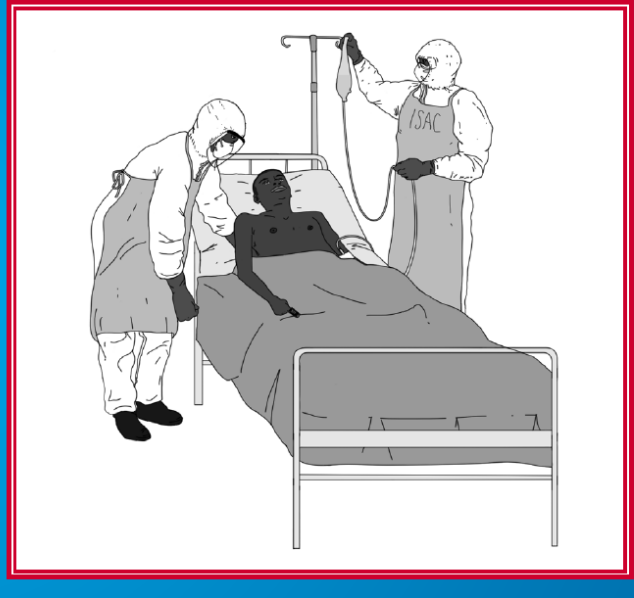
Clinical management of patients with viral haemorrhagic fever

A pocket guide for front-line health workers

FEBRUARY 2016



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Insert national foreword from the Ministry of Health

Note: For Ebola-affected countries, the adaptation and foreword may reflect a guide which concentrates on clinical care delivered in Ebola Treatment Units (ETUs; also called Ebola Treatment Centres, or ETCs) as well as in Ebola Holding Centres (EHC), Ebola Holding Units (EHU) and Ebola Community Care Centres (CCC). These guidelines are also relevant to managing suspect or probable Ebola patients in an isolation ward in a mainstream health facility and patients isolated prior to referral to an ETU.

For at-risk countries the guidelines should also include a section for facilities without VHF treatment capacity, where quality screening for Ebola and other VHF should take place and then, if VHF is suspected, isolation (with treatment in full personal protective equipment (PPE) and rapid transfer to an ETU or holding centre.

Although these guidelines concentrate on Ebola Virus Disease (EVD), referred to throughout this guide as Ebola, they also address Lassa fever, which is an endemic problem in Sierra Leone and also occurs in Liberia, Guinea and Nigeria, as well as two other viral haemorrhagic fevers that are transmitted person-to-person, Marburg and Crimean-Congo haemorrhagic fever. Country adaptation should address which VHFs are included in this pocket guide.

Introduction to second edition, February 2016

The large number of cases of Ebola in Guinea, Sierra Leone and Liberia required many new ETUs and holding centres to provide many more treatment beds and a large scale-up of training and mentoring to prepare health workers. This large scale-up required efficient and effective approaches to case management. Much has been learned about clinical presentation and management during this epidemic. The VHF pocket guide has provided a good resource for such training and care within ETUs.

The predominant clinical syndrome in the West African Ebola epidemic is a severe gastrointestinal illness with vomiting and large-volume diarrhoea, leading to volume depletion, metabolic abnormalities and hypovolaemic shock *(1,2).*

Experience from the treatment of patients with Ebola in developed health-care settings reveals that the case fatality rate with well-resourced supportive care may be much lower than in resource-constrained environments. This observation highlights the potential value of improving the provision of supportive care in all environments *(3),* particularly adequate fluid resuscitation and prevention and correction of electrolyte abnormalities (4,5). In patients not able to maintain hydration orally, "...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" *(1).* The absence of reports of fluid overload and pulmonary oedema in the ETUs, whereas these have occurred in a few patients receiving ICU care *(6),* also suggest that inadequate fluid resuscitation has been common in most ETUs.

While this pocket guide provides 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 very large numbers of Ebola patients place severe pressures on staff-to-patient ratios or staff qualifications. Priority must be given to admitting and providing safe, basic care to as many Ebola patients as possible in order to stop transmission in the home and community while striving to provide the best care that staffing permits.

This pocket guide provides strong support for the practical application of key lifesaving interventions that are feasible in an ETU as well as interventions that relieve pain and other symptoms. Providing good supportive care while in personal protective equipment

(PPE), which limits the time for patient care and can impair vision and dexterity, is a challenge. Practical approaches to improving the volume of fluids administered are discussed using ORS, IV and intraosseous (IO) fluids.

This pocket guide seeks to provide clear guidance on current best practices for VHF, including both clinical management and infection prevention and control. Throughout, 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 come predominantly from published VHF guidelines (primarily consensus-based), and also are draw from algorithms for diarrhoeal diseases, sepsis and vaginal bleeding management from the WHO Integrated Management of Adolescent and Adult Illness (IMAI) and Childhood Illness (IMCI) guidelines and other current WHO normative guidelines. The rationale for including the management of GI loss from diarrhoeal disease and vomiting and the sepsis algorithms is that many patients in the West African Ebola epidemic have had severe diarrhoea and vomiting with dehydration and shock; others have this combined with severe sepsis or a clinical pictures consistent with suspected pathophysiology and final common pathway of severe sepsis, with manifestations of increased vascular permeability, vasodilatation, multiple organ failure and shock. In addition, this book provides guidance on infection prevention and control to minimize nosocomial transmission and on the 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. Separate notes have been added on the care of children and pregnant women.

Importantly, this document does not cover how to create a VHF treatment unit (that is, an 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 complement such guidance and will strengthen the overall response to VHF outbreaks in Africa, contributing to the Integrated Disease Surveillance and Response activities necessary for compliance with international health regulations.

This is the updated version of the WHO's *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*, first published in March 2014 (*7*).

Contents

Appendices

Tables

Tables in appendices:

Sources

This manual draws heavily on:

- Sierra Leone Ministry of Health and Sanitation. Clinical management of patients in the ebola treatment centres and other care centres in Sierra Leone: A pocket guide- interim emergency guideline. Freetown, 15 December 2014 *(8)*.
- World Health Organization (WHO). IMAI District Clinician Manual: hospital care for adolescents and adults *(9)*.
- WHO. Pocket book of hospital care for children: guidelines for the management of common childhood illnesses, 2nd edition *(10)*.
- Médecins Sans Frontières. Guidelines for the management of viral haemorrhagic fevers *(11)*.
- WHO Infection prevention and control (IPC) guidelines (*12,13,14).*
- Sierra Leone, Liberian and Guinean Ministries of Health, WHO, nongovernmental organization (NGOs) and other partners' experience in running Ebola treatment centres and holding units and national standard operating procedures from MoH case management pillars in the Ebola response.
- Expert review and recent clinical publications.
- WHO. Informal review on clinical experience of patients with Ebola Virus Disease in the context of the ongoing outbreak in West Africa, Geneva, July 21–22, 2014.
- WHO informal consultations on clinical aspects of Ebola Virus Disease and advancing standards of clinical care, Geneva, January 26–27, 2015 *(15)* and Rome, 20–21 April 2015 *(3)*.
- WHO informal consultations on clinical aspects and case management of paediatric Ebola Virus Disease, Freetown, 2 March 2015 and Geneva, 25–26 March 2015.

Quality improvement indicators for clinical care based on the guidelines in this pocket guide can be found at www.walimu.org/qi/ebola/

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 viruses of the following families:

- *Arenaviridae* (Lassa, Lujo, Junin, Guanarito, Sabia, Machupo and Chapare)
- *Bunyaviridae* (Crimean-Congo haemorrhagic fever [CCHF], Rift Valley fever and hantaviruses)
- *Filoviridae* (Ebola and Marburg)
- *Flaviviridae* (yellow fever, dengue, Omsk haemorrhagic fever, Kyasanur forest disease and Alkurma haemorhagic 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 are not transmitted directly from person to person.

Purpose

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

Objectives

- To establish a systematic approach to comprehensive clinical management of VHF cases
- To build health workers' capacity to use current best practices in managing VHFs
- Through training and skills transfer, to build health workers' confidence in their ability to safely manage VHFs.

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. Also, there is 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 (or from persistent virus in the body fluids of an Ebola survivor) 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 by a tick from infected domestic or wild animals (such as deer, cattle, goats and sheep), 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*, 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 estimated tens of thousands of cases annually; the highest incidence occurs in the Kenema and Bo districts of Sierra Leone, but it also occurs in other districts in Sierra Leone and in Nigeria, Guinea and Liberia. In the 2014–15 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, 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 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 (for example, malaria, typhoid, bacterial sepsis, acute gastroenteritis). Thus, without standard infection prevention and control precautions maintained at all time and a high level of suspicion for VHF in the differential diagnosis, health staff and other patients are at risk for infection.

The provision of medical care to critically ill patients can be challenging in any setting, but particularly in environments with limited resources (including health personnel, medical supplies and equipment) 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 de-prioritization of patient care.

Health workers have an obligation to provide the best medical care to improve patient survival and also to provide symptom relief and palliation when required. In the context of patients with VHF, clinical care must be strengthened while 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 (that is, during and outside of outbreaks). Importantly, inadequate care for VHF patients may lead to increased reluctance on the part of individuals from the community to seek health care from designated facilities and to help identify and isolate possible patients. This downstream effect makes case finding through community triage difficult and can seriously affect control of an outbreak of infection.

The application of appropriate skills and case management protocols makes the care of a patient with VHF less daunting. The optimal approach requires a clear understanding of the likely means of transmission in a health-care environment (and, thus, of the real risks to health workers). Such understanding builds trust in the efficacy of protective measures and prudence in their use. This is necessary for an approach to patient care that minimizes hazard while maximizing effectiveness of the care.

2 Principles of VHF management

2.1 Case identification/detection

The diagnosis of VHF is based on three components:

- history of exposure
- detailed clinical assessment
- 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 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

History of exposure to 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 – that is, within the potential incubation period for Ebola and Marburg.

The most common exposure is to blood or any other body fluid (for example, vomit, diarrhoea, sweat, urine, semen) from a known or suspected Marburg or Ebola case (dead or alive), usually while providing care or attending a funeral. Before an outbreak is 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, and religious leaders who had contact with blood or body fluids and those participating in traditional burial rituals. Health workers are a recognized high-risk group and should be questioned about recent patient contact and unwell colleagues. Also inquire about health workers' exposure from family and friends, in the community and in private clinics or other private care-giving.

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

Other exposures are:

- Contact with infected animals, usually monkeys, chimpanzees and bats, alive or dead, for example, 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. Therefore, well cooked meat is considered virus free.

  Being breastfed by a woman with Ebola or Marburg is considered an exposure; Ebola virus has been found in breast milk *(16)* with recent evidence suggesting that breast milk can remain positive for Ebola virus at least for up to 9 months after symptom onset in survivors who were pregnant or lactating when infected. Spontaneous galactorrhea has also been reported in female survivors – one survivor's breast milk tested positive for Ebola by PCR nine months after onset of symptoms *(17)*.

- Being the sexual partner of a known or suspected male case, as the viral RNA has persisted in semen up to 12 months after clinical recovery *(18,19,20,*21*)*.

- Coming into contact with contaminated items, for example, medical

devices, eating utensils, linens from infected patients *(16)*.

Note: The virus cannot survive very long in non-organic material outside the body, but it can be present in material contaminated with body fluids, such as needles or other medical material that is reused dirty bed sheets, etc..

- Receiving health care from a provider who is also treating Ebola or Marburg patients and who is not taking appropriate infection control measures.

Ebola infection in pregnancy may result in persistence of viral RNA in the products of conception (amniotic fluid, placenta, fetus). Products of conception can remain potentially infectious among survivors who were pregnant during their Ebola infection. Pregnant women with Ebola infection may have no clinical symptoms of Ebola (and do not meet Ebola case definition)(22) or have mild clinical symptoms.

Newborns of infected mothers may be infectious even if they are not exhibiting symptoms (see section 3.6).

Persistent and viable Ebola virus was recently demonstrated in the aqueous humour of a survivor's eye 9 weeks after convalescence but not in the tears or conjunctival secretions *(23)*.

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

History of exposure to Lassa fever

Multimammate rats breed frequently and are a common rodent, most common in rural areas and in dwellings more than in the countryside *(24)*. 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 that carry the virus are found throughout West Africa, and 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 exposure to infected rats at home, other possible modes of exposure include:

- Close contacts with a Lassa fever patient within 3 weeks of the 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 and 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, for example, medical material, eating utensils, linens from infected patients.

Note: the virus cannot survive very long in non-organic material, but it can be present in material contaminated with body fluids, such as needles or other medical material that is reused, dirty bed sheets, etc.

History of exposure to CCHF *(25,26)*

Farmers, abattoir workers, veterinarians and health workers are included in the occupational risk groups.

Transmission of the CCHF virus to humans can occur in several ways:

- A 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. Aerosol generating procedures have also resulted in cases of secondary nosocomial infection of health workers (27, 28).

- 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 vertical transmission from a mother to her child has been reported. The risk of exposure during breast feeding is unclear, although considered high *(29)*.

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 differential diagnosis to include other causes of fever and non-specific symptoms (for example, malaria, typhoid, acute gastroenteritis, respiratory infections and urinary tract infections). Also, despite being called a viral haemorrhagic fever, the clinical presentation of VHF includes haemorrhage in less than half of confirmed Ebola/Marburg cases in earlier outbreaks and less than 20% in confirmed Lassa cases. In the current West African outbreak of Ebola, significant haemorrhage is even less common; instead significant vomiting and diarrhea are the predominant symptoms in addition to fever. 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 addition, there is a difference between early and late clinical signs of VHF. Therefore, 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. Front-line health workers should have a high level of suspicion for VHF in patients with a history of exposure even when their clinical presentation is mild.

Children, depending on age, communicate pain less accurately than adults. Crying and irritability is usually a sign of pain from any site; children may also become withdrawn or still when in pain. In addition, difficulty breathing, rash and conjunctivitis are common but non-specific signs. History needs to be obtained from the caretakers and, if available, the mobile phone number of the caretaker or neighbors recorded if the child is separated from the caretakers. Young children might progress more rapidly to severe disease. They should be monitored closely and started on IV fluid therapy early (see sections 3 and 4.4).

Clinical features of Ebola/Marburg *(30,11)*

Both the Ebola and Marburg viruses are part of the family of *Filoviridae.* The incubation period for these viruses (that is, 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 occasionally hiccups. Patients may also complain of dysphagia and abdominal pain – epigastric, right subcostal and lower abdominal pain. These are usually followed by gastrointestinal symptoms: nausea, vomiting and diarrhoea. See Table 1.

In the West African outbreak of 2014-2015, the gastrointestinal symptoms (anorexia, vomiting, diarrhoea) were particularly severe and led to most of the physiological decompensation experienced. A range of multi-organ acute complications of Ebola were observed, including hypovolaemic and septic shock, metabolic acidosis, occasional hypoxic pulmonary insufficiency and ventilatory failure, electrolyte abnormalities and renal insufficiency, and coagulation abnormalities but without frequent hemorrhagic shock *(3)*. See Table 2.

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

Table 1. Early and late clinical features of Ebola/Marburg infection

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

Early clinical features *(30)*

- Intense tiredness, weakness, malaise
- Fever (defined as ≥ 38.0˚C axillary)*
- Headache
- Myalgia (muscle pain)
- Arthralgia (joint pain)
- Hiccups
- Conjunctivitis
- Nausea and loss of appetite
- Throat pain and difficulty swallowing
- Abdominal or epigastric pain
- Diarrhoea (can be bloody or non-bloody)
- Irritability, excessive crying, restlessness in children under 5 years

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 (e.g., ecchymoses, petechiae, purpura)
  - bleeding from the gums
  - conjunctival haemorrhage (bleeding from the eyes)
  - epistaxis (bleeding from the nose)
  - haematemesis (blood in vomitus)
  - haemoptysis (blood in sputum)
  - dark blood in stool (melena, hematochezia)
  - unexplained vaginal bleeding in women
  - haematuria (blood in urine)
- Miscarriage in pregnant women**
- Respiratory distress
- Shock (see definition of shcok in section 4)

* **Fever may be absent in early and late stages** (31).

** Miscarriage or unexplained vaginal bleeding may be the initial, presenting feature in a pregnant woman. 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.

Table 2. Natural history of Ebola, based on 2014 outbreak, combined experience from Sierra Leone *(32)* and Liberia *(2)*

Average time since symptom onset	Phase of illness	Clinical features
0–3 days	Undifferentiated febrile illness (90%)	• Fever (≥38.0 ºC axillary)(some do not report fever) • body and joint pain (occasionally back pain) • progressive and profound weakness (might precede fever • loss of appetite • sore throat • headache • fatigue.
4–10 days	Gastro-intestinal (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. • hypovolaemia and dehydration with shock may occur.

≥10 days	Hypovolemic shock/ dehydration	• Oligoanuria • dry mucosa • hypoglycaemia • tachypnoea • tachycardia • diminished consciousness or coma.
	Neurological complications	• confusion and disorientation • agitation (may lead to falling on the floor) • bradipsichia (unable to keep attention) • extreme weakness (unable to stand up and walk) Death may occur in 24–48 hours after the onset of neurological abnormalities.
	Haemorrhagic complications	• Gum bleeding • melena • haematemesis • epistaxis • bleeding from puncture and IV line sites.
	Late complications OR Recovery	• Resolution of gastrointestinal symptoms and fever • increased appetite • increased energy • convalescent weakness. • Secondary infections (including candidiasis, oral ulcers) • multiorgan failure • tachypnoea (Kussmaul breathing from acidosis) • seizures • death • complications due to electrolyte abnormalities in patients with previous good outcome.

Clinical features of Lassa fever

The incubation period is 6–21 days.

Clinical differentiation among VHFs is difficult. Therefore, prompt laboratory testing is important to identify Lassa fever early enough for ribavirin to be effective. Swollen face and neck are classic signs in Lassa fever but occur in only about 10% of cases; these signs 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. Lassa fever typically has a more indolent presentation; patients feel fatigued and "feverish" for a few days. By comparison, Ebola/Marburg begins more abruptly and evolves more rapidly.

In about 80% of people infected, Lassa fever is mild or has no observable symptoms. Unapparent infection, diagnosed serologically, is common in endemic areas. Because of these frequently 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% *(33,34)*. Severe multisystem disease is seen in a subset of patients, however, and in some epidemics mortality as high as 80% has been reported. There may be differences in viral strain 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 *(35)*. The extent of sexual transmission is unknown.

Table 3. Clinical stages of severe Lassa fever

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 mmHg in adults) • 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 in hospital inpatients compared with none among febrile controls *(36)*), 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 viraemic are indicators of poor prognosis for the patient. Albuminuria and haemoconcentration may accompany severe disease.

Clinical features of Crimean-Congo Haemorrhagic Fever *(37,38,39)*

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. 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, anorexia, lethargy, back pain, joint pain, abdominal pain and vomiting. Symptoms may also include jaundice and in severe cases changes in mood and sensory perception.

The haemorrhagic period is usually short (2–3 days, but it can be up to 2 weeks), develops rapidly, and usually begins between the third and 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, has been reported. In approximately 30% of patients, hepato-splenomegaly can also be found.

Laboratory features of CCHF include 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. Adverse prognostic indicators and risk factors include age greater than 60 years, rapid progression of clinical status and laboratory values, somnolence and platelets <50,000 mm^3 or prolonged aPTT (40).

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 for Ebola

Precautions and advice during screening in Ebola facilities (ETUs, Ebola holding centres) and in non-Ebola health facilities during an Ebola outbreak

Screening is based on a thorough interview and observation of the patient, including history of current symptoms, contact history and local epidemiology. No physical exam is performed at the screening area – only body temperature is checked (see below) – but observation for relevant signs is important if patients are not forthcoming with symptom history (due to fear, desire not to be isolated in an ETU, etc.).

Health workers should wear light PPE (face shield, gown, and clean gloves; if no face shield is available, substitute mask and goggles) during interview. To admit the patient to an ETU (or to an isolation ward, or for isolation prior to ambulance transfer to an ETU), a health worker wearing full PPE for Ebola should be called to accompany the patient to the ward and to perform the initial physical exam inside the red zone.

The physical setup for screening assures 1–2 meter (3–6 feet) distance between the screener and the patient at all times:

- whenever possible, impose a physical barrier between patient and health worker that allows one-way transfer of medications/materials to the patient;
- when a physical barrier is not feasible, offset the positioning of the patient to avoid being face-to-face during screening.

Several approaches can be used to measure temperature:

- use an infrared thermometer (requires coming within 1 m of patient). Clean with 0.5% chlorine if any contact with patient). OR
- give the patient a digital thermometer and demonstrate how it is used. The patient measures his or her own axillary temperature (or their child's) and reads it aloud or shows the reading to the screener. The thermometer is kept with the patient if the patient is admitted or is

cleaned with 0.5% chlorine between uses with different patients in the screening area.

Patients for screening may be walk-ins (especially in non-Ebola health-care facilities) or may be sent by Ebola surveillance officers in the community (usually via ambulance). Some may also arrive by taxi or other paid transporation, requiring disinfection of this vehicle and education/evaluation of others (for example the taxi driver).

Note that Ebola screening is still required for Ebola survivors for several reasons. A person may mistakenly believe that he or she is an Ebola survivor simply because they were admitted to and discharged from an ETU. In fact, they may have been a suspect case who tested negative. There are also reports of confirmed cases of Ebola who survived, tested negative and were discharged but subsequently presented with symptoms and tested positive again (recrudescence). See clinical guidance on care of Ebola survivors for management of possible recrudescence (*17*). Cases have been reported of HIV-positive Ebola survivors who have had recrudescent disease (*41*).

Interview

- Ensure privacy during the interview.
- Train health workers on taking a history using open-ended questions followed by probing questions and clinical observations.
- Clinical observations of patient are an integral part of the interview. Patients might not be forthcoming with their symptom history (due to fear or denial), or, in the case of unaccompanied children or those with altered neurological status, be unable to explain their history and symptoms. Health workers should be trained to observe and interpret a patient's general appearance and be alert to discrepancies between clinical observation and symptom history.
- Make sure to have staff/family members who speak the local languages. Ensure effective communication between the screener and the contact tracing team, the family and the referring health worker or surveillance officer to clarify the epidemiologic links and contact/exposure history. Patients may say they are well now but may have recently become ill or still be in denial about symptoms.

Ebola screening and case definitions (42, 45)

See Appendix A1 for definitions of suspect, probable and confirmed cases. These case definitions for surveillance differ when an outbreak of Ebola or Marburg is or is not occurring.

An Ebola screening form should incorporate the current case definitions. The form should be used to decide whether a patient fits a probable or a suspect Ebola case definition.

Case definitions may vary depending on the stage of the outbreak and whether the emphasis is on maximizing sensitivity or specificity. For example, in Sierra Leone, the case definition for adults during the start and at the height of the epidemic consisted of any one the following criteria:

- Fever AND contact with a clinical case; OR
- Fever AND 3 or more additional symptoms* of Ebola; OR
- Contact AND 3 or more symptoms* of Ebola; OR
- Unexplained bleeding or miscarriage; OR
- Sudden unexplained death

* Headache, fatigue, generalized or joint pain, loss of appetite, nausea, vomiting, diarrhoea, abdominal pain, difficulty swallowing, hiccups, difficulty breathing, miscarriage.

As the epidemic declined and cases continued to occur in only a few districts, the Sierra Leone MoHS (43) adopted a more sensitive case definition for probable cases (Contact AND 1 or more symptoms of Ebola), defined age-appropriate signs for children under 3 years (see Table 4), more operational separation between probable and suspect cases, and special considerations for pregnant women (see below and section 3.6). Also, the contact criteria were expanded to include: assessment or treatment by a traditional healer; recent admission to an Ebola facility or isolation ward for possible Ebola; any other risk of Ebola, for example sexual contact with a male survivor; or touching or caring for someone who was sick or died and had been in a district with ongoing Ebola cases.

During an Ebola outbreak, all pregnant or postpartum women who satisfy Ebola suspect or probable case definitions, or who survived Ebola during their current pregnancy, or who present with Ebola-associated complications (abortion; pre-labour ruptured membranes; pre-term labour or birth; antepartum, intrapartum or postpartum hemorrhage; fetal death,

stillbirth or neonatal death) or who are a contact (even without symptoms) must be managed as if they are potentially infectious until proven negative by blood PCR test from the mother and, where appropriate, swabs obtained from products of conception or baby (amniotic fluid, foetus / stillbirth / neonate, any surface on the inside of the amniotic sac) (44). See section 3.6 on risk of transmission. The mother and their newborn must remain in the Ebola care facility and managed using full PPE and IPC measures pending results of Ebola PCR tests.

Table 4. Ebola symptoms adults and children ≥ 3 years and < 3 years old (43)

Recent onset of symptoms of Ebola (less than 3 weeks)	
For adults and children 3 years and above	**For children less than 3 years**
Intense fatigue (general body weakness)	Prostration / severe weakness
Loss of appetite	Poor feeding/inability to suck
Nausea or vomiting	Nausea or vomiting
Diarrhoea	Diarrhoea
Abdominal pain	Abdominal pain
Muscle pain, joint pains, backache	Excessive crying/irritable/restless
Sore throat or pain with swallowing	Drooling / pain swallowing
Hiccups	Hiccups
Difficulty breathing	Difficulty breathing
Conjunctivitis ('red eyes')	Conjunctivitis ('red eyes')
Unexplained bleeding	Unexplained bleeding
Headache	

The case definition emphasizes fever in the last 48 hours – either a recorded temperature of >38.0 °C at the time of screening or within the previous 2 days, or else a history of fever in the last 48 hours. History of fever within last 48 hours or during the current acute illness is a valid indication of fever. The patient may have taken paracetamol or non-steroidal anti-inflammatory drugs (NSAIDs) and thus suppressed fever.

Clinicians should observe for signs that the patient is unwell, dehydrated or presyncopal. Some patients deny symptoms to avoid admission to the ETU.

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 or contact with other children from outside the home, Ebola is unlikely.

Screening by a clinician should seek additional clinical and epidemiological information to aid in the decision 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, even if he/she denies symptoms.

If the patient fulfils the suspect or probable case definition:

- Counsel the patient on what is happening.
- Isolate the patient. **Call for staff in full PPE to accompany patient to the isolation ward** (or to care for the patient before he or she is transferred to an ETU).
    - Provide and encourage drinking oral rehydration solution (ORS).
    - Do not perform physical exam in the screening area.
    - Do not perform rapid diagnostic test for malaria. (This will be done on the ward. Some screening areas have adjacent "waiting" areas (red zone) for patients as they wait to transfer to the suspect/probable or isolation wards. These may be conducive to the safe provision (in full PPE) of physical examination and/or rapid malaria testing, and especially the initiation of treatment (antimalarials, antibiotics, IV fluids, etc.).)
- Report the suspect or probable case (a "live alert") to the surveillance system and work with the Case Investigation Team to identify all possible contacts, including within the health facilities.

What is meant by a contact (*45*)

Contact tracing can only break the chain of Ebola transmission if it is implemented immediately upon identification of a potential Ebola case. The identification of a suspect, probable or confirmed case of Ebola should trigger a "live alert" or an alert based on a suspect, probable or confirmed Ebola death. Laboratory confirmation should not delay the initiation of contact tracing. When a potential Ebola case is first detected at a health facility or in the community, the Case Investigation Team should be immediately mobilized to

investigate.

Contacts include:

- People with direct physical contact with a case (alive or dead) during the illness. This includes people who touched the blood or body fluids (including urine, faeces, vomit, tears, or sweat) of a case during their illness
- People with sexual contact with a case or unprotected sexual intercourse with a male survivor within 12 months of the survivor's Ebola recovery whose semen has not been tested or tested and not yet converted.
- People who lived with the case (alive or deceased) since symptom onset in the same household (including all who slept in the house)
- People who touched the clothes or linens of a case
- People who attended burial preparation rituals or the funeral of someone with Ebola and touched the body or had contact with fluids or material in contact with the body
- A baby breastfed by a case or by an Ebola survivor (who were infected during this pregnancy) whose breast milk has not been tested or has not converted to PCR negative.
- A patient who was admitted to the suspect ward of an ETC then discharged (after negative PCRs), within the last 21 days.

To find all contacts requires investigating:

- All people who visited the case (alive or deceased) since symptom onset (e.g., at home, health facility) or who otherwise came into contact with the case since symptom onset (e.g., work, pharmacy, place of worship, extended family, traditional healers)
- All health facilities visited by the case including all health workers who cared for the case (when Ebola precautions, including full PPE were not applied) and patients on the same medical ward. Health workers should include both clinicians, aids, and those involved in cleaning, waste management, laboratory technicians, etc.

Attendance at a safe burial (Ebola corpse in body bag and buried according to protocol) or attendance without contact with the body and without contact with those who touched the body or any fluids or materials that contacted the body are not considered contacts. If there is doubt, consider anyone who attended an unsafe burial a contact and review exposure history with the surveillance officer.

Asymptomatic contacts are not infectious. Contacts admitted to hospital for other illnesses

should be screened for the development of new Ebola symptoms every shift.

Ebola polymerase chain reaction (PCR) testing and re-testing

Cases are confirmed by laboratory testing, for example, a positive PCR test for Ebola virus. Suspect, probable and confirmed cases should be admitted to physically separate areas/wards. The flow of health workers should go from suspect to probable to confirmed cases to mitigate risk of nosocomial transmission inside an ETU (see section 7.4). Patients should also be further separated according to wet (diarrhoea, vomiting or any bleeding) symptoms and dry (no diarrhoea, no vomiting, no bleeding).

In the first 3 days of symptoms, a PCR test for Ebola may still be negative. Thus, patients (including all probable cases) with an initially negative PCR test will require a second PCR on day 3 of symptoms before they can be considered truly negative. In suspect patients whose symptoms have improved or resolved before day 3, a second Ebola PCR test may not be necessary.

Determination of the onset of symptoms can be challenging in children. Repeat Ebola virus PCR in all symptomatic children who are contacts (that is, probable cases) at 3 days from admission if unsure about the date of symptom onset. Ebola virus PCR-negative newborns of mothers who are Ebola suspect or probable cases should be handled in full PPE even with an initial negative test. PCR should be repeated after 2 days (see section 3.6). For neonates born to an Ebola confirmed case, the neonate should remain in the ETU and have PCR testing repeated when symptomatic. Even if remaining asymptomatic, neonatal blood Ebola PCR should be tested on days 22 and 24 after birth. If well, the neonate may be discharged provided both tests are negative (with a plan for feeding).

2.1.4 Surveillance: complete the case investigation form

- Ebola facilities should have a surveillance officer working with the clinician doing the screening to complete 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; and then notify the surveillance system.
- The family/next of kin should also be notified of the admission.

2.2 Laboratory investigations and specimen collection

2.2.1 VHF laboratory testing *(46)*

All samples should be considered 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. Insert below the current list of national (or nearest regional) laboratories for haemorrhagic fever viruses in your country, including:

Laboratories that can perform PCR for Ebola or Marburg:

.....

.....

.....

Laboratories that can perform PCR for Lassa:

.....

.....

.....

Laboratories that can perform PCR for CCHF:

.....

A system of sample collection and transport is required that can adjust to the evolving situation (increase or decrease in number of cases, new mobile laboratories being established, etc.). Personnel who collect and handle samples (laboratory personnel; nurses,doctors and phlebotomists who do blood sampling); personnel who package samples for transport; and surveillance officers who obtain oral swabs in dead bodies) should be trained on how to put PPE on and take it off. Safe shipment of highly infectious biological substances should adhere to locally developed SOPs that ensure the following procedures for investigations are followed:

- Ensure that all specimen collection containers and materials are available (see Table 5). Ensure that all the equipment is assembled. Ideally, use needle safe devices, if available, and always have a

sharps box at hand.

- Ideally, invasive procedures should be undertaken by two health workers.
- Follow necessary protective precautions when collecting samples including full PPE.
- Ensure that samples are appropriately labelled, including three unique patient identifiers – name, age and unique identification number.
- Triple package samples- see examples in Appendix J.
- Send the samples immediately to the appropriate reference laboratory, marked "Urgent" with the biohazard sign. There may be a country-wide network of laboratories where samples for transportation to the national reference laboratory (or a laboratory in a neighboring country) are gathered. Often the regional centres have the means to pick up samples from lower-level health units in their areas of operation.

The basis of PCR testing is to detect viral RNA by amplifying the number of RNA copies with each cycle run of the machine. PCR test results are often reported in terms of cycle threshold (Ct) or viral load (copies/ml). The Ct is defined as the number of cycles needed to detect viral RNA over a background level (that is, to exceed the threshold). Ct is inversely proportional to viral load (i.e. the lower the Ct the higher the viral load).

Careful consideration should be given to the selection of diagnostic tests which takes into account technical specifications, disease incidence and prevalence and social and medical implications of test results. Both PCR and automated PCR testing is now available such as GeneXpert. Both PCR and GeneXpert are nucleic acid amplification tests; either can be used to confirm Ebola infection.

Lateral flow rapid antigen tests (RDTs) with high-specificity and high-sensitivity are recommended for use as a screening tool or for use in remote settings where PCR testing is not easily accessible. In epidemiological situations where Ebola disease prevalence is low, RDTs with high specificity are required. Widespread use of low specificity assays will generate more false positives than true positives. All specimens with a reactive RDT must be retested by PCR for diagnostic confirmation.

Repeat assessment is required for any negative test if taken within 72 hours of onset of symptoms.

Table 5. Specimen collection for viral haemorrhagic fevers	
Specimen	*For PCR:* Whole blood or blood clot, serum/plasma or tissue; oral swab from corpses; semen and breast milk *For ELISA:* Whole blood, serum or plasma *For immunohistochemistry:* Skin or tissue specimens from fatal cases.
When and how to collect	Collect a specimen from every suspected case. All specimens should be regarded as potentially infectious. Health workers who collect or transport clinical specimens should adhere rigorously to full PPE and other VHF precautions (see section 7) to minimize the possibility of exposure to pathogens.
How to prepare, store, and transport	HANDLE AND TRANSPORT SPECIMENS FROM SUSPECTED VHF PATIENTS WITH EXTREME CAUTION. WEAR PPE AND USE BARRIER PRECAUTIONS (see section 7) until the specimens are triple packaged. *Sample for ELISA or PCR:* Refrigerate whole blood, serum or clot and oral swabs Freeze (−20 ºC or colder) specimens for virus isolation *Tissues for immunohistochemistry:* Fix skin snip specimen in formalin. Specimen can be stored for at least 6 weeks. The specimen is not infectious once it is in formalin. Formalin-fixed specimens may be stored and transported at room temperature and do not require triple-packaging. NOTE: A TRIPLE PACKAGING SYSTEM SHOULD BE USED FOR ALL SPECIMENS EXCEPT FOR THOSE IN FORMALIN (see Appendix J). SPECIMENS MUST BE APPROPRIATELY LABELLED AND ACCOMPANIED BY COMPLETE DOCUMENTATION (INCLUDING CASE INVESTIGATION FORM).

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 (Table 5). The ability to confirm the diagnosis of VHF usually requires highly specialized reference laboratories (with rigorous biosafety infrastructure) that are centrally located. In the large West African Ebola outbreak, however, it was essential to have mobile labs able to perform PCR near the hotspots rather than centrally located.

Table 6. Interpretation of VHF laboratory results from acute symptomatic patients

Lab confirmation of:	Result
Acute infection	PCR positive; ± Igm positive
Recent infection (within previous couple of months)	IgM and IgG positive
Past infection	IgG positive only (no IgM)

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

- A PCR test, often referred to as real time or reverse transcriptase PCR or RT-PCR, provides evidence of the virus in the blood or tissues during the acute phase of the clinical disease. It 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, but that test is less sensitive.
- The finding of IgM antibody, usually by an ELISA test, indicates infection within the previous few months.
- IgG antibody, also detected by ELISA, persists for years after acute disease. The presence of IgG alone is not suggestive of recent or ongoing infection, but paired samples showing IgG seroconversion can be used to confirm acute infection. Cross-reactivity is often a problem with IgG assays.

The levels of virus increase during the first days of symptoms, as does the patient's infectiousness. Viral levels depend on both the patient's immune response and the amount of infecting virus. 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.

Although these other blood tests are not advised due to the risk of transmission in the routine laboratory, findings of thrombocytopenia, elevated haematocrit and marked leukopenia (in combination with the clinical presentation) are suggestive of VHF but not conclusive.

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

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

Pitfalls in interpreting laboratory results

False-negative results may occur in samples taken in early phases of infection while virus level are still low. Therefore, a negative PCR result on whole blood, plasma or serum in samples taken less than 3 days after the onset of symptoms requires collection of a new sample for repeat testing 2 to 3 days later. Particularly in the early stages of infection, PCR on oral swabs is less sensitive than PCR on blood. Oral swabs are taken only from corpses, in which the viral load is high.

Patients who present late in the course of their illness or have mild disease may already have cleared viraemia and be PCR-negative. If there is a high clinical suspicion, serology can be used.

Remember to consider testing for Lassa in a suspect Ebola case that clinically looks like VHF but tests negative, and that new viruses may emerge for which all existing tests will be negative.

2.2.2 Other laboratory tests

Due to the potential risk of transmission to laboratory workers, additional blood tests are not to be sent to the laboratory that does routine testing until the results of the VHF screen are known and negative. An exception to this is the use of rapid diagnostic tests (RDTs) for malaria, HIV and other point-of-care testing equipment by appropriately trained personnel in full PPE within the red zone.

Malaria testing

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

It is dangerous to attribute fever to malaria incorrectly; the patient does not get the right case management if 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.

Other investigations

In ETUs with attached labs, some labs are able to perform malaria RDTs and other tests to measure electrolytes (for example, using a Piccolo machine) or to detect other non-Ebola causes of febrile illness using multiplex PCR.

In some ETUs clinicians in full PPE are doing point-of-care testing in the red zone (for example, RDTs for malaria, HIV, blood glucose, I-Stat for electrolytes, etc.) while others are only drawing blood for analysis in the lab.

Pulse oximeters are useful to quickly measure the pulse rate and SpO_2.

The Piccolo and multiplex PCR bench-top machines and the I-Stat handheld device are unlikely to be available until an outbreak is declared and additional support is provided.

Pregnancy tests should be done for women of childbearing age if pregnancy status is uncertain. The urine test can be carried out by the woman herself and does not require a health worker to be in physical contact with body fluids. The woman should be asked to urinate directly on the strip and then to communicate the reading or show it to the health worker.

For TB diagnosis, manual manipulation of sputum is minimised by the GeneXpert system, and it is therefore recommended over other TB laboratory tests (sputum microscopy, conventional culture, phenotypic drug-susceptibility testing) to limit the risk of Ebola transmission to laboratory workers (47). If Xpert MTB/RIF testing is available (48), one (preferably early morning) sputum specimen should be collected and treatment initiated based on the test results.

2.3 Notification

In this Ebola outbreak immediate notification takes place in the following order of priority:

1. The lab notifies the clinician who requested the test;
2. The lab sends at least daily results to the MoHS – depending on response structures,
3. 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 *(49)* for details).

2.4 Isolation and/or referral

One of the key guiding principles in the management of VHFs is the screening of cases and ensuring isolation of suspected, probable and confirmed cases to mitigate further spread of disease. In a new outbreak, once VHF is suspected, an isolation area should ideally be available to admit patients requiring isolation. If an isolation area is not available or if advance preparations have not been done, 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.

During an outbreak, all non-Ebola health facilities should reinforce standard precautions and consistent hand hygiene. Every health facility should have a screening area at the facility entrance and an isolation or holding area to put Ebola suspect patients while they are awaiting transfer to an ETU.

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 vary across the spectrum of disease severity and include 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 administered from either a non-glass vial or, if glass, a vial with a rubber stopper. Avoid vials that require breaking the glass, which is both difficult and dangerous within the ETU when wearing PPE and has resulted in several medical evacuations for (low-risk) exposures. In some ETUs, medications are drawn up in the green zone to reduce the risk of sharps exposure in the red zone. 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 *(9)* (in adolescents and adults) or the Emergency Triage Assessment and Treatment algorithm (ETAT) (in children) *(10)* for emergency signs and respond with emergency treatments (see section 4 for emergency signs). If the patient has signs of severity, use section 4. The wall charts for signs of severity and for child and adult doses of common medications should be posted in the isolation wards. For further details on care the *IMAI district clinician manual (9)* (IMAI DCM) and the *Pocket book of hospital care for children (10)* should be available for consultation.

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

Antimalarial treatment: if an RDT is available, treat if positive. If an RDT is unavailable or results delayed, give antimalarials empiricially to all patients with fever or history of fever.

- It is important to know whether the malaria RDT is positive; this is particularly true in children.
- Treat with injectable artesunate rather than oral ACT if there are signs of severe malaria (give a minimum of 24 hours of artesunate then complete a full 3-day course of ACT). (See Appendix C)
- An RDT can be performed at the bedside using blood from an IV line, thereby eliminating risks associated with an additional needle stick.
- Give empirical antimalarial treatment if a reliable test result is not immediately available from bedside testing.
- Take note of whether the patient has already received antimalarial treatment and the number of doses in a holding centre or community care centre or before referral from a non-Ebola health facility.
- RDTs used should be obtained from a reputable source (see http://www.who.int/entity/malaria/publications/atoz/rdt_selection_criteria/en/index.html).

Give ORS. If vomiting and diarrhoea or any sign of dehydration or not drinking well, 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 ORS supply regularly.

Antibiotics: empirical oral antibiotics (for example, ciprofloxacin or cefixime or amoxicillin-clavulanate) or IV antibiotics (for example, ceftriaxone) should be given to:

- Ebola suspect patients with clinical concerns for a bacterial infection, for example directed antibiotics for focal findings.
- All severely ill patients, given risk of bacterial sepsis.

- All children less than 5 years admitted with suspected Ebola: Signs and symptoms of sepsis in children are non-specific so it is recommended that all receive broad spectrum antibiotics IV or IM (ceftriaxone 80mg/kg IV/IM once daily for those >1 week old, maximum 2 grams for 5-10 days. Under 1 week of age, 150 mg IV/IM). (An alternative is to give ceftriaxone 50 mg/kg twice daily for all age groups, then if a single dose is missed it means the child misses antibiotics for only 12 hours.)

- In a patient receiving IV Lactated Ringer's, flush with 10 ml 0.9% saline before using the line to administer ceftriaxone to avoid calcium deposition.
- When to stop antibiotics: evaluate the need for and efficacy of the antibiotic, limiting treatment courses to the shortest duration possible. If Ebola PCR positive and not severely ill, consider discontinuing antibiotics.
- Consider risks of drug interactions (see Appendix D) and side-effects.
- Consider addition of metronidazole for worsening abdominal pain or bloody diarrhoea.

If a woman is of childbearing age, ask her if she is pregnant. Perform a pregnancy test.

Consider the differential diagnosis including the possibility of co-morbidities: pneumonia, typhoid fever, HIV, TB, sickle cell disease, malnutrition, other tropical infections endemic in West Africa, for example, amoebiasis, schistosomiasis, filariasis, trypanosomiasis, intestinal helminthiasis, giardiasis, rickettsial diseases. Hyperinfection by Strongyloides can mimic severe Ebola. For severely ill patients, particularly suspect patients with a negative Ebola PCR, consider empirical treatment with ivermectin.

Patients on HIV antiretroviral therapy, TB treatment, or medicines for diabetes mellitus, hypertension or other chronic medical conditions, need to continue their treatment (with attention to possible modifications in dose for certain medicines if the patient is severely ill with renal or liver impairment or hypotensive). If antiretroviral therapy or TB treatment is interrupted during severe illness, it should be restarted as soon as possible and the interruption reported to the clinical team managing the patient's TB *(50)*.

Do a full assessment of infants and young children, including a nutritional assessment, and consider the differential diagnosis and empirical treatments as laid out in Integrated Management of Neonatal and Childhood Illness (IMNCI) (51) and the *Pocket book of Hospital care for children (*10*)*. Remember that many children who are admitted due to suspected Ebola may have underlying conditions other than Ebola.

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

Consider other causes of fever in your differential diagnosis and exclude through appropriate investigations if they are available and can be done safely (see section 2.2.2), or consider empirical treatment if they cannot be reliably and safely excluded. Refer to the differential diagnosis tables for adults in the *IMAI district clinician manual (9)* and to the *Child pocket book for hospital care of children (10)*.

3.2. Manage symptoms/signs

Suggestions for specific management of signs and symptoms follow. Beware of interactions of medicines and avoid polypharmacy, particularly giving several medicines at the same time that can lengthen the QT interval and contribute to arrhythmias (these include ondansetron, amodiaquine, lumefantrine, ciprofloxacin) (see Appendix D) For some patients, it may be possible to avoid use of an antiemetic by reversing acidosis with IV rehydration. It is important to stop giving medicines once they are no longer needed.

Table 7. Specific management of signs and symptoms	
Symptom/ sign	**Treatment**
Fever (≥38.0 °C)	Manage fever with paracetamol (see Appendix C for dosing). Avoid nonsterioidal antipyretics (diclofenac, ibuprofen or aspirin) due to platelet effects. (See also section 3.1: Antimalarial treatment). *See further details in IMAI DCM: Section 10.1; Child pocket book: page 305.*
Acute significant bleeding/ severe pallor	Transfusion of fresh whole blood or red blood cell components should be considered, guided by clinical and ideally laboratory indicators (e.g. Hgb, Hct, INR, etc). Many malnourished or ill patients with diminished oral intake, and those treated with antibiotics, have mild vitamin K deficiency which may lead to elevations in INR/PT and predispose to bleeding. Multivitamin and/or vitamin K administration (e.g. 10 mg orally daily for 3 days) at admission, or vitamin K 10 mg intravenously for those unable to take pills, who are bleeding and who have IV access, is reasonable although its efficacy in Ebola patients is unknown. Treatment of significant bleeding with fresh frozen plasma should ideally be guided by INR/PT. Other medications to prevent or treat bleeding such as antifibrinolytics (IV tranexamic acid) may be reasonable based on extrapolation of evidence from other patient populations but direct evidence in patients with Ebola is lacking. *See further details in IMAI DCM: section 4.0, 10.18; Child pocket book: pages 161, 218, 308–312.*
Pain	1st line: paracetamol (PO, IV) 2nd line: tramadol (PO, IV) 3rd line: morphine (PO, IV) Avoid diclofenac, ibuprofen, aspirin or other NSAIDs due to platelet effects. Beware of respiratory depression with morphine use. See Appendix C for paracetamol, tramadol and morphine doses. *See further details in IMAI DCM: section 20; in Child pocket book: section 10.4, page 306.*
Difficulty breathing/ respiratory distress	Oxygen: titrate to $Sp0_2$ ≥90% If SpO_2 <90%, start adult on 5 litres/minute (nasal prongs); start child at 1–2 litres/minute (nasal prongs). In the acute phase of shock (first 24 hours) in children, where there is impaired oxygen delivery, also give oxygen if SpO2<94% *(52).*

	Evaluate for pneumonia, wheezing, fluid overload, congestive heart failure and manage accordingly. (Do not share nasal prongs – dispose of them once used by a patient.) *See further details in IMAI DCM: section 3.2 for management respiratory distress, CHF and pneumonia; Child pocket book: pages 11, 82, 312–315.*
Shock	See section 4. (S*ee further details in IMAI DCM: section 3.1; in Child pocket book: section 1.3.*)
Diarrhoea, vomiting, signs of dehydration	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). Give zinc for 10–14 days in children with diarrhoea, 20 mg/day; for infants under 6 months, 10 mg/day.*(53)* Nausea and vomiting are common. Vomiting due to acidosis may become less with IV hydration, therefore, anyone with significant vomiting should be given glucose-containing IV therapy. Antiemetic medications may provide some relief and facilitate oral rehydration especially with protracted vomiting affecting oral intake. **Preferred: ondansetron 4 mg tablet:** 6 months to 2 years (<10 kg): ½ tab once daily 2–4 years (>10 kg): ½ tablet twice daily 4–12 years: 1 tablet twice daily 12 years and up, adults: 1–2 tablets twice daily Ondansetron injection >6 months to adult, 0.15 mg/kg three times daily Or for adults, give chlorpromazine 25–50 mg, 4 times daily IM or orally, or metoclopramide 10 mg IV/orally 3 times daily until vomiting stops. Or for children >2 years, promethazine 12.5 mg IM. Monitor for extrapyramidal signs. Beware of oversedation. Diarrhoea with blood – consider adding metronidazole or tinidazole for amoebiasis (+/− ciprofloxacin if not on ceftriaxone). *See further details in IMAI DCM: sections 10.7c and 10.7d; Child pocket book: section 5.*
Dyspepsia ("heartburn")	In adults and children ≥10 years, give omeprazole 20–40 mg orally daily or magnesium trisilicate, 2 tablets every 8 hours until symptoms resolve.

	In children 2–12 years, give omeprazole 10–20 mg (1 mg/kg) or magnesium trisilicate: 5–10 mls, 3 times daily or liquid gaviscon or peptobismol if available. *See further details in IMAI DCM: section 10.7c.*
Convulsions/ fitting	Approach convulsing patients with caution, call for assistance, give treatment only if safe to do so. Remember hypoglycaemia, hyperpyrexia and other reversible causes of convulsions. Give diazepam to abort seizure if prolonged (rectally if there is not an IV already in place and no diarrhoea- 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). *See further details in IMAI DCM: Quick Check page 42; ETAT: page 15.*
Signs of hypo-glycaemia	Test glucose and monitor regularly. (If glucose testing is not available and hypoglycaemia is suspected, treat empirically and observe response.) If glucose is low: in child, give 5 ml/kg of D10 (or 1 ml/kg of D50); in adolescent or adult, give 125 to 250 ml D10 rapidly (or 25 to 50 ml of D50). Use D5 in all maintenance fluids. Provide food/nutritional support (see section 3.8). Make sure that the child is feeding. *See further details in IMAI DCM: Quick Check page 42; in Child pocket book: page 16.*
Anxiety	Provide psychological support (see section 6). Diazepam – adults: 5–15 mg/day in 3 divided doses may be considered in severe cases. *See further details in IMAI DCM: section 10.11.*
Confusion in cooperative patient	Reason with the patient in a calm and non-aggressive fashion. Keep lights on at night. Consider diazepam 5 mg at night (adult)
Agitation, confusion and aggression in non-cooperative adult patient	Give sedation: haloperidol 2.5 to 5 mg IM (depending on size of adult). Approach patient with caution, call for assistance, and give treatment only if safe to do so. *See further details in IMAI DCM: Quick Check, page 60.*
Unexplained neurological	Consider thiamine deficiency (beriberi) and give vitamin B1: 50 mg IM or IV daily for several days.

symptoms including peripheral neuropathy, cranial nerve palsies, encephalopathy, aphonia, cardiac failure	

3.3 Manage mild and moderate cases

Clinical manifestations of Ebola can be variable and patients may present with only mild or moderate illness, particularly early in the disease course. 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 patients should be given ORS and encouraged to drink it.
- Provide symptomatic management (see section 3.2).
- Monitor every shift to detect development of severe illness (go to section 4).
- If stable, no lab after initial malaria RDT.
- If no fever for 72 hours, send new PCR and plan for discharge (see section 8).

3.4 Fluid resuscitation – oral and intravenous fluids

Approaches to optimizing intake of ORS or other fluids:

- Patients need to be actively encouraged to take frequent sips. In the confirmed ward, have mildly ill patients help support ORS intake in patients who are more ill.
- If nausea or vomiting, consider an antiemetic medication such as ondansetron.
- Give flavored ORS or "jelly water" (coconut milk from a young coconut)

or mix in some fruit juice.

- Use a container that the patient can easily handle while lying in bed (make straw available or "sippy mug" if possible).
- Provide bedside table or shelf at an appropriate height so that the container is easily accessible.
- Provide a 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.
- In children, especially <2 years of age, a nasogastric (NG) tube should be provided if the fluid intake is low. Liquid feeds (F-75) can also be administered through the NG tube. Before feeds, aspiration or flushing with 10 ml normal saline without the child coughing ensures that the tube is in place.

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

It is important to assess the adequacy of the patient's intake of ORS. ORS depends on patient self- administration. In general, a low threshold should be maintained for starting an IV line for hydration. 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 walk?
- Is the patient vomiting?
- Does the patient have diarrhoea? If yes, is it a large volume/very frequent?
- Does the patient have signs of shock and dehydration?
- Is the patient a moderately unwell child with no caregiver available?

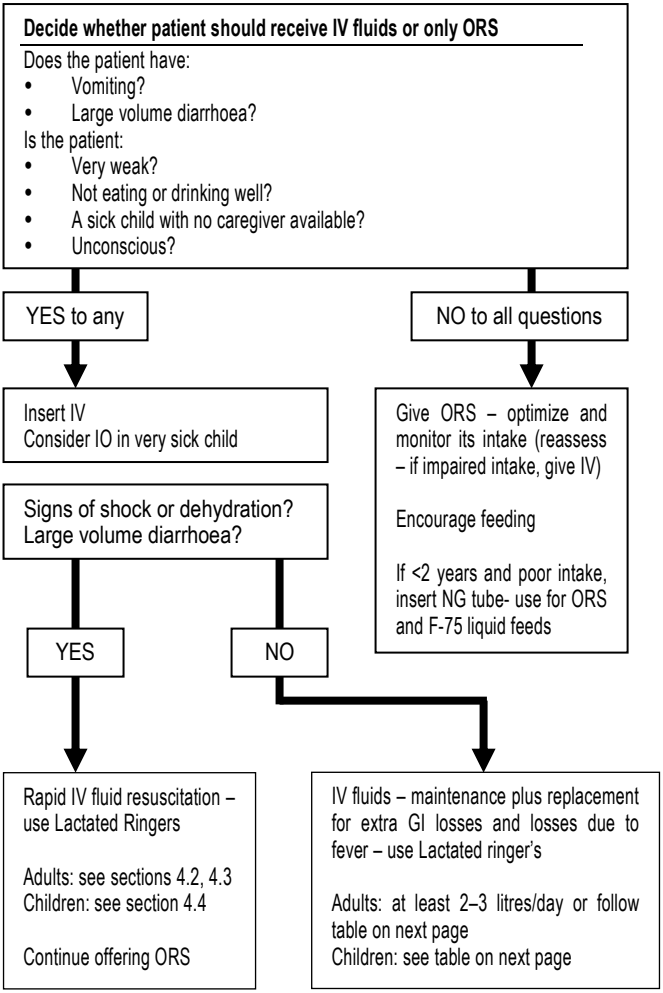
Decide whether patient should receive IV fluids or only ORS
Does the patient have:
• Vomiting?
• Large volume diarrhoea?
Is the patient:
• Very weak?
• Not eating or drinking well?
• A sick child with no caregiver available?
• Unconscious?
YES to any
NO to all questions
Insert IV
Consider IO in very sick child
Give ORS – optimize and monitor its intake (reassess – if impaired intake, give IV)
Encourage feeding
If <2 years and poor intake, insert NG tube- use for ORS and F-75 liquid feeds
Signs of shock or dehydration?
Large volume diarrhoea?
YES
NO
Rapid IV fluid resuscitation – use Lactated Ringers
Adults: see sections 4.2, 4.3
Children: see section 4.4
Continue offering ORS
IV fluids – maintenance plus replacement for extra GI losses and losses due to fever – use Lactated ringer's
Adults: at least 2–3 litres/day or follow table on next page
Children: see table on next page

Table 8. Maintenance fluids by weight- by hour and 24 hours.
Rate calculation - based on total body weight: 4 ml/kg/hr for the first 10 kg + 2 ml/kg/hr for the next 10 kg + 1 ml/kg/hr for each remaining kg of body weight

Body weight (kg)	as ml/ kg/ hour	Drops/ minute*	Fluid in ml/day (24 hours)		Body weight (kg)	as ml/ kg/ hour	Drops/ minute*	Fluid in ml/day (24 hours)
1	4	1	96		19	58	19	1392
2	8	3	192		20	60	20	1440
3	12	4	288		21	61	20	1464
4	16	5	384		22	62	21	1488
5	20	7	480		23	63	21	1512
6	24	8	576		24	64	21	1536
7	28	9	672		25	65	22	1560
8	32	11	768		26	66	22	1584
9	36	12	864		27	67	22	1608
10	40	13	960		28	68	23	1632
11	42	14	1008		29	69	23	1656
12	44	15	1056		30	70	23	1680
13	46	15	1104		35	75	25	1800
14	48	16	1152		40	80	27	1920
15	50	17	1200		45	85	28	2040
16	52	17	1248		50	90	30	2160
17	54	18	1296		55	95	32	2280
18	56	19	1344		60	100	33	2400

* Assumes "adult" IV giving sets where 20 drops=1 ml. Calculate separately if using paediatric burette where 60 drops= 1 ml.

How to administer intravenous fluids

Staff using IV catheters must adhere rigorously to infection prevention and control (IPC) 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 that at least one additional staff member is available to assist in the IV catheter insertion (more will be required for children).
  - In high volume ETUs, consider use of a dedicated IV start team.
  - Consider clinical staffing patterns that "stagger" entry to the ETU to assist with completion or continuation of IV fluids that often cannot be administered in the duration of a single team round.
- **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, use a one-way valve system (for example, Clave©) attached to the intravenous cannula, so that when the IV infusion is completed blood will not flow back into the IV fluid tubing. This will facilitate disconnection of the IV tubing after fluid administration is done.
  - In children and adults with difficult IV access, early consideration should be given to intraosseous access (preferably using a powered device if available), according to the availability of skilled staff.
  - Consider compression devices for haemostasis if bleeding around the IV does not stop with simple gauze, pressure, and tape.
- **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.

- Disinfect gloves by rubbing with an alcohol-based handrub solution or if unavailable, wash gloved hands in 0.05% or 0.5% chlorine, then adequately disinfect the skin of the insertion site (14).

- **Insert IV.**
- **Closely monitor the IV and the adequacy of fluid resuscitation.**
  - There should be close supervision of patients with IV fluids running.
  - The tables with fluid volumes which provide drops per minute assume "adult" IV giving sets where 20 drops=1 ml. If using paediatric burettes, 60 drops = 1 ml; 20 drops per minute = 20 ml/ hour. Use an electronic infusion pump if possible for accurate titration of IV fluids especially in children if available.
  - Monitor output – and add more fluids accordingly.
  - Monitor hydration status (see section 4.1).
  - Recheck frequently for signs of shock or dehydration and increase the fluid rate if any signs occur, using section 4.2.
  - Check frequently for signs of overhydration that may include respiratory distress (from pulmonary oedema) or peripheral oedema (swollen feet). In general, swollen feet alone should not prompt discontinuation of fluids, but should prompt more careful reassessment of the possibility of developing pulmonary oedema and overhydration that could be dangerous to the patient.
  - When health care providers or other staff are not present (for example at night), 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. It may also be helpful to cover a catheter in the foot or hand with a sock.

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, the risk to the health worker and likely poor outcomes should be considered.

3.5 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 is not effective. 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 *(33, 34)*.

Table 9. Ribavirin dose for treatment of Lassa fever and CCHF *(34)*

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, breastfeeding 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 *(34)*. 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 *(54)*. 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 >9 years for oral and IV is the same as for adults. In those ages 6–9 years, 400 mg every 6 hours can be given orally. For ages 3–6 years, 7.5mg/kg every 12 hours has been used to treat hepatitis C and should be considered *(55)*.

3.6 Special considerations in pregnancy and the newborn

Ebola (44):

- It is important to identify and assess the risk of Ebola transmission in all pregnant or postpartum women attending mainstream health facilities or on admission to an Ebola care facility. Pregnancy status should be carefully documented in the clinical record.
- There is no evidence to show that women who survive Ebola and subsequently become pregnant pose a risk for Ebola virus transmission. However, pregnant women with active Ebola and pregnant women who survive Ebola without pregnancy loss may transmit the virus during delivery and/or management of obstetric complications. Pregnant women who are contacts of confirmed Ebola cases pose a potential risk.
- Ebola in pregnancy is associated with a high rate of obstetric complications and poor maternal and perinatal outcomes, including spontaneous abortion, prelabour rupture of membranes, preterm labour/preterm birth, antepartum and postpartum haemorrhage, intrauterine fetal death, stillbirth, maternal death and neonatal death. Although rare, some pregnant women with Ebola have recovered without loss of pregnancy. Evidence has shown that intrauterine contents remain PCR positive for Ebola virus RNA (56). There are only rare reports of survival beyond the neonatal period.
- **On initial contact with a woman of childbearing age, ask if she could be pregnant and the date of her last menstrual period.** This information should be documented and communicated to other health workers (ensuring confidentiality and privacy wherever possible). Urine pregnancy testing should be performed on amenorrheic patients or if pregnancy status is otherwise in question. If feasible, routine urine pregnancy testing for all women of reproductive age may be considered. Note IPC precautions should be taken when testing urine.
- Suspect, probable and confirmed pregnant Ebola patients should be sent to an ETU with capacity (staff and equipment) to handle essential childbirth and obstetric and newborn complication care.

ETU management of pregnant and postpartum women

- Determine gestational age by last menstrual period, with verification of uterine size through abdominal palpation and fundal measurement.
- Ask if woman is breastfeeding and if she previously had a caesarean delivery.
- Use a fetal heart doppler to determine the presence or absence of fetal heart tones on admission to the ETU and when relevant for clinical decision-making and informed consent.
- Manage the pregnant woman in a separate area with provisions for privacy. Basic facilities for childbirth and a private area to manage complications such as spontaneous abortion should be installed. As described below, caution must be used during provision of childbirth care and management of obstetric complications to avoid health worker infection.
- Provide appropriate fluids, antibiotic and antimalarial treatment as in section 3. In addition, provide ferrous sulfate/folic acid and multivitamins when the woman is clinically stable. If feasible, follow MoH or WHO guidelines for HIV testing/PMTCT of HIV.
- Antibiotic prophylaxis should be provided for ruptured membranes and may be considered for incomplete abortion; obstetric haemorrhage or retained placenta. Antibiotic treatment should be provided for suspicion of chorioamnionitis, pelvic inflammatory disease or tubo-ovarian abscess. Antibiotics may also be considered for intrauterine procedures or following normal spontaneous vaginal birth if there is concern for secondary infection.
- Pre-assembled delivery box/kit *(57)* (plastic umbilical cord clamps, gauze, disposable scissors, absorbent drapes, menstrual pads, very absorbent pads (*58*), and misoprostol for prevention of PPH should be immediately available in all health facilities (Ebola and non-Ebola) to mitigate risks around childbirth.
- Pre-assembled boxes/kits should also be immediately available for management of obstetric complications such as PPH and eclampsia.
- Operative management of complications such as obstructed labour will depend on the ETU staff competencies and capacity for surgical procedures to save the mother, paying attention to the risks involved and appropriate IPC measures.

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

- Plan and organize team members before performing procedures (4 trained staff are recommended – including 2 experienced in childbirth and emergency obstetric care, a cleaner to identify and decontaminate environmental spills and an observer to ensure IPC safety).
- Use full PPE for childbirth care in Ebola settings (including head cover, face mask, goggles or face shield, boots, coverall or gown, apron, and double gloving) with outer elbow length gloves *(44)*. IPC standards must be strictly maintained – including handwashing, safe disposal of waste contaminated with blood or other body fluids; proper handling of soiled linen; careful handling and disposal of "sharps"; and proper disinfection of instruments and other contaminated equipment.
- Where possible, avoid the use of sharp instruments/materials. Disposable scissors are also an option.
- Where possible, limit vaginal exams and invasive procedure.

Labour and childbirth

- Full PPE for childbirth care in Ebola settings with outer elbow length gloves should be worn, always changing the outer pair and washing gloved hands between every procedure.
- Early placement of a peripheral IV is advised to facilitate venous access if emergent IV fluid and/or medication administration is necessary.
- Allow the woman to go through spontaneous labour without interruption. Do not perform artificial rupture of membranes. Limit the number of vaginal examinations. If feasible, use of the partograph is recommended.
- Fetal heart rate should be measured with a doppler on admission to the Ebola treatment facility and subsequently as clinically indicated. Continuous fetal monitoring is not advised.
- A uterotonic drug should be given immediately after the baby is delivered to prevent PPH according to WHO and national guidelines *(59)*. If a skilled birth attendant is not available, give misoprostol and wait for placental expulsion.
- If the baby is stillborn, there is no need to clamp and cut the cord.
- If the baby is born alive, wait one minute after the birth or for up to

three minutes if the cord continues to pulsate, then clamp the cord with 2 disposable cord clamps and cut with disposable scissors.

- Health worker safety and clinical outcomes should be carefully considered, using caution prior to undertaking any invasive procedures such episiotomy, manual removal of placenta, or vacuum extraction. Limit exposure to sharps and excess fluids by considering safe alternative treatment approaches. For example:
  - External pressure with absorbent pads may first be applied to superficial perineal lacerations instead of immediate suture repair.
  - If the woman is clinically stable, retained placenta should be initially managed conservatively with uterotonic agents and extended observation prior to consideration of manual removal. Only trained providers with elbow length gloves should perform manual removal of the placenta.
- Upon discharge from the ETU, provide counselling on breastfeeding, prevention of sexually transmitted infections, and use of family planning methods (see section 9).

Prevention of PPH

- Ensure that there is not a second baby in the uterus.
- Oxytocin is the uterotonic drug of choice for prevention and treatment of PPH. However, misoprostol may be used if oxytocin is not available or not feasible. As timely administration of the uterotonic is a critical aspect of PPH prevention, misoprostol has been recommended as a first-line agent in the ETU. Guidelines and training are needed: uterotonic agents should only be administered or directed by trained providers.
- In the situation where oxytocin is not available or not possible to administer, give oral misoprostol 600 µg for PPH prevention immediately after the (final) baby is born. If the patient is unable to take PO, 400 µg sublingual (SL) may be used.
- If an IV infusion is in place, oxytocin IV 10 IU may be given as a slow push (using a three way connector and not diluted in the 1 litre IV fluid bag).
- IM oxytocin (10 IU) injection may also be used, however sharps exposure should be considered.

Note: the potential side-effects of misoprostol include fever, chills, nausea, vomiting and diarrhoea, similar to Ebola symptoms. However, misoprostol related side-effects are often self-limiting. Provide care accordingly.

Treatment of PPH

- Oxytocin is the preferred uterotonic drug. In addition to fluids for prevention and management of hypovolemic shock, infuse 40 units of oxytocin in 1 litre – run it in initially at 60 drops per minute while uterus contracts, then lower infusion rate to 40 drops per minute.
- If oxytocin is not feasible, administer misoprostol 800 micrograms sublingually.
- If feasible, perform external uterine massage with protective covering (such as absorbable pads) on the patient's abdomen, while standing to the side of the patient. To avoid exposure to blood and other body fluids do not face the patient directly. External aortic compression may also be considered.
- Use of the non-pneumatic anti-shock garment as a temporizing measure for treatment of obstetric hemorrhage may be considered if it is available and staff are trained in its use.

Newborn care

- While limited data to date indicate that fetal and neonatal outcomes in pregnant women with Ebola are poor, essential newborn care should be provided per WHO IMPAC guidelines.
- Keep the baby warm and dry.
- Infected mothers of newborns should decide whether to breastfeed depending on whether they are too ill and their preference- see section 3.7 on breastfeeding and use of breast milk substitutes.
- Provide Vitamin K IM (ideally, the newborn should also receive routine immunizations – BCG and hepatitis B).
- Appropriate infection prevention measures must be taken by health workers to avoid neonatal infection through cord care.
- Neonatal resuscitation equipment (suction, bag and mask) and trained providers should be available.
- Neonates with confirmed Ebola should be actively managed in the

ETU including supportive management for Ebola and antibiotic coverage for possible neonatal sepsis.

Induction of labour at term *(60)*

- Misoprostol should not be used if the patient has a history of previous caesarean delivery or uterine surgery *(61)*. As gestational size increases, the uterus becomes more sensitive to misoprostol and lower doses are used.
- If available, 25 microgram misoprostol tablets should be used.
- Administer misoprostol 20–25 µg orally every 2 hours *(62)*. Check misoprostol tablet strength – if it is 200 µg, dissolve in 200 ml water for patient to drink 20 ml every 2 hours.

Treatment of incomplete abortion/miscarriage (63)

- Pregnant patients with Ebola are at increased risk for spontaneous abortion.
- Health worker exposure to blood and other bodily fluids should be minimized.
- Considering the concern of needle use and other instrumental procedures, misoprostol should be used for treatment of incomplete abortion.

If uterine size at the time of treatment is equivalent to a pregnancy of gestational age 13 weeks or less:

- Provide a single dose of misoprostol 400 micrograms sublingually.
- If bleeding is excessive and the woman's clinical condition deteriorates, provide further intravenous fluid (Lactated Ringer's), and if feasible, consider manual vacuum aspiration with precautions for provider safety.

If uterine size at the time of treatment is equivalent to a pregnancy of more than gestational age 13 weeks:

- Provide ***misoprostol 400 micrograms sublingually***. This dose may be repeated every 3–4 hours if necessary.
- If bleeding is excessive and the woman's clinical condition deteriorates further, provide IV fluids (Lactated Ringer's) or blood transfusion with fresh whole blood, and if feasible, consider manual vacuum aspiration

with precautions for provider safety.

Note: There are no WHO recommendations for the medical management of second trimester incomplete abortion where the uterine size is greater than the size of a 13-week gestation. Experts recommend using the first trimester regimen and then repeating the dose as needed. Larger doses of misoprostol may also be considered. If possible document and report outcomes.

Post-abortion care

- Following abortion, women should receive appropriate post-abortion care. Before leaving the health-care facility, all women should receive contraceptive information, counselling and methods of post-abortion contraception, including emergency contraception. Dual protection – the use of condoms alone or along with another method, to protect against both pregnancy and STIs – should be promoted. Women should receive clear, simple, oral and written instructions about how to care for themselves after leaving the health-care facility and how to recognize complications that require medical attention.
- The woman should be advised to use contraception for a minimum of 6 months in order to reduce the risks of adverse maternal and perinatal outcomes. Upon discharge from the ETU, provide counselling on the prevention of sexually transmitted infections, including HIV.

Pregnant women in the ETU who become PCR-negative

- Pregnant women can recover from Ebola (with negative blood PCR) while their fetus and amniotic fluid remain PCR positive, raising the possibility of risk to family and attendants at birth.

Determine whether the fetus is alive (using Doppler or ultrasound).

- **If there is a fetal demise,** she may undergo induction of labour, with consideration of risks and benefits versus conservative management. Induction requires careful planning, counselling and consent. Non-invasive procedures should be the first treatment of choice (such as oral misoprostol administration).
- **If the fetus is viable**, the woman should be counselled on potential fetal outcomes based on current scientific evidence:
  - Even if the mother survives, it is likely that the newborn will be

born, as stillbirth or alive, with the virus. The amniotic fluid and products may be infectious to others. Even if the baby is born without symptoms, they most likely will fall sick, turn Ebola positive and have a very high mortality. Newborns are potentially infectious before showing symptoms and therefore need to be kept in the ETU with health workers caring for them in full PPE and tested again.

Counsel the mother on options:

- She may be observed with close follow up (documented daily contact) near an ETU where she should return for signs or symptoms of spontaneous abortion, other danger signs or signs of labour. If feasible, a maternal waiting home could be considered. Patients discharged with an ongoing pregnancy should be advised to return to the ETU for childbirth or management of complications such as fetal death. Treat all pregnancy-associated tissues and fluids (for example, products of conception, amniotic fluid, placenta, and fetus/neonate) as potentially infectious. Health workers should use full PPE plus elbow length gynaecologic gloves.
- The decision to continue or terminate a pregnancy in women who recover from Ebola with an intact pregnancy should take into consideration the risks posed by pregnancy continuation and the very small chance of neonatal survival. One newborn treated with experimental therapy survived. The woman should have accurate information and be offered counselling about her situation, the risks of carrying the pregnancy, and her options for safe, legal abortion (according to her gestational age and the law), in a way that she can understand, to enable her to make an informed decision.
- If a termination is desired, safe abortion to the full extent of the law, should be provided using medical methods and as per the technical guidelines of WHO. Full IPC precautions should be employed as with other obstetric interventions.
- Women should not be coerced into abortion but neither should such services be withheld if it is desired by the woman and legal or if it is medically needed. If termination is indicated and chosen

by the woman, the earlier it is performed, the safer it is.

Management of newborns with an elevated risk of Ebola

Asymptomatic neonates must be monitored closely for 21 days in an Ebola care facility using full PPE and IPC precautions in any of the following circumstances:

- If the mother is confirmed to be Ebola PCR positive during the pregnancy, based on blood or breastmilk or postmortem oral swab of a deceased mother or if cord blood, oral or surface swabs after delivery are PCR positive.
- If the mother is a contact, suspect or probable case until proven with Ebola PCR testing to be Ebola negative (see section 2.1.3 on screening and case definition, even if without symptoms).
- Samples of amniotic fluid and any surface on the inside of the amniotic sac, neonatal oral and surface swabs, and neonatal or cord blood should be obtained at delivery for Ebola PCR.

Symptoms of Ebola in neonates are non-specific and can progress very rapidly. Limited data indicated that Ebola-infected neonates may be PCR positive up to 3 days before symptom onset. The neonate must have a blood PCR test immediately if there is any suspicion. A negative test does not exclude Ebola if taken within 72 hours of onset of symptoms. Even if remaining asymptomatic, the neonate should be tested on days 22 and 24. If well, the neonate may be discharged provided both tests are negative.

Lassa:

- Fetal death is reported to occur in 80% of pregnant Lassa fever patients as well as high maternal mortality. There are reports of clinical improvement in pregnant women with Lassa fever after spontaneous abortion and delivery*(64)*. Uterine evacuation in pregnant patients appears to lower maternal mortality. As in Ebola, any obstetrical procedures must be performed with extreme caution, given potential for nosocomial transmission and the risk for inducing maternal haemorrhage *(34)*. See section 3.5 on ribavirin.

3.7 Special considerations in breastfeeding women and use of breast milk substitutes

- Ebola and Marburg viruses have been found in breast milk. During a Marburg outbreak in Angola in 2005, there were a high number of paediatric cases. Breastfeeding may have been a factor in Marburg virus transmission as indicated by the epidemiology and Marburg virus-positive breast milk specimens *(65)*.
- Given the potential risk of transmission through breast milk and close physical contact during breastfeeding and general infant care, a woman who has been admitted as an Ebola, Marburg, Lassa fever or CCHF patient may have already infected her breastfed infant.
- However, data are still lacking on how to manage breastfeeding in mother-infant discordant pairs and especially on how to manage mother and infant when both are PCR-positive. Current recommendations are based on anecdotal cases, limited field experience and the assumption that the presence of Ebola virus in breast milk increases the likelihood of severe Ebola in an already infected infant.
- Safe, sustainable feeding with an appropriate breastmilk substitute (BMS) will be necessary for newborns and some other infants (see Table 10), but challenging and expose infants to immediate risks of malnutrition and infectious disease in many contexts. These infants require special attention and support.and there may be cultural stigma associated with BMS use. Where possible, provide liquid ready-to-use infant formula (RUIF) (61), which is a less risky option than powdered infant formula (PIF) since it does not require reconstitution with water. However both RUIF and reconstituted PIF are a rich medium for bacterial growth. Hygiene of feeding utensils, adequate supplies for as long as the infant needs (to at least six months of age, and formula or some other source of milk and/or animal source food after that until 2 years of age), and access to health services are essential. When providing infant formula (liquid or powdered), support the primary caregiver on minimising the risks of formula feeding. RUIF supply has considerable cost and storage implications that need careful consideration in every context.

Table 10. Interim breastfeeding recommendations

Status	Breastfeeding	Nutrition	Care
Lactating woman and child POSITIVE	If replacement feeding with RUIF is acceptable, feasible, and provision is guaranteed: SUSPEND breastfeeding* until breast milk tests are negative.	When artificial feeding is possible: <6 months: RUIF; 6–23 months: RUIF or UHT full cream (or whole) cow's milk and complementary feeding.** When artificial feeding is not possible: Breast milk* and, in addition, complementary foods** for 6-23 months of age.	When artificial feeding is possible: The mother and infant should be separated in the ETU. When artificial feeding is not possible: The mother should take care of the infant inside the ETU, if well enough.
Lactating woman POSITIVE (or suspect awaiting results) and child NEGATIVE (or contact - asymptomatic)	SUSPEND	<6 months: RUIF; 6–23 months: UHT and complementary feeding	The child should be separated from the mother, placed in an observational unit (cared for by a survivor caregiver) and followed as a contact.
Lactating woman NEGATIVE (or contact - asymptomatic) and child POSITIVE	SUSPEND	<6 months: expressed breast milk if possible and/or RUIF; 6–23 months: UHT and complementary feeding	The child should be taken care of inside the ETU by a survivor caregiver or a positive relative. The mother should be followed as a contact.
Lactating	CONTINUE	Breast milk and, in	Both followed as

woman and child NEGATIVE (or asymptomatic contacts***)		addition, complementary foods for 6-23 months of age	contacts.

RUIF: ready-to-use infant formula; UHT: ultra-high temperature milk; see section 3.9.

* There is a high level of uncertainty around the risks of continued breastfeeding when both mother and child are positive. This information should be included in the counselling given to the mother in case she wishes to continue breastfeeding in which case she should be supported to do so. Note that there is one newborn treated with experimental therapy who survived.

** With the addition of multiple micronutrient supplement powder when the nutrient content of complementary foods is expected to be inadequate.

***This includes quarantined mothers with a breastfed child.

- A mother who abruptly stops breastfeeding will need help to express her breast milk to alleviate pain and engorgement, and prevent inflammation , especially within the first month after delivery. Her breast milk is a contaminated product and should be treated as per infection control protocols.
- Recently breastfed infants of an acutely ill Ebola-positive mother should be considered especially high risk.
- Recently breastfed infants of an Ebola survivor mother whose breast milk is positive should also be considered 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 Observational Interim Care Centre (OICC) or other arrangements with precautions for caregivers (see section 5.3).
- Lactating women who are discharged cured (after two consecutive negative blood PCR tests) and have an infant or young children who are

Ebola-negative or non-suspected (asymptomatic) should not resume breastfeeding until two negatives breast milk PCR tests (see section 9).

- All lactating women who had acute Ebola while pregnant should have their breast milk tested for Ebola virus by PCR. If Ebola virus RNA is detected, breastfeeding should be suspended and the breast milk retested every 48 hours until two consecutive "undetected" results are obtained. During this time, breast milk should be replaced with a sustainable appropriate breast-milk substitute (see page 141 and section 3.9).
- Wet nursing is not recommended as the risk of Ebola virus transmission from a wet-nurse to an infant and vice versa is considered high if either becomes infected.

3.8 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 of infected mothers should be handled in full PPE even with a negative test. Testing should be repeated.
- Breastfed newborns and young children are unlikely to avoid infection from a mother testing positive.
- With the exception of neonates and children who are breastfeeding from an infected mother, if the child is negative (and it may be prudent to carry out two tests two days apart), he/she can leave paediatric 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.
- Weighing should be done on admission for correct dosing of drugs and fluids and follow up during admission.
- Nutritional status of all children less than 5 years should be assessed by the mid-upper arm circumference (MUAC) tapes and by checking for bilateral pitting oedema of the feet diagnostic of kwashiorkor.
- Small children are at particular risk of dehydration. Inability to drink and feed is frequent and early intervention with ORS (NG tube if needed) or IV fluids is crucial.
- Caregivers (sick family members or survivors) should be present continuously.
- Children should be cared for by health workers and caregivers in full PPE and should be encouraged to carefully comfort the child. Leaving children with “no touch” can be harmful for them.

3.9 Nutrition (66,67,68)

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 the patient's needs and condition should be part of the supportive care provided to all Ebola-infected patients in the ETU in order to improve their chances of survival *(66).*

Among all the patients attending the ETU, there are two groups that should be specially considered: infants and young children who are maternal orphans on one hand, and the group of lactating women and their infants and young children on the other (see section 3.7).

Given the fact that the Ebola virus is found in various body fluids, breast milk included, and that wet nursing should be avoided, the following is recommended for **maternal orphans**:

- Infants <6 months should be supported with an appropriate breastmilk substitute, e.g. ready-to-use infant formula (RUIF) and if not available, powdered infant formula (PIF) 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 the ETU 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 within 2 weeks after discharge will be scheduled to assess the infant's outcome if the evolution of the outbreak allows it.
- The Child Protection team should be informed of cases of orphans to ensure an adequate link to the Welfare and Social Department.

For **lactating women and their infants and young children,** see section 3.7 for advice on when to stop and when to continue breastfeeding, depending on the symptoms and lab results of the mother and infant, and on the care that can be provided by the ETU.

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1. Nutrition in the ETU

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

- Infants <6 months should receive RUIF (50–100 ml every 3 hours) if the recommendation is to suspend breastfeeding (see section 3.7).
- Lactating women should be advised to suspend breastfeeding upon arrival if their infant or young child is asymptomatic or tested negative for Ebola (see section 3.7).
- Weighing upon admission and assessment of nutritional status by MUAC and examination of the feet for bipedal oedema are important for dosing and detection of malnutrition. When a child is identified as having severe acute malnutrition, treatment should be applied according to the national protocol for the treatment of severe acute malnutrition taking into account the principles of treatment of Ebola.
- Children less than 5 years who have not received Vitamin A supplementation in the last 6 months should be given a sigle dose unless they have signs of vitamin A deficiency or measles. Children with severe acute malnutrition should only receive a high dose of vitamin A if fortified foods are not given. The treatment dose for infants 6–11 months is 100 000 IU; for children 12–59 months 200 000 IU, on days 1, 2 & 8) *(69)*.
- Ebola patients should be provided with minimum recommended daily allowance of nutrients through normal traditional and fortified foods. Until further evidence is available, excess use of any micronutrient for Ebola patients is currently not recommended, unless correcting for a specific micronutrient loss (e.g. treating hypokalaemia). For patients who receive adequate quantities of fortified ready-to-use-food, multivitamins are not required.

2. Nutritional support throughout the treatment

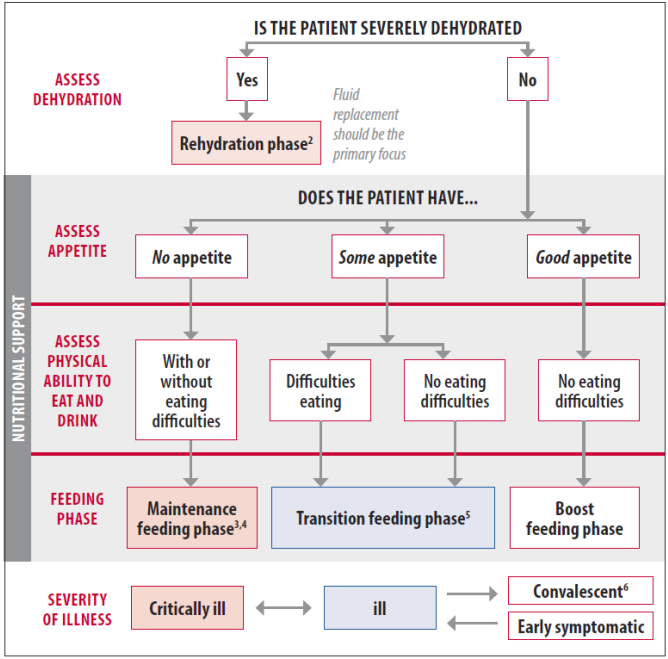
Although traditional food is often low in protein and micronutrients, utilizing locally accepted foods that the patient is familiar with should be an alternative or an addition to nutritional supplements. Foods that can be easily consumed include bananas, porridge and cooked cereals with soft cooked vegetables, meat or ground nuts.

Field experience with Ebola patients in treatment centres shows differences in their capacity to eat and drink. There are three feeding phases for Ebola patients: maintenance feeding, transition feeding and boost feeding, in addition to an initial rehydration phase, where necessary (see Figure 1 below (70). For patients requiring nutritional support, the foremost considerations in the selection of food commodities include the osmolarity and renal solute load of the diet, along with the texture of food commodities.

In the maintenance phase, providing liquid or easily digestible food is important. Once recovering, more attention should be paid to a nutrient-rich diet.

Providing large amounts of food and nutrients to patients who are not used to it or are very sick (especially if nasogastric tubes are inserted and large volumes of feeding are provided too quickly), could hamper recovery by overloading the already impaired body systems, most specifically the liver.

Figure 1. Decision tree to ascertain patients' feeding phase[1]



[1] It is very important to maintain hydration with oral rehydration salt (ORS) solution; particularly in the maintenance feeding phase.
[2] These patients need ORS. Fluid replacement should be the primary focus in this phase.
[3] "Maintenance feeding phase" refers to maintaining vital body functions.
[4] Irrespective of the presence or absence of eating difficulties, nutritional care will be the same.
[5] The presence or absence of eating difficulties will determine nutritional care.
[6] For convalescent patients do not limit the quantity of food and provide extra snacks.

Feeding during the supportive treatment of patients with Ebola

- The type of nutritional support for patients will depend on their tolerance of food by mouth. Patients who can't eat (or have no appetite) should be only hydrated with ORS or by intravenous fluids if severely dehydrated, until the

clinician advises differently. If not severely dehydrated, providing some nutritional support is important, especially in children.

- 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 *(71)*.

Tolerance test (see Appendix G) on admission in all patients who can eat.

- Clinically stable patients should 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 *(66, **Error! Bookmark not defined.**)* 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 should not be force-fed (e.g. by nasogastric tube) more than their maintenance requirements for energy (100 kcal/kg/day for children and 35 kcal/kg per day for adults).
- Patients who are stable and capable of eating more can have amounts of food increased and should be encouraged to eat as much as they can.
- Patients who cannot finish the recommended ration should reduce the amount of cooked food[1] as it is less nutrient-energy dense than ready-to-use therapeutic food (RUTF) (children >6 months and adults).

[1] Caloric value of traditionally prepared food is yet to be determined.

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

Check for emergency signs from the Quick Check *(9)* (for adolescents and adults) and the ETAT *(10)* (for children) in the ETU:

Airway and breathing
- appears obstructed
- central cyanosis
- severe respiratory distress

Circulation
- weak or fast pulse
- capillary refill more than 3 seconds
- cold extremeties
- heavy bleeding – any site.

Altered level consciousness/convulsing (coma, convulsions)

For children, also evaluate signs of severe dehydration (any two of these: lethargy, sunken eyes, very slow return after pinching the skin).

4.1 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 and the ETAT for children.
- 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:
- electrolytes- K, Na, HCO_3
- glucose
- creatinine
- lactate
- for women of childbearing age: pregnancy test

Secondary priority:
- magnesium
- haemoglobin or hematocrit
- platelet count
- INR and PTT

4.2 Shock in VHF patients

General signs of shock (poor perfusion)
- Fast, weak pulse
- Pallor or cold extremities
- Prolonged capillary refill (>3 seconds)
- Dizziness or inability to stand
- Decreased urine output (<30 ml/hour)
- Difficulty breathing
- Impaired consciousness, lethargy, agitation, confusion
- Low BP (SBP <90; see table on page 94 for SBP by age/weight of child). 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.

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

VHF patients can be in shock from hypovolaemic from GI loss (most common in the 2014-2015 West African Ebola outbreak), septic shock or haemorrhagic shock (uncommon) or a combination of these.

The pathophysiology and the intensive supportive care for septic shock in VHF in adolescents and adults are the same as for septic shock from a bacterial infection or other causes *(72)*. See section 3.1.5 in the *IMAI district clinician manual (9)* for some differences in management of septic shock depending on likely etiology. 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 and that requires specific treatment.

Table 11. Shock observed in Ebola patients in West Africa outbreak 2014–2015	
*** Large GI loss with dehydration: **HYPOVOLEMIC SHOCK**	Follow fluid resuscitation and electrolyte replacement guidelines; see section 4.3 (adolesecents and adults) and 4.5 (children)
Shock not explained by large GI loss or haemorrhage: **SEPTIC SHOCK**	Follow septic shock guidelines; see section 4.4 (adolescents and adults) and 4.5.7 (children)
HAEMORRHAGIC SHOCK (uncommon)	Replace blood. Often not feasible.

4.3 Manage hypovolaemia from large GI loss in adolescents and adults

Most patients with Ebola develop vomiting and diarrhoea; 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 hypovolaemic shock and metabolic abnormalities.

4.3.1 Assess for shock and signs of dehydration, and monitor volume of GI loss

Assess for shock in adults (see section 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?

Table 12. Classify and treat dehydration – modified for Ebola

Signs	Classify as	Treatments
Two of the following signs: • Lethargic or unconscious • Sunken eyes • Not able to drink or is drinking poorly • Skin pinch goes back very slowly	**SEVERE DEHYDRATION**	IV fluid resuscitation, while continuing ORS. See Plan C (Appendix B)
Two of the following signs: • Sunken eyes • Drinks eagerly, thirsty • Skin pinch goes back slowly • In children: restlessness, irritability	**SOME DEHYDRATION***	Start IV fluids while continuing ORS.* Continue feeding the patient. See Plan B (Appendix B)
Not enough signs to classify as severe or some dehydration	**NO DEHYDRATION**	Give ORS and food. See Plan A (Appendix B)

* 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; they can be managed with oral rehydration solution. The weakness and lethargy that often accompany Ebola and the limitated time for patient care in the ETU suggest that patients with signs of some dehydration, with lethargy or weakness accompanying diarrhoea; or with significant vomiting, should be immediately started on active intravenous fluid resuscitation while also offered ORS.

4.3.2 Fluid resuscitation with large GI losses

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

- IV fluid of choice: Lactated Ringer's (also called Hartmann's solution)
- Place IV catheter (aim for 18G or larger). Place in largest available peripheral vein. Avoid antecubital fossa (elbow crease) if another site is available due to frequent interruption of flow with bending of elbow.

Fluid bolus

Adults: Give 1 litre IV over 30 min or faster.

- Reassess as soon as the litre has run in. Look for signs of dehydration and shock.
- If signs of shock persist following initial fluid bolus,, repeat crystalloid bolus.
- Many severely ill adults with large GI loss will require 3 to 6 liters of fluid per day.
- If signs of severe dehydration, see Plan C for fluid requirements (see Appendix B).

Appropriate fluid administration should be accompanied by close observation, with frequent reassessment, of the patient for signs of response to treatment and fluid overload, but fluid administration should proceed until hydration target are reached (see box) or 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 the condition fails to improve and it is operationally feasible, the addition of vasopressors should be considered.

Hydration targets in adults

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

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

- 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).

Most adults require 2–3 litres of maintenance fluids per day. A maintenance rate can also be calculated for adults using 2 mg/kg of total body weight or using the same formula as for children: 4 ml/kg/hr for the first 10 kg, plus 2 ml/kg/hr for the next 10 kg, plus 1 ml/kg/hr for each additional kg (see table in section 3.4 on page 45).

Although volume repletion should be individualized, total per-day fluid administration might be double (or greater) than the standard maintenance rate for those with substantial ongoing extra gastrointestinal losses (vomiting and/or diarrhoea). Hydration targets should be assessed at least once per shift.

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

- Dedicated trips through ward to replenish IV bags
- Use one litre bags of Lactated Ringer's or normal saline
- Hang 2 bags simultaneously using a "Y" connection.

To avoid haemorrhage from the patient pulling out the IV line when unattended at night, cap off or use a 1-way valve (for example, Clave®) on the 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 that the patient continue eating and to be offered ORS even when on IV fluids.

4.3.3 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 hypokalaemia is documented, add 20 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 Lactated Ringer's 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 (for example, jelly water/coconut contains 54 mEq/L and bananas, approximately 10mEq/banana).
- Concomitant correction of hypomagnesaemia, also common with Ebola, assists correction of hypokalaemia. Oral magnesium supplementation may exacerbate diarrhoea; instead, intravenous magnesium (2–4 g/IV over 1 hour) may facilitate correction of hypokalaemia.
- Patients with acute kidney injury from pre-renal failure (shock) may have hyperkalaemia and acidosis. Hypokalaemia is not the only potassium abnormality which can occur and speaks to the need for routine electrolyte monitoring in these patients.

Table 13. Potassium replacement therapy for adolescents and adults	
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 3 times daily
2.4–2.6	80 mEq PO every 8 hours
<2.4	10 mEq/hour IV and 80 mEq PO every 6–8 hours

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

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

4.3.4 Antibiotics for patients with large GI losses

Consider empirical therapy with a broad spectrum antibiotic such as ceftriaxone for patients with significant abdominal symptoms with risk of secondary bacterial infections due to possible gut translocation of bacteria and for patients with suspected sepsis.

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

For Ebola confirmed patients, discontinue antibiotics after 5 days if symptoms improve or without other indication to continue.

4.4 Manage septic shock in adolescents and adults

Distinguishing different forms of shock in patients with Ebola in ETUs is challenging. Although hypovolaemic 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 text below summarizes an evidence-informed approach to management of septic shock. Certain diagnostic (radiographs, cultures) and therapeutic (hourly follow-up, oxygen, vasopressors) aspects may not be feasible in ETUs.

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 ºC or >38 ºC).

Use the chart on the following pages for specific guidance on the management of septic shock. It is arranged by hours, starting from patient arrival or the time septic shock is diagnosed. It 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 including providing empirical antibiotic therapy.
- If operationally feasible, the addition of vasopressors should be considered if SBP <90 and signs of inadequate perfusion after fluid resuscitation.
- Monitor – record – respond.

These basic recommendations provide guidance on intensive supportive care for adolescent and adult patients with shock of most aetiologies, including VHF. The pages following the chart provide more detailed information.

Table 14. Management of septic shock in adolescents and adults

	Manage septic shock: first 2 hours	2–6 hours
Recognize	**Clinical diagnosis of severe sepsis or septic shock** • Suspected infection • Hypotension (systolic blood pressure <90 mmHg) and 1 or more of the following. • Pulse >100 beats per minute (bpm). • Respiratory rate >24. • Abnormal temperature (<36 °C or >38 °C).	Reconsider other causes of shock if no change in SBP following fluid boluses. Consider internal haemorrhage. Establish any additional source of infection.
Fix the physiology, stabilize the patient	**Oxygen:** Where available, titrate to SpO_2 90. Also give oxygen if SpO_2 < 90%. **Fluids:** 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 on page 81) (See table that follows for fluid volumes by weight.)	**Oxygen:** Where available, titrate to SpO_2 90. Also give oxygen if SpO_2 < 90%. **Fluids:** If SBP >90, continue fluids at 2 ml/kg/hour (see page 75). If SBP <90 at 2 hours or later, start vasopressors if available and continue fluids at 5–10 ml/kg/hour (see page 75). Give vasopressor only if trained and feasible to continuously monitor. If vasporessors are not available or feasible, continue giving 500 ml boluses every 30 minutes, with close monitoring.
Treat infection	**Urgent empirical antimicrobials** • Antibiotics. • Antimalarials (if RDT bedside malaria test positive or if test result delayed or no RDT available). • Antivirals – consider ribavirin in confirmed Lassa fever or CCHF. **Identify any additional source of infection** • Use signs or symptoms to consider source. • Chest X-ray if portable machine available. • If considering TB, Chest X-ray or GeneXpert could assist diagnosis if available • Chest X-ray, Gram-stain sputum.	Treat any additional source of infection. Review results of investigations.
Monitor, record	**Every 30 minutes until stable, then every 1 hour** • SBP, pulse • Respiratory rate • SpO2 • Mental status (AVPU) • JVP, auscultate for crepitations • Check results of emergency laboratory • If haemoglobin <7 mg/dl (Hct <20), consider transfusion with fresh whole blood. If glucose <3 mmol/l (54 mg/dl), then give 50% dextrose 25–50 ml.	**Every 30 minutes until stable, then every 1 hour** • SBP, pulse • Respiratory rate • SpO2 • Mental status (AVPU). • JVP, auscultate for crackles (rales) • Urine output.
Respond	**If respiratory function declining (increasing RR, falling SpO_2)** • Check oxygen supply and fix. • If wheezing, give salbutamol. • If JVP elevated, increasing crepitations,-consider fluid overload. • If fluid overload suspected, slow rate of fluid administration (and, if patient still in shock, start vasopressors, if available). • If visible secretions and suction is available, suction – recognizing that this may produce an aerosol requiring additional respiratory protection (N95 or equivalent mask).	**If respiratory function declining (increasing RR, falling SpO_2)** • Check oxygen supply and increase flow rate if possible. • If elevated JVP and increasing crackles, consider fluid overload. • If signs of fluid overload, SBP >100 and shock resolved, stop IV fluids, give furosemide 20 mg IV and raise head of bed • If wheezing, give salbutamol. • Check that antimicrobials have been given. • Treat other diagnoses or infections; see above.

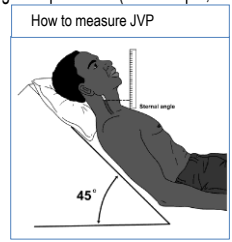
	Manage septic shock: 6–24 hours	Post-resuscitation
Recognize	If no change in SBP following fluid boluses: • Reconsider the possible diagnoses. • Establish source of any additional infection. Could there be a surgical cause that would benefit from drainage? • Get a second opinion.	Perform full reassessment. Review available diagnostic data and treat underlying diagnosis. Evidence of a primary cardiac or pulmonary process? Add its specific management.
Fix the physiology, stabilize the patient	**Oxygen:** Titrate to SpO_2 90. **Fluids:** • When SBP >90, continue fluids at 2 ml/kg/hour. • If on vasopressors, reduce rate. • If SBP <90, continue or increase vasopressors and continue LR or NS at 2 ml/kg/hour. • See table on next page for fluid volumes by estimated patient weight.	**Oxygen:** Titrate to SpO_2 >90 and discontinue when 90 on room air. **Fluids:** • Reduce to maintenance (maximum of 2 ml/kg/hour) and switch to oral when patint is able to take.
Treat infection	**Continue empirical antimicrobials – next dose** • Antibiotics • Continue antimalarials if started. • Ribavirin, if confirmed Lassa fever of CCHF.	**Continue antimicrobials – switch to oral dose** • Antibiotics • Antimalarials (Give IV antimalarials for at least 24 hours total before switching to oral.) • Ribavirin, if confimed Lassa fever of CCHF. .
Nutrition	Add dextrose 50% 25–50 ml to the IV bag every 6 hours.	Procedures to follow once the patient has stabilized, or after 1–2 days: • 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). • 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. • Consider NG feeding using semisolid foods (porridge or mashed foods) if the patient cannot swallow safely and is not severely ill. • Give a small amount initially (e.g. 20–40 ml/hour) and monitor NG aspirates to check for absorption. • Increase rate of feeding as tolerated.
Monitor, record	**Every hour if SBP <90 or on vasopressors; otherwise every 2 hours** • SBP, pulse • Respiratory rate • SpO2 • Mental status (AVPU) • JVP; ausculate for crackes (rales) **Every 6 hours:** • Urine output. **Every 12 hours:** • Repeat glucose and Hb if initial value abnormal.	**Every 8 hours (check SBP hourly if weaning off vasopressors); then daily** • SBP, pulse • Respiratory rate • SpO2 • Mental status (AVPU).) Respond to changes as indicated above.
Respond	Respond to changes as indicated for 2–6 hours on previous page.	Respond to changes as indicated above.

Table 15. Weight-based fluid for septic shock in adolescents and adults

Target volume	Small patient 30 kg)	Medium-sized patient (50 kg)	Large patient (≥70 kg)
Initial bolus 20 ml/kg	500 ml	1000 ml	1500 ml
Fluid target between 1–2 hours (20–40 ml/kg)	500–1000 ml	1000–2000 ml	1500–3000 ml
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 good urine output	60 ml/hr = 240 ml over 4 hours	100 ml/hr = 400 ml over 4 hours	140 ml/hr = 760 ml over 4 hours

Give fluids rapidly

- First give an initial 1000 ml Lactated Ringer's (LR) or normal saline (NS) bolus for adults, continue LR or NS at 20 ml/kg/hour, not to exceed 60 ml/kg in the first 2 hours (including the initial bolus).
- Monitor systolic blood pressure (SBP) and clinical signs of perfusion (for example, 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 ETUs.
- To avoid fluid overload, give smaller boluses (see table above).
- 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 above). However, if



the pulse is still high and there are other signs of poor perfusion, the patient may still be volume-depleted and need more fluids.

- Watch carefully for signs of fluid overload (increased respiratory rate, increased jugular venous pressure (JVP), 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 national or institutional guidelines. Common choices are ceftriaxone (2 gram daily IV); or ampicillin 2 grams every 6 hours plus either gentamicin 1.5 mg/kg IV every 8 hours or else ciprofloxacin 400 mg IV every 12 hours.
- **Antimalarials:** If RDT positive (or no RDT available or test results delayed) start artesunate IV (see Appendix C for antimalarial doses).
- **Antivirals**: Consider ribavirin in confirmed cases of Lassa fever and CCHF only.

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 E).

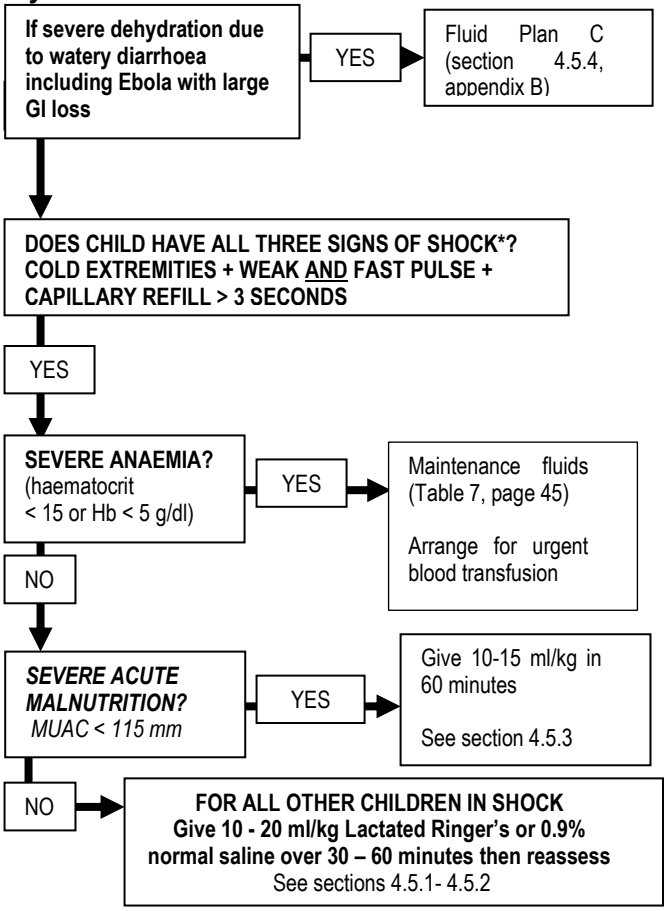
Signs of poor perfusion

- decreased urine output
- altered mental status

Signs of fluid overload

- worsening crepitations on auscultation
- dyspnoea
- increased respiratory rate
- elevated JVP
- peripheral oedema.

4.5 Assess for and manage shock and dehydration in children



***** Only children with all 3 signs of shock (cold extremities plus weak and fast pluse plus capillary refill > 3 seconds) and with no severe anaemia or severe acute malnutrition should receive 10-20 ml/kg Lactated Ringer's over 30-60 minutes *(52)*.

Children with only 1-2 signs of shock should:

- only receive maintenance fluids plus replacement for GI loss and losses due to fever (see page 44);
- be prioritized for full assessment and treatment; and
- reassessed within one hour.

Note: In the absence of shock or dehydration, rapid IV fluids may be harmful to children.

In all children:

- **monitor hydration targets and watch carefully for fluid overload**- and respond—see section 4.5.5.
- **monitor electrolytes and correct abnormalities**- see section 4.5.6

4.5.1 Assess for shock, severe dehydration, severe malnutrition, severe anaemia

Signs of shock in children:

- Cold extremities **and**
- Weak and fast pulse **and**
- Capillary refill time >3 seconds.

Children who have shock with **all these 3** signs require immediate fluid resuscitation.

Assess for shock

Check if child is lethargic or unconscious.

Check whether the child's hand is cold. If yes, 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.*

- If capillary refill takes 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 ETAT *(10)*).

Assess for severe anaemia

- Severe palmar pallor

  Often with fast pulse rate, difficult breathing, confusion or restlessness.

Assess for severe malnutrition (as the fluid volume and rate are different). Classify as severely malnourished:

- Infants 0 to 6 months of age having a weight for length less than minus 3 SD
- Children 6 months to 5 years with a mid-upper arm circumference (MUAC) of <115 mm and/or with bilateral pitting oedema of the feet.

Assess for signs of severe dehydration:

- Lethargy
- Sunken eyes
- Very slow recovery from skin pinch
- Unable to drink or drinks poorly.

Children with only one or two signs of impaired circulation, for example cold extremities, OR a weak and fast pulse, OR capillary refill >3 seconds but who do not have the full clinical features of shock, i.e. all 3 signs present together should not receive any rapid infusions of fluids but should still receive maintenance fluids and replacement for GI losses and losses due to fever appropriate for age and weight.

4.5.2 Initial fluid resuscitation for shock in children without severe dehydration, severe anaemia, or severe malnutrition

Any child in shock without severe malnutrition/anaemia/dehydration should be given an IV bolus of 10-20 ml/kg over 30-60 minutes, while the cause of shock is further assessed.

Initial intravenous fluid resuscitation for children with shock (and no severe malnutrition, severe anaemia, or severe dehydration) *(2)*

- Insert an IV line (and draw blood for emergency laboratory investigations). Place an appropriate-sized IV catheter (if possible 18G) in largest available peripheral vein or intraosseous access. If there has been previous bleeding, a smaller catheter should be used to avoid haemorrhage from large puncture sites.
- Attach Lactated Ringer's or normal saline; make sure the infusion is running well.
- Use the first column of the table below to determine the volume of fluid.
- Run the 10-20 ml/kg in over 30 -60 minutes, carefully observing the child.

All children should be fully assessed, an underlying diagnosis made, other treatment given and their condition monitored

Table 16. Immediate fluid resuscitation in children with shock without severe dehydration, severe anaemia or severe malnutrition

10-20 ml/ kg Lactated Ringer's or normal saline over 30 - 60 minutes				
Weight (kg)	20 ml/kg over 30- 60 minutes in ml	20 ml/kg in drops per minute* if over 60 minutes	10 ml/kg over 30-60 minutes In ml	10 ml/kg in drops per minute* If over 60 minutes
2	40	13	20	7
2.5	50	17	25	8
3	60	20	30	10
4	80	27	40	13
5	100	33	50	17
6	120	40	60	20
7	140	47	70	23
8	160	53	80	27
9	180	60	90	30
10	200	67	100	33
11	220	73	110	37
12	240	80	120	40
13.	260	87	130	43
14	280	93	140	47
15	300	100	150	50
16	320	107	160	53
17	340	113	170	57
18	360	120	180	60
19	380	127	190	63
20	400	133	200	67

* Assumes "adult" IV giving sets where 20 drops=1 ml. Calculate separately if using paediatric burette where 60 drops= 1 ml.

Consider immediate blood transfusion if severe pallor or Hb <5g/dl on admission.

Children with shock and severe anaemia (erythrocyte volume fraction or haematocrit < 15 or haemoglobin < 5 g/dl)(*10*) should receive a blood transfusion as early as possible and only receive other intravenous fluids to maintain normal hydration status. The child should be reassessed at the completion of the infusion and over the subsequent hours to check for any deterioration:

Table 17. Reassess the child after the appropriate volume has been infused	
Reassess after first infusion	If no improvement, repeat 10 ml/kg over 30 minutes. If no response or if bleeding, give whole blood 10 ml/kg over at least 3 hours and observe closely. If shock has resolved, then provide fluids to maintain normal hydration status only (maintenance fluids)
Reassess after second infusion	If no improvement and signs of dehydration, repeat 10 ml/kg over 30 minutes. If no improvement with suspected septic shock, repeat 20 ml/kg over 30 minutes and consider vasopressors if feasible. Go to section 4.5.5.

Any child who does not improve after one hour should be given a blood transfusion (10 ml/kg slowly over at least 3 hours). The child may have internal bleeding or require transfusion in severe septic shock to improve oxygen carrying capacity.

Monitor hydration status and watch carefully for signs of fluid overload. If, at any time, there are signs of fluid overload, cardiac failure or neurological deterioration then the infusion of fluids should be stopped and no further intravenous infusions of fluids should be given until these signs resolve. See section 4.5.6.

4.5.3 Initial fluid resuscition for shock in children with severe malnutrition

Children with severe acute malnutrition with shock should receive 10-15 ml/kg of intravenous fluids over the first hour. Children who improve after the initial infusion should only receive oral or nasogastric maintenance fluids. Use one of the following IV fluids according to availability:

- Lactated Ringer's with 5% glucose (dextrose)
- Half strength Darrow's solution with 5% glucose (dextrose)
- 0.45% NaCl plus 5% glucose (dextrose).

Table 18. Immediate fluid resuscitation in children with shock with severe malnutrition

	10-15 ml/kg Lactated Ringer's with 5% glucose, half strength Darrow's solution with 5% glucose, or 0.45% NaCl with 5% glucose			
Weight (kg)	15 ml/kg over 60 minutes in ml	15 ml/kg in drops per minute* if over 60 minutes	10 ml/kg over 60 minutes in ml	10 ml/kg in drops per minute* If over 60 minutes
2	30	10	20	7
2.5	38	13	25	8
3	45	15	30	10
4	60	20	40	13
5	75	25	50	17
6	90	30	60	20
7	105	35	70	23
8	120	40	80	27
9	135	45	90	30
10	150	50	100	33
11	165	55	110	37
12	180	60	120	40
13.	195	65	130	43
14	210	70	140	47
15	225	75	150	50
16	240	80	160	53
17	255	85	170	57
18	270	90	180	60
19	285	95	190	63
20	300	100	200	67

* Assumes "adult" IV giving sets where 20 drops=1 ml. Calculate separately if using paediatric burette where 60 drops= 1 ml.

If child improves:

- Switch to maintenance oral or nasogastric fluids using ReSoMal at

10mls/kg/hour for up to 10 hours.

- As soon as conscious, introduce F75 and appropriately reduce amount of ReSoMal given.

If child does not improve:

- Give only maintenance IV fluid at 4 ml/kg/hour as you wait for blod transfusion.
- Transfuse 10 ml/kg whole blood over 3 hours as soon as it is available.
- Initiate refeeding with starter F75 after transfusion complete.
- Give IV antibiotics if not yet started

Discuss with senior clinician.

4.5.4 Fluid resuscitation with signs of severe dehydration or large GI losses in children

If there are signs of severe dehydration and evidence of large GI losses, then follow fluid plan C (see also Appendix B) and the table above, using the columns on Fluid Plan C steps 1 and 2. Give 0.9% normal saline with 5% dextrose, or Lactated Ringer's with 5% dextrose, or 0.9% saline (in order of decreasing preference)). Infants <1 year should receive either 0.9% normal saline or Lactated Ringer's with 10% dextrose.

Age	First give 30 ml/kg over:	Then give 70 ml/kg over:
Infants (under 12 months)	1 hour	5 hours
Older (12 months or older, including adults)	30 minutes	2½ hours

Source: Fluid plan C- see Appendix B.

If the child is vomiting and have significant diarrhoea, even without signs of dehydration, early IV access is important,as a child's condition can deteriorate rapidly and IV access can be difficult. Symptoms in children under five are often recognized late due to their more subtle clinical presentation and children's difficulty effectively describing their symptoms. As a result, the illness in these children commonly progresses rapidly to death, often within hours rather than days of symptom onset. Therefore, be proactive

with IV access when oral intake of fluids is considered inadequate, without waiting for signs of severity.

Table 19. Immediate fluid resuscitation in children with shock with severe dehydration but no severe malnutrition

Weight (kg)	Plan C – Step 1	Plan C – Step 2		
	30 ml/kg Lactated Ringer's	70 ml/kg Lactated Ringer's or nasogastric ORS		
	Age <12 m, 1 hour Age ≥1 yr, ½ hour Volume	Age <12m, over 5 hours Drops/min*	Volume	Age ≥1yr, over 2½ hrs Drops/min*
2	60	10	140	
2.5	75	13	175	
3	90	13	210	
4	120	20	280	
5	150	27	350	55
6	180	27	420	55
7	210	33	490	66
8	240	33	560	66
9	270	40	630	80
10	300	50	700	100
11	330	55	770	110
12	360	55	840	110
13	390	60	910	120
14	420	66	980	135
15	450	66	1050	135
16	480	75	1120	150
17	510	80	1190	160
18	540	80	1260	160
19	570	90	1330	180
20	600	95	1400	190

*Assumes "adult" IV giving sets where 20 drops=1 ml. Calculate separately if using paediatric burette where 60 drops= 1 ml.

If attempts at IV cannulation in paediatric patients are unsuccessful, an intraosseous (IO) needle should be used, provided adequately trained staff are available. Intraosseous access, preferably with a powered device, such as an EZ-IO©, is quick, safe and much easier than IV insertion in peripherally "shut-down" children. Extreme caution is advised in manual intraosseous access (for example, with a Cook© needle), as there is a risk of

needle-stick injury. Owing to risk of contamination, the same powered intraosseous device should be used only in confirmed Ebola patients. The IO should be replaced as soon as possible with an IV line.

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; this trial excluded patients with gastroenteritis *(73)*.

Fluid resuscitation in children with signs of some dehydration

Plan B ORS rehydration depends on close monitoring, supervised intake and periodic assessment dehydration status of children that may be practically difficult for children admitted in ETUs. It is also difficult to assess the amount of ongoing fluid losses due to diarrhoea and vomiting to allow for replenishment.

Children under five with diarrhoea and some dehydration or poorly taking orally should be started early on IV fluids. Alternatively, nasogastric in those able to keep the tube in place but with close supervision or where IV access may be difficult.

Table 20. Fluid resuscitation in children with some dehydration	
	Plan B – 75 ml/kg
	Oral /nasogastric ORS
Weight (kg)	Over 4 hours
2	150
2.5	190
3	225
4	300
5	375
6	450
7	525
8	600
9	675
10	750
11	825
12	900
13	975
14	1050
15	1125
16	1200
17	1275
18	1350
19	1425
20	1500

Monitor volume of GI loss:

- Unable to drink or drinks poorly
- Clarify recent history of vomiting and diarrhoea
- Ask parents/caregivers about urine output and oral fluid intake.

4.5.5 Monitor hydration targets and watch carefully for fluid overload

Hydration targets for children:

- Capillary refill ≤2 seconds, normal pulse, and warm extremities
- Normal heart rate for age
- Urine output >1 mL/kg/hour.

Table 21. Normal pulse rate, systolic BP, respiratory rate in children			
Age (years)	**Pulse rate* (range)**	**Systolic BP**	**Respiratory rate**
0–1	100–160	>60	0–3 months: 35–55 3–6 months: 30–45 6–12 months: 25–40
1–3	90–150	>70	20–30
3–6	80–140	>75	20–25

Normal pulse rates are 10% slower in sleeping children. Children with fever have higher pulse rates by 10-20 beats per degree of temperature above 37° C; this is a normal phenomenon, not necessarily a sign of dehydration. 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.

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 rate.
- 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 paediatric expert to consider giving oral or IV furosemide 1 mg/kg once or twice a day for 24 hours (and oxygen therapy). Aspiration of pleural fluid can be considered but risks bleeding and pneumothorax, both complications difficult to manage in an ETU.
- If shock has resolved and the child is stable, stop IV fluids. The excess fluid will be re-absorbed and lost through urinary diuresis.

Note: If there is large prior haemorrhage, severe shock and high near-term risk of death, consideration should be given to whether attempting IV or IO access is appropriate, or whether palliative and comfort care is more appropriate.

4.5.6 Electrolyte abnormalities

Hypokalaemia from GI losses is frequent and can be serious in children. Correction by the IV route carries a risk if not closely controlled. Oral correction and replacement should be preferred whenever possible.

To avoid serious electrolyte abnormalities:

- Where possible, use point–of-care testing for electrolytes and correct abnormalities. If hypokalaemia is documented, add 20 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.
- Oral rehydration solution (ORS) contains potassium (20 mEq/L), which is usually sufficient to replace ongoing losses if sufficient ORS is ingested.
- Additional drinks and foods may be good sources of potassium (for example, jelly water/coconut contains 54 mEq/L and bananas, approximately 10 mEq/banana)
- For correction by oral route, give oral potassium supplements (1- 4 mEq/kg/day; for example, 20 mEq for a 10 kg infant)
- Levels of 3.0 and above are usually asymptomatic and corrected by dietary intake and ORS.
- IV maintenance and correction should be used only when when a child has severe hypokalaemia (levels <2.5) or is not able to drink.

Table 22. Potassium replacement therapy for children

Potassium level	Dosing
3.0 or more	None
2.5–2.9	0.5–2 mEq/kg PO every 12 hours Maintenance: 10 mEq/L fluid
<2.5	0.5 mEq/kg/hour IV for correction. Maintenance: 20–40 mEq/L fluid, 2 mEq/kg PO every 12 hours

- For IV maintenance, 10–20 mEq/L is recommended.
- Addition of potassium to IV fluids must be done carefully to avoid errors, or use clearly labelled bags with added potassium prepared in the pharmacy in the green zone.
- Maximum concentration to correct hypokalaemia IV is 40 mEq/L; maximum rate is 0.5 mEq/kg/h (for example, 5 mEq in a 10 kg infant in 1 hour).
- High concentrations need a proper – preferably large – vein due to the irritating effects on the tissue.
- Concomitant correction of hypomagnesemia, also common with Ebola, assists correction of hypokalaemia. Oral magnesium supplementation may exacerbate diarrhoea; instead, intravenous magnesium (25–50 mg/kg IV over 6–12 hours, maximum single dose of 2 grams) may facilitate correction of hypokalaemia.

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

Any child in shock should be given an IV bolus of 10-20 ml/kg over 30-60 minutes, while assessed further for the cause of shock. See instructions in section 4.5.1.

It may be difficult initially to distinguish between hypovolaemic shock and septic shock. If unclear, in the first 2 hours use the hypovolaemic shock fluid replacement volumes.

General principles of managing children with septic shock

- Manage airway (see ETAT *(7)*).
- Give oxygen through nasal prongs or catheter. Start at 1–2 litres/minute to aim for oxygen saturation ≥90. In the acute phase of shock (first 24 hours), where there is impaired oxygen delivery, also give oxygen if SpO2<94% *(52)*.
- Give IV fluid: initial 10-20 ml/kg LR or NS over 30-60 minutes (if not severely malnourished—see section 4.5.3 for fluid recommendations).
- Treat underlying cause:
- **Antibiotics:** Administer empirical broad-spectrum antibiotics (for example, ceftriaxone 80 mg/kg once daily (maximum 2 grams);
- **Antimalarials:** Bedside RDT for malaria and, if positive (or if RDT results not available immediately), start IV artesunate (see Appendix C for dosing);
- **Antivirals:** Consider ribavirin in confirmed Lassa fever or CCHF.
- Consider vasopressors (if feasible) if fluids and blood fail to raise SBP and if signs of inadequate perfusion persist. Note: the health worker must have been trained to use vasopressors.

Monitor – record – respond.

Follow recommendations in section 4.5.4 on hydration targets, watching for and responding to fluid overload.

Follow recommendations in section 4.5.5 on managing electrolytes and glucose abnormalities.

5 Contacts: clinician's role in contact tracing and management of exposed individuals

5.1 Clinician's role in contact tracing

When screening patients who present to an ETU, holding centre 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. See section 2.1.3.

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 (for example, conjunctiva) should be irrigated with copious amounts of water or eyewash solution.

If the incident occurs inside the red zone:

- The health worker should exit immediately unless the glove was perforated.
- In the event of an injury perforating the gloves inside the red zone (for example, needle-stick), the health worker should remove the gloves, wash the hands carefully and put new gloves on before exiting. Although this approach ~~won't~~ may not change the probability of infection, it will allow the health worker to respond directly and calm down.
- For injury through any other part of the PPE, the health worker should exit first.
- Remove the PPE following the routine procedures (see section 7.3).
- It is essential that the health worker stay calm and strictly follow the PPE removal procedures to avoid exposure with potentially contaminated PPE during removal.

- Once in the green zone, proceed with washing the affected skin surface or mucous membrane as describe above.
- The exposure incident should be reported immediately to the designated occupational health professional.
- Exposed persons should be medically evaluated and receive follow-up care, including fever monitoring, twice daily for 21 days after exposure.
  - In case of a temperature above 38 °C or other clinical symptoms of VHF (diarrhoea, etc.), hospitalize immediately in strict isolation. The incubation period between exposure and clinical symptoms is a minimum of 48 hours.
  - Post-exposure prophylaxis (for example, HIV, Hepatitis B) should be considered.

Health workers suspected of being infected (that is, presenting symptoms compatible with Ebola) 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 Lassa or 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 workers, defined as one of the following:

(1) Penetration of skin by a contaminated sharp instrument (for example, needle stick injury);
(2) Exposure of mucous membranes or broken skin to blood or bodily secretions (for example, blood splashing in the eyes or mouth);
(3) Participation in emergency procedures without appropriate personal protective equipment (for example, resuscitation after cardiac arrest, intubation or suctioning); or
(4) Prolonged (that is, hours) and continuous contact in an enclosed space without appropriate personal protective equipment (for example, a health worker accompanying a patient during a medical evacuation in a small airplane) *(74)*.

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 *(74)*.

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 *(74)*.

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 be monitored during this incubation period in their home and community. However, when both parents have been admitted to the ETU and no guardian at home can take care of them, it is essential to have designated facilities to provide general care, nutrition, psychosocial support, and Ebola symptom and temperature monitoring for exposed and asymptomatic children during their 21 days. Whenever possible, asymptomatic children should not be admitted into the ETU with their parents, although the designated faciliites/nurseries may be adjacent to the ETU. Survivors can be trained as caregivers for this population. Strict standard, contact and droplet precautions should be applied in these facilities with rapid scaling up of PPE and isolation when a child presents symptoms. Options may include *(75)* kinship care within quarantine, foster care by a survivor, or an OICC. See also section 3.6.

- Child contacts under 5 years of age 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,due to evidence of rapid clinical deterorioration, requiring closer observation for symptom onset and frequent (3 times/day) temperature monitoring with more attention from dedicated health staff.

  .

6 Psychological support

Support to patient and family

Psychological support for the patient, the family and the staff 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 of each patient, then look out for mental health problems developing as a result of the patient's adjustment to being ill. Transient symptoms of acute stress are to be expected. 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 *(9)*.

Ideally a psychologist, social worker or nurse psychosocial provider (eg psychologist, social workers, or nurse or supervised community worker skilled and full-time dedicated in to providing psychological support) should be involved from the outset. He/she should be present at the screening area to counsel the patient on what is happening inside the wards and then should follow the patients daily inside the red zone if possible. If it is not feasible to bring a dedicated psychosocial provider into the red zone, then general nurses inside the red zone should be trained and supervised to provide at least basic psychological support. Basic psychological support to patients is described in *Psychological First Aid during Ebola Virus Disease Outbreaks* (76). An alternative would be to have the trained psychosocial provider present in an area of the green zone that is in close verbal and visual proximity to an area in the red zone where patient can be brought and counselling conducted across a safe barrier.

The ability of the psychosocial provider to communicate in the local languages is essential. Providing psychological care in PPE can be uncomfortable and difficult. The PPE is physically exhausting for the psychosocial provider, and for the patient it is difficult to see the face of the psychosocial provider(seeing faces helps to establish a good

rapport). For mobile patients an area with privacy can should be created where the patients can talk over the fence of the high-risk area with the psychosocial provider at sufficient distance to prevent transmission. Psychosocial interventions for patients and families are described in section 10.11 in the *IMAI District Clinician Manual (9)*. Support groups for family members and for affected patients after discharge may be useful.

If survivors are employed to provide psychosocial support, they need appropriate training, continuous mentoring and often psychosocial support themselves (as for others on the clinical team- see below).

Control of pain, abdominal discomfort and nausea, as well as management of anxiety are important to the patient's well-being (see section 3.2). 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 *(77)*.

Support patients and family members at the ETU as feasible:*

- Define an area where the family members can stay outside.
- Try to design areas where the staff and family can view patients through plexiglass.
- Encourage patients in stable condition to sit outside to communicate with their family across the fence.
- Regularly inform the family about the patient and inform the patient that his or her family is around.

- Support the patient's mobile phone use from inside ward. Provide a way to recharge the mobile phone (electrical plugs/airtime) or provide a mobile phone for patient's use.
- When possible and safe* allow a family member under close supervision to visit their children inside the centre, wearing full PPE, to give food, to encourage ORS and to talk to them.
- Some ETUs allow a family member to come in full PPE to view the dead body.*
- Clearly explain the rules inside the ETU and accompany family members at all times.

*These visits may not be possible if the ward is overcrowded or understaffed or if there are insufficient IPC measures in place, etc. There are risks for family members to be in the red zone in full PPE which should be weighed against the benefits.

Child-friendly wards

- ETUs caring for children should be designated for constant visual overview from the staff areas (windows or similar) and from the family.
- Designated area should be designed to keep the family together.
- Younger children will need continuous care and support, ideally from family members in the ward or survivors. It is important to interact with children and touch them. This facilitates oral fluids and feeding as well as psychological health.
- Cots, playpens or beds with grids are needed to prevent moving children from falling out or moving around in the ward.
- Paediatric oral formulations of medicines, supplies of diapers/pampers, absorbing pads and paediatric portable toilets/potties should be considered to improve care and comfort.
- As the child improves, toys or similar items appropriate for the age should be available.

Support to health workers and other staff (including survivors hired to assist clinical team)

Psychological support to staff is essential to help them cope with the high mortality, infection among colleagues and difficult working conditions (for example, heat stress). Clinical staff are confronted with patients presenting with severe pain and discomfort that are difficult to relieve. Many Ebola patients are conscious to the end; others are very confused and agitated or uncommunicative. Staff should be prepared to deal with these stressful situations.

Someone with mental health and psychological support expertise should be part of the medical team to counsel and train support the staff in psychological skills, how to talk with the patient and family, as well as to train then in stress management skill to deal with their own stress.

Culturally sensitive counselling support is essential. Training and supervision of local staff to provide psychological support in local languages to the patient and family should be considered whenever possible. During the West Africa Ebola outbreak, there were very few locally trained psychologists but the demand was very high.

If survivors are employed to provide psychosocial support and care for children, they need the same appropriate psychological support, as the rest of the staff.

7 Infection prevention and control (IPC)[1]

Infection prevention and control is key to reducing the spread of infection from patients to health workers, from health workers to other 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 requires 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 *(78)*.

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.

[1] Infection prevention and control recommendations in this document are based on published WHO guidelines *(9, 13, 14, 79,80)*.

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

Standard precautions + Contact precautions + Droplet precautions

Contact precautions are used in addition to standard precautions to reduce the risk of transmitting infectious agents by direct and indirect touch (or contact).

Droplet precautions are used in addition to standard precautions to reduce the risk of transmitting infectious agents that spread by large droplets (>5µm).

In addition to standard precautions, the following are WHO recommendations for direct patient care for known or suspected viral haemorrhagic fever patients *(81,82).*

- 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 those necessary for the patient's well-being and care, such as a child's parent or caregiver. All visitors should wear full PPE.
- Ensure that all those entering the ETU patient care area use full PPE according to recommendations. Before they enter the isolation area,,instruct all visitors on putting on, using and removing PPE correctly (see recommendations on pages 119 to 128) and on correct hand hygiene practices (see illustrations on page 130-131). Make sure they understand and follow the instructions strictly.
- Apply infection control precautions to avoid any possible unprotected direct contact with blood and body fluids (e.g., blood, urine, faeces, vomit, sweat, saliva, semen, breast milk) when providing care to any VHF patient, including suspected cases.
- Perform hand hygiene according to the indications listed below by using either an alcohol-based handrub or soap and running water and applying the correct technique recommended by WHO. Bleach/chlorine solutions 0.05% may be used in emergency situations until alcohol-based handrubs or soap and water become available at the facility.
- Perform hand hygiene before and after direct patient care, after any contact with potentially contaminated surfaces, and after removing PPE. Neglecting to perform hand hygiene after removing PPE reduces or negates the 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. See guidelines below on the 2-step procedure to change gloves safely between patients or if compromised.
- 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 and body fluids and to blood-borne pathogens.

- Wear facial protection to prevent splashes to the nose, mouth and eyes.
- Wear a fluid-resistant medical/surgical mask with a structured design that does not collapse against the mouth (for example, duckbill, cup shape).
- Wear either a face shield or goggles.
- Wear waterproof boots (for example, rubber/gum boots).
- Wear a head cover that covers the head and neck.
- Before leaving 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 (for example, 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 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 section 3 for precautions for preparing medicines for injection and risk assessment before deciding to administer medicines or insert an IV.
- 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.
- Any other person who enters the red zone.

7.2 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 are the standard of care and should be made available at every point 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 *(83)*. See Appendix I. Chlorine preparation.

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 (that is, are not visibly soiled).

Other aspects of hand hygiene

- 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).
- Maintaining healthy skin integrity.
- Avoid wearing 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.
- 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 steps.

Indications for glove disinfection

Glove disinfection should be performed within the red zone every time it is needed according to the above indications during care of a patient. When caring for patients in the same room, it is essential to complete the care for each patient before moving to the next. Gloves should be changed between patients; glove change can be safely performed by following a two-step procedure: 1) disinfect the outer gloves before removing them safely and 2) keep the inner gloves on and disinfect them before putting on a clean outer pair. Alcohol-based handrubs are preferred when disinfecting gloved hands. However, if this is unavailable 0.5% bleach/chlorine solutions are acceptable in the interim.

Respiratory hygiene

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

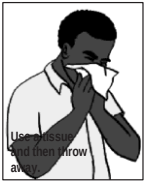
- Cover mouth and nose when coughing or sneezing.
- Cough or sneeze into your arm.
- Perform hand hygiene after contact with respiratory secretions.
- Have single-use tissues available in the waiting area or provide a medical mask. Dispose of tissues in no-touch receptacles. Then wash hands.

  When tissues, cloths, or face masks are not available, instruct all health workers, other staff, patients and visitors to lift an arm and cover the nose and mouth with the inner surface of the arm or forearm when coughing or sneezing.

- For persons with respiratory symptoms:

  (1) Source control measures: Cover their nose and mouth with a tissue or mask when coughing or sneezing;

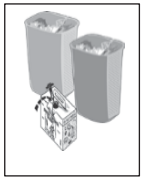
  (2) Spatial separation of at least one meter from persons with acute febrile respiratory symptoms.



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 when they are ¾ full.

Safe waste disposal



Waste management

- **Wear a full set of PPE** (see above), and **heavy duty/rubber gloves**, when cleaning the environment and handling infectious waste.
- Ensure safe waste management.
- In an ETU or isolation ward, treat all waste from the red zone, waste from any clinical site outside the red zone that is contaminated with blood, body fluids, secretions or excretions, and human tissue and laboratory waste directly associated with a specimen as infectious *(84)*.
- Waste should be segregated at the point of generation to enable appropriate and safe handling.
  - Sharp objects (needles, syringes, glass articles) and tubing that has been in contact with blood or body fluids should be placed inside puncture-resistant waste containers.
  - All solid, non-sharp, infectious waste should be collected in leak-proof waste bags in covered bins.
- Discard single-use items properly.

Cleaning and disinfection of the environment

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


Cleaning

- Floors and horizontal work surfaces should be cleaned at least once a day or whenever soiled.
- Cleaning should always be carried out from "clean" areas to "dirty" areas, in order to avoid transfer of contaminants.
- 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 become contaminated quickly.
- Environmental surfaces or objects contaminated with blood, other body fluids, secretions or excretions should be cleaned and disinfected as soon as possible using standard hospital detergents / disinfectants (e.g. a 0.5% chlorine solution or a solution containing 5,000 ppm available free chlorine). ***Application of disinfectants should be preceded by cleaning*** to prevent inactivation of disinfectants by organic matter.
- WHO discourages spraying occupied or unoccupied clinical areas with disinfectant. This is a potentially dangerous practice that has no proven disease control benefit. This is a potentially dangerous practice that has no proven disease control benefit. If spraying is not preceded by cleaning, the disinfectant may not work in the presence of organic matter and blood/body fluids. In the context of VHF outbreaks, spraying may be accepted outdoors and in some community settings (e.g. decontamination of Ebola victims' households by a burial team) as the only feasible option. 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 even after being sprayed.

Appropriate handling of contaminated linens

Staff should use full PPE and heavy duty/rubber gloves and apron when handling, transporting and processing used linen.

- Prevent skin and mucous membrane exposure and contamination of clothing.
- Place all used linen and waste in bags or containers that can be transported without damage.
- Remove any solid matter on soiled linen and dispose of it in a dedicated toilet for suspected or confirmed VHF patients. If the linen is heavily soiled, avoid manipulation and preferably incinerate.
- For low-temperature laundering, wash linen with detergent and water, rinse and then soak in 0.05% chlorine solution (a solution containing 500 ppm available free chlorine) for approximately 15 minutes. Linen should then be dried according to routine standards and procedures.
- Washing contaminated linen by hand should be discouraged. However, if washing machines are not available or power is not ensured, take the soiled linen out of the container and empty it into a large drum container of water and soap. Soak the linen in this drum and make sure it is totally covered with water. Use a stick to stir; then throw out the water and refill the drum with chlorine 0.05% (a solution containing 500 ppm available free chlorine) and soak for 15 minutes. Remove the linen and then rinse in clean water. Remove excess water and spread out to dry. Avoid splashing as much as possible.

Cleaning and disinfection of patient care equipment

- Handle equipment soiled with blood, body fluids, secretions and excretions in a manner that reduces exposure to skin and mucous membranes, contamination of clothing and transfer of pathogens to other patients or the environment.
- Clean, disinfect, sterilize and reprocess reusable equipment appropriately before use with another patient.

Table 23. Generic standard operating protocols for equipment decontamination

(85)

Asset category	Examples	SOP summary
1. Medical furniture / hospital hardware / utensils	• Bed frames and stretchers • Polypropylene buckets • Chair with plastic sheet • Autoclave • Bedpan with handle, polypropylene • Sheets, mattress • Urinal with plastic lid • Intravenous poles	SOP 1 Decontaminate surfaces as soon as possible; clean and then use standard hospital disinfectant (a 0.5% chlorine solution or a solution containing 5000 ppm available free chlorine).
2. Medical equipment		
Non-electromechanical medical devices	• Tourniquets (for blood testing), latex rubber • Measuring tape/ ruler	SOP 1 See above.
Mechanical medical equipment	• Blood pressure cuffs • Stethoscopes • Sphygmomanometer, aneroid • Mechanical scales	SOP 2 If possible, dismantle the devices to facilitate thorough cleaning. Devices should be thoroughly cleaned first with water and soap using appro-priate PPE to remove organic matter and then wiped with alcohol.
Electro-mechanical	• Infrared thermometer • Electrocardiogram (ECG) and	SOP 2 See above.

hospital equipment	monitor cables • Pulse oximeter • Laboratory clinical diagnostic equipment	If battery operated, remove battery.
Electro-mechanical respiratory equipment	• Oxygen concentrators • Flow splitter for oxygen concentrator • Suction system, general purpose • General anaesthesia machine • Ventilators	SOP 3 Respiratory and anaesthesia equipment should be disassembled, filters discarded, cleaned and disinfected.

3. Disposables / consumables		
Single-use devices without sharp edges	• Single-use PPE • Cannula, peripheral intravenous, sterile, disposable, with needle stick prevention • Catheter, intravenous, extension • Film/sheet, dressing, transparent, sterile, adhesive • Infusion-giving set • 3-way stopcocks with extension tubing, sterile • Wrap, self-adherent, disposable • Lock/cap/stopper, intravenous • Gauze • Catheter, Foley, sterile, disposable • Oxygen prongs, nasal, non-sterile • Oxygen tube, extension • Tube, aspirating/feeding • Tube, feeding sterile • Swab, cotton-tip, tube, sterile • Triple packaging boxes for specimen transport • Tube, blood collection, sterile • Tube, blood collection, serum	SOP 4 Immediately dispose of in a safe, leak-proof and clearly labelled bag after use, as they pose cross-infection risks. Items with intact packages found in storage may be returned to donor or redistributed to be used.

	• Tube, blood collection, plain/dry • Pipettes	
Single-use devices with sharp edges	• Syringe, reuse prevention feature • Sharps container (containing used sharps) • Needles and scalp vein needles • Intraosseous infusion system • Syringe and needle, insulin type, sterile	SOP 5 Must be immediately disposed of in puncture-resistant, leak-proof sharps containers after use, as they pose cross-infection risks. Final disposal includes incineration.
4. Medical/surgical instruments	• Scissors • Forceps • Scalpels • Retractors • Clamps	SOP 6 Combined protocol that includes physical contaminant removal (manual or ultrasound cleaning) and either physical or chemical disinfection or sterilization

7.3 Steps to put on and remove PPE

Viral haemorrhagic fevers can be transmitted from person to person, usually through direct contact with the contaminated blood or body fluids of an infected person, or through exposure to objects that have been contaminated with infected secretions. Infection probably occurs most often through oral or mucous membrane exposure (that is, eyes, mouth and nose) or breaks in the skin. Currently, 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 addresses health workers providing direct and indirect care to VHF patients. It constitutes the minimum guidance to achieve appropriate protection for IPC. Importantly, during an outbreak the types of PPE available in the field may not be the same at all 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 are available 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 compromising patient care through unnecessary barriers or excessively uncomfortable protective equipment.

Accordingly, the following instructions are an illustration of the steps to put on and take off the required PPE, with some additional measures depending on the conditions occurring during the outbreak. They may need adaptation according to local circumstances.

Purpose of using PPE for VHF

To ensure safety of health workers and patients:

- Avoid contamination from patient's body fluids.
- Avoid self-contamination (e.g. hands touching your mouth, nose or eyes).
- Avoid contamination when you take off PPE.
- Avoid transmission to others (patients, co-workers, visitors).

Principles of using PPE

- Protect eyes, nose and mouth at all times (keep facial protection to the end).
- Never touch your face with gloved hands.
- Always remove PPE carefully to avoid self-contamination when doffing.

Recognizing who people are among those providing care in the ETU

- Place the name of the person in PPE in a visible location (for example, on the disposable apron) so that the person can be easily recognized inside the treatment center.
- Important to include a "buddy" system (to supervise/support each other during donning/doffing PPE and working inside the red zone).
- Distinguish roles – who is a clinician, a hygienist/cleaner, etc.

Have a dedicated, trained staff member at all times to supervise removal (doffing) of PPE that assures each step of safe removal.

Safe and effective use of PPE depends on:

- Adequate and regular supplies
- Adequate staff training

- Proper hand hygiene
- Appropriate behavior
- Close supervision and support.

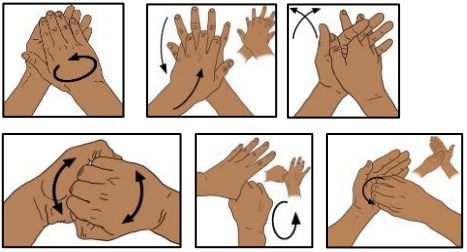
Do not touch your face- eyes, nose or mouth with gloved or ungloved hands.

Hang the wallchart on donning and doffing PPE, according to whether coveralls or gowns are used. For donning coveralls:
http://apps.who.int/iris/bitstream/10665/150116/1/WHO_HIS_SDS_2015.2_eng.pdf?ua=1
For doffing coveralls
http://apps.who.int/iris/bitstream/10665/150118/1/WHO_HIS_SDS_2015.4_eng.pdf

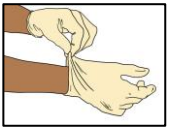
Steps to put on PPE including coverall

1. Remove all personal items (jewelry, watches, phones, pens, etc.).
2. Put on the scrub suit and rubber boots* in the changing room.
   ** 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).*

3. Move to the clean area at the entrance of the isolation unit.
4. By visual inspection, ensure that all sizes of the PPE set are correct and the quality is appropriate.
5. Undertake the procedure of putting on PPE under the guidance and supervision of a trained observer (colleague/buddy).
6. Perform hand hygiene.



7. Put on gloves (examination, nitrile gloves).

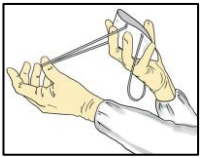


8. Put on coverall.
   Make a thumb (or middle finger) hole in the coverall sleeve to ensure that your

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 face mask.




10. Put on face shield OR goggles.

OR

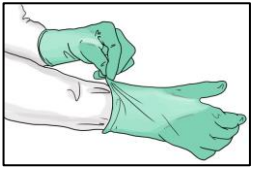
11. Put on head and neck covering: surgical bonnet covering neck and sides of the head (preferable with face shield) OR hood.

OR

12. Put on disposable waterproof apron (if not available, use heavy duty, reusable waterproof apron).

It is difficult to don some apron models after one has mask and goggles/ face shield on. In such cases it should be done after step 8.

13. Put on a second pair of (preferably long cuff) gloves over the cuff of the coverall.
    Do not use adhesive tape to attach the gloves.



14. Self-check in mirror.

15. Check buddy and write name/occupation/time of entry of the PPE.

Enter the decontamination area by walking through chlorine tray. If available, use scrub brush to remove any particulate matter (mud or organic material) that may be on the soles or surface of the boots and then wipe all sides with 0.5% chlorine solution.

Steps to remove PPE with a coverall

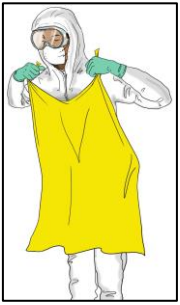
1. Always remove PPE under the guidance and supervision of a trained observer (colleague).
   Ensure that infectious waste containers are available in the doffing area for safe disposal of PPE. Separate containers should be made available for reusable items.

2. **Perform hand hygiene on gloved hands** (0.5% chlorine or clean running water and soap).
   During work in the patient area, outer gloves should be changed between patients and prior to exiting (change after seeing the last patient).

WHO recommends not to spray at this step. In the West African outbreak, however, most doffing stations include a sprayer. If spraying is going to take place, spraying should take place only below the nipple line to minimize splashing or misting above the neck. Furthermore, if spraying is used at this step, staff should still maintain maximum attention while removing PPE, because they may still be contaminated by the Ebola virus even after being sprayed.

3. Remove apron leaning forward and taking care to avoid contaminating your hands.
   When removing a disposable apron, tear it off at the neck and roll it down without touching the front area. Then, untie the back and roll the apron forward.

   When removing a reusable apron over the head, take care to not disrupt the face shield/ goggles/ mask.



4. Perform hand hygiene on gloved hands (0.5% chlorine or clean running water and soap).

5. Remove head and neck covering (bonnet or hood), taking care to avoid contaminating your face, and dispose of safely.

6. Perform hand hygiene on gloved hands (0.5% chlorine or clean running water and soap).

7. Remove coverall and outer pair of gloves.*

Ideally in front of a mirror, tilt head back to reach zipper, unzip completely without touching any skin or scrubs, and start removing coverall from top to bottom. After freeing shoulders, remove the outer gloves while pulling the arms out of the sleeves. With inner gloves roll the coverall from the waist down and from the inside of the coverall, down to the top of the boots. Use one boot to pull off coverall from other boot and vice versa, then step away from the coverall and dispose of it safely.

* Outer pair of gloves can also be removed before removing the coverall. In that instance perform additional hand hygiene as in point 6.

8. Perform hand hygiene on gloved hands (0.5% chlorine or clean running water and soap).

9. Remove eye protection by pulling the string from behind the head (keep eyes closed) and dispose of safely.

10. Perform hand hygiene on gloved hands.

11. Remove the mask from behind the head (keep eyes closed), by first untying the bottom string above the head and leaving it hanging in front; and then the top string next, from behind the head, and dispose of safely.

12. Perform hand hygiene on gloved hands (0.5% chlorine or clean running water and soap).

13. Decontaminate boots appropriately (all sides and bottom) and move to lower risk area one foot at a time.
    If removing the boots, avoid touching them. And perform additional hand hygiene on gloved hands.

14. Remove gloves carefully with appropriate technique and dispose of safely.

15. Perform hand hygiene (alcohol-based hand rub or clean running water and soap).

At the end of the day, boots should be disinfected by soaking in a 0.5% chlorine solution for 30 minutes, and then rinsed and dried.

Note: Donning and doffing procedures may need to vary based on specific type of PPE.

If you are using gowns in a non-Ebola health facility, follow the donning and doffing steps in http://www.who.int/csr/resources/publications/ebola/ppe-steps/en/.

Hand hygiene

The correct application, technique and duration of the procedure are crucial to achieving the desired effect for both handrubbing with an alcohol-based hand rub 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. For 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 apply the correct technique, the same steps as for handrubbing should be followed.

How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the entire procedure: 40-60 seconds

Wet hands with water;

Apply enough soap to cover all hand surfaces;

Rub hands palm to palm;

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

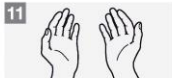
Palm to palm with fingers interlaced;

Backs of fingers to opposing palms with fingers interlocked;

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

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

Rinse hands with water;



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Source: http://www.who.int/gpsc/5may/How_To_HandWash_Poster.pdf

Source: http://www.who.int/gpsc/5may/How_To_HandRub_Poster.pdf

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, the apron needs to be disinfected by the person wearing it. This should include cleaning to remove gross contamination, disinfection and then hanging it 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. Each person should consider having his/her own goggles/face shield with their name on it. Goggles or reusable face shields need to be disinfected by soaking in a 0.5% chlorine solution for 10 minutes, washed with water and then hung outside the changing room to dry.

Condensation can be a major problem: it impairs the user's vision and so is dangerous. The application of an anti-fog spray can help to avoid or minimize visual impairment.

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 best guarantee of hand decontamination after glove removal.

Medical gloves are single-use items. Therefore, for the purpose of reprocessing (re-use), glove decontamination is not recommended and should be avoided, even if it is common practice in many health-care settings with resources and where glove supply is limited.

Disinfection by "spraying"

WHO discourages spraying occupied or unoccupied clinical areas with disinfectant. This is a potentially dangerous practice that has no proven disease control benefit. If spraying is not preceded by cleaning, the disinfectant may not work in the presence of organic matter and blood/body fluids (58).

Spraying should not be routinely encouraged. Evidence does not supported its efficacy. Furthermore, it can cause aerosolization of the virus and, if extensively used, can lead to adverse events among staff and patients. Even if chlorine solution is sprayed, staff should still maintain maximum attentiveness while manipulating organic material, touching contaminated surfaces and removing PPE because these may still be contaminated by the Ebola virus.

In the context of VHF outbreaks, spraying may be accepted outdoors and in some community settings (for example, decontamination of Ebola victims' households by a burial team) as the only feasible option. It may also be considered when disinfecting sand or gravel floors.

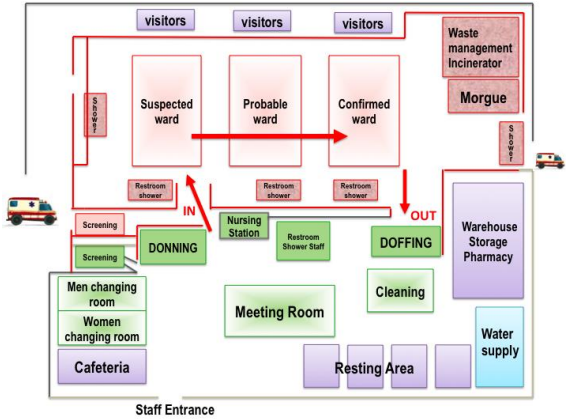
Most common PPE mistakes and hazards

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

7.4 Flow through the ETU, for health workers and patients

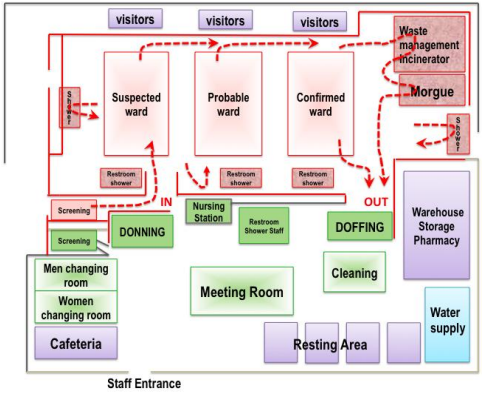
General flow inside the red zone

Flow should always be from the less to the more contaminated area.



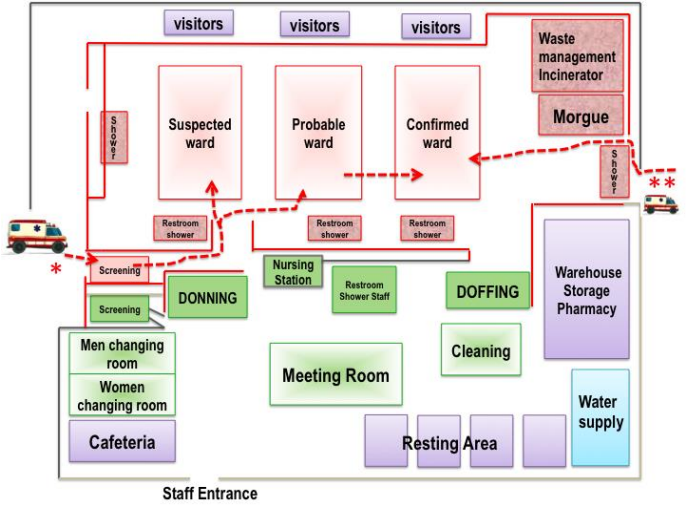
Flow for medical team (clinicians and hygienists)

Inside the red zone the staff should respect the general flow from suspected to probable to confirmed ward.



Patient entry flow

* Entrance of suspected and probable patients
** Entrance of confirmed patients



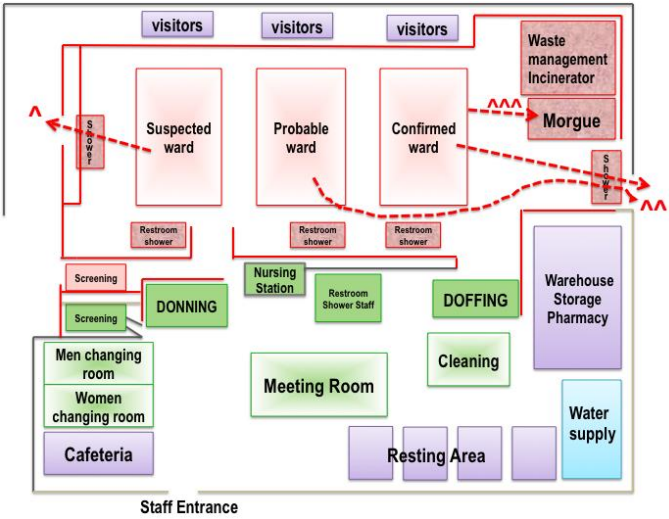
Patient exit flow

Patients (alive) leaving the red zone should take a disinfecting shower (0.05% chlorine).

^Exit for patients admitted as suspect but that have tested **NEGATIVE** for Ebola

^^Exit for **convalescent** patients admitted as suspect or probable that have tested **POSITIVE**

^^^Exit for **deceased** patients admitted as suspect or probable that have tested **POSITIVE**



7.5 How health workers can protect themselves from infection (including outside the workplace) *(86,87,88)*

Recommended policies and procedures (based on field experiences and supported by MoHs in the affected countries during the 2014–15 West African outbreak)

- All health workers and other ETU staff should have their temperatures checked every day when they arrive at the ETU. No exceptions.
- Policy should be clear that, if the health worker is sick, she or he calls from home and stays at home—and that the salary will be continued.
- Occupational health infrastructure such as a small clinic should be in place for health workers to report sicknesses and incidents and to be assessed for exposures and treated for signs and symptoms.
- A specific ETU for health workers at the national level should be considered.

Important precautions for health workers

- No sharing of personal items and no close contact (no handshakes and no contact less than 1 meter).
- If you are sick, stay at home. Some health worker infections have occurred from contact with a colleague coming to work with symptoms.
  - Do not let anyone enter your room, including medical colleagues.
  - Immediately report to your supervisor or designated occupational health person.
  - Do not panic. Almost always the symptoms are NOT due to Ebola.
- There seems to be a natural tendency toward denial or hiding by the person with symptoms and "protection" by colleagues.
  - This risks your team and can lead to transmission.
  - Trust your team and be responsible.
- Keep to the job that you have been prepared for.
  - No one whose job does not involve working with Ebola patients, bodies or contaminated environments should be in the places where these activities occur.
  - For each job, you need appropriate protection and training.
- Make sure that safe IPC practice and measures are in place at the ETU.
- Avoid taking care of patients in the community during an outbreak or do it using adequate PPE and other IPC measures.
  - Informal care for sick colleagues, family and friends appears to have caused

many infections among health workers.
  - Refer them to appropriate health facilities.
- Avoid working simultaneously in a non-Ebola health facility; these facilities have experienced many health worker infections. It is important that any health facility do good Ebola screening on entry to the facility and repeat inpatient screening every shift, as well as to maintain good IPC.

8 Discharge

Discharge of an alert case is done under the following conditions *(89)*. The patient has been reviewed by the VHF clinical management team and is found:

- not to meet the case definition of a suspected case, with no epidemiological link to any suspected or confirmed case;
- to have a conclusive diagnosis that is not VHF, recognizing that co-infections do occur;
- to have responded to specific treatment;
- to be in good health condition and able to go back home

Discharge of a VHF-confirmed case or suspected case 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**†
  - Symptoms that suggest ongoing shedding of virus (for example, diarrhoea, coughing, bleeding) should have disappeared. Soft stools are not regarded as an ongoing shedding of virus in children <5 years.
  - 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**†
  AND
- **Able to perform activities of daily living**†: independently feeding and carrying 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.

- All lactating women should have PCR of breast milk in order to know what IPC precautions are required and when her breast milk is no longer contagious. See section 3.7.

†If an Ebola-confirmed patient continues to suffer symptoms and/or his or her condition is not improving, but it is not thought to be due to acute filovirus disease, two 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.

Counsel all patients on discharge and arrange for follow-up care - see section 9.

Suggested discharge package for Sierra Leone	
• Rice • Pulses • Maize or grain cereal • Cooking oil • Salt • Bleach • Water bucket • Mosquito net • Soap • Condoms • Clothing • Footwear • Discharge certificate	• Relatives of the deceased also get everything except certificate, condoms, clothing.

9 Follow up

Discharged convalescent patients: These patients may remain weak and suffer persistent symptoms. A system for follow-up clinical and psychosocial supportive care should be set up for them. If these 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 Ebola 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 by the Ebola care facility that transferred the patient. If returned home, their community may require assurance from medical authorities before accepting the patient.

Supportive treatment for all discharged patients

- Provide nutritional advice and fortified foods. Identify locally available high-energy foods that are easy to digest, rich in complex carbohydrates and balanced in fat, protein and fiber. In many settings, discharged adult survivors are given high energy biscuits and a family ration. Specific fortified foods for children depend on their age—see Appendix G.
- Provide a one-month supply of vitamin supplements.
- Children should be followed up weekly, especially for nutritional needs and vaccination (for example, measles immunization at discharge).
- 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 counselled 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. At discharge, Ebola survivors should be provided with documents containing

their unique patient ID, name, age, symptoms at presentation and any convalescent symptoms at discharge, a brief record of their treatment in the ETU), and their Ebola Survivor's Certificate. This information will facilitate 'transfer of care' into their outpatient care. They should be instructed to bring these documents to all future clinic or hospital visits.

- Psychological support and follow-up should be considered, including advocacy on the patients' behalf and interceding with community leaders where necessary.
- Connect the patient with Ebola survivor health care.

Prevention of secondary sexual transmission *(17,18)*

All male Ebola survivors and their sexual partners should receive counselling to ensure safe sexual practices until their semen has tested negative twice.

- Male survivors should be provided with condoms and instructions on using the condoms for at least 3 months after onset of symptoms, to minimize the risk of sexual transmission of Ebola virus. Ebola survivors and their sex partners should receive detailed counselling to ensure safe sexual practices, including abstinence or safe sex with condoms, and good hand and personal hygiene by immediately and thoroughly washing with soap and water after any physical contact with semen, including after masturbation.
- Survivors should be provided with condoms. Condoms should be handled and disposed of safely (in a leak-proof bag for incineration/burying or latrine) so as to prevent contact with seminal fluids.
- Male survivors should be offered semen testing at 3 months, and then, for those who test positive, every month thereafter until their semen tests negative for the virus twice by PCR, with an interval of one week between tests.
- Having tested negative, survivors can resume sexual practices without fear of Ebola virus transmission. However counselling should be provided with regard to HIV and other STI prevention, as well as prevention of unplanned pregnancy.
- If PCR testing is not available, male survivors should continue using

condoms/practicing safe sex for at least 12 months. This interval may be adjusted as additional information becomes available on the prevalence of Ebola virus in the semen of survivors over time.

Breastfeeding women who are Ebola survivors *(17)*

Ebola virus RNA has been detected at low levels in breast milk up to 16 months after onset of symptoms. Spontaneous galactorrhea has also been reported in female survivors – Ebola virus RNA was detected in one survivor's breast discharge nine months after onset of symptoms. More evidence is needed to know the precise duration and infectivity of Ebola virus persistence in breast milk. Due to the possible risk of virus persistence in breast milk, Ebola survivors who are lactating are encouraged to have their breast milk tested for Ebola virus by PCR. Breast milk should be tested by PCR immediately upon discharge from the ETU.

- Lactating women who do not know the status of their breast milk or who were tested and for whom no Ebola virus RNA was detected should continue breastfeeding. If Ebola virus RNA is detected, breastfeeding should be suspended and the breast milk retested every 48 hours until two consecutive "undetected" results are obtained. During this time, breast milk should be replaced with a sustainable appropriate breast-milk substitute. Where possible, provide liquid ready-to-use infant formula (see http://www.ennonline.net/operationalguidanceiycfv2.1), which is a less risky option than powdered infant formula since it does not require reconstitution with water. Hygiene of feeding utensils, adequate supplies for as long as the infant needs, and access to health services are essential. When providing infant formula (liquid or powdered), counsel the mother on minimising the risks of formula feeding (for practical considerations on replacement feeding see *Infant feeding in the context of Ebola (68).* Meanwhile, mothers should be supported to keep up their breast milk production and enable them to resume breastfeeding once two consecutive milk samples test negative. Other psychosocial support should be provided to the mother and family as needed. In order to resume breastfeeding, she should be taught and supported to express breast milk regularly either

manually or with a breast pump, following Ebola IPC guidelines to reduce risk of virus transmission (see below). Babies who have been breastfed by a mother whose milk tests positive should be monitored as a close contact for 21 days since the last day of breastfeeding of the PCR positive milk.

- Lactating Ebola survivors whose breast milk is PCR positive or has not been tested should practice good hand and personal hygiene by immediately and thoroughly washing with soap and water after any contact with breast milk. Any other exposed objects or equipment contaminated with breast milk should be washed with water and soap and then decontaminated by soaking them in a 0.5% chlorine solution for about 15 minutes. Linen or clothing contaminated with breast milk should ideally be safely disposed and incinerated; if laundered, linen should be washed with detergent and water first, rinsed and then soaked in 0.5% chlorine solution for approximately 15 minutes. Women should be informed that linen soaked in 0.5% chlorine solution may become damaged.
- Infant feeding counselling and support should be provided according to the infant's age.

Sexually active female Ebola survivors

- At discharge, all postpartum women and women of reproductive age should receive counselling on family planning and contraception and the prevention of sexually transmitted infections.
- Women of reproductive age should be assessed for amenorrhea at the first follow-up clinic visit, and every visit thereafter. Urine or blood pregnancy test should be conducted for every convalescent female who is amenorrheic for more than 4 weeks (including time in the Ebola treatment facility).
- A female Ebola survivor who becomes pregnant following recovery from Ebola should receive antenatal, delivery and postnatal care, according to WHO and national standards.

Special care for pregnant women who have recovered from Ebola with an ongoing pregnancy- see section 3.7.

- At discharge, patients with an ongoing pregnancy should receive close

clinical follow-up including antenatal and nutritional care.

- Arrangements should be made for immediate transfer from home or regular hospital to an ETU with facilities for safe delivery and neonatal care.
- The delivery should be conducted in full PPE, and the products of conception (amniotic fluid, placenta, neonate) should be tested for Ebola PCR.

Management of convalescent symptoms in Ebola survivors (17, 90)

- Patients may remain weak and suffer new or persistent symptoms that start early in convalescence (in the treatment unit) or within the first 3 months of convalescence.
- A system for follow-up of clinical and psychosocial/mental health care should be set up for these patients.
- Survivors should receive psychological and social support counseling before discharge and then be seen in regular follow-up, sometimes aided by regular phone check-ins to gauge stress. If a significant mental health problems are noted before discharge or anticipated afterwards, it may be appropriate to refer the patients directly to a mental health care provider.
- All patients should receive at least one follow-up clinical and psychosocial health assessment within 2 weeks of discharge.
- All patients should be given specific instructions on who to contact if they eoncouter problems or have questions.
- A general history and physical and rheumatologic, ocular (at minimum, visual acuity), nutritional, and mental health screening exams should be performed early after discharge, with continued psychological and social support as needed.
- Ocular symptoms warrant urgent attention (comprising tests of visual acuity, slit lamp examination, measurement of intraocular pressure, and dilated fundoscopic examination). Visual acuity and abnormal intraocular pressure are two key potential markers of more severe disease.
- On discharge, patients may face stigmatization and/or rejection, so discharge should be accompanied by the necessary psychosocial support

and community awareness activities.

- Sequelae often occur in the first few weeks following discharge and may last for years, although the intensity tends to decrease with time.
    - **Stress and other psychological sequelae** are common. The majority experience discriminatory behavior including lack of acceptance by family and friends and even not being welcome in their household. Some have sleep and memory disturbances, anxiety disorders, depression, post-traumatic stress disorder, and survivors' guilt.
    - **Arthralgia** is one of the most commonly reported sequela, consistently noted in 50-75% of survivors, including in the West African outbreak. This is generally symmetrical and polyarticular and worse in the morning. The most affected joints were, in order, the knees, back, hips, fingers, wrists, neck, shoulders, ankles, and elbows.
    - **Ocular complications** including eye pain, conjunctivitis, photophobia, hyperlacrimation, uveitis, and loss of visual acuity appear to be frequent in survivors and have been reported in about half of the survivors evaluated in Kenema and Port Loko, Sierra Leone. Uveitis was frequent, with reports of progression to severe visual impairment and blindness if untreated.
    - **Neurologic complications.** Tinnitus and hearing loss have been reported in up to 27% of survivors, although a small controlled study found no significant difference on audiometric testing between survivors and household contacts.
    - **Skin disorders.** Generalized dry skin and pruritus and desquamation, mostly affecting the extremities and

including the palms and soles, have been variably reported in survivors.

See *Interim guidance*: *Clinical care for survivors of Ebola virus disease* (17).

APPENDIX A1. Case definitions, Ebola or Marburg

During an Ebola or Marburg outbreak: case definitions used by the surveillance – during an outbreak, the case definitions are likely to be modified to be adapted to new clinical presentation(s) or different modes of transmission related to the local event. Please see the WHO website (www.who.int) for the most up-to-date case definitions. Case definitions may be adapted considering the local context.(45)

Suspected Ebola case

- Any person, alive or dead, suffering or having suffered from a sudden onset of high fever and having had contact with an Ebola case, or a dead or sick animal, **OR**
- Any person with sudden onset of high fever and at least three of the following symptoms: headache, vomiting, diarrhoea, anorexia/loss of appetite, lethargy, stomach pain, aching muscles or joints, difficulty swallowing, breathing difficulties, or hiccups; **OR**
- Any person with unexplained bleeding/haemorrhaging; **OR**
- Any person with sudden, unexplained death **OR**
- Clinical suspicion of Ebola

Probable Ebola case

- Any suspected case evaluated by a clinician, **OR**
- Any person who died from 'suspected' EVD and had an epidemiological link to a confirmed case but was not tested and did not have laboratory confirmation of the disease

Confirmed Ebola Case

- Any suspected or probable cases with a positive laboratory result

For routine surveillance in countries <u>without</u> Ebola or Marburg outbreak: standard case definition in IDSR for the notification of Ebola or Marburg cases- for use in countries without Ebola or Marburg outbreak (42,49)

Suspected Ebola or Marburg cases for routine surveillance:

Illness with onset of fever and no response to treatment for usual causes of fever in the area, and at least one of the following hemorrhagic signs: bloody diarrhoea, bleeding from gums, bleeding into skin (purpura), bleeding into eyes and urine
OR clinical suspicion of Ebola or Marburg

Confirmed Ebola or Marburg cases for routine surveillance:

- A suspected case with laboratory confirmation (positive IgM antibody, positive PCR or viral isolation)

"Alert case"- standard case definition for community-based surveillance

Illness with onset of fever and no response to treatment of usual causes of fever in the area, OR at least one of the following signs: bleeding, bloody diarrhoea, bleeding into urine
OR any sudden death

A <u>probable case</u> is any person:

- Having had contact with a probable or confirmed case **AND**
- Presenting with acute fever* (>38°C axillary or history fever in last 2 days)

APPENDIX A2. Case definition, suspected Lassa fever

Fever >38°C for less than three weeks **AND**	
Absence of signs of local inflammation **AND**	
Absence of a clinical response after 48 hours of antimalarial treatment and/or a broad-spectrum antibiotic **AND**	
Two major signs or one major and two minor signs described below	
MAJOR SIGNS	**MINOR SIGNS**
Bleeding	Headache
Swollen neck or face	Sore throat
Conjunctival injection or subconjunctival haemorrhage	Vomiting
Spontaneous abortion	Diffuse abdominal pain /tenderness
Maculopapular or petechial rash	Chest/retrosternal pain
New onset of tinnitus or altered hearing (appears as acute disease resolves)	Cough
Persistent hypotension	Diarrhoea
Absence of clinical response after 48 hours to antimalarial and/or broad spectrum antibiotic therapy	Generalized myalgia or arthralgia
Elevated liver transaminases, especially AST>ALT	Profuse weakness
Exposure to a person confirmed or suspected to have Lassa fever	Proteinuria
Direct exposure to rodents (including touching live animal or uncooked flesh and exposure to urine or feces)	Leukopenia < 4000/µL

APPENDIX B. 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.
- Return to the health facility if needed.

1. 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 content)
   - 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, he or she should continue taking 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 (in Ebola, many should also receive IV fluids- see section 3.4)

Counsel the patient on the 3 rules of home treatment:
- Drink extra fluid.
- Continue eating.
- Return to the health facility if needed.

1. Determine amount of ORS to give during first 4 hours.
    - To determine the approximate amount of ORS required (in ml), multiply the patient's weight (in kg) by 75. (See table 18 for ml/kg and corresponding drops/minute.)
- Use the patient's age if you do not know the weight.
- If the patient wants more ORS, 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 ORS, but more slowly.

2. After 4 hours or each clinical round:
- 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 (2 packets, as recommended in Plan A).

Plan C: Treat severe dehydration quickly

If able to give IV fluids: Start IV fluid immediately. If the patient can drink, give ORS by mouth while the drip is set up. Give 100 ml/kg Lactated Ringer's solution (or, if LR not available, normal saline), divided as follows:

Age	First give 30 ml/kg in:	Then give 70 ml/kg in:
Infants (under 12 months)	1 hour*	5 hours*
Older (12 months or older, including adults)	30 minutes*	2½ hours

* Repeat once if radial pulse is very weak or not detectable.

See table 18 for ml/kg and corresponding drops/minute for children.

- 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.
- 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.

If not able give IV fluids, arrange for referral to health facility which can. Start rehydration by nasogastric tube (or mouth) with ORS solution. Give 20 ml/kg/hour for 6 hours (total of 120 ml/kg).

- Reassess the patient every 1– 2 hours:
  - If there is repeated vomiting or increasing abdominal distension, give the fluid more slowly.
  - If hydration status is not improving after 3 hours, send the patient for IV therapy.

After 6 hours, reassess the patient. Classify dehydration. Then, choose the appropriate plan (A, B or C) to continue treatment.

Table 24. Analgesic dosing in adolescents and adults: morphine, tramadol, paracetamol *(9)*

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: <50 kg: 15 mg/kg IV every 6hours, not to exceed 750 mg/dose or 3.75 grams/ day 50 kg or more: 1000 mg IV every 6 hours, not to exceed 4 grams/day	Only 1 tablet may be required in the 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.

Oral morphine 5 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, 2.5–5mg, if patient is very old or frail.	According to Pain. **There is NO ceiling dose.**	Unless diarrhoea, give laxative to avoid constipation. Excessive dosage can cause respiratory depression/ reduced respiratory rate.

Table 25. Paracetamol and morphine dosing in children 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 hours; increase if necessary for severe pain IM: 0.1–0.2 mg/kg every 4–6 hours IV: 0.05–0.1 mg/kg every 4–6 hours, or 0.005–0.01 mg/kg per hour by IV infusion						

Antimalarials for uncomplicated *P. falciparum* malaria.

Treat for 3 days – children and adults and following treatment with parenteral artesunate or artemether

Table 26. Artesunate-amodiaquine fixed dose combination dosing	
≥4.5 kg to <9 kg	1 tablet (25 mg artesunate/67.5 mg amodiaquine) per day for 3 days
≥9 kg to <18 kg	1 tablet (50 mg artesunate/135 mg amodiaquine) per day for 3 days
≥18 kg to <36 kg	1 tablet (100 mg artesunate/270 mg amodiaquine) per day for 3 days
≥36 kg	2 tablets (100 mg artesunate/270 mg amodiaquine) per day for 3 days

Dose according to body weight

Table 27. Artemether/ lumefantrine dosing. Give twice daily for 3 days*								
Dosage	**Form**	**3–<6 kg**	**6–<10 kg**	**10–<15 kg**	**15–<20 kg**	**20–<24 kg**	**20–<50 kg**	**> 50 kg**
Oral: 2 mg/kg artemether – 12 mg/kg lumefantrine twice per day	**Tablet:** 20 mg artemether– 120 mg lumefantrine	1	1	1	2	2	3	4

*The second dose on the first day should be given any time between 8 and 12 hours after the first dose. Dosage on the second and third days is twice daily (morning and evening). Lumefantrine absorption is enhanced by co-administration with fat. It is essential that patients or caregivers are informed of the need to take this ACT immediately after a fatty meal or drink – particularly on the second and third days of treatment.

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

Table 28. Artesunate IV, IM and artemether IM dosing

Weight	ARTESUNATE IV or IM		ARTEMETHER IM			
	IV or IM 2.4 mg/kg on admission; then at 12 hours and 24 hours; then once daily. For each dose, freshly mix 60 mg anhydrous artesunic acid ampoule with 1 ml of 5% sodium bicarbonate solution.		Initial loading dose: 3.2 mg/kg Subsequent doses: 1.6 mg/kg each day until able to take oral medication			
	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	1.2 ml	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. Drug interactions

Types of drug interactions which may occur in the ETU

1. Drug-induced QT prolongation and/or torsade de pointe(91,92**)**
Certain drugs used in ETU can cause QT interval prolongation. Most patients with long QT have no signs and symptoms. In rare occasion, long QT interval can result in syncope, convulsions, or sudden death, due to "Torsades de Pointes" (TdP). The risk of TdP is difficult to assess but might increase when several QT prolonging drugs or drugs that inhibit their metabolism are combined or in the presence of risk factors such as hypokalaemia, hypomagnesemia, female gender, and bradycardia.

In ETU, concomitant use of several prolonging QT drugs might be clinically warranted but without an ECG to diagnose long QT, they should be used with caution, in particular in the presence of the risk factors. Patients should be monitored closely for complications and QT prolonging drugs removed in case of suspicion of toxicity. See Table 29.

2. CNS Depressant Drugs
The concomitant use of two or more drugs that have the potential to depress CNS function (either as a therapeutic intention or a side effect) may be clinically appropriate. However, it is important to recognize that the risk of unwanted effects may increase with such use and requires close monitoring.
CNS depressant drugs commonly used in ETU include chlorpromazine, diazepam, haloperidol, morphine, tramadol, phenobarbital, and promethazine.

3. Considerations for patients on treatment for TB and HIV
These patients are likely to be using drugs that interact with other drugs. Rifampicin, a key TB drug will reduce blood levels and possibly impair efficacy of a wide range of drugs. Check the product label. Suspension of the TB treatment during the acute management of a patient with severe Ebola illness can be considered to limit the possibility of drug interactions.

For antiretroviral drugs clinicians should check regularly updated sources such as

www.hiv-druginteractionslite.org.

Table 29. Drugs commonly used in ETU with a potential for prolonging QT interval and/or TdP- by each drug	
Level of risks	**Drugs**
Known risk (evidence that these drugs prolong QT interval AND are associated with a risk of TdP)	azithromycin, chloroquine, chlorpromazine, ciprofloxacin, erythromycin, haloperidol, levofloxacin, ondansetron, quinidine
Possible risk (evidence that these drugs can prolong QT interval BUT unclear if associated with TdP)	oxytocin, promethazine
Conditional risk (evidence that these drugs are associated with risk of TdP BUT under certain conditions- excessive dose, hypokalaemia, congenital long QT or drug-drug interaction resulting in excessive QT interval prolongation)	metoclopramide, metronidazole, quinine sulfate, furosemide, artemether/lumefantrine
No known risk (for each drug used alone)	amodiaquine, amoxicillin and clavulanate, artemether, bismuth subsalicylate, cefixime, ceftriaxone, furosemide, gaviscon, ivermectin, magnesium sulfate, misoprostol, omeprazole, paracetamol, phenobarbital, potassium chloride, ranitidine, sodium chloride, thiamine, tinidazole, tramadol, zinc sulfate

Table 30 which follows shows drug interactions (adapted from Lexi-Comp OnlineTM Interaction Analysis)

Legends	Mechanisms
QT	QT prolonging agents
CNS	CNS depressants or effects on similar neurotransmission pathways (serotonin, dopamine)
↖	Potential increased exposure of the drug on the **left** hand side of the table
↙	Potential decreased exposure of the drug on the **left** hand side of the table
↑	Potential increased exposure of the **upper** drug of the table
↓	Potential decreased exposure of the **upper** drug of the table

Light red: potential interaction, may require a dosage adjustment or close monitoring
Dark red: these drugs should not be co-administered

Other combinations with special precautions:
Lactated Ringer's IV with ceftriaxone IV- flush 10 ml 0.9% saline before using the line to administer ceftriaxone to avoid calcium deposition.

No or minor interactions
Amoxicillin and clavulanate, artemether, artesunate, bismuth subsalicylate, cefixime, ceftriaxone, furosemide, gaviscon, ivermectin, magnesium sulfate, misoprostol, paracetamol, sodium chloride, thiamine, tinidazole, zinc sulfate

	amodiaquine	artemether/lumefantrine	chlorpromazine	ciprofloxacin	diazepam	erythromycin	haloperidol	magnesium trisilicate	metoclopramide	metronidazole	omeprazole	ondansetron	oxytocin	phenobarbital	potassium chloride	promethazine	quinine	ranitidine	sodium bicabornate	tramadol	zithromax (azithromycin)
amodiaquine			↗													→					
artemether/lumefantrine			QT	QT		QT	QT			QT						QT	↖			↖	QT
chlorpromazine	↗	QT		QT	CNS	QT	QT	←	CNS	QT		QT	QT			QT	↖	←		↖	QT
ciprofloxacin		QT	QT			QT	QT	←	QT	QT		QT				QT	↖			↖	QT
diazepam						QT	QT	←	QT	QT		QT				CNS	↖		CNS		QT
erythromycin		QT	QT	QT	QT		QT	CNS	QT		→					CNS	↖	↗			
haloperidol		QT	QT	QT	QT	QT		QT	CNS	QT		QT	QT	←		QT	↖			↖	QT
magnesium trisilicate						←	QT							←		QT	↖			↖	QT
metoclopramide			CNS	QT	QT	QT	CNS					QT				CNS					
metronidazole			QT	QT		QT	QT					QT		←							
omeprazole					→									←							
ondansetron			QT	QT		QT	QT		QT	QT			QT	←		QT	↖			↖	QT
oxytocin			QT	QT		QT	QT			QT		QT		←							
phenobarbital			CNS	QT		QT	QT														
potassium chloride (oral)																					
promethazine			QT	QT	CNS	QT			CNS												
quinine	→			QT			QT	↖													
ranitidine						↗															
sodium bicarbonate			←																		
tramadol			↖		CNS																
zithromax (azithromycin)		QT	QT	QT																	

APPENDIX E. Clinical monitoring forms

Examples of clinical monitoring forms 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**
Airway/ Breathing	Respiratory Distress?	Yes []	No []		Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []
Circulation	Pulse	Fast? [] Normal? []	Weak? []		Fast? [] Normal? []	Weak? []	Fast? [] Normal? []	Weak? []	Fast? [] Normal? []	Weak? []	Fast? [] Normal? []	Weak? []	Fast? [] Normal? []	Weak? []		
	Capillary Refill (>3sec)?	Yes []	No []		Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []
	Bleeding?	Yes []	No []		Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []
		Site:														
Confusion/ Convulsions	Convulsions?	Yes []	No []		Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []
	AVPU	[] A [] V [] P [] U			[] A [] V [] P [] U		[] A [] V [] P [] U		[] A [] V [] P [] U		[] A [] V [] P [] U		[] A [] V [] P [] U			
General assessments	Ambulating?	Yes []	No []		Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []
	Urinating?	Yes []	No []		Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []	Yes []	No []
Vital Signs	Temperature (°C)															
	HR (bpm)															
	RR (breaths/min)															
	SBP (mmHg)															
	O_2 saturation (%)															
Other observations																

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

APPENDIX F. Fluid balance chart

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		

APPENDIX G. Nutrition tables

Children

On admission:

- Check weight (with plastic covered scales), MUAC (with individual tapes) and feet for bilateral pitting oedema.
- Body weight directs the patient's needs, and age is used only when weight is unknown.
- Check breastfeeding status (breastfed or not). See section 3.7.
- If severe acute malnutrition- use specific recommendations for fluid management and feeding.

Rehydration phase:

- Hydration is the number one priority, given as ORS or IV fluids.
- Please refer to section 4.3 on fluid management.

Rehydration and maintenance phases (see Figure on page 66)

Rehydration phase (severely dehydrated):

- Hydration is the number one priority, given as ORS or IV fluids.
- Please refer to section 4.3 on fluid management.

Maintenance phase (poor appetite, no dehydration):

Maintenance for infants <6 months

- Breast milk is still recommended when the mother and/or child are positive (see section 3.7).
- If the mother is negative and child positive, breast milk should be expressed and given by cup.
- A suitable breast-milk substitute (ideally ready-to-use infant formula (RUIF) or if not available, PIF) should be given as a replacement if breast milk is not an option.
- Wash hands with clean water and soap before feeding the infant.
- RUIF is safer to use than powder milk as it does not need any preparation nor dilution.
- RUIF or reconstituted PIF must be used within 2 hours after opening, after that discarded.

- The infant must be fed on demand; do not restrict nor force feed the infant
- Pour the recommended quantity (see table below) into a clean and disinfected cup (see cup feeding instructions)(93)
- Feeding bottles should NOT be used because of high infection risks since the bottles and teats are difficult to clean.

Table 31. Amount of prepared RUIF an infant needs per day (120–150 ml/kg/day; 100 ml contains on average 70 kcal)(94)

Age in months	Weight (average) in kg	Amount of formula per day	Number flasks (200ml)	Number feeds per day	Size of each feed in ml
0–1	3	450 ml	2	8	60 ml
1–2	4	600 ml	3	7	90 ml
2–3	5	750 ml	4	6	120 ml
3–4	5	750 ml	4	6	120 ml
4–5	6	900 ml	5	6	150 ml
5–6	6	900 ml	5	6	150 ml

Maintenance for children > 6 months

- F75 is preferred as a liquid feed in the maintenance phase. Liquid feeds are generally better tolerated with faster transit and lower risk of vomiting. UHT milk may be used as an alternative (70 kcal/100 ml, 75 kcal/100 ml in F75).
- Note that F75 is normally designed for patients with severe complicated malnutrition who have impaired liver and kidney function with infection. The diet allows their biochemical, physiological and immunological function to start to recover before they have the additional stress of making new tissues.

Table 32. Example- F75 amounts according to weight (>100 - 130 ml/kg/day) (95)

Weight in kg	8 feeds per day: ml of F75 for each feed	6 feeds per day ml of F75 for each feed	Number flasks (200 ml)	Size of feed in ml/day
4.5 – 4.9	75	100	3	572
5.0 – 5.4	80	110	4	650
5.5 – 5.9	90	125	4	702
6.0 – 6.9	100	130	4	780
7.0 – 7.9	115	160	5	910
8.0 – 8.9	130	180	5	1040
9.0 – 9.9	150	200	6	1170
10 – 10.9	160	220	7	1300
11 – 11.9	190	250	8	1450
12 – 12.9	200	250	8	1600
13 – 13.9	220	290	9	1700
14 – 14.9	230	300	9	1800

Adolescents and adults

Rehydration phase (severely dehydrated):

- Hydration is the key priority (IV fluids and ORS).
- Please refer to the section 4.3 on fluid management.

Maintenance phase (poor appetite, no dehydration):

- Liquid foods are generally better tolerated with faster transit and lower risk of vomiting.
- F75 is preferred, and UHT milk may be used as an alternative (with 70 kcal/100 ml, 75 kcal/100 ml in F75).

Table 33. Maintenance phase for poor appetitie, no dehydration: F75 per day				
Weight in kg	Caloric needs per day	Amount of F75 per day (ml)	Number of feeds per day	Size of feed in ml
30–40	1500	2000	6	330
40–60	2000	2600	6	450
60–80	2300	3000	6	500
>80	2500	3300	6	550

- Gradual introduction of solid foods as preferred and tolerated (see next section).

Transition and boost phases

Children > 6 months, adolescents and adults

Transition phase (some appetite, no dehydration, no eating difficulties). Any one or combination of any of the following:

- Ready-to-use fortified nutrient-rich biscuits/bars (can also be offered as a porridge or paste)
- 1–3 porridges per day of fortified cereal legume blends with added sugar (adults) and added sugar and milk (children)
- Common family meal (plus micronutrient powders [MNP], if no fortified food is given); preferably offer ready-to-use pastes or biscuits in addition to common family food.

Eating difficulties: As for those with no eating difficulties, except that:

- common family meal should be offered as mashed food or as soups
- ready-to-use pastes are not suitable for patients with swallowing difficulties
- ready-to-use fortified nutrient-rich biscuits/bars (as porridge)

In addition, the following commodities are also suitable:

- milk-based fortified diets (F100)
- for adults: "sip feeds" (special liquid diets; low renal solute load, low-osmolarity options)

Boost phase (good appetite, no swallowing difficulties)

Any one or combination of any of the following:

- ready-to-use fortified nutrient-rich foods (as a paste, porridge or biscuit/bar)
- 1–2 porridges of fortified cereal legume blends with added sugar (adults) and added sugar and milk (children)
- common family meal (plus MNP, if no fortified food is given); preferably offer offer ready-to-use pastes or biscuits in addition to common family food
- snacks: for example high-energy biscuits (HEBs).

Convalescent patients usually need (and want) more food: do not limit the quantity of food, and provide extra ready-to-use fortified nutrient-rich foods.

Owing to the high osmolarity of sugary carbonated beverages and fruit juices, it is important that they are not given to patients with diarrhoea, as they may exacerbate diarrhoea. In addition, sugary carbonated beverages are low in electrolytes and nearly all essential nutrients. If patients request these commodities, they should only be offered during the boost feeding phase.

These recommendations are adapted from the WHO/UNICEF/WFP *Interim guideline for nutritional care in adults and children infected with Ebola virus disease in treatment centers* (66) and the WHO *Pocket book of hospital care for children* (*10).*

INFECTION CONTROL – Non-patient care activities

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 (for example, EU FFP2, US NIOSH-certified N951), and eye protection or 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 (for example, gloves, coveralls or gowns) and any area of the face (that is, 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: alcohol or sodium hypochlorite at 0.5%, 5000 ppm available chlorine (that is, 1:10 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 a 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 (that is, eyes, nose or mouth).
- Hand hygiene should be performed immediately following the removal of protective equipment used during post-mortem examination, and equipment 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 into account 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 or incinerated, if culturally appropriate.

Environmental cleaning and management of linen

- 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 disinfectants should be preceded by cleaning.
- Do not spray 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 (for example, 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 (for example, 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 (84)

- Waste should be triaged to enable appropriate and safe handling.
- Sharp objects (for example, 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

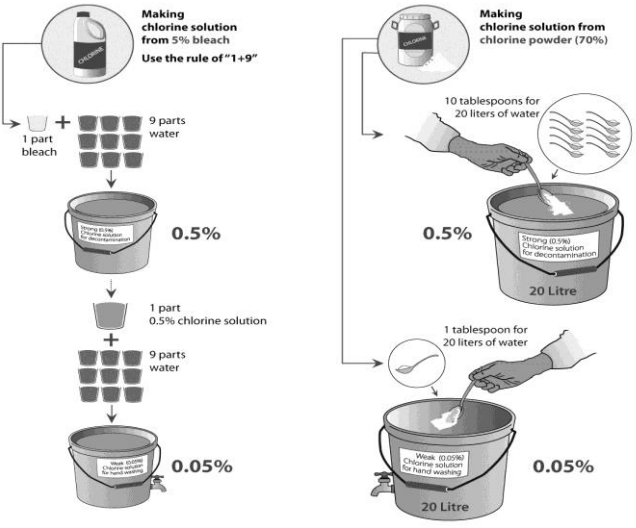
items are used.

- 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 (for example, 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 (for example, 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 (for example, 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 I. How to prepare chlorine solution

Preparing Chlorine Solution

Wear gloves, eye protection and face mask while preparing chlorine solution



Always cover the bucket with a lid

Keep it in shade away from direct sunlight

Always stir the mixture very well and wait at least 30 minutes before use

Prepare solution fresh daily or frequently as needed

Throw away any leftover solution from the day before

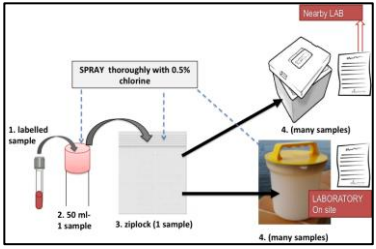
Do not use dirty chlorine solution

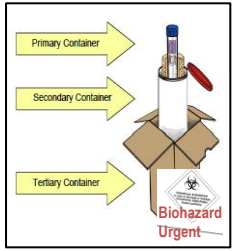
Use strong (0.5%) chlorine solution to disinfect surfaces and objects

Use weak (0.05%) chlorine solution to wash hands

APPENDIX J. Packaging VHF specimens for transport locally and internationally

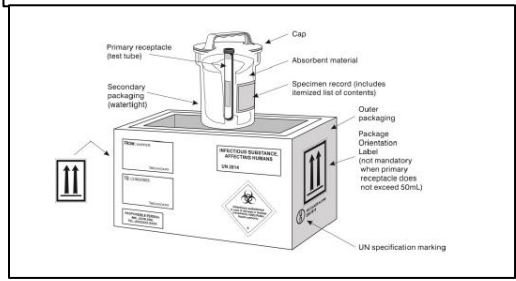
Triple packaging for transport of blood samples to lab at ETU or nearby (these are examples)





http://apps.who.int/iris/bitstream/10665/144818/2/WHO_EVD_GUIDANCE_Lab_14.4_eng.pdf?ua=1&ua=1

Triple packaging shipment of human blood samples within a country by road, rail and sea or internationally



See the following documents for further guidelines and instructions.
http://apps.who.int/iris/bitstream/10665/176754/1/WHO_EVD_Guidance_Lab_15.1_eng.pdf?ua=1
http://apps.who.int/iris/bitstream/10665/176754/1/WHO_EVD_Guidance_Lab_15.1_eng.pdf?ua=1&ua=1
http://apps.who.int/iris/bitstream/10665/78075/1/WHO_HSE_GCR_2012.12_eng.pdf?ua

List of abbreviations, acronyms and definitions 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
BMS	Breast milk substitute
BPM	Beats per minute
BMS	Breat milk substitute
BUN	Blood urea nitrogen
CCHF	Crimean-Congo Haemorrhagic Fever
CDC	Centers for Disease Control and Prevention
CP	Child Protection
Dysphagia	Painful swallowing
ELISA	Enzyme-Linked-Immunosorbent Assay
ETC	Ebola Treatment Centre (term used in Sierra Leone for ETU)
ETU	Ebola Treatment Unit
EVD	Ebola Virus Disease
F75	Therapeutic milk (see recipe in the *Pocket book of hospital care for children* (10))
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
IMAI DCM	IMAI District Clinician Manual
IMCI	Integrated Management of Childhood Illness
IMNCI	Integrated Management of Newborn and Childhood Illness
IPC	Infection prevention and control

IV	Intravenous
JVP	Jugular venous pressure
µg	Microgram
mg	Milligram
ml	Milliliter
MOF	Multiple organ failure
MoH	Ministry of Health
MSF	Médecins Sans Frontières
NGO	Nongovernmental organization
Ngt	Nasogastric tube
Nosocomial	An infection acquired at a hospital or other health-care facility
NSAID	Non-steroidal anti-inflammatory drug
OICC	Observational Interim Care Centre
ORS	Oral rehydration salt(s)
PAPR	Powered air purifying respirators
Photophobia	Painful oversensitivity to light
PCR	Polymerase chain reaction (also called RT-PCR)
PIF	Powdered infant formula
PMTCT	Prevention of maternal to child transmission
PPE	Personal protective equipment
PPN	Plumpy nut
ReSoMal	Rehydration solution for malnutrition
RDT	Rapid diagnostic test
Reservoir	Any person, animal, anthropoid, plant, or substance which can harbor infection and hence act as a source of a disease outbreak.
RR	Respiratory rate
RUIF	Ready-to-use infant formula
RUTF	Ready-to-use therapeutic food
SBP	Systolic blood pressure
SpO_2	Oxygen saturation
Tachypnoea	Fast breathing
UNICEF	United Nations Children's Fund
UHT milk	Ultra-high temperature treated milk
VHF	Viral haemorrhagic fever
WHO	World Health Organization

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Others contributing to the original generic VHF Pocket guide March 2014 (not listed above) included Henry Kyobe Bosa, James Lawler, and Sheik Humarr Khan (Kenema General Hospital, Sierra Leone- deceased). Contributors to the Sierra Leone adaptation included Alie Wurie and others from MoHS, Juan Diez (SCI), CDC, China CDC, UK Department for International Development (DFID), Emergency, GOAL, IMC, King's Partnership/Connaught, MSF, PIH, UK-Med, UK Ministry of Defense, UNICEF, Welbodi Partnership, WHO and the Republic of Sierra Leone Armed Forces and the Sierra Leone: Medical and Dental Association/Council, Nursing Association, Nurses & Midwifery Board and Pharmacy Board.

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