds.

- **Patient preparation and decision on safety of insertion:**
  - Adequately explain the procedure to the patient.
  - Placement of an IV catheter in an agitated patient may not be safe: clinical judgment is necessary.
- **Equipment requirements:**
  - Gather all equipment: sharps container at bedside, adhesive dressing, IV catheter, disinfectant swabs, tourniquet
  - Single-use IV catheter preparation kits that contain disinfectant swabs, tourniquet, and adhesive dressings are useful to streamline the process and equipment preparation.
  - Safety catheters with shielded retractable needles should be used where possible to help eliminate accidental needle-stick injury.
  - Ideally a one-way valve system (e.g. Clave©) attached to the intravenous cannula so that when the iv infusion is completed, blood will not flow back in the iv fluid tubing; and, to facilitate disconnection of the IV tubing after fluid administration is done.
- **Wash gloved hands in 0.5% chlorine then adequately disinfect the skin.**
- There should be close supervision of patients with IV fluids running. Overnight the catheter should be capped off and wrapped unless there is a high level of supervision. In children, the catheter should be well wrapped and splinted if possible. Covering a catheter in the foot or hand with a sock may also assist.
- In children with difficult IV access, early consideration should be given to intraosseous access preferably using a powered device, according to the availability of skilled staff.
- In peripherally shut down children with unprovoked bleeding, serious consideration should be given as to whether attempts at IV access are appropriate. This will depend on the setting, but the risk of bleeding from puncture sites, risk to health worker and likely poor outcome should be considered.

### 3.4 Specific therapy for Lassa fever and CCHF

Ribavirin can be used to treat patients with Lassa fever and CCHF and also considered for high-risk Lassa fever and CCHF patient contacts. Ribavirin is not used in Ebola or Marburg disease for which it has no activity. Its efficacy in CCHF and Lassa fever has not been proven by a randomized controlled trial, and there are differences in opinion on its clinical effectiveness in the published literature. Nevertheless, observational data from Lassa fever, for which there has been more experience, suggest that ribavirin is most effective if given in the first 6 days of illness<sup>16,17</sup>.

Ribavirin dose for treatment of Lassa fever and CCHF <sup>17</sup>		
Route	Dose	Interval
IV*	30 mg/kg (maximum 2 grams)**	Loading dose followed by:
IV*	15 mg/kg (maximum 1 gram)**	Every 6 hours for 4 days, followed by:
IV*	7.5 mg/kg (maximum 500 mg)**	Every 8 hours for 6 days.

\* Dilute ribavirin in 150 ml of 0.9% saline and infuse slowly.

\*\* Reduce the dose in persons known to have renal insufficiency (creatinine clearance < 50 ml/minute).

Major adverse effects due to short-term ribavirin therapy are rare but require monitoring. The main side-effect is a dose-dependent, mild-to-moderate haemolytic anaemia that infrequently necessitates transfusion and disappears with cessation of treatment. Rigors may occur when ribavirin is infused too rapidly. Relative contraindications include severe anaemia or haemoglobinopathy, coronary artery disease, renal insufficiency, decompensated liver disease, breast-feeding and known hypersensitivity. Jaundice may develop in patients with Gilbert's syndrome. Haemoglobin/haematocrit and bilirubin levels should be checked at initiation of ribavirin therapy and then every few days, with consideration of transfusion of packed red blood cells if significant anaemia develops. Because of the long terminal half-life (~24 hours) and large volume of distribution, ribavirin may still have effect for hours or even days after cessation, particularly in red blood cells where it accumulates. Although findings of teratogenicity and fetal loss in laboratory animals have rendered ribavirin technically contraindicated in pregnancy, its use must still

be considered as a lifesaving measure given the extremely high maternal and fetal mortality associated with Lassa in pregnancy<sup>17</sup>. Patients who have had ribavirin should refrain from unprotected sex for up to 6 months after exposure.

Both progressive hemolytic anemia and hypomagnesemia have been shown to be dose-dependent<sup>26</sup>. Bradycardia has also been reported. Other non-specific complaints associated with ribavirin include headache, fatigue, insomnia, and nausea.

Oral formulations should be restricted to post-exposure prophylaxis for high-risk exposures to Lassa fever and CCHF (see Section 5).

In children, the dosage in those >9yr for oral and IV is the same as for adults. In those aged 6-9yrs 400mg every 6 hours can be given orally. Age 3-6yr, 7.5mg/kg every 12 hours has been used to treat Hepatitis C and should be considered<sup>27</sup>.

### 3.5 Special considerations in pregnancy

- On initial contact with women of childbearing age, ask about reproductive age and date of last menstrual period. This information should be documented and communicated to other health workers. Privacy should be provided wherever possible. Basic facilities for deliveries and a private area to manage miscarriage and vaginal bleeding should be installed. Extreme caution must be used during management of bleeding to avoid health worker infection.
- Full term deliveries are uncommon in Ebola/Marburg. **Pregnant patients with Ebola are at increased risk of complications:** postpartum hemorrhage (PPH), fetal demise/stillbirth, and spontaneous abortion.
- Pregnant patients should be sent to a holding centre or ETC with capacity (staff and equipment) to handle miscarriage and delivery. Primary health care units should not conduct deliveries or other procedures in pregnant women who are suspected Ebola<sup>28</sup> unless labour is imminent (and then with full PPE and decontamination after delivery).<sup>17</sup>
- In Ebola, it appears that pregnant women can recover from Ebola (with negative PCR) while their fetus and amniotic fluid remain positive, raising the possibility of risk to family and birth attendants on delivery if discharged from the ETC. If possible, determine whether the fetus is alive (using Doppler or ultrasound within a specially equipped ETC or holding center) and counsel the mother on options. Induction for termination of pregnancy within a care center requires careful planning, counseling and consent. Non-invasive procedures should be the first treatment of choice (such as misoprostol if termination is chosen).

**Health worker exposure to blood and other bodily fluids should be minimized during any procedure:**

- Plan and organize at least 3 people including someone experienced in delivery, before performing procedures
  - Use full PPE appropriate for labour and delivery which includes face shield, boots, apron and elbow gloves
- Misoprostol should be used for prevention and treatment of post-partum bleeding, treatment of incomplete abortion, intrauterine fetal death and induction of labour. Potential side effects include fever, chills, nausea, vomiting, and diarrhoea (*similar to Ebola symptoms*).<sup>29</sup>

Labor and delivery: active management third stage labour	Misoprostol, 600 mcg sublingual (SL)/po single dose immediately after delivery of baby <ul style="list-style-type: none"> <li>• After delivery, confirm that there is no undiagnosed twin before giving misoprostol</li> <li>• If stillborn, do not clamp and cut the cord</li> <li>• If alive, clamp cord with 2 disposable cord clamps and cut with disposable scissors</li> </ul>
Post-partum haemorrhage	<ul style="list-style-type: none"> <li>• Misoprostol, 600 mcg SL/po single dose (but if not received for active management third stage labour)</li> <li>• Start IV fluids (Ringers Lactate)</li> <li>• External uterine massage</li> <li>• Use blue pads on patient's abdomen</li> <li>• Stand at side of patient to avoid exposure to blood and other body fluids</li> </ul>
Intrauterine fetal death in 2 <sup>nd</sup> trimester	13-17 weeks: 200 mcg per vagina (pv) 6 hourly (maximum x 4) 18-26 weeks: 100 mcg pv 6 hourly (maximum x 4)
Induction of labour in 3 <sup>rd</sup> trimester	25 mcg per vagina(pv) 4 hourly (maximum x 6) or 20mcg po 2 hourly (maximum x 12) If intrauterine death (27-43 weeks): 25-50 mcg pv 4 hourly (maximum x 6)
Incomplete abortion/miscarriage	If uterine size ~ ≤ 13 weeks: <ul style="list-style-type: none"> <li>• Misoprostol, 600 mcg po (single dose)</li> </ul> If uterine size ~ >13 weeks: <ul style="list-style-type: none"> <li>• Misoprostol, 400 mcg SL → repeat every 3-4 hours if necessary</li> </ul>

Lassa: Fetal death is reported to occur in 80% of pregnant Lassa fever patients. There are reports of clinical improvement in pregnant women with Lassa fever after the uterus is evacuated.<sup>30</sup> As uterine evacuation in pregnant patients appears to lower maternal mortality, it should be considered in confirmed cases of Lassa given the extremely high maternal and fetal mortality. However, this high-risk procedure must be performed with extreme caution, given potential for nosocomial transmission and the risk for inducing maternal haemorrhage<sup>17</sup>.



### 3.6 Special considerations in breastfeeding women

- Ebola and Marburg viruses have been found in breast milk. During a Marburg outbreak in Angola in 2005 there was a high number of paediatric cases, and breastfeeding may have been a factor in Marburg virus transmission as indicated by the epidemiology and Marburg virus- positive breast-milk specimens<sup>31</sup>.
- Given the potential risk of transmission through breastfeeding, a woman who has been admitted as a suspect Ebola, Marburg, Lassa fever or CCHF patient may have already infected her breastfed infant.
- See section 3.8- Lactating women for advice on when to stop and when to continue breastfeeding, depending on the symptoms and lab results of the mother and infant. An additional consideration in stopping breastfeeding when the mother is Ebola positive is a possible increase in severity of illness in her infant with ongoing exposure to virus in breastmilk.
- A mother who abruptly stops breastfeeding will need help to express her breastmilk to alleviate pain and prevent inflammation. Her breastmilk is a contaminated product and should be treated as per infection control protocols.
- Recently breastfed infants of an Ebola-positive mother should be considered especially high risk.
- Psychosocial support of a mother who is separated from her infant is important.
- There is ongoing discussion and work on the best placement for asymptomatic infants of an Ebola-positive mother—whether isolated in the convalescent ward (where arrangements could be made for some care and RUIF feeding by an ambulatory mother with mild illness in gown, mask and gloves) versus placement in an OICC or other arrangements with precautions for caregivers (see section 5.3).

### 3.7 Special considerations for children

- If the child becomes sick and both the mother and child test positive for Ebola or Marburg disease, then the child can be returned to the mother.
- Less is known about Ebola in newborns and infants and it is possible that they may be infectious before becoming symptomatic, so negative newborns and infants should be handled cautiously even with a negative test. Testing should be repeated. Breastfed neonates are unlikely to avoid infection from a mother testing positive.
- If the child is negative (and it may be prudent to carry out two tests two days apart), he/she can leave pediatric isolation and be followed closely as a high-risk contact; or, the child can be admitted to an onsite single isolation room or nearby OICC for the potential period of incubation, ensuring the child has the ability to receive sufficient support. See section 5.3 on OICC.
- Zinc supplementation has been shown to reduce the duration and severity of diarrhoea, and to prevent subsequent episodes. Zinc supplementation should be provided for children for 10-14 days (20mg, 10mg for infants under 6 months) with diarrhoea<sup>32</sup>.
- Vitamin A reduces all-cause mortality in settings of widespread deficiency and should be provided to all children under 5 (infants 6-11 months 100000 IU, children 12-59 months 200000 IU, on days 1,2 & 8).<sup>33</sup> Presumptive treatment with Vitamin B complex (1 tab Becozyme Forte per day) and vitamin C (ascorbic acid 125-250mg PO TDS) should also be considered<sup>34</sup>. Alternatively multivitamins with additional vitamin A should be provided.
- Vitamin K is routinely used to treat disseminated intravascular coagulation in other settings<sup>35</sup>. Although there is currently a lack of evidence to support its use in VHF, there is a strong theoretical possibility of benefit in children with symptoms of haemorrhage and little potential risk of harm. A 5-day course of oral vitamin K (1mg) (or IV vitamin K when an IV is in place, when oral vitamin K is unavailable or patient is unable to take orals) should be provided to those with haemorrhage.

### 3.8 Nutrition<sup>36, 37, 38</sup>

Ebola can severely affect the nutritional status of infected people, worsening the already impaired immune response to the virus. Symptoms like poor appetite, weakness, nausea, vomiting, sore throat, dysphagia and diarrhoea affect food consumption and/or nutrient absorption. Ebola affects most body systems, especially the hepatic and renal functions, therefore the nutritional support should balance the needs and the body's capacity to tolerate food. Nutritional support adapted to patients' needs and condition should be part of the supportive care provided to all Ebola infected patients in the ETC in order to improve their chances of survival.<sup>39</sup>

Among all the patients attending the ETC, there are two groups that should be specially considered: the maternal orphans on one hand, and the group of lactating women, infants and young children on the other. Given the fact that Ebola virus is found in various body fluids, breast milk included, and that wet nursing should be avoided, the following is recommended:

#### A) Maternal orphans

- Infants <6 months should be supported with Ready to Use Infant Formula (RUIF) and the amounts and frequency should be adapted to the age.
- Infants and young children 6-23 months should be supported with Ultra High Temperature (UHT) milk and complementary feeding adapted to the age.
- Infants <6 months discharged from ETC should be supported with adequate amounts of RUIF until they reach 6 months. Their caretakers should be provided with nutrition education especially on safe use of RUIF and complementary feeding.
- A home visit 4 weeks after discharge will be scheduled to assess infant's outcome if the evolution of the outbreak allows it.
- Child Protection team should be informed on any case of orphans to ensure adequate link to the Welfare and Social Department.

## B) Lactating Women and Infants and Young Children

- Where both lactating women and the infant or young child are positive or suspected, breastfeeding should continue. If the mother is too weak to breastfeed, RUIF should be provided to infants <6 months and UHT milk and complementary feeding to children 6-23 months.
- Lactating women and their infant or young child considered 'contact cases' should continue breastfeeding if both are asymptomatic.
- Lactating women positive for Ebola or awaiting blood test results (suspected case) should suspend breastfeeding if their infant or young child is negative for Ebola or non-suspected (asymptomatic).
- Where breastfeeding has been suspended, infants <6 months should be fed with RUIF, while infants and children 6-23 months should receive Ultra-High Temperature (UHT) milk and complementary feeding in the ETC.
- Lactating women and their infant or young child who are discharged cured from the ETC should be recommended to continue breastfeeding.
- Lactating women discharged cured having an infant or young children negative for Ebola or non-suspected (asymptomatic) should be recommended to wait 8 weeks before resuming breastfeeding when it is not possible to determine before the clearance of Ebola from her milk (two negatives milk tests).

## Nutrition in ETC

### 1. Patients flow

Triage and suspect areas:

- Infants <6 months should receive nutritional support (50ml every 3h) if the recommendation is to suspend breastfeeding (see section A and B).
- Lactating women should be advised to suspend breastfeeding upon arrival if their infant or young child is non-suspected (asymptomatic) or negative for Ebola.

Treatment area:

- All admitted patients should receive nutritional support adapted to their age and condition, following the nutrition protocol specified below.

## 2. Nutritional support throughout the treatment

In Sierra Leone, nutrition practices are rarely optimal. Traditional food is often low in proteins and micronutrients. Providing large amounts of food and nutrients to patients that are not used to it or are very sick, could hamper recovery by overloading the already impaired body systems, most specifically the liver. In the absence of laboratory tests to quantify enzymes like amylase and with clinical signs of pancreatitis it is advisable to discontinue all foods rich in fat <sup>40</sup>.

### Feeding during the supportive treatment of patients with Ebola

- Type of nutritional support for patients will depend on tolerance of food by mouth. Patients who can't eat, should be only hydrated with ORS until the clinician advises differently.
- Nutritional support should balance an individual's needs and their tolerance to food.
- Providing a tolerable amount of nutrients, especially to most severe cases, will reduce the risk of developing re-feeding syndrome<sup>41</sup>.

### Tolerance test (see Appendix G)

- To be carried out upon admission in all patients who can eat.
- Clinically stable patients will have tolerance assessed (vomiting/diarrhoea/swallowing).
- Patients who do not tolerate food should be retested on a regular basis until they qualify for the nutrition protocol.

### Nutrition protocol adapted to the age ( see Appendix G)

- WHO recommendations on energy and protein<sup>42, 43</sup> have been adapted to design a protocol that intends to provide a sufficient amount of nutrients to allow recovery without inducing additional metabolic stress.
- Amounts are meant to take into consideration the expected capacity of the body to digest nutrients.
- Patients who are stable and capable of eating more can have amounts of food increased up to 100 extra kcal per day.
- Patients who cannot finish the recommended ration should reduce the amount of cooked food<sup>44</sup> as it is less nutrient-energy dense than RUTF (children >23 months and adults).



## 4. Manage severe confirmed or suspected cases of Ebola with emergency signs (also Lassa fever, Marburg, or CCHF)

Emergency signs from the Quick Check<sup>4</sup> are feasible in the ETC:

### Airway and breathing

- Appears obstructed
- Central cyanosis
- Severe respiratory distress

### Circulation:

- Weak or fast pulse
- Capillary refill more than 3 seconds
- Heavy bleeding – any site

### Altered level consciousness/convulsing

## 4.0 Monitoring the severely ill patient

It is important to regularly:

- reassess for emergency clinical signs and use the Ebola-simplified Quick Check or another triage/severity score
- monitor input and output (when possible) and record at the bedside. When impractical to document separately (in several buckets), the total volume of urine, vomit, and stool collected in a bedside bucket may be qualitatively or quantitatively estimated based on volume measures marked on the outside of the bucket. Train staff to measure waste volumes before discarding if feasible - record on white board (see Appendix F).
- if not able to quantify urine output, attempt to document the frequency per shift.
- document clinical data daily on a patient monitoring form.
- Update white board or other system inside / outside the ward after each shift (see Appendix E).

Priority lab testing for ill patients should be made available:

- Electrolytes, especially potassium; glucose
- Creatinine
- Lactate
- Haemoglobin or hematocrit
- Platelet count
- INR and PTT (if available)

#### • 4.1 Shock in VHF patients

General signs of shock (poor perfusion)

- Fast weak pulse
- Pallor or cold extremities
- Decreased capillary refill
- Dizziness or inability to stand
- Decreased urine output (<30 ml/hour)
- Difficulty breathing
- Impaired consciousness, lethargy, agitation, confusion.
- Low BP (SBP <90)

*Note: Assessment of pulse and BP should be taken in the context of the patient's pre-morbid state, pregnancy, age, and medication. Some pregnant women, patients with chronic illness, and others may normally have a SBP <90 mmHg and have normal mental status, capillary refill, and urine output; they do not have shock.*

VHF patients can be in shock from hypovolemia from GI loss (most common), haemorrhage, disseminated intravascular coagulation (DIC) or from septic shock or a combination of these.

- The pathophysiology and the intensive supportive care for VHF are the same for septic shock from a bacterial infection, malaria and other causes of septic shock<sup>45, 46</sup>. Intensive supportive care is the only clinical management that can be provided to these patients and may have a positive impact on disease outcome.
- VHF patients may also have co-infection with bacteria or malaria that can contribute to septic shock.



<b>Shock observed in Ebola patients in West Africa outbreak 2014</b>	
*** Large GI loss with dehydration: <b>HYPOVOLEMIC SHOCK</b>	Follow fluid resuscitation and electrolyte replacement guidelines, section 4.2
Shock not explained by large GI loss or hemorrhage: <b>SEPTIC SHOCK</b>	Follow septic shock guidelines, section 4.3
<b>HEMORRHAGIC SHOCK</b>	Replace blood- often not feasible

Call for help from the most experienced clinician available when an Ebola patient develops shock.

## **4.2 Manage hypovolemia from large GI loss**

Most patients with Ebola develop vomiting and diarrhea; some develop a severe gastrointestinal illness with large volume GI loss. Loss of fluids and electrolytes can lead to rapid and profound dehydration, low serum potassium levels, and acidosis. If not corrected, these abnormalities can lead to death from hypovolemic shock and metabolic abnormalities.

### **4.2.1 Assess for shock, for signs of dehydration, and monitor volume of GI loss.**

#### **Assess for shock in adults (see 4.1)**

#### **Assess for signs of dehydration:**

- Is the patient lethargic?
- Is the patient not drinking, drinking poorly, or drinking eagerly?
- Does the patient have sunken eyes?
- Does a skin pinch go back very slowly (more than 2 seconds)?  
Pinch the inner skin of the forearm for 1 second, then release.
- Look at stool or vomit containers. Has there been a large volume of GI losses?

## Classify and treat dehydration- modified for Ebola

Signs	Classify as	Treatments
Two of the following signs: <ul style="list-style-type: none"> <li>● Lethargic or unconscious</li> <li>● Sunken eyes</li> <li>● Not able to drink or is drinking poorly</li> <li>● Skin pinch goes back very slowly</li> </ul>	<b>SEVERE DEHYDRATION</b>	IV fluid resuscitation, while continuing ORS.
Two of the following signs: <ul style="list-style-type: none"> <li>● Sunken eyes</li> <li>● Drinks eagerly, thirsty</li> <li>● Skin pinch goes back slowly</li> </ul>	<b>SOME DEHYDRATION*</b>	Start IV fluids while continuing ORS. Continue feeding the patients.
Not enough signs to classify as severe or some dehydration	<b>NO DEHYDRATION</b>	Give ORS and food.

\*The experience with most diarrhoeal disease in adults, both cholera and other pathogens, suggests that most adults who develop some signs of dehydration will be thirsty and drink eagerly, and can be managed with oral rehydration solution. The weakness and lethargy that often accompanies Ebola and the limitations in time for patient care within the ETU, suggests that patients with signs of some dehydration, with lethargy or weakness accompanying diarrhoea; or with significant vomiting, be immediately started on active intravenous fluid resuscitation, while also offering ORS.

## 4.2.2 Fluid resuscitation with large GI losses

When there is large GI loss from diarrhea and vomiting, it is important to administer IV fluids aggressively to keep up with losses. Do not wait for signs of dehydration to begin or increase IV fluids. Patients can deteriorate rapidly and often have poor oral intake.

- IV fluid of choice: Ringer's lactate
- Place IV catheter (aim for 18G or larger) – place in largest available peripheral vein; avoid antecubital fossa (elbow crease) if another site available due to frequent interruption of flow with bending of elbow.

### Fluid bolus:

Adults => Give 1 liter IV over 30 min or faster.

- Reassess as soon as the liter has run in. Look for signs dehydration and shock.
- If following initial fluid bolus signs of shock persist repeat crystalloid bolus.

Appropriate fluid administration should be accompanied by close observation of the patient for signs of response to treatment and fluid overload with frequent reassessment, but it should proceed until hydration target are reached\*, fluid overload is observed. Check the respiratory rate before and after each bolus. Use a pulse oximeter if possible to check heart rate and oxygen saturation. If failure to improve the addition of vasopressors, if feasible, should be strongly consider.

Check every 8 hours whether the IV infusion is needed. When the patient no longer shows signs of shock (e.g. blood pressure normal, has adequate urine production, has cleared elevated lactate), fluid administration may be reduced to maintenance levels, if it is feasible to administer continuous fluid. If ambulating and taking oral fluids well, stop the IV infusion.

**\*Hydration Targets in adults:**

- HR < 100
- Urine output > 30ml/hour
- SPB > 90
- Other markers of perfusion that compliment BP also include
- Capillary refill <3 sec
- Absence of skin mottling; easily palpable peripheral pulses; warm dry extremities; improved mental status.

Stop earlier if no signs of volume responsiveness or if signs of volume overload develop such as elevated JVP, increased respiratory rate or decreased oxygen saturation (if pulse oximetry available).

Follow this with either maintenance rate plus replace volume of GI loss or twice the maintenance rate, while reassessing for hydration targets at least once per shift\* if it is feasible to administer continuous fluid.

Maintenance rate calculation: 4mL/kg for the first 10kg, plus 2mL/kg for the next 10kg, plus 1mL/kg for each additional kg.

**Possible solutions to address challenges of administering adequate fluids within the ETU:**

1. Dedicated trips through ward to replenish IV bags
2. Use one liter bags of Ringers lactate or Normal saline
3. Hang 2 bags simultaneously using a “Y” connection.

To avoid haemorrhage from patient pulling out the IV line when unattended at night, cap off or use 1-way valve (e.g. Clave®) on IV catheter when the team leaves, and wrap the arm with gauze dressing.

In addition to fluids, in all cases of diarrhoea, it is important to continue eating and to continue to offer ORS, even when the patient is on IV fluids.

### 4.2.3 Electrolyte and glucose abnormalities

Electrolyte abnormalities (from GI losses) can be serious and may be the proximate cause of death (arrhythmia, cardiac arrest, seizure) in some patients. To avoid serious electrolyte abnormalities:

- Where possible, use point of care testing for electrolytes and correct abnormalities. If hypokalemia is documented, add 30 meq KCL to each litre of IV fluids.
- If electrolyte and creatinine measurement are not possible, empirically add 10 meq KCl to each litre of IV fluids when there is large vomiting and diarrhoeal loss.
- Give oral rehydration salts rather than plain water.
- Give oral potassium supplements (40 meq/day), in addition to IV supplementation for patients who can tolerate oral intake.
  - \* Note that Ringer's lactate has only a small amount of potassium- 4 meq per litre
  - \* ORS contains 20 mEq/L of potassium. Patients can continue sipping ORS while receiving supplemental IV fluids. Additional drinks and foods may be good sources of potassium (e.g., jelly water/coconut contains 54 mEq/L and bananas (approximately 10mEq/banana)
- Effective correction of hypokalemia is assisted by concomitant correction of hypomagnesemia, also common with Ebola. Oral magnesium supplementation may exacerbate diarrhea; instead intravenous magnesium (2-4 g/IV over 1 hour) may facilitate correction of hypokalemia.

#### Potassium replacement therapy

Potassium level	Dosing
4.0 or more	None
3.6-4.0	None
3.3-3.5	40 mEq PO daily
2.9-3.2	60-80 mEq PO daily
2.7-2.8	60 mEq PO three times a day
2.4 -2.6	80 mEq PO every eight hours
< 2.4	10 mEq/hr IV and 80 mEq PO every six to eight hours

**Although not commonly seen among adult patients, hypoglycemia** may accompany dehydration and may result in seizures, coma, and death. Small children and elderly or severely malnourished patients are especially at risk.

- When suspected, check glucose with bedside glucometer. Replete as needed.
- Ampoules of D50 can be added to bags of Lactated Ringers or NS to provide some glucose.
- If measurement is not possible, give glucose empirically if the patient develops lethargy, seizure, or coma. See section 3.2

#### 4.2.4 Antibiotics

Consider empirical therapy with a third or fourth generation cephalosporin (e.g. ceftriaxone) for patients with significant abdominal symptoms with risk of secondary bacterial infections/possible gut translocation and in those patients with suspected sepsis.

If worsening GI complaints and/or bloody diarrhea in patients without confirmed Ebola, consider adding metronidazole for empiric treatment of amoebic, enteric anaerobic and *C. difficile* infection.

Discontinue antibiotics after 5 days if symptoms improve or without other indication to continue.

## 4.3 Manage septic shock in adolescents and adults

Distinguishing different forms of shock in patients with Ebola in ETCs is challenging. Although hypovolemic shock may be the most common aetiology, pathophysiology of septic shock may co-exist due to Ebola virus, or co-exist because of a secondary infection. The below summarizes an evidence-informed approach to the management of septic shock. Certain diagnostic (radiographs, cultures) and therapeutic (hourly follow-up, oxygen, vasopressors) aspects may not be achievable in ETCs.

### CLINICAL DIAGNOSIS of severe sepsis or septic shock:

- Suspected infection **plus**
- Hypotension (systolic blood pressure < 90 mmHg) **plus**
- One or more of the following:
- Pulse > 100 per minute
- Respiratory rate > 24 breaths per minute
- Abnormal temperature (< 36° C or > 38° C).

Use the flowchart on the following pages for specific guidance on the management of septic shock. It is arranged by hours, starting from patient arrival or time septic shock is diagnosed and uses a systematic approach for the recognition of problems, giving oxygen and fluids, and how to monitor, record, and respond to findings.

#### General principles of managing patients with septic shock

- Manage airway (see Quick Check).
- Give oxygen if available (see Quick Check).
- Give IV fluid rapidly (see specific fluid recommendations which follow).
- Treat underlying cause.
- Consider vasopressors if available for SBP < 90 and signs of inadequate perfusion after fluid resuscitation
- Monitor – record – respond.

These basic recommendations provide guidance on intensive supportive care for patients with shock of most aetiologies, including VHF. Below is more detailed information about these basic interventions.

### Give fluids rapidly

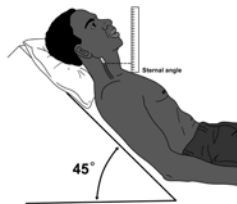
- First give an initial 1000 ml Ringer's lactate (LR) or Normal saline (NS) bolus for adults, continue LR or NS at 20 ml/kg/hour, not to exceed a maximum of 60 ml/kg in the first 2 hours (including the initial bolus).
- Monitor systolic blood pressure (SBP) and clinical signs of perfusion (e.g. urine output, mental status).
- If SBP remains <90 and signs of poor perfusion, continue fluid resuscitation over the first 2 hours.
  - Vasopressors (dopamine, norepinephrine or epinephrine) would usually be considered but are not feasible in most ETCs.
  - To avoid fluid overload, give smaller boluses- see table on page 58.
- At 2–6 hours, if SBP rises above 90, continue fluids at 2 ml/kg/hour – this will usually have to be calculated and administered as a volume to give every 3 or 4 hours on ward rounds (see table p. 58). However, if the pulse is still high and there are other signs of poor perfusion, patient may still be volume-depleted and need more fluids.
- Watch carefully for signs of fluid overload (increased jugular venous pressure, increasing crepitations on auscultation). If present, decrease the rate of fluid administration.

### Give empirical IV antimicrobials within the first hour.

- Antibiotics: Urgently administer broad- spectrum antibiotics by IV. Take blood cultures before antibiotics, but do not delay treatment to get blood cultures.
  - Choice of antibiotics depends on presence of signs of local infection, local disease patterns, and availability of antibiotics. A good choice is ceftriaxone 2 grams daily IV.
    - If community-acquired pneumonia is suspected, refer to your national or institutional guidelines. Common choices ceftriaxone (2 gram daily IV); or ampicillin 2 grams every 6 hours plus gentamicin 1.5 mg/kg IV every 8 hours, or plus ciprofloxacin 400 mg IV every 12 hours.

**Antimalarials:** Do bedside RDT for malaria and if positive start artesunate IV, or if not available, IV quinine (see Appendix C for antimalarial doses)

**Antivirals:** Consider ribavirin in confirmed cases of Lassa fever and CCHF only.





# Management of septic shock in adults and adolescents

## Manage Septic Shock: First 2 hours

## 2-6 hours

Recognize	<p><b>Clinical diagnosis of severe sepsis or septic shock</b></p> <ul style="list-style-type: none"> <li>▶ Suspected infection.</li> <li>▶ Hypotension (systolic blood pressure &lt;90 mmHg) and 1 or more of the following.</li> <li>▶ Pulse &gt;100 beats per minute (bpm).</li> <li>▶ Respiratory rate &gt;24.</li> <li>▶ Abnormal temperature (&lt;36°C or &gt;38°C).</li> </ul>	<p>Reconsider other causes of shock if no change in SBP following fluid boluses.</p> <p>Consider internal haemorrhage.</p> <p>Establish any additional source of infection.</p>
Fix the physiology/ stabilize the patient	<p><b>Oxygen:</b> titrate to SpO<sub>2</sub> 90, where oxygen available</p> <p><b>Fluids:</b> After initial bolus of 1000 ml, continue rapid fluids LR or NS at 20 ml/kg/hour, up to 60 ml/kg within the first 2 hours (see table or page 58) (see table which follows for fluid volumes by weight)</p>	<p><b>Oxygen:</b> Titrate to SpO<sub>2</sub> 90, where oxygen available</p> <p><b>Fluids:</b> If SBP &gt;90, continue fluids at 2 ml/kg/hour (see p.58). If SBP &lt;90 at 2 hours or later, start vasopressors if available and continue fluids at 5–10 ml/kg/hour (see p. 58). Only give vasopressor if trained and feasible to continuously monitor.. If vasopressors not available or feasible, continue giving 500 ml boluses every 30 minutes with close monitoring</p>
Treat Infection	<p><b>Urgent empirical antimicrobials</b></p> <ul style="list-style-type: none"> <li>▶ Antibiotics.</li> <li>▶ Antimalarials (if RDT bedside malaria test positive).</li> <li>▶ Antivirals – consider ribavirin in confirmed Lassa fever or CCHF.</li> </ul> <p><b>Identify any additional source of infection</b></p> <ul style="list-style-type: none"> <li>▶ Use signs or symptoms to consider source.</li> <li>▶ Chest X-ray if portable machine available.</li> <li>▶ If considering TB, Chest X-ray or GeneXpert could assist diagnosis if available and not able to do AFB smear of sputum in the laboratory</li> <li>▶ Chest X-ray, Gram-stain sputum.</li> </ul>	<p>Treat any additional source of infection.</p> <p>Review results of investigations.</p>
Monitor, Record	<p><b>Every 30 minutes until stable; then every 1 hour</b></p> <ul style="list-style-type: none"> <li>▶ SBP, pulse.</li> <li>▶ Respiratory rate.</li> <li>▶ SpO<sub>2</sub>.</li> <li>▶ Mental status (AVPU)</li> <li>▶ JVP, auscultate for crepitations.</li> <li>▶ Check results of emergency laboratory</li> <li>▶ If haemoglobin &lt;7 mg/dl (Hct &lt;20), consider transfusion with fresh whole blood [reference anaemia section]. If glucose &lt;3 mmol/l (54 mg/dl), then give 50% dextrose 25–50 ml.</li> </ul>	<p><b>Every 30 minutes until stable; then every 1 hour</b></p> <ul style="list-style-type: none"> <li>▶ SBP, pulse.</li> <li>▶ Respiratory rate.</li> <li>▶ SpO<sub>2</sub></li> <li>▶ Mental status (AVPU).</li> <li>▶ JVP, auscultate for crackles (rales).</li> <li>▶ Urine output.</li> </ul>
Respond	<p><b>If respiratory function declining (increasing RR, falling SpO<sub>2</sub>)</b></p> <ul style="list-style-type: none"> <li>▶ Check oxygen supply and fix.</li> <li>▶ If wheezing, give salbutamol.</li> <li>▶ If JVP elevated, increasing crepitations- consider fluid overload</li> <li>▶ If suspect fluid overload, slow rate of fluid administration [and start vasopressors if still in shock, if available].</li> <li>▶ If visible secretions and suction is available suction- realizing this may produce an aerosol requiring additional respiratory protection (N95 or equivalent mask)</li> </ul>	<p><b>If respiratory function declining (increasing RR, falling SpO<sub>2</sub>)</b></p> <ul style="list-style-type: none"> <li>▶ Check oxygen supply and increase flow rate if possible</li> <li>▶ If elevated JVP and increasing crackles, consider fluid overload</li> <li>▶ If wheezing, give salbutamol.</li> <li>▶ Check that antimicrobials have been given.</li> <li>▶ Treat other diagnoses or infections; see above.</li> <li>▶ If signs of fluid overload, SBP &gt;100, and shock resolved, stop IV fluids, give furosemide 20 mg IV, and raise head of bed.</li> </ul>

## Manage Septic Shock: 6-24

## Post-resuscitation

	hours	
Recognize	<p>If no change in SBP following fluid boluses -</p> <ul style="list-style-type: none"> <li>▶ Reconsider the possible diagnoses.</li> <li>▶ Establish source of any additional infection. Could there be a surgical cause that would benefit from drainage?</li> <li>▶ Get a second opinion.</li> </ul>	<p>Perform full reassessment.</p> <p>Review available diagnostic data and treat underlying diagnosis.</p> <p>Evidence of a <u>primary</u> cardiac or pulmonary process? Add its specific management.</p>
Fix the physiology/ stabilize the patient	<p><b>Oxygen:</b> Titrate to SpO<sub>2</sub> 90.</p> <p><b>Fluids:</b></p> <ul style="list-style-type: none"> <li>▶ When SBP &gt;90, continue fluids at 2 ml/kg/hour.</li> <li>▶ If on vasopressors, reduce rate.</li> <li>▶ If SBP &lt;90, continue or increase vasopressors and continue LR or NS at 2 ml/kg/hour.</li> </ul> <p>See table page 58 for fluid volumes by estimated patient weight.</p>	<p><b>Oxygen:</b> Titrate to SpO<sub>2</sub> &gt;90 and discontinue when 90 on room air.</p> <p><b>Fluids:</b> Reduce to maintenance maximum 2 ml/kg/hour and switch to oral when patient is able to take.</p>
Treat Infection	<p><u>Continue empirical antimicrobials – next dose</u></p> <ul style="list-style-type: none"> <li>▶ Antibiotics.</li> <li>▶ Antimalarials (if malaria test positive).</li> <li>▶ Ribavirin, if confirmed Lassa fever or CCHF.</li> </ul>	<p><u>Continue antimicrobials – switch to oral dose</u></p> <ul style="list-style-type: none"> <li>▶ Antibiotics.</li> <li>▶ Antimalarials (give IV antimalarials for at least 24 hours total before switching to oral).</li> <li>▶ Ribavirin, if confirmed Lassa fever or CCHF.</li> </ul>
Nutrition	<p>Add dextrose 50% 25-50 ml every 6 hour to the IV bag.</p>	<p>Procedures to follow once the patient has stabilized, or after 1–2 days:</p> <ul style="list-style-type: none"> <li>▶ Due to risk of aspiration, do not give food orally if patient cannot safely swallow, (due to, e.g. altered mental status, severe shortness of breath, or severely ill with ongoing vomiting).</li> <li>▶ All other patients should be provided with food. Most patients lose their appetite when ill and may find soft foods and fluids easier to tolerate. Small frequent meals often are tolerated better.</li> <li>▶ Consider NG feeding using semisolid (porridge or mashed foods) foods if the patient cannot swallow safely and is not severely ill.</li> <li>▶ Give a small amount initially (e.g. 20–40 ml/hour) and monitor NG aspirates to check for absorption.</li> <li>▶ Increase rate of feeding as tolerated.</li> </ul>
Monitor, Record	<p><u>Every hour if SBP &lt;90 or on vasopressors; otherwise every 2 hours</u></p> <ul style="list-style-type: none"> <li>▶ SBP, pulse.</li> <li>▶ Respiratory rate.</li> <li>▶ SpO<sub>2</sub>.</li> <li>▶ Mental status (AVPU).</li> <li>▶ JVP, auscultate for crackles (rales).</li> </ul> <p><u>Every 6 hours:</u></p> <ul style="list-style-type: none"> <li>▶ Urine output.</li> </ul> <p><u>Every 12 hours:</u></p> <ul style="list-style-type: none"> <li>▶ Repeat glucose and Hb if initial value abnormal.</li> </ul>	<p><u>Every 8 hours (check SBP hourly if weaning off vasopressors); then daily</u></p> <ul style="list-style-type: none"> <li>▶ SBP, pulse</li> <li>▶ Respiratory rate</li> <li>▶ SpO<sub>2</sub></li> <li>▶ Mental status (AVPU)</li> </ul> <p>Respond to changes as indicated earlier.</p>
Respond	<p>Respond to changes as indicated for 2–6 hours on previous page.</p>	<p>Respond to changes as indicated earlier.</p>

Weight-based fluid for septic shock			
Target volume	Small sized patient/ adolescent (30kg)	Medium sized patient (50kg)	Large sized patient (≥70kg)
Initial bolus 20ml/kg	500ml	1000ml	1500ml
Fluid target between 1-2 hours (20-40 ml/kg)	500-1000ml	1000-2000ml	1500-3000ml
Repeat boluses if SBP remains <90 and no vasopressors – every 30 minutes with close monitoring of hydration targets and for signs of fluid overload	250 ml	500 ml	750 ml
Maintenance fluids once SBP > 90 (2 ml/kg/hour) and urine output	60ml/hr = 240 ml over 4 hours	100ml/hr = 400 ml over 4 hours	140ml/hr = 760 ml over 4 hr

In addition to repeated measurement of SBP, pulse, respiratory rate and pulse oximetry, regular clinical examination is important for patients in shock. Pay particular attention to the signs of poor perfusion and signs of fluid overload to help guide on-going management. Use the severely ill patient monitoring form (Appendix D).

- Signs of poor perfusion:
  - decreased urine output
  - altered mental status
- Signs of fluid overload:
  - worsening crepitations on auscultation
  - dyspnoea
  - elevated JVP
  - peripheral oedema

## 4.4 Manage hypovolemia from large GI loss in children

Early IV access is important as children can deteriorate rapidly and IV access can be difficult. There should be a maximum of 2 attempts at IV cannulation in shocked paediatric patients; and, if intraosseous access and staff with adequate training are available this can be attempted. Intraosseous access, preferably with a powered device such as an EZ-IO<sup>®</sup>, is quick, safe and much easier in peripherally 'shut down' children. Extreme caution is advised in manual intraosseous access (e.g. with a Cook<sup>®</sup> needle) as there is a risk of needle stick injury.

Note, if there is large prior haemorrhage, severe shock and high near-term risk of death, consideration should be given as to whether attempting IV or IO access is appropriate, or whether palliative and comfort care is more appropriate. The IO should be replaced as soon as possible with an IV line.

### **Fluid bolus:**

If shock or signs of severe dehydration:

Place IV catheter (18G) – place in largest available peripheral vein. If there has been previous bleeding, a smaller catheter should be used to avoid haemorrhage from large puncture sites. Intraosseous access, preferably with a powered device, should be considered early if available along with skilled staff. Owing to risk of contamination, the same powered device should be used only in confirmed Ebola patients.

Avoid rapid fluid boluses. Give fluid therapy (especially in infants and neonates) more cautiously - one trial found that repeated 20 ml/kg boluses can increase mortality, but this trial excluded patients with gastroenteritis.<sup>47</sup>

If signs of severe dehydration, follow fluid plan C: 100 ml/kg in first 3 hours  
Give 100 ml/kg Ringer's lactate solution (or 0.9% saline with 5% dextrose if available, or Ringers lactate with 5% dextrose, or 0.9% saline in order of decreasing preference. Infants <1 week should receive either 0.9% saline or Ringers lactate with 10% dextrose), divided as follows:

Age	First give 30 ml/kg over:	Then give 70 ml/kg over:
Infants (under 12 months)	1 hour*	5 hours*

See fluid management charts on page 51 to 52.

### Hydration targets:

Capillary refill < 2 seconds, normal pulse, and warm extremities

Normal systolic blood pressure for age

Urine output > 1 mL/kg/hour

## 4.5 Manage septic shock in children (not shock due to large GI fluid loss)

Use standard precautions (see section 7). Signs of shock in children:

- Cold hands **plus**
- Weak or absent pulse **and either**
- Capillary refill time > 3 seconds **OR**
- AVPU less than Alert

Children in shock who require bolus fluid resuscitation are often lethargic and have cold skin, prolonged capillary refill, fast weak pulse and hypotension.

1. *Check whether the child's hand is cold.* If so, determine whether the child is in shock.
2. *Check whether the capillary refill time is longer than 3 seconds.* Apply pressure to whiten the nail of the thumb or the big toe for 5 seconds. Determine the time from the moment of release until total recovery of the pink colour.
3. *If capillary refill is longer than 3 seconds, check the pulse. Is it weak and fast? If the radial pulse is strong and not obviously fast, the child is not in shock. If you cannot feel the radial pulse of an infant (< 1 year old), feel the brachial pulse or, if the infant is lying down, the femoral pulse. If you cannot feel the radial pulse of a child, feel the carotid. (See the Emergency Triage Assessment and Triage guidelines<sup>5</sup>).*

Normal pulse rate, SBP, RR in children*			
Age (years)	Pulse rate (range)	Systolic BP	Respiratory rate
0-1	100-160	>60	0-3 mo: 35-55 3-6 mo: 30-45 6-12 mo: 25-40
1-3	90-150	>70	20-30
3-6	80-140	>75	20-25

*\*Note: Normal pulse rates are 10% slower in sleeping children. In infants and children, the presence or absence of a strong central pulse is often a more useful guide to the presence or absence of shock than a blood pressure reading.*

### **General principles of managing children with septic shock**

- Manage airway (see ETAT).
- Give oxygen through nasal prongs or catheter- start at 1-2 litres/min to aim for oxygen saturation  $\geq 90\%$ , where oxygen available.
- Give IV fluid – initial 20 ml/kg LR or NS bolus. See charts below.
- Treat underlying cause:
  - Administer empirical broad spectrum antibiotics (e.g. ceftriaxone 80 mg/kg once daily (max 2 g)
  - Antimalarials: Bedside RDT for malaria and if positive, start IV artesunate- (see Appendix C for dosing)
  - Antivirals: Consider ribavirin in confirmed Lassa fever or CCHF
- Consider vasopressors, where available, if failure of fluids and blood to raise SBP and if signs of inadequate perfusion persist. Note: the health worker must have been trained to use vasopressors
- Monitor – record – respond.

### **Initial intravenous fluid resuscitation for children with shock (and no severe malnutrition)<sup>2</sup>**

- Check that the child is not severely malnourished, as the fluid volume and rate are different (see below). Children with a mid-upper arm circumference (MUAC) of  $< 115\text{mm}$  should be classified as severely malnourished.
- Insert an IV line (and draw blood for emergency laboratory investigations).
- Attach Ringer's lactate or normal saline; make sure the infusion is running well.

### Urgent Fluid management – Child WITHOUT severe malnutrition<sup>27\*</sup>

Weight kg	Shock, 20 ml/kg Ringer's or Saline over an hour	Plan C – Step 2				Plan B - 75 ml/kg
		30 ml/kg Ringer's	70 ml/kg Ringer's or nasogastric ORS			Oral /nasogastric ORS
		Age <12 m, 1 hour Age ≥1 yr, ½ hour Volume	Age <12m, over 5 hours =drops/min**	Volume	Age ≥1yr, over 2 ½ hrs =drops/min**	Over 4 hours
2	40	50	10	150	** Assumes adult IV giving sets where 20 drops=1ml	150
2.5	50	75	13	200		150
3	60	100	13	200		200
4	80	100	20	300		300
5	100	150	27	400	55	350
6	120	150	27	400	55	450
7	140	200	33	500	66	500
8	160	250	33	500	66	600
9	180	250	40	600	80	650
10	200	300	50	700	100	750
11	220	300	55	800	110	800
12	240	350	55	800	110	900
13	260	400	60	900	120	950
14	280	400	66	1000	135	1000
15	300	450	66	1000	135	1100
16	320	500	75	1100	150	1200
17	340	500	80	1200	160	1300
18	360	550	80	1200	160	1300
19	380	550	90	1300	180	1400
20	400	600	95	1400	190	1500

- Infuse 20 ml/kg over 1 hour



<b>Reassess the child after the appropriate volume has been infused.</b>	
Reassess after first infusion	<ul style="list-style-type: none"> <li>• Can repeat second bolus in second hour. If no response, give blood.</li> <li>• If whole blood, give 20 ml/kg over 2 to 4 hours.</li> </ul>
Reassess after second infusion	If still low BP, consider vasopressors.

## Emergency Fluid management in Severe Malnutrition<sup>48</sup>

As a rapid screening tool for severe malnutrition, mid-upper arm circumference (MUAC) <115mm should be used as a diagnostic criteria.

### Shock:

Cold hands plus absent, slow (<60 bpm) or weak pulse and either capillary refill >3 seconds or reduced consciousness.

- Give 15 ml/kg in 1 hour of Half Strength Darrows (HSD) in 5% dextrose or Ringers lactate. If HSD in 5% Dextrose not available it can be made by adding 50 ml 50% dextrose to 450 ml HSD (withdraw 50 ml from 500 ml bag first then add 50 ml of 50% dextrose).

Urgent Fluid management – Child WITH severe malnutrition				
	Shock		Oral / ngt Resomal	Emergency Maintenance
	15 ml/kg		10 ml/kg/hr	4 ml/kg/hr
	Half-Strength Darrows in 5% Dextrose		Resomal	HSD in 5% Dextrose
	iv		Oral / ngt	iv
Weight kg	Shock= over 1 hour Volume (ml)	Drops/min if 20 drops/ml giving set	10 ml/kg/hr for up to 10 hours Volume (ml)	Hourly until transfusion Volume (ml)
4	60	20	40	15
5	75	25	50	20
6	90	30	60	25
7	105	35	70	30
8	120	40	80	30
9	135	45	90	35
10	150	50	100	40
11	165	55	110	44
12	180	60	120	46
13	200	65	130	48
14	220	70	140	50
15	240	80	150	52

### If child improves:

- Repeat this bolus over another 1 hour.
- Then switch to oral or ng fluids using ReSoMal at 10 ml/kg/hour for up to 10 hours.
- As soon as conscious introduce F-75 & appropriately reduce amount of ReSoMal given.

### If child does not improve:

- Give maintenance IV fluids at 4 ml/kg/hr.
- Transfuse 10 ml /kg whole blood over 3 hours as soon as it is available. If blood unavailable, continue fluid resuscitation.
- Introduce F-75 after transfusion complete.

### Follow fluid guidelines strictly to avoid fluid overload.

#### Watch carefully for signs of fluid overload in children

Fluid overload is an important complication of treatment for shock. It can develop due to:

- Excess or too rapid IV fluids
- Incorrect use of hypotonic rather than isotonic crystalloid solutions
- Continuation of IV fluids for too long (once plasma leakage has resolved)
- Use of large volumes of IV fluid in children with severe capillary leakage

#### Early signs:

- Fast breathing
- Chest indrawing
- Large pleural effusions
- Ascites
- Peri-orbital or soft tissue oedema

#### Late signs:

- Pulmonary oedema
- Cyanosis
- Irreversible shock (often a combination of ongoing hypovolaemia and cardiac failure)

## The management of fluid overload varies depending on whether the child is in or out of shock

- ▶ Children who remain in shock and show signs of severe fluid overload are extremely difficult to manage and have a high mortality.
- ▶ Avoid diuretics, as they will cause further intravascular fluid depletion
- ▶ If shock has resolved but the child has fast breathing and large effusions, consult with pediatric expert to consider giving oral or IV furosemide 1mg/kg once or twice a day for 24 hours (and oxygen therapy). Aspiration of pleural fluid can be considered but with a risk of bleeding and pneumothorax, both difficult to manage complications in an ETC.

If shock has resolved and the child is stable, stop IV fluids and keep the child on bed rest for 24-48 hours. The excess fluid will be re- absorbed and lost through urinary diuresis.



## 5. Clinician's role in contact tracing and management of exposed individuals (contacts)

### 5.1 Clinician's role in contact tracing

When screening patients who present to an Ebola Treatment Unit, Holding Center or CCC for admission, it is essential that the clinician admitting the patient or a surveillance officer also fills out the contact tracing form and that these are forwarded to the surveillance system.

### 5.2 Management of exposed health workers

Individuals including health workers with percutaneous or mucocutaneous exposure to blood, body fluids, secretions, or excretions from a patient with suspected VHF should immediately wash the affected skin surfaces with soap and water. Mucous membranes (e.g. conjunctiva) should be irrigated with copious amounts of water or eyewash solution.

Exposed persons should be medically evaluated and receive follow-up care, including fever monitoring, twice daily for 21 days after exposure. In case of temperature above 38.3°C (101°F), hospitalize immediately in strict isolation. The incubation period between exposure and clinical symptoms is a minimum of 48 hours.

Health workers suspected of being infected should be isolated and the same recommendations outlined in this document must be applied until a negative diagnosis is confirmed. Contact tracing and follow-up of family, friends, co-workers, and other patients who may have been exposed through close contact with the infected health workers is essential.

### Possible use of ribavirin to high-risk contacts of CCHF patients

Post-exposure prophylaxis should be considered for those exposed to Lassa fever or CCHF. This should be limited to high-risk close contacts of the patients and laboratory and health care workers, defined as one of the following:

- (1) Penetration of skin by a contaminated sharp instrument (e.g. needle stick injury);
- (2) Exposure of mucous membranes or broken skin to blood or bodily secretions (e.g. blood splashing in the eyes or mouth);
- (3) Participation in emergency procedures without appropriate personal protective

equipment (e.g. resuscitation after cardiac arrest, intubation or suctioning) or

(4) Prolonged (i.e. hours) and continuous contact in an enclosed space without appropriate personal protective equipment (e.g. a health worker accompanying a patient during medical evacuation in a small airplane)<sup>49</sup>.

In estimating infection risk, note that the most infectious patients are those with severe clinical conditions, usually late in the course of illness. Prophylaxis should not be used when the only exposure was during the incubation period or during convalescence after fever has subsided<sup>49</sup>.

The prophylaxis dose is oral ribavirin 35 mg/kg loading dose (maximum 2.5 g) followed by 15 mg/kg (maximum 1 g) every 8 hours for 10 days<sup>49</sup>.

If a temperature of 38.3°C or higher develops, treatment with ribavirin can be considered as presumptive treatment of Lassa fever or CCHF.

## 5.3 Manage high-risk child contact

Any child who has had contact with someone who is a probable or confirmed case, having tested positive or died from Ebola, will require observation /surveillance for 21 days. The majority of children will do this quarantine period in their home and community. See current Sierra Leone SOP for Observational Interim Care Centers (OICC) on the options, which may include kinship care within quarantine, foster care by a survivor, or an OICC. See also section 3.6.

Child contacts under 5 years who have been exposed to the Ebola virus are increasingly being cared for as a specific group, due to evidence that they may rapidly succumb to the disease, requiring closer observation of symptoms with more attention from dedicated health staff. Symptoms in children under five are often recognized late due to their more subtle clinical presentation, and their inability to effectively communicate their symptoms. As a result, the illness in these children commonly progresses rapidly to death, often within hours rather than days of symptom onset.

## 6. Psychological support

Psychological support for the patient and the family are very important in the management of VHF. Anxiety and fear are normal given the high mortality rate for confirmed VHF. It is important to communicate well with the patient and family, explaining the need for isolation and PPE, and to provide psychological support from the beginning of care. Make sure to do a complete mental health assessment in each patient; then look out for mental health problems developing as a result of patient's adjustment to being ill. Depression, associated with feelings of hopelessness and/or suicidal thoughts, may be present. See Section 10.11 (Mental health problems) in the IMAI District Clinician Manual for their management<sup>4</sup>.

Ideally a psychologist or nurse skilled in providing psychological support should be involved from the outset, but providing psychological care in PPE can be uncomfortable and difficult. The PPE is physically exhausting for the psychologist and for the patient it is difficult to see the face of the psychologist (seeing faces helps to establish a good rapport). For mobile patients, an area can be created where the patients can talk over the fence of the high-risk area with the psychologist at sufficient distance to prevent infection<sup>14</sup>. Psychosocial interventions for patients and families are described in Section 10.11 in the IMAI District Clinician Manual<sup>4</sup>. Support groups for family members and for affected patients after discharge may be useful.

Control of pain, abdominal discomfort and nausea, and management of anxiety are important to the patient's well-being (**SEE SECTION 4**). Patients who are terminal need skilled and thoughtful end-of-life care within the isolation facility.

Many Ebola patients are very conscious to the end and are not encephalopathic. Others are very confused and agitated. Some become very confused, delirious and uncommunicative, yet are walking around.

For psychosocial and spiritual support for the patient and support for the bereavement, loss and grief experienced by family members, see also the IMAI-IMCI *Palliative care: symptom management and end-of-life* guideline module<sup>50</sup>.

### **Allow Family Members at the Ebola Treatment Unit as feasible\***

- Define an area where the family members can stay outside.
- Encourage patients in stable condition to sit outside to communicate with their family across the fence.
- Inform the family regularly and inform the patient that his family is around.
- Support patient's cell phone use from inside ward– provide way to recharge (electrical plugs/airtime) or provide cell phone
- When possible\* allow a family member to visit their children inside the center wearing full PPE under close supervision to give food, encourage ORS and talk to them.
- Allow a family member to come in full PPE to view dead body\*
- Explain clearly the rules inside the ETU and accompany at all times

\*These visits may not be possible if ward overcrowded, understaffing, insufficient IPC measures in place, etc.



## 7. Infection prevention and control (IPC)<sup>a</sup>

Infection prevention and control is key to the reduction of spread of infection from patients to health workers, health workers to health workers, and from the patient to the rest of the community. Evidence from outbreaks strongly indicates that the main routes of transmission of VHF 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. Avoiding transmission dictates strict adherence to standard precautions as well as droplet and contact precautions for health care, environmental, and laboratory workers. Moreover, while there is no evidence of any airborne transmission of the Ebola virus, aerosol-generating procedures should be avoided if possible, or health workers and other patients should be adequately protected during procedures that might aerosolize virus.<sup>51</sup>

**All health workers (clinical and non-clinical) should use standard precautions in caring for all patients, in all health facilities. These include:**

- Hand hygiene
- Appropriate personal protective equipment (PPE) based on risk assessment at the point of care
- Respiratory hygiene
- Prevention of injuries from needles and other sharp instruments
- Safe waste disposal
- Cleaning and disinfection of the environment
- Safe handling of contaminated linens
- Cleaning and disinfection of patient-care equipment

The systematic application of these precautions should prevent the transmission of viral haemorrhagic fever.

<sup>a</sup> Infection prevention and control recommendations in this document draw heavily on published WHO guidelines.

## 7.1 Recommendations for direct patient care for known or suspected VHF patients

### Standard + Contact precautions + Droplet precautions

In addition to standard precautions, the following are WHO recommendations for direct patient care for known or suspected viral haemorrhagic fever patients<sup>7, 523</sup>

- Restrict all non-essential staff from patient care areas.
- Maintain a register of all people entering the patient care area.
- Limit the number of visitors allowed access to the patient to include only those necessary for the patient's well-being and care, such as a child's parent or caregiver- in PPE.
- Ensure that all those entering the ETC patient care area use PPE according to the facility guidelines. Prior to entering the isolation area, provide all visitors with instructions on using PPE correctly, and instructions for correct hand hygiene practices- see illustrations below. Make sure they understand and practice the instructions strictly.
- Apply infection control precautions to avoid any possible unprotected direct contact with blood and body fluids when providing care to any VHF patient, including suspected cases.
  - Perform hand hygiene before and after direct patient care, after any contact with potentially contaminated surfaces, and after removal of PPE. Neglecting to perform hand hygiene after removing PPE will reduce or negate any benefits of the protective equipment.
  - Wear double correctly sized gloves (non-sterile examination gloves or surgical gloves, preferably nitrile gloves) when entering the patient care area.
  - Wear a disposable gown and waterproof apron, or a disposable coverall and waterproof apron to cover clothing and exposed skin. The gown and the coverall should be made of fabric that is tested for resistance to penetration by blood or body fluids or to blood-borne pathogens.
  - Wear facial protection to prevent splashes to the nose, mouth, and eyes.
    - Wear fluid-resistant medical/surgical mask with a structured design that does not collapse against the mouth (e.g. duckbill, cup shape).
    - Wear either a face shield or goggles.
  - Wear waterproof boots (e.g. rubber/ gum boots)
  - Wear a head cover that covers the head and neck

- Before exiting the isolation area of a patient with suspected VHF, carefully remove and dispose of protective equipment- see section 7.3 on steps in doffing PPE.
- When removing protective equipment, be careful to avoid any contact between the soiled items (e.g. gloves, gowns) and any area of the face (eyes, nose, or mouth).
- Ensure that clinical and non-clinical personnel are assigned exclusively to VHF patient care areas and that members of staff do not move freely between the isolation areas and other clinical areas during the outbreak.
- Limit the use of needles and other sharp objects as much as possible. See precautions for preparing medicines for injection, risk assessment before deciding to administer medicines or insert an IV in section 3.
- Limit the use of phlebotomy and laboratory testing to the minimum necessary for essential diagnostic evaluation and patient care.

### **Specify who should wear PPE**

- All doctors, nurses, and health workers who provide direct patient care to suspected VHF patients.
- All support staff who clean the isolation room, handle contaminated supplies and equipment, launder re-usable supplies, and collect and dispose of infectious waste from VHF patients.
- All laboratory staff who handle patient specimens and body fluids from suspected VHF cases.
- Laboratory support staff who clean and disinfect laboratory equipment used to test VHF specimens.
- Burial teams who remove bodies of deceased VHF patients and prepare them for burial.
- Family members who care for VHF patients.

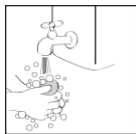
## 7.2 Standard precautions- at all times, for all patients

### Standard Precautions—At All Times, For All Patients

#### Hand hygiene

Ensure availability of hand-washing facilities with clean running water.

Ensure availability of hand hygiene products (clean water, soap, single-use clean towels, and alcohol-based hand rub). Alcohol-based hand rubs should be made available at every point of care and are the standard of care. Bleach/chlorine solutions 0.05% may be used in emergency situations until alcohol-based handrubs or soap and water become available at the facility.<sup>54</sup>



When to wash hands with soap and running water:

- when hands are visibly dirty.

When to use alcohol-based hand rub:

- when hands appear clean (i.e. are not visibly soiled).
- Do not wear artificial fingernails or extenders when having direct contact with patients.
- Keep natural nails short (tips less than 0.5 cm long or approximately ¼ inch).
- Keep a healthy skin.
- Avoid using rings, a wrist watch or bracelets.
- Ensure that hands are dry before starting any activity.
- Dry hands with single-use towels.

#### Indications for hand hygiene

Before and after any direct contact between a health worker and a patient and contact between patients, whether or not gloves are worn. Hands should be washed in the following scenarios:

- before donning gloves and wearing PPE on entry to the isolation room/red zone;
- before any clean/aseptic procedures being performed on a patient;
- after any exposure risk or actual exposure to the patient's blood and body fluids;
- after touching (even potentially) contaminated surfaces/items/equipment;
- after removal of PPE, upon leaving the care area.

See section 7.3 for details of specific steps.

## Standard Precautions--At All Times, For All Patients

### Respiratory hygiene

Educate all staff, health workers, patients, and hospital visitors:

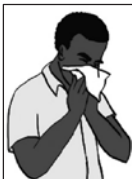
- Cover mouth and nose when coughing or sneezing.
- Hand hygiene after contact with respiratory secretions.
  - Have single-use tissues available in the waiting area or provide a medical mask. Dispose of tissues in no-touch receptacles. Then wash hands.

When tissues, cloths, or face masks are not available, instruct all staff, health workers, patients, and visitors to lift their arm up and cover their nose and mouth with the inner surface of the arm or forearm when they cough or sneeze.

- For persons with respiratory symptoms:
  - (1) source control measures- cover their nose and mouth with a tissue or mask when coughing or sneezing; (2) Spatial separation of at least one metre from persons with acute febrile respiratory symptoms.



Cough or sneeze into your arm.



Use a tissue and then throw away.

## Standard Precautions--At All Times, For All Patients

### Prevention of injuries from needles and other sharp instruments

- Use care when handling, using, cleaning, and disposing of needles, scalpels, and other sharps.
- Do not bend, break, or otherwise manipulate used needles, scalpels, or other sharp instruments.
- Do not recap needles.
- Keep a sharps container nearby when giving injections. Discard single-use needles and syringes immediately after use and directly into the sharps container, without recapping and without passing to another person.
- Close, seal, and send sharps containers for incineration before they are completely full (i.e. when they are  $\frac{3}{4}$  full).



### Safe waste disposal

- Ensure safe waste management.
- Treat waste contaminated with blood, body fluids, secretions, and excretions, and human tissue and laboratory waste directly associated with specimen, as clinical waste.
- Segregate at the point of generation the 4 categories of waste:
  - sharps
  - non-sharps infectious waste
  - non-sharp non-infectious waste
  - hazardous waste
- Discard single use items properly.



## Standard Precautions--At All Times. For All Patients

### Cleaning and disinfection of the environment

Use adequate procedures for the routine cleaning and disinfection of environmental and other frequently touched surfaces.

- Floors and horizontal work surfaces should be cleaned at least once a day.
- Cleaning should always be carried out from “clean” areas to “dirty” areas, in order to avoid contaminant transfer.
- Dry sweeping with a broom should never be done.



Rags with dust should not be shaken out and surfaces should not be cleaned with dry rags. Cleaning with a moistened cloth helps to avoid contaminating the air with air-borne particles.

- Clean **BEFORE** you disinfect.
- Change cleaning solutions and equipment frequently, as these items will get contaminated quickly (follow your hospital protocols).

### Appropriate handling of contaminated linens

Handle, transport, and process used linen appropriately:

- Prevent skin and mucous membrane exposure and contamination of clothing.
- Avoid transfer of pathogens to other patients or the environment:
- Place all used linen and waste in bags or containers that are able to withstand transportation without being damaged.
- Remove any solid matter on soiled linen and flush down a toilet. If the linen is heavily soiled, avoid manipulation and preferably dispose of them safely and incinerate.,

### Cleaning and disinfection of patient care equipment

Handle equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposure, contamination of clothing, or transfer of pathogens to other patients or the environment.

Clean, disinfect, sterilize, and reprocess reusable equipment appropriately before use with another patient.

### 7.3 Steps to put on and remove PPE

Viral haemorrhagic fevers can be transmitted person-to-person, usually through direct contact with contaminated blood or body fluids of an infected person, or exposure to objects that have been contaminated with infected secretions. Infection probably occurs most often through oral or mucous membrane exposure (e.g., eyes, mouth, nose) or breaks in the skin. Presently, there is no evidence for human-to-human transmission of VHF through an airborne route.

The following information about proper PPE during a VHF outbreak targets the health workers providing direct and indirect care to VHF patients and represents the minimum guidance to achieve appropriate protection for infection prevention and control. Importantly, during an outbreak, the types of PPE available in the field may not be the same across sites and may even differ based on the organization providing them. Thus, it is imperative that the clinical team involved in triage and clinical management of patients assesses the evolving situation during the outbreak to determine whether the minimum requirements can be utilized or additional protective measures are necessary. In any case, it is important for clinicians to weigh the benefits of protecting themselves and patients against the risks of diminishing effective patient care through unnecessary barriers or excessively uncomfortable protective equipment.

Accordingly, the following instructions are an illustration of the steps to put on and remove essential required PPE with some additional measures depending on the conditions occurring during the outbreak:



## Principles of PPE for VHF

- Ensure safety of health workers:
  - Avoid contamination from patient's body fluids
  - Avoid your contaminated hands touching your mouth, nose or eyes
  - Avoid contamination when you take off PPE
- Recognizing who people are amongst those providing care in treatment center
  - Add name of the person in PPE in a visible location (e.g. on the disposable apron) to easily recognize the person inside the treatment center
  - Important to include a "buddy" system where one person assists another, including during donning and doffing of PPE.
  - Distinguish who is clinician, hygienist/cleaner, etc.
- Have a dedicated, trained staff at all times to supervise removal of PPE that assures each step of safe removal.
- Effectiveness of PPE depends on:
  - Adequate and regular supplies
  - Adequate staff training
  - Proper hand hygiene
  - Appropriate human behavior
  - Close supervision and support

**Do not touch your face- eyes, nose or mouth- with gloved or ungloved hands.**

## Steps to put on WHO PPE using coverall (donning)

1. Remove all personal items (jewelry, watches, cell phones, pens, etc.)
2. Put on the scrub suit and rubber boots\* in the changing room.
3. Move to the clean area at the entrance of the isolation unit
4. Gather all the necessary items of the PPE beforehand. Select the right size coverall for you and inspect that the quality is appropriate.
5. Undertake the procedure of putting on PPE under the guidance and supervision of a trained observer (colleague)
6. Perform hand hygiene.
7. Put on coverall.
8. If the inner gloves or the coverall sleeves are not long enough, make a thumb (or middle finger) hole in the coverall sleeve to ensure that your forearm is not exposed when making wide movements. Some coverall models have thumb loops attached to sleeves which can be used instead.
9. Put on inner gloves (examination, nitrile) under cuff.
10. Put on face mask.
11. Put on face protection (either face shield or goggles)
12. Put on head covering, either:
  - a. Surgical bonnet covering neck and head if wearing face shield\*\* OR
  - b. Hood if wearing goggles
13. Put on disposable waterproof apron (if not available, use heavy duty, reusable waterproof apron)
14. Put on outer gloves (examination, nitrile) over cuff.
15. Self-check in mirror.
16. Check buddy and write name/ occupation/ time of entry.

\* If not available, use closed shoes (slip-ons without shoelaces and fully covering the dorsum of the foot and ankles) and shoe covers (nonslip and preferably impermeable)

\*\*Attached hood may not fit over face shield so surgical bonnet or similar head covering is recommended

## Steps to take off WHO PPE using coverall (doffing)

1. Always remove PPE under the guidance and supervision of a trained observer (colleague)
2. Enter decontamination area by walking through chlorine tray. If available, use scrub brush to remove any particulate matter that may be on the soles or surface of the boots.
3. Perform hand hygiene on gloved hands (0.5% chlorine).\*
4. Remove apron taking care to avoid contaminating your hands by peeling it off
5. Perform hand hygiene on gloved hands (0.5% chlorine).
6. Remove hood or bonnet taking care to avoid contaminating your face
7. Perform hand hygiene on gloved hands (0.5% chlorine).
8. Remove coverall and outer pair of gloves:
  - a. Tilt head back to reach zipper, unzip completely without touching any skin or scrubs, and start removing coverall from top to bottom.
  - b. After freeing shoulders, remove the outer gloves while pulling the arms out of the sleeves.
  - c. With inner gloves roll the coverall, from the waist down and from the inside of the coverall, down to the top of the boots.
  - d. Use one boot to pull off coverall from other boot and vice versa, then step away from the coverall and dispose of it safely.
9. Perform hand hygiene on gloved hands (0.5% chlorine).
10. Remove the goggles or face shield from behind the head (keep eyes closed)
11. Perform hand hygiene on gloved hands
12. Remove mask from behind the head (keep eyes closed):
  - a. Bend head downwards and remove bottom elastic first
  - b. Remove top elastic second

13. Perform hand hygiene on gloved hands (0.5% chlorine)
14. Remove inner gloves with appropriate technique and dispose of safely
15. Decontaminate boots appropriately (all sides and bottom) and move to lower risk area one foot at a time
16. Perform hand hygiene (0.05% chlorine)

*\*WHO does not recommend the use of spraying at this step. In this outbreak, however, most doffing stations include a sprayer. If spraying is going to occur, spraying should only occur below the nipple line to minimize splashing or misting above the neck.*

Note: MSF employs donning and doffing procedures that are specific to their type of PPE.

## Perform hand hygiene, Wash hands.



Wet hands with water and apply soap.



Rub hands, palm to palm.



Right palm over left dorsum with interlaced fingers and vice versa.



Palm to palm with fingers interlaced.



Back of fingers to opposing palms with fingers interlocked.



Rotational rubbing of left thumb clasped in right palm and vice versa.



Rinse hands with water.



Dry hands thoroughly with single use towel.

## Hand hygiene

The correct application technique and duration of the procedure are considered crucial to achieving the desired effect for both handrubbing with an alcohol-based handrub and handwashing with soap and water. For handrubbing, WHO recommends applying a palmful of alcohol-based handrub to cover all surfaces of the hands. Hands should be rubbed by following specific steps for 20 to 30 seconds until dry. When washing hands with soap and water, hands should be wet with clean, running water and a sufficient amount of product to cover all surfaces should be applied. Hands should be rinsed with water and dried thoroughly with a single-use towel. WHO recommends that to achieve the desired effect, the procedure should last 40-60 seconds. For chlorine solutions, a concentration of 0.05% should be applied for a minimum time of 40 to 60 seconds until hands are dried. To perform the correct technique, the same steps as for handrubbing should be followed.

## Apron and boots

Plastic or rubber aprons provide extra protection of the front part of the body. Ideally disposable aprons should be used, but if non-disposable, aprons need to be disinfected by the person wearing it. This should include cleaning to remove gross contamination, disinfection and then hanging to dry outside the changing room in the sun. Boots should also be cleaned to remove gross contamination and then disinfected at least once a day by soaking in a 0.5% chlorine solution for 30 minutes.

## Goggles or face shields

Goggles must fit comfortably and securely, and person should consider having his/her own goggles/face shield with their name on them. Goggles or reusable face shields need to be disinfected by soaking them in a 0.5% chlorine solution for 10 minutes, washed with water and then hung outside the changing room to dry. Condensation of the goggles can be a major problem: it impairs the user's vision and is dangerous, but can be minimized by anti-fog spray.

## Protective gloves

The efficacy of gloves in preventing contamination of health workers' hands and helping to reduce transmission of pathogens in health care has been confirmed in several clinical studies. Nevertheless, health workers should be informed that gloves do not provide complete protection against hand contamination.

Pathogens may gain access to the caregivers' hands via small defects in gloves or by contamination of the hands during glove removal. Hand hygiene by rubbing or washing remains the basis to guarantee hand decontamination after glove removal. Medical gloves are also single-use items. Glove decontamination and reprocessing are not recommended and should be avoided, even if it is common practice in many health-care settings with low resources and where glove supply is limited.

## Disinfection by 'spraying'

Hand-held spraying devices incorporating a chlorine solution have regularly been utilized in VHF outbreaks. This is generally as part of the 'disinfection' process of PPE suspected of being the most heavily contaminated and to allow its subsequent re-use i.e. heavy duty gloves, reusable aprons and boots. Although the VHF viruses are susceptible to disinfection with chlorine solutions, generic principles of disinfection in healthcare facilities should be considered and raise doubt to the effectiveness of 'spraying'. The first is that the presence of visible organic matter such as blood or fecal material can interfere with the antimicrobial activity of disinfectants in at least two ways<sup>52, 55</sup>. Most commonly, interference occurs by a chemical reaction between the disinfectant and the organic matter resulting in a complex with less of the active germicide available for attacking the virus. Chlorine and iodine disinfectants, in particular, are prone to such interaction. Organic material also protects the virus from attack by acting as a physical barrier and physical removal is required.

Additionally items must be exposed to the disinfectant for the appropriate minimum contact time. Multiple scientific studies have demonstrated the

efficacy of a range of hospital disinfectants against pathogens with a contact time of at least 1 minute<sup>56</sup>. This supports the principle of utilizing disposable equipment in VHF settings when possible, and when PPE is to be re-used it requires physical cleaning followed by disinfection with an adequate contact time.

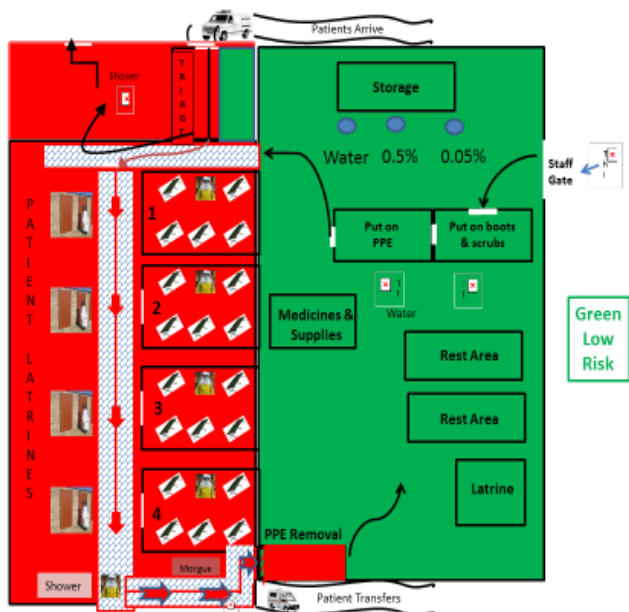
In summary, spraying should not be routinely encouraged because it is not an evidence-based practice, and it can cause aerosolization of the virus and if extensively used, can lead to adverse events among staff and patients. If spraying chlorine solutions is utilized, staff should still maintain maximum attention while manipulating organic material, touching contaminated surfaces, and removing PPE because these may still be contaminated by the Ebola virus.

### **Most common PPE mistakes and hazards**

- Uncovering wrists with wide movement, especially in tall people.
- Goggles:
  - Touching the goggles to adjust them with contaminated gloves
  - Early removal during removal procedure that increase risk of contaminating face
  - For people wearing medical glasses, increased risk of glasses falling when removing the goggles



## 7.4 Flow through the isolation ward, for patients and health workers



## 8. Discharge

Discharge of an alert case is done on the following conditions<sup>57</sup>

- ▶ Patients have been reviewed by the VHF clinical management team and found to not meet the case definition of a suspected case, with no epidemiological link to any suspected or confirmed case.
- ▶ Have a conclusive diagnosis that is not VHF, recognizing that co-infections do occur.
- ▶ Have responded to specific treatment
- ▶ Be in good health condition and able to go back home

Discharge of a VHF-confirmed case or suspected cases is based on the clinical presentation and the correct interpretation of the laboratory findings. Consider discharge when the following criteria are met:

- ▶ **Three or more days without fever or any significant symptom<sup>†</sup>**
  - ▶ Symptoms that suggest ongoing shedding of virus (e.g. diarrhea, coughing, bleeding) should have disappeared.
  - ▶ Viral shedding known to occur in the semen of male patients, and probably in the breast milk of lactating females, need not preclude discharge, but must be taken into consideration when providing instructions to the patient (see below)

AND

- ▶ **Significant improvement in clinical condition<sup>†</sup>**

AND

- ▶ **In a relatively good general condition<sup>†</sup>:** independently feeding and to carry out other activities of daily life, like washing and walking, without assistance, taking into account any previous disabilities.

AND

- A negative blood PCR for VHF (regardless of any other serologic tests) on the third day of being asymptomatic.
  - If this PCR is positive, repeat in 48 hours. If repeat PCR is negative, then patient can be discharged.
- For previously blood PCR positive mothers, that are breast feeding, it may

be safer to delay discharge until PCR on breast milk turns negative as well if mothers wish to continue breast feeding or are still expressing milk.

<sup>1</sup>If a patient continues to suffer symptoms and/or their condition is not improving, but this is not thought to be due to acute filovirus disease, 2 negative blood PCR tests 48 hours apart, with at least one test being done 3 days or more after onset of symptoms, are needed before discharge/ referral to a normal ward for further care.

<b>Discharge package considerations for Sierra Leone</b>	
<ul style="list-style-type: none"><li>• rice</li><li>• pulses</li><li>• maize or grain cereal</li><li>• cooking oil</li><li>• salt</li><li>• bleach</li><li>• water bucket</li><li>• mosquito net</li><li>• soap</li><li>• condoms</li><li>• clothing</li><li>• footwear</li><li>• discharge certificate</li></ul>	Relatives of the deceased also get everything except certificate, condoms, clothing.

## 9. Follow up

**Discharged convalescent patients:** They may remain weak and suffer persistent symptoms. A system for follow-up care should be set up for these patients. If those patients are discharged back home they often face stigmatization and/or rejection, so discharge should be accompanied by the necessary psychosocial support and community awareness activities.

**Patients that were admitted but turned out not to be cases:** If suffering from another disease, referral to a normal ward is sometimes needed. The normal health care system is often unwilling to accept these patients, or where they are accepted, their care may suffer from neglect. Referral should therefore be followed up closely. If returned home, their community may require assurance from medical authorities before accepting the patient.

### Supportive treatment for all discharged patients

- Provide one-month supply of vitamin supplements.
- Nutritional advice. Identify locally available high-energy foods that are easy to digest, rich in complex carbohydrates and balanced in fat, protein and fiber.
- Provide condoms. Also, provide instructions on using the condoms, and the minimum length of time they should be used (3 months).
- Breastfeeding women should stop breastfeeding until PCR testing of breast milk is negative. Infant feeding counseling and support should be provided according to the infant's age.
- Anticipate that rejection of discharged patients by their communities may occur. Therefore, the patient, his/her family and relatives, and health care personnel (if the patient is transferred) must be counseled to be sure that they understand that the patient does not constitute any danger.
- A medical certificate should be given at discharge to certify that the patient does not constitute any danger to his family and his neighbors.
- Psychological support and follow up should be considered, including advocacy on patients' behalf and interceding with community leaders where necessary.



## APPENDIX A1:

### Case definitions for Ebola and Marburg virus disease during an epidemic:

A suspect case is any person:

- Having had contact with a clinical case<sup>4</sup> **AND**
- Presenting with acute fever ( $>38^{\circ}\text{C}$ )

OR

- Having had contact with a clinical case (suspect, probable or confirmed) **AND**
- Presenting with 3 or more of the symptoms below:

OR

- Presenting with acute fever **AND**
- Presenting with 3 or more of the concerning symptoms below:
  - Headache
  - Generalized or articular pain
  - Intense fatigue
  - Nausea or vomiting
  - Loss of appetite
  - Diarrhea
  - Abdominal pain
  - Difficulty in swallowing
  - Difficulty in breathing
  - Hiccups
  - Miscarriage

OR

- Any person with unexplained bleeding<sup>5</sup> or miscarriage

OR

- Any unexplained death.

- Cases are confirmed by laboratory testing, e.g. a positive PCR test for Ebola or Marburg virus.

The definition of a probable case varies;

2 often used definitions are:

- A suspect case that is known to have had contact with a known case (suspect, probable, or confirmed).

OR

- A patient that is, on clinical and/or epidemiological grounds, very likely to have Ebola or Marburg.

**An alert case is a patient presenting with:**

- Unexplained fever or history of fever (onset less than 3 weeks) **AND**
- Unexplained bleeding signs:
  - Haemorrhagic or purpuric rash
  - Blood in stool
  - Epistaxis (nose bleed) Haemoptysis (blood in sputum)
  - Haematemesis (blood in vomit) - Other haemorrhagic signs

**AND**

- No known predisposing factors for haemorrhagic manifestations

**OR**

- A patient presenting with:
- Any fever **OR 3** more of the following:
  - Headache
  - Abdominal pain
  - Nausea or vomiting
  - Generalized or articular

**pain**

- Loss of appetite
- Difficulty in swallowing
- Diarrhea
- Difficulty in breathing
- Intense fatigue

**AND**

- Possible filovirus exposure:
  - Unexplained death(s) in the family or close contacts
  - Unexplained (cluster of) serious illness in family or close contacts
  - Provision of care for the seriously ill or handling bodies (caretakers,

**health workers, those participating in traditional funerals)**

- At risk contact with chimpanzees, monkeys or bats, dead or alive
- When animals in the area, chiefly chimpanzees or monkeys, die unexpectedly
  - Handling and/or eating "bush" animals (apes or bats)
  - Entry into caves or proximity to fruit trees that host bats

## APPENDIX A2

### Case definition- suspected case of Lassa fever

Known exposure to a person suspected to have Lassa fever	
Fever >38°C for less than three weeks <b>PLUS</b>	
Absence of signs of local inflammation <b>AND</b>	
Two major signs or one major and two minor signs	
MAJOR SIGNS	MINOR SIGNS
Bleeding	Headache
Swollen neck or face	Sore throat
Conjunctiva or subconjunctival hemorrhage	Vomiting
Spontaneous abortion	Diffuse abdominal pain /tenderness
Petechial or hemorrhagic rash	Chest/retrosternal pain
New onset of tinnitus or altered hearing	Cough
Persistent hypotension	Diarrhea
Absence of clinical response after 48 hrs to antimalarial and/or broad spectrum antibiotic therapy	Generalized myalgia or arthralgia
	Profuse weakness





## Fluid plans A, B, and C (fluid and food)

### Plan A: Treatment of diarrhoea at home

- Counsel the patient on the 3 rules of home treatment.
- Drink extra fluid.
- Continue eating.
- Advise the patient when to return to the health facility.

#### 1. Drink extra fluid

- Drink extra fluid:
  - as much as the patient will take
  - safe fluid that is clean or has been boiled or disinfected
  - ORS or other fluid (except fluids with high sugar or alcohol)
  - drink at least 200–300 ml after each loose stool
  - continue drinking extra fluid until the diarrhoea stops.

It is especially important to provide ORS for use at home if the patient cannot return to the clinic if the diarrhoea worsens.

If ORS is provided:

- teach the patient how to mix and drink ORS
- give 2 packets to take home.

If the patient is vomiting, they should continue to take small sips.

- Antiemetics are usually not necessary.

#### 2. Continue eating

#### 3. Return to the health facility when:

- Diarrhoea becomes worse
- The patient has persistent diarrhoea or a large volume.

## Plan B: Treatment of patient with some dehydration using ORS

1. Determine amount of ORS to give during first 4 hours.
  - The approximate amount of ORS required (in ml) can be calculated by multiplying the patient's weight (in kg) times 75.
  - Use the patient's age if you do not know the weight.
  - If the patient wants more ORS than shown, give more.
  - Give the recommended amount of ORS in the clinic over a 4-hour period.
  - If the patient is weak or vomits:
    - give frequent small sips from a cup.

After a vomit, wait 10 minutes then continue, but more slowly.
2. After 4 hours or each clinical rounds
  - Reassess the patient and classify for dehydration.
  - Select the appropriate plan to continue treatment.
  - Begin feeding the patient in the clinic.
3. If the patient must leave before completing treatment
  - Show the patient how to prepare ORS solution at home.
  - Show the patient how much ORS is needed to finish a 4-hour treatment at home.
  - Give enough ORS packets to complete rehydration.

Give 2 packets as recommended in Plan A.
4. Explain the 3 rules of home treatment
  1. Drink extra fluid.
  2. Continue eating.
  3. Return to the health facility if needed.

## Plan C: Treat severe dehydration quickly

Follow the arrows. If the answer is “yes” go across. If “no”, go down. **START HERE**

<p>Can you give intravenous (IV) fluid immediately? <b>YES→</b> ↓<b>NO</b></p>	<ul style="list-style-type: none"> <li>• Start IV fluid immediately. If the patient can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Ringer’s lactate solution (or, if not available, normal saline), divided as follows:</li> </ul>									
<p>Is IV treatment available nearby (within 30 minutes) <b>YES↘</b> ↓<b>NO</b></p>	<table border="1"> <thead> <tr> <th data-bbox="429 212 764 274">Age</th> <th data-bbox="764 212 943 274">First give 30 ml/kg in:</th> <th data-bbox="943 212 1407 274">Then give 70 ml/kg</th> </tr> </thead> <tbody> <tr> <td data-bbox="429 274 764 310">Infants (under 12 months)</td> <td data-bbox="764 274 943 310">1 hour*</td> <td data-bbox="943 274 1407 310">5 hours*</td> </tr> <tr> <td data-bbox="429 310 764 367">Older (12 months or older, including adults)</td> <td data-bbox="764 310 943 367">30 minutes*</td> <td data-bbox="943 310 1407 367">2½ hours</td> </tr> </tbody> </table>	Age	First give 30 ml/kg in:	Then give 70 ml/kg	Infants (under 12 months)	1 hour*	5 hours*	Older (12 months or older, including adults)	30 minutes*	2½ hours
Age	First give 30 ml/kg in:	Then give 70 ml/kg								
Infants (under 12 months)	1 hour*	5 hours*								
Older (12 months or older, including adults)	30 minutes*	2½ hours								
<p>Are you trained to use a naso-gastric (NG) tube for rehydration? <b>YES→</b> ↓<b>NO</b></p>	<ul style="list-style-type: none"> <li>*Repeat once if radial pulse is very weak or not detectable.</li> <li>• Reassess the patient every 1–2 hours. If hydration status is not improving, give the IV drip more rapidly. Also give ORS (about 5 ml/kg/hour) as soon as the patient can drink, usually after 3–4 hours (infant) or 1–2 hours for children, adolescents, and adults.</li> <li>• Reassess an infant for 6 hours and older patient after 3 hours. Classify dehydration. Then choose the appropriate plan (A, B, or C) to continue treatment.</li> </ul>									
<p>Can the patient drink? <b>YES→</b> ↓<b>NO</b></p>	<p>Refer <b>URGENTLY</b> to hospital for IV treatment.</p> <ul style="list-style-type: none"> <li>• If the patient can drink, provide a relative or friend with ORS solution and show how to give frequent sips during the trip.</li> </ul>									
<p>Refer <b>URGENTLY</b> to hospital for IV or NG treatment.</p>	<ul style="list-style-type: none"> <li>• Start rehydration by tube (or mouth) with ORS solution. Give 20 ml/kg/hour for 6 hours (total of 120 ml/kg).</li> <li>• Reassess the patient every 1–2 hours:             <ul style="list-style-type: none"> <li>◦ if there is repeated vomiting or increasing abdominal distension, give the fluid more slowly;</li> <li>◦ if hydration status is not improving after 3 hours, send the patient for IV therapy.</li> </ul> </li> <li>• After 6 hours, reassess the patient. Classify dehydration. Then choose the appropriate plan (A, B or C) to continue treatment.</li> </ul>									

## Morphine, tramadol, paracetamol and antimalarial dosing for children and adults

### Paracetamol, tramadol and morphine in adolescents and adults<sup>4</sup>:

Analgesics	Starting dose in adults	Range	Side-effects and cautions
Paracetamol (also lowers fever)	Oral: 1 gram every 4–6 hours, but no more than 4 grams in 24 hours  IV:	Only 1 tablet may be required in elderly or the very ill, or when combined with an opioid. Mild pain might be controlled with doses every 6 hours.	Do not exceed 4 grams in 24 hours (more can cause serious liver toxicity).
Tramadol	50-100 mg po/IM/slow IV every 4-6 hours as needed		Can cause liver toxicity, Lowers seizure threshold
<b>Oral morphine:</b> 5 mg/5 ml or 50 mg/5 ml or 50 mg/5 ml or slow release tablets (10 mg or 30 mg). Give by mouth. If necessary, can be given IV or IM or subcutaneously.	Initially, morphine sulphate 2.5–10 mg every 4 hours, increased by 30%–50% if pain persists. Start with low dose 2.5mg-5mg if patient is very old or frail.	According to pain  <b>There is NO ceiling dose.</b>	Unless diarrhoea, give laxative to avoid constipation. Excessive dosage can reduce respiratory rate.

## Paracetamol and morphine in children:

Dose according to body weight

Drug	Dosage	Form	3-<6 kg	6-<10 kg	10-<15 kg	15-<20 kg	20-<29 kg
Paracetamol	10–15 mg/kg, up to six times a day	100-mg tablet	-	1	1	2	3
		500-mg tablet	-	¼	¼	½	½
Morphine	Calculate exact dose based on weight of the child. Oral: 0.2–0.4 mg/kg every 4–6 h; increase if necessary for severe pain IM: 0.1–0.2 mg/kg every 4–6 h IV: 0.05–0.1 mg/kg every 4–6 h, or 0.005–0.01 mg/kg per hour by IV infusion						

## Antimalarials <sup>1</sup>

Uncomplicated *P. falciparum* malaria- treat for 3 days - children and adults

<b>Artesunate-amodiaquine fixed dose combination dosing</b>	
≥4.5kg to < 9 kg	1 tablet (25mg artesunate/ 67.5 mg amodiaquine) per day for 3 days
≥9kg to <18kg	1 tablet (50mg artesunate/ 135 mg amodiaquine) per day for 3 days
≥18kg to <36kg	1 tablet (100mg artesunate/ 270 mg amodiaquine) per day for 3 days
≥ 36kg	2 tablets (100mg artesunate/ 270 mg amodiaquine) per day for 3 days

How to give emergency antimalarial treatment if falciparum malaria is possible. Preferred treatment is artesunate IV, especially if patient is in shock.

ARTESUNATE IV or IM			ARTEMETHER IM			
<p>IV or IM 2.4 mg/kg on admission then at 12 hr and 24 hr then once daily.</p> <p>For each dose, freshly mix 60 mg anhydrous artesunic acid ampoule with 1 ml of 5% sodium bicarbonate solution</p>			<p>Initial loading dose: 3.2 mg/kg</p> <p>Subsequent doses 1.6 mg/kg each day until able to take oral medication</p>			
Weight	For IV, further dilute with 5 ml of 5% dextrose (for 10 mg/ml)	For IM, further dilute with 2 ml of 5% dextrose (for 20 mg/ml)	Adult 80 mg/ml (in 1 ml ampoule)	Adult 80 mg/ml (in 1 ml ampoule)	Child 20 mg/ml (in 1 ml ampoule)	Child 20 mg/ml (in 1 ml ampoule)
3 kg	0.8 ml	0.4 ml	-----	-----	0.5 ml	0.3 ml
4 kg	1.0 ml	0.5 ml	-----	-----	0.6 ml	0.3 ml
5 kg	1.2 ml	0.6 ml	-----	-----	0.8 ml	0.4 ml
6 kg	1.4 ml	0.7 ml	-----	-----	1.0 ml	0.5 ml
7 kg	1.7 ml	0.8 ml	-----	-----	1.1 ml	0.6 ml
8 kg	2.0 ml	1.0 ml	-----	-----	1.3 ml	0.7 ml
9 kg	2.2 ml	1.2 ml	-----	-----	1.5 ml	0.7 ml
10 kg	2.4 ml	1.2 ml	-----	-----	1.6 ml	0.8 ml
15 kg	3.6 ml	1.8 ml	-----	-----	2.4 ml	1.2 ml
20 kg	4.8 ml	2.4 ml	-----	-----	3.2 ml	1.6 ml
30 kg	7.2 ml	3.6 ml	1.2ml	0.6 ml		
40 kg	9.6 ml	4.8 ml	1.6 ml	0.8 ml		
50 kg	12.0 ml	6.0 ml	2.0 ml	1.0 ml		
60 kg	14.4 ml	7.2 ml	2.4 ml	1.2 ml		
70 kg	16.8 ml	8.4 ml	2.8 ml	1.4 ml		
80 kg	19.2 ml	9.6 ml	3.2 ml	1.6 ml		
90 kg	21.6 ml	10.8 ml	3.6 ml	1.8 ml		



## APPENDIX D

Example of clinical monitoring form- to stay near patient's bed.

Name:		Date of Admit:		Area: / Bed #:	
Age:		Sex: M F		If F, pregnant? Y N	

Quick Check/ Other assessments	Observations	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time
		Date	Time	Date	Time	Date	Time	Date	Time	Date	Time
Airway/ Breathing	Respiratory Distress?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Pulse	Fast? <input type="checkbox"/>	Weak? <input type="checkbox"/>	Fast? <input type="checkbox"/>	Weak? <input type="checkbox"/>	Fast? <input type="checkbox"/>	Weak? <input type="checkbox"/>	Fast? <input type="checkbox"/>	Weak? <input type="checkbox"/>	Fast? <input type="checkbox"/>	Weak? <input type="checkbox"/>
Circulation	Capillary Refill (>3sec)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Bleeding?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Confusion/ Convulsions	Convulsions?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	AVPU	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U	<input type="checkbox"/> A <input type="checkbox"/> V <input type="checkbox"/> P <input type="checkbox"/> U
General assessments	Ambulating?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
	Urinating?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Vital Signs	Temperature (°C)										
	HR (bpm)										
	RR (breaths/min)										
	SBP (mmHg)										
	O <sub>2</sub> saturation (%)										
Other observations											

Example of a fluid balance chart- can be written on whiteboard at bedside of severely ill patient

Date:		Name:	
Fluids		8 AM- 8 PM	8 PM- 8 AM
IN	Via oral		
	Via intravenous		
Out	Urine		
	Diarrhoea		
	Vomit		
	Mixed		
	Blood		
	Other		

Possible recording format for laminated poster or white-board to track patients:

Name		Vitals	G.I.	Fluid Therapy	Other Meds	Lab Results & Date	Comments & Complications	Disposition
Bed #		Febrile: <input type="checkbox"/> Y <input type="checkbox"/> N	Vomiting? <input type="checkbox"/> Y <input type="checkbox"/> N	Oral Fluid? <input type="checkbox"/> Y <input type="checkbox"/> N	1.	Admit Ebola PCR: <input type="checkbox"/> Pos <input type="checkbox"/> Neg		Date of last symptom:
Admit Date (DD/MM)		Pulse: <input type="checkbox"/> weak <input type="checkbox"/> fast	Diarrhea? <input type="checkbox"/> Y <input type="checkbox"/> N	IV Fluid? <input type="checkbox"/> Y <input type="checkbox"/> N	2.	Date (DD/MM): _____		Date last PCR:
Age		AVPU score:	Bleeding? <input type="checkbox"/> Y <input type="checkbox"/> N	IV placed? <input type="checkbox"/> Y <input type="checkbox"/> N	3.			Counseling? <input type="checkbox"/> Y <input type="checkbox"/> N
Sex [M] [F]		Urinating? <input type="checkbox"/> Y <input type="checkbox"/> N		IV needs replacement? <input type="checkbox"/> Y <input type="checkbox"/> N	4.	Malaria RDT: <input type="checkbox"/> Pos <input type="checkbox"/> Neg		Discharge Package? <input type="checkbox"/> Y <input type="checkbox"/> N
Pregnant [Y] [N]		Ambulating? <input type="checkbox"/> Y <input type="checkbox"/> N			5.	Date (DD/MM): _____		
7.					6.			
					7.			
					.			
Name		Vital Signs	G.I.	Fluid Therapy	Other Meds	Lab Results & Date	Comments & Complications	Disposition
Bed #		Febrile: <input type="checkbox"/> Y <input type="checkbox"/> N	Vomiting? <input type="checkbox"/> Y <input type="checkbox"/> N	Oral Fluid? <input type="checkbox"/> Y <input type="checkbox"/> N	1.	Admit Ebola PCR: <input type="checkbox"/> Pos <input type="checkbox"/> Neg		Date of last symptom:
Admit Date (DD/MM)		Pulse: <input type="checkbox"/> weak <input type="checkbox"/> fast	Diarrhea? <input type="checkbox"/> Y <input type="checkbox"/> N	IV Fluid? <input type="checkbox"/> Y <input type="checkbox"/> N	2.	Date (DD/MM): _____		Date last PCR:
Age		AVPU score:	Bleeding? <input type="checkbox"/> Y <input type="checkbox"/> N	IV placed? <input type="checkbox"/> Y <input type="checkbox"/> N	3.			Counseling?
Sex [M] [F]		Urinating? <input type="checkbox"/> Y <input type="checkbox"/> N		IV needs replacement? <input type="checkbox"/> Y <input type="checkbox"/> N	4.	Malaria RDT: <input type="checkbox"/> Pos <input type="checkbox"/> Neg		<input type="checkbox"/> Y <input type="checkbox"/> N
Pregnant [Y] [N]		Ambulating? <input type="checkbox"/> Y <input type="checkbox"/> N			5.	Date (DD/MM): _____		Package? <input type="checkbox"/> Y <input type="checkbox"/> N
					6.			
					7.			
					.			

## APPENDIX F

### INFECTION CONTROL – Non-patient care activities for known or suspected VHF patients

#### Diagnostic laboratory activities

- Activities such as micro-pipetting and centrifugation can mechanically generate fine aerosols that might pose a risk of transmission of infection through inhalation.
- Laboratory personnel handling potential VHF clinical specimens should wear full PPE, particulate respirators (e.g., EU FFP2, US NIOSH-certified N951) and eye protection and powered air purifying respirators (PAPR) when aliquotting, performing centrifugation or undertaking any other procedure that may generate aerosols.
- When removing protective equipment, avoid any contact between the soiled items (e.g. gloves, coveralls or gowns) and any area of the face (i.e. eyes, nose or mouth).
- Perform hand hygiene immediately after the removal of protective equipment used during specimen handling and after any contact with potentially contaminated surfaces.
- Place specimens in clearly labeled, non-glass, leak-proof containers and deliver directly to designated specimen handling areas.
- Disinfect all external surfaces of specimen containers thoroughly (using an effective disinfectant) prior to transport. (Example of effective disinfectant: sodium hypochlorite at 0.05%, 500 ppm available chlorine (i.e. 1:100 dilution of household bleach at initial concentration of 5%).

## Post-mortem examinations

- Post-mortem examination of VHF-patient remains should be limited to essential evaluations only and should be performed by trained personnel.
- Personnel examining remains should wear full PPE as recommended for patient care.
- In addition, personnel performing autopsies of known or suspected VHF patients should wear eye protection or face shield and a particular respirator or, preferably, a powered air purifying respirator (PAPR).
- When removing protective equipment, avoid any contact between soiled gloves or equipment and the face (i.e. eyes, nose or mouth).
- Hand hygiene should be performed immediately following the removal of protective equipment used during post-mortem examination and that may have come into contact with potentially contaminated surfaces.
- Place specimens in clearly labeled, non-glass, leak-proof containers and deliver directly to designated specimen handling areas.
- All external surfaces of specimen containers should be thoroughly disinfected (using an effective disinfectant) prior to transport.
- Tissue or body fluids for disposal should be carefully placed in clearly marked, sealed containers for incineration.

## Movement and burial of human remains

- The handling of human remains should be kept to a minimum. The following recommendations should be adhered to in principle, but may need some adaptation to take account of cultural and religious concerns:
- Remains should not be sprayed, washed or embalmed.
- Only trained personnel should handle remains during the outbreak.
- Personnel handling remains should wear personal protective equipment (gloves, gowns, apron, surgical masks and eye protection) and closed shoes.
- Protective equipment is not required for individuals driving or riding in a vehicle to collect human remains.

- PPE should be put on at the site of collection of human remains and worn during the process of collection and placement in a body bag.
- PPE should be removed immediately after remains have been placed in a body bag and then placed inside a coffin.
- Remains should be wrapped in sealed, leak-proof material and should be buried promptly.

### Cleaning

- Environmental surfaces or objects contaminated with blood, other body fluids, secretions or excretions should be cleaned and disinfected using standard hospital detergents/disinfectants. Application of disinfectant should be preceded by cleaning.
- Do not spray (i.e. fog) occupied or unoccupied clinical areas with disinfectant. This is a potentially dangerous practice that has no proven disease control benefit.
- Wear full PPE (coverall or gown and apron, mask and eye protection, and head cover), heavy duty gloves, and boots when cleaning the environment and handling infectious waste. Cleaning heavily soiled surfaces (e.g. soiled with vomit or blood) increases the risk of splashes.
- Soiled linen should be placed in clearly labelled, leak-proof bags or buckets at the site of use and the container surfaces should be disinfected (using an effective disinfectant) before removal from the site.
- Linen that has been used by VHF patients can be heavily contaminated with body fluids (e.g. blood, vomit, stool) and splashes may result during handling. Therefore, soiled linen should be preferably incinerated to avoid any unnecessary risks to individuals handling these items.
- Linen should be transported directly to the laundry area and laundered promptly with water and detergent. For low-temperature laundering, wash linen with detergent and water, rinse and then soak in 0.05% chlorine for approximately 15 minutes. Linen should then be dried according to routine standards and procedures.

### Waste management during VHF outbreaks

- Waste should be triaged to enable appropriate and safe handling.
- Sharp objects (e.g. needles, syringes, glass articles) and tubing that have been in contact with the bloodstream should be placed inside puncture resistant containers. These should be located as close as practical to the area in which the items are used.
- Collect all solid, non-sharp, medical waste using leak-proof waste bags and covered bins.
- Waste should be placed in a designated pit of appropriate depth (e.g. 2 m deep and filled to a depth of 1–1.5 m). After each waste load the waste should be covered with a layer of soil 10–15 cm deep.
- An incinerator may be used for short periods during an outbreak to destroy solid waste. However, it is essential to ensure that total incineration has taken place. Caution is also required when handling flammable material and when wearing gloves due to the risk of burn injuries if gloves are ignited.
- Placenta and anatomical samples should be buried in a separate pit.
- The area designated for the final treatment and disposal of waste should have controlled access to prevent entry by animals, untrained personnel or children.
- Wear heavy duty gloves, gown and closed shoes (e.g. boots) when handling solid infectious waste.
- Waste, such as faeces, urine and vomit, and liquid waste from washing, can be disposed of in the sanitary sewer or pit latrine. No further treatment is necessary.
- Wear gloves, gown, closed shoes and facial protection, when handling liquid infectious waste (e.g. any secretion or excretion with visible blood even if it originated from a normally sterile body cavity). Avoid splashing when disposing of liquid infectious waste. Goggles provide greater protection than visors from splashes that may come from below when pouring liquid waste from a bucket.



## APPENDIX G Nutrition tables

Tolerance test		
Beneficiaries	Food and amount/day	Comments
Children <23 months	Artificial milk First feed 50ml <u>Total</u> 400-500ml/day in 8 feeds - <6 months RUIF - 6-23 months UHT milk	-If well tolerated, patients should start with the recommended protocols for their age the next day -Milk should always be given in drinking cups (bottles and spoons are to be avoided) -Milk shouldn't be heated or frozen
Children >23 months and adults	BP100 <sup>1</sup> First meal 1 tablet 28.4gr <u>Total</u> 1,5 bars/day in 2-4 meals - 24-59 months 1,5 bar/day - >5 years 1,5 bars/day Each bar contains 2 tablets	-Porridge is recommended for children 6-23 months but could also be given to older children and adults to assess their capacity to swallow - BP100 porridge/milk: crumble 1 tablet of BP100 in 100ml of cooled boiled water or 2 tablets in 200ml -Additionally, 200-300ml of drinking water should be offered if it doesn't interfere with the hydration protocol

<sup>1</sup> High energy protein biscuits, similar to PPN but made from wheat/oat flour.

## Nutrition protocol adapted to the age

a) 0-6 months (315 – 630 kcal/day). Amount of prepared RUIF an infant needs per day<sup>58</sup>

Age of infant in months	Amount of formula per day	Approx. # of flasks (200ml*)	Number of feeds per day	Size of feed in ml
0-1	450ml	2	8	60ml
1-2	600ml	3	7	90ml
2-3	750ml	4	6	120ml
3-4	750ml	4	6	120ml
4-5	900ml	5	6	150ml
5-6	900ml	5	6	150ml

\*100ml contains on average 70kcal

The infant should be fed using a disposable feeding cup. Spoons and bottles should be avoided because of the risk of aspiration and contamination

- Infants should be fed every 3-4 hours including during the night
- Children should never be forced to drink, but encouraged instead
- If the infant can't finish the feed, the amount should be reduced by 10 ml in the next feed and readjust to expected when possible
- Discard leftovers and disposal of the feeding cup should follow infection control procedures

b) 6-11 months (average 850 kcal/day)

Food	Quantity/day	Kcal/day	Meals/day	Length**
UHT milk	500ml	350	3	D1 – onwards
BP100*	1.5 bars	450	3	D1 – D3
PPN	1 sachet	500	3	D4 – onwards

\*1 bar is made of 2 tablets of 28.4g each. BP100 will be replaced by PPN starting on D4 while milk support continues

\*\*D means Days, D1 means first day of nutritional support

c) 12-23 months (average 900 kcal/day)

Food	Quantity/day	Kcal/day	Meals/day	Length**
UHT milk	600ml	420	3	D1 – onwards
BP100*	1.5 bars	450	3	D1 – D3
PPN	1 sachet	500	3	D4 – onwards

\*1 bar is made of 2 tablets of 28.4g each. BP100 will be replaced by PPN starting on D4

while milk support continues

\*\*D means Days, D1 means first day of nutritional support

d) 24-59 months (average 1200 kcal/day)

Food	Quantity/day	Kcal/day	Meals/day	Length**
BP100*	1.5 bars	450	3	D1 – D3
Cooked food	small portion	Up to 250	1	D1 – onwards
PPN	1 sachet	500	4	D4 – onwards
Supercereal + oil	100g+10ml	470	2	D1 – onwards

\*1bar is made of 2 tablets (28.4g each). BP100 will be replaced by PPN starting on D4 while Supercereal porridge continues

\*\*D means Days, D1 means first day of nutritional support

e) 5-18 years (average 1600 kcal/day)

Food	Quantity/day	Kcal/day	Meals/day	Length**
BP100*	2 bars	900	4	D1 – D3
PPN	1 sachet	500	4	D4 – onwards
Cooked food	Portion	300	1	D1 – D3
Supercereal + oil	150g+15ml	705	2	D1 – onwards

\*1bar is made of 2 tablets (28.4g each). BP100 will be replaced by PPN starting on D4 while Supercereal porridge continues

\*\*D means Days, D1 means first day of nutritional support

f) Adults (average 2000 kcal/day)

Food	Quantity/day	Kcal/day	Meals/day	Length**
BP100*	2 bars	600	4	D1 – D3
PPN	1 sachet	500	4	D4 – onwards
Cooked food	Portion	500	1	D1 – onwards
Supercereal + oil	200mg+20ml	940	2	D1 – onwards

\*1bar is made of 2 tablets (28.4g each). BP100 will be replaced by PPN starting on D4 while Supercereal porridge continues

\*\*D means Days, D1 means first day of nutritional support

N.B:

- BP100 should be given the first 3 days that follow the beginning of the intake along with milk (<23 months) and Supercereal porridge (>23month). Both BP100 and PPN contain similar amounts of nutrients, but BP100 is made from wheat/oat flour while PPN is made from peanut butter. In Ebola affected people, it should be assumed that BP100 is more digestible than PPN, consequently, PPN should be reserved to day 4th and continue until discharge.
- Pregnant and lactating women who are clinically stable and have appetite should be recommended to increase the daily intake for their respective age group up to 300 kcal/day (1 bar of BP100).

Note: for further information on Kcal and presentation/packaging of the RUTF available and how to prepare food for the patients, please refer to the annexes contained in the original document by Save the Children

## List of abbreviations, acronyms and definition of some medical terms

---

Aerosol	A fine mist or spray that contains minute particles
AFB	Acid-fast bacillus
Antibody	Type of protein in the blood that produces immunity against microorganisms or their toxins
Antigen	A molecule or substance that is recognized by the immune system, which triggers an immune response, such as the release of antibodies
Arthralgia	Joint pain
Asthenia	Severe weakness
AVPU	Alert, responding to voice, responding to pain, unresponsive
BPM	Beats per minute
BUN	Blood urea nitrogen
Case definition	Criteria for deciding whether a person has a particular disease
Carrier	A person or animal that harbors a specific infectious agent without visible symptoms of the disease. A carrier acts as a potential source of infection.
CCHF	Crimean-Congo Haemorrhagic Fever
CDC	Centers for Disease Control and Prevention
CP	Child Protection
CPHL	Central Public Health Laboratory
Dysphagia	Painful swallowing
ELISA	Enzyme-Linked-Immunosorbent Assay
ETC	Ebola Treatment Centre
F-75	Therapeutic milk (see recipe in the Pocket book of hospital care for children <sup>2</sup> )

g	Grams
GI	Gastrointestinal
Haematemesis	Vomiting of blood
Haemoptysis	Coughing up blood
Host	An organism in which a parasite lives and by which it is nourished.
hr	Hour
HR	Heart rate
IgM	Immune globulin M
IgG	Immune globulin G
IM	Intramuscular
IMAI	Integrated Management of Adolescent and Adult Illness
IMCI	Integrated Management of Childhood Illness
Incubation Period	Period that the patient is infected with the virus, but is still asymptomatic and not contagious yet
IPC	Infection Prevention and Control
IV	Intravenous
JVP	Jugular venous pressure
mcg	Microgram
mg	Milligram
ml	Milliliter
MOF	Multiple Organ Failure
MoH	Ministry of Health
MSF	Medecins Sans Frontieres
NGO	Non-governmental organization

<b>Ngt</b>	Nasogastric tube
<b>Nosocomial Infection</b>	An infection acquired at a hospital or other healthcare facility.
<b>NSAID</b>	Non-steroidal anti-inflammatory drug
<b>Oedema</b>	An accumulation of an excessive amount of watery fluid in cells and tissues of the body
<b>ORS</b>	Oral rehydration salt(s)
<b>PAPR</b>	Powered Air Purifying Respirators
<b>Photophobia</b>	Painful oversensitivity to light
<b>PCR</b>	Polymerase Chain Reaction
<b>PPE</b>	Personal Protective Equipment
<b>PPN</b>	Plumpy Nut
<b>ReSoMal</b>	Rehydration solution for malnutrition
<b>RDT</b>	Rapid Diagnostic Test
<b>Reservoir</b>	Any person, animal, anthropoid, plant, or substance which can harbor infection and hence act as a source of disease outbreak.
<b>RR</b>	Respiratory rate
<b>RUIF</b>	Ready to Use Infant Formula
<b>RUTF</b>	Ready to Use Therapeutic Food
<b>SBP</b>	Systolic blood pressure
<b>SpO<sub>2</sub></b>	Oxygensaturation
<b>Tachypnoea</b>	Fast breathing
<b>UNICEF</b>	United Nations Children's Fund
<b>UHT milk</b>	Ultra-High Temperature treated milk
<b>VHF</b>	Viral Haemorrhagic Fever
<b>WHO</b>	World Health Organization

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