LIBERIA EBOLA VIRUS DISEASE (EVD)

CLINICAL MANAGEMENT GUIDELINES

VERSION TWO

JULY 2021

EVD CASE MANAGEMENT

NPHIL | MOH

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PREFACE

The Liberia Ebola Virus Disease Clinical Management Guidelines reflects improvement in the treatment and care of patients diagnosed with Ebola Virus Disease (EVD) since the 2014-16 Ebola Virus Disease Outbreak in Liberia. Since the 2014-16 EVD outbreak, two drugs, one vaccine, Optimized Supportive Care, and innovative Ebola Treatment Unit designs have been approved by the World Health Organization. The Guidelines includes the following changes to the 2014 Liberia EVD Clinical Guidance:

- Optimized Supportive Care of EVD
- Novel and effective therapeutics for the specific treatment of EVD
- EVD Vaccination for the prevention of Ebola Virus infection after high risk exposure
- Management of pregnant women, new-born, and children, with EVD
- Palliative care of patients with EVD
- Improved patient and staff security (IPC)
- EVD research priorities and ethics integrated into EVD response
- Appendices of essential medicines, supplies and isolation-readiness assessment tools

The goal is to facilitate faster, safe and quality care informed by the experiences and lessons learned from responding to recurrent public health emergencies, and the synthesis of existing evidence on what is most likely to help patients affected by EVD. Clinicians in Liberia shall use these guidelines in the care of patients with EVD and continue to update their knowledge. The guidelines will be updated as new evidence becomes available and capabilities for critical care provision are enhanced. Other useful supplementary references include the following:

a. Optimized Supportive Care for Ebola Virus Disease, WHO
b. Liberia ETU Operational Manual 2016, Ministry of Health
c. Liberia National Therapeutic Guidelines, 2nd Edition, 2017
d. Liberia National IPC Guidelines, 2020
e. Other guidelines [e.g., WHO Hospital Care for Children, WHO Oxygen therapy for children, WHO Management of complications of pregnancy, labor and delivery, etc.]
f. Liberia Psychosocial Guidelines and the mhGAP Humanitarian Intervention Guide.

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ACRONYMS/ABBREVIATIONS

ARDS Acute Respiratory Distress Syndrome
AVPU Alert, Voice, Pain, Unresponsiveness
CFR Case Fatality Rate
CTV Cycle Threshold Value
ETU Ebola Treatment Unit
EVD Ebola Virus Disease
FDA Food & Drug Authorization
GCS Glasgow Coma Scale
HCWs Health Care Workers
HCWs Health Care Workers
IMS Incident Management System
MAP Mean Arterial Pressure
NCMP National Case Management Pillar
NIV Non-invasive Ventilation
oSoC Optimized Supportive Care
ORS Oral Rehydration Solution
PPE Personal Protective Equipment
QSOFA Quick Sequential Organ Failure Assessment Score
RDT Rapid Diagnostic Test
RESOMAL Rehydration Solution for Malnutrition
RT-PCR Reverse Transcriptase-Polymerase Chain Reaction
SAM Severe Acute Malnutrition
SoPs Standard Operation Procedures
SpO_2 Oxygen Saturation
WHO World Health Organization

1 INTRODUCTION

The prolonged 2013–16 EVD outbreak in West Africa allowed for an evolution of care such that by the end of the outbreak the capacity to provide individualized and Optimized Supportive Care (oSoC), including volume resuscitation, symptom control, laboratory and bedside monitoring of glucose, electrolyte levels and organ dysfunction, as well as rapid detection and treatment of co-infections, was built and potentially contributed to the downward trend in the case fatality rate (CFR) [1-3]. This guideline provides recommendations for the management of adults and children with suspected and confirmed EVD in Liberia.

1.1 OVERVIEW OF EVD

Ebola Virus Disease (EVD) is a life-threatening multisystem, highly contagious infectious disease associated with fever, gastrointestinal (GI) and other systemic symptoms, that frequently leads to hypovolemia, metabolic acidosis, hypoglycemia, and multi-organ failure. It is caused by infection with Ebola viruses of the family Filoviridae. The virus family Filoviridae includes three genera: Ebolavirus, Marburgvirus, and Cuevavirus. Since its discovery in 1976, six species of the genus Ebolavirus have been identified:

1. Bombali ebolavirus
2. Bundibugyo ebolavirus (BDBV)
3. Reston ebolavirus (RESTV)
4. Sudan ebolavirus (SUDV)
5. Taï Forest virus (TAFV)
6. Zaire ebolavirus (EBOV)

The Zaire, Bundibugyo and Sudan viruses have been associated with large outbreaks in humans in Africa. Reston virus causes asymptomatic infections, while Taï Forest viruses have not been associated with human outbreaks. The new species Bombali virus has not yet been identified in humans but could still pose a health risk. The Marburgvirus (Marburg virus (MARV) and Ravn virus (RAVV) cause Marburg Disease.

Estimated 30-44 distinct EVD outbreaks have occurred since 1976, mostly in Sub-Saharan Africa. At least 17 have originated in Gabon, Guinea, Republic of Congo or Democratic Republic of Congo (DRC). At the time of writing, 28,832 cases, including nearly 11,424 deaths have been documented since the first two outbreaks in 1976 in Nzara, South Sudan and Yambuku, DRC, respectively.[1, 2, 4] The 2014–16 outbreak in West Africa (mainly in Guinea, Liberia, and Sierra Leone) was the largest Ebola outbreak with more 28,652 cases (including 830 healthcare workers (HCWs)) and 11,325 deaths.[1] The average case fatality rate (CFR) of EVD is 50% (range: 18-90%).

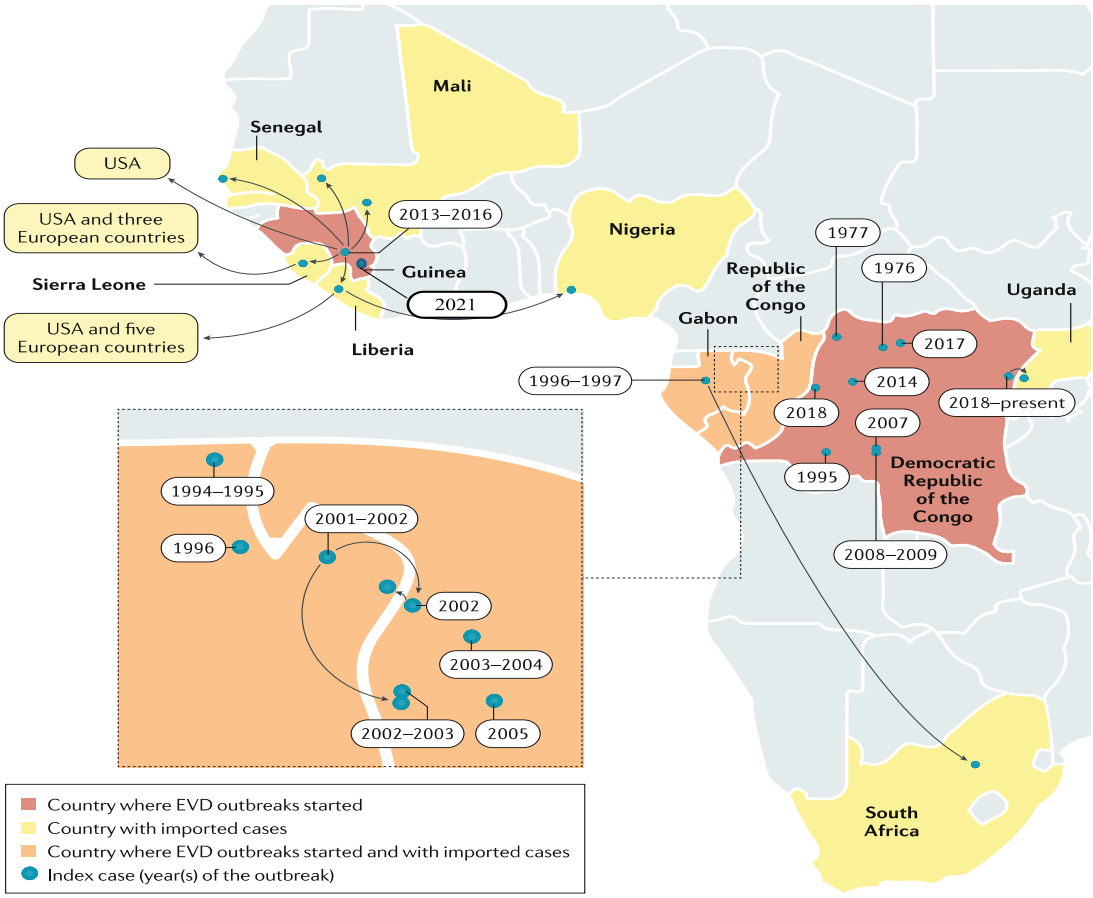


Fig. 1: Ebola virus disease outbreaks. The map shows the location and years of all reported Ebola virus disease (EVD) outbreaks. Two cases of laboratory acquired EVD occurred in Russia (not shown).

Source: Modified from Jacob, et Al. 2020.[2]

1.1.1 TRANSMISSION

Fruit bats of the Pteropodidae family are believed to be the natural hosts. Human infection occurs through contact with the blood, secretions, organs, or other bodily fluids of

infected animals such as fruit bats and mammals.[1, 2, 5] Epidemics (one confirmed case) occur through human-to-human transmission.

Ebola virus can be transmitted from person-to-person via:

- Direct contact with blood and bodily fluids of an infected person.
- Sexual transmission (Oral, vaginal, or anal)
- Indirect contact of non-intact skin or mucous membranes with environments contaminated with infected body fluids. Such fluids include blood, vomit, sweat, feces, semen, urine, breast milk, and saliva
- Indirect contact with contaminated fomites such as needles, syringes injuries, linens and other clothing, and other inanimate objects
- Droplet spread is considered but unlikely
- Convalescent transmission can occur through direct contact with immunologically protected body fluids (e.g., direct sexual transmission, vertical transmission) with viable Ebola virus particles or relapse after meningitis, which leads to new onset viremia.
- Airborne transmission has never been documented

Health-care workers (HCWs) face the highest risk of infection. Other high-risk activities include burial ceremonies that involve direct contact with the body of the deceased and home care of EVD patients by family members such as women.

1.1.2 CASE DEFINITIONS

The case definition to use depends on whether an outbreak is ongoing or during non-outbreak (routine surveillance).

1.1.2.1 Routine Surveillance case definition (non-outbreak setting)

Suspected case:

A patient (alive or dead) who presents with onset of fever and no response to usual causes of fever in the area, and at least one of the following signs:

- bloody diarrhea,

- bleeding from gums,
- bleeding into skin (purpura),
- bleeding into eyes and urine, other abnormal bleeding.

Confirmed case:

A suspected case with laboratory confirmation (positive IgM antibody, positive PCR, or viral isolation), or epidemiological link to a confirmed case or outbreak.

1.1.2.2 Case Definition in setting

The following standard case definitions may guide appropriate detection of cases:

1.1.2.2.1 Suspected case:

A patient is a suspected case of EVD who presents with any of the following:

- Sudden onset of fever and at least three of the following symptoms:
  - Headache, lethargy, anorexia, muscles or joints aches, stomach pain, difficulty swallowing, vomiting, difficulty breathing, diarrhea, hiccups.
- Sudden onset of fever and contact with a suspected, probable, or confirmed case.
- Any person with inexplicable bleeding.
- Any sudden, inexplicable death.

1.1.2.2.2 Probable case:

- Any suspected case evaluated by a clinician, OR
- Any deceased suspected case (where it was not possible to collect specimens for laboratory confirmation) having an epidemiological link with a confirmed case.

1.1.2.2.3 Confirmed Case:

- Any patient with a positive RT-PCR test result.

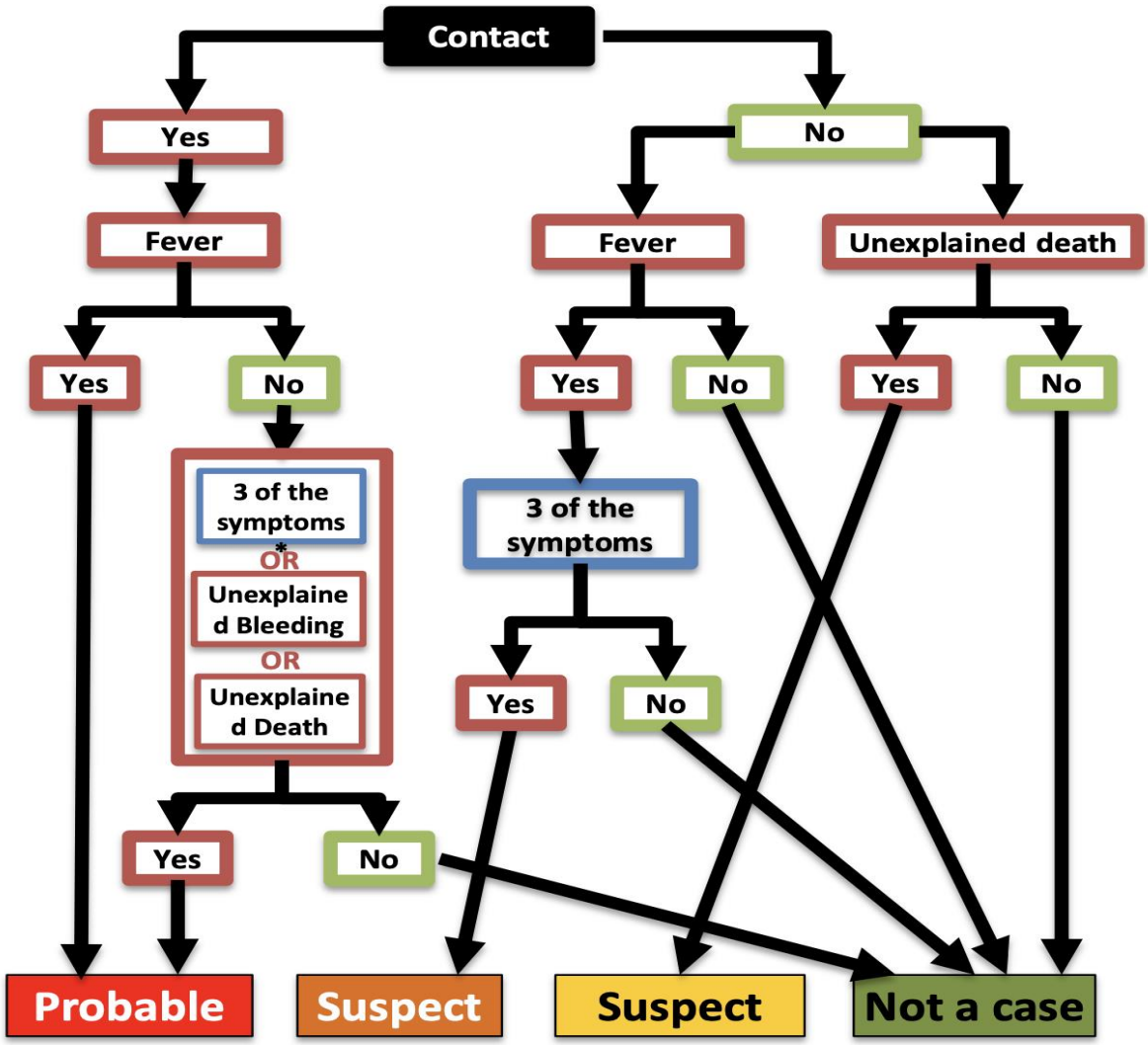


Figure 1: Liberia EVD Outbreak Screening Algorithm

Suspected or probable Case	Confirmed Case
• Put patient in a holding area • Notify relevant public health authorities • Commence Fluid therapy • Monitor vital signs and urine output every 4 hours • Send sample for diagnostic testing (RT-PCR)	Transfer patient to the treatment unit Commence supportive care (See Chapter 3) Assess Patient for possible complications and manage accordingly (See Chapter 4)

1.1.3 EVOLUTION OF CLINICAL ILLNESS

- Initial presentation of EVD is non-specific and mimics many common infections including malaria, typhoid, diarrheal diseases, meningitis, sepsis, Marburgvirus disease, Lassa fever, yellow fever, and other viral hemorrhagic fevers.
- Early identification of suspected and probable cases is very important to interrupt transmission, initiate early targeted therapies, mitigate risk of complications and improve outcomes.

1.1.3.1 Incubation period

Patients with EVD typically have an abrupt onset of symptoms 2 – 21 days after Ebola infection.

1.1.3.2 Signs and symptoms

- Initial syndrome (Table 1):
    - Most cases begin with an abrupt onset of non-specific symptoms such as fever, malaise, headache, loss of appetite, weakness, myalgias, and sore throat. As the illness progresses, systemic manifestations may develop as discussed below

- Rash:
    - A diffuse erythematous, non-pruritic maculopapular rash may develop by day 5 – 7 of illness involving the face, neck, trunk, and arms and can desquamate.

- Gastrointestinal:
    - GI symptoms develop within the first few days of illness
    - Typically, watery diarrhea up to 10 liters per day, nausea, vomiting and abdominal pain which may result in significant fluid loss potentially leading to dehydration, hypotension, electrolyte imbalances, and shock

- Hemorrhage:

    - Many patients develop some degree of bleeding during their illness manifested as hemorrhagic conjunctivitis (red eyes), blood in stool, petechiae, ecchymoses, oozing from venipuncture sites and/or mucosal bleeding
    - Significant hemorrhage can occur during the terminal phase of illness
- Neurologic:
    - Patients occasionally develop meningoencephalitis with findings such as confusion, altered level of consciousness, hyperreflexia, myopathy, stiff neck, gait instability and/or seizures.
    - These manifestations typically develop around days 8 – 10 of illness.
- Cardiac:
    - Pulse-temperature dissociation with relative bradycardia may occur.
    - Additionally, retrosternal pain may be reported attributed to pericarditis.
- Respiratory:
    - Tachypnea and shortness of breath may represent hypoxia or hypoventilation due to respiratory muscle fatigue, resulting in respiratory failure
- Ocular:
    - Patients may develop conjunctivitis and/or signs and symptoms of uveitis for example blurred vision, photophobia, blindness during the acute phase of illness. However, uveitis has been documented mostly during convalescence.

Table 1: Ebola Virus Disease temporal presentation

	Time since symptom onset	Clinical features	Typical patient
Early febrile or mild stage	0–3 days	Non-specific features: fever, weakness, lethargy, and myalgia	Ambulatory, able to compensate for fluid losses; no indication for intravenous fluid administration
Gastrointestinal involvement	3–10 days	Same as early stage plus diarrhoea, vomiting, or both, or abdominal pain	Unable to compensate for fluid losses because of emesis or large volume losses; indication for intravenous fluid administration
Complicated stage	7–12 days	Same as gastrointestinal involvement stage plus haemorrhage, shock, organ failure, and neurological complications	Critically ill, usually hypovolaemic, often with confusion or seizures

Adapted from Chertow and colleagues[63] and Hunt and colleagues.[64]

Table 1: **Ebola virus disease presentation by stage**

Source: Mally et al. Ebola Virus Disease. Lancet ID (2019)

Patients typically begin to improve during the second week of illness. However, most patients with high risk of death start to develop severe signs and symptoms with rapid progression to multi-organ failure and death typically by the second week. Convalescent patients can develop clinical sequelae soon after recovery from their initial infection.

1.1.4 LABORATORY TESTING TO CONFIRMED EVD

Screen all sick patients in the community or visiting health facilities in endemic areas for symptoms of EVD (Section 1.1.2). Isolate and test those who meet the case definition of EVD. In settings where testing is not available, manage patients meet the case definition for 21 days in an isolation facility.

A. Reverse Transcriptase- Polymerase Chain Reaction

RT-PCR is the recommended method of diagnosing. EBOV RNA is detectable in blood samples by RT-PCR assay within three days after onset of symptoms.

- Repeat RT-PCR test after 72 hours if an initial negative RT-PCR, to establish diagnosis.
- A negative RT-PCR test collected ≥72hours after onset of symptoms excludes EVD. Discharge the patient home or refer for routine care to a non-Ebola health facility.

- Transfer patients with positive RT-PCR to the ETU and provide specific EVD treatment and optimized supportive care according to these Guidelines.

Postmortem EVD diagnosis: While blood is the preferred specimen for testing, oral swabs are used for postmortem diagnosis because of high viral titers in body fluids at the time of death.

B. Rapid immunoassays

Rapid Immunoassays are most useful to support a provisional diagnosis in places where RT-PCR is not readily available. They should not be used for general EVD screening or testing asymptomatic people, or to make triage decisions.

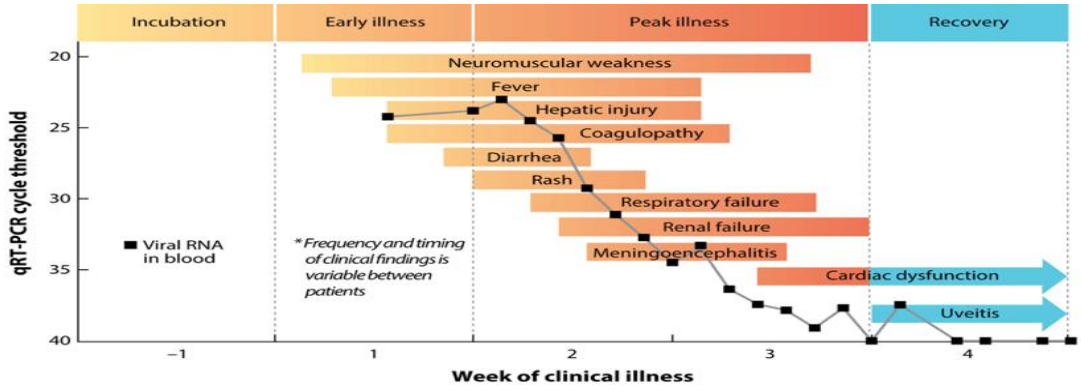


Figure 2: CT VALUES by stage of illness [**Source**: *Baseler, L et al Annu Rev Pathol Mech Dis 2017]*

C. Laboratory presentation of acute EVD

Patients with EVD typically develop a wide range of laboratory abnormalities including leucopenia, thrombocytopenia, elevation of liver enzymes as well as renal and coagulation abnormalities (Table 2).

Table 2: Laboratory findings by stage of illness

Timing	Laboratory finding
Early illness	■ Leukopenia, lymphopenia, and thrombocytopenia ■ Elevated hemoglobin and hematocrit ■ Elevated aspartate aminotransferase and alanine aminotransferase (ratio ≥3:1) ■ Elevated prothrombin time, activated partial thromboplastin time, and D-dimer
Peak illness	■ Leukocytosis, neutrophilia, and anemia ■ Hyponatremia, hypo- or hyperkalemia, hypomagnesemia, hypocalcemia, hypoalbuminemia, hypoglycemia ■ Elevated creatinine phosphokinase and amylase ■ Elevated blood urea nitrogen and creatinine ■ Elevated serum lactate and low serum bicarbonate
Recovery	■ Thrombocytosis

Source: Baseler et al. The Pathogenesis of Ebola Virus Disease. Annu Rev Pathol 12, 387–418 (2017)

1.1.5 DIFFERENTIAL DIAGNOSIS

Symptoms of EVD can be confused with many endemic infectious diseases. When evaluating a patient for possible EVD, always consider alternative and/or concurrent diagnoses both infectious and non-infectious disorders including:

- Systemic infections – e.g., Malaria, typhoid fever, meningococcal diseases, HIV, etc.
- Hemorrhagic fevers – e.g., Marburg, Lassa Fever, Yellow fever, etc.
- Diarrheal diseases – e.g., Travelers' diarrhea

1.1.6 TREATMENT

a) Optimized Supportive Care (e.g., rehydration, hypoglycemia, etc.)
b) Treat the patient's symptoms (e.g., fever, myalgia, headache, abnormal bleeding, etc.)
c) Manage complications (e.g., sepsis, shock, renal injury, ARDS, bleeding, etc.)
d) Specific treatment. Two monoclonal antibodies (Inmazeb and Ebanga) are approved for the treatment of Zaire Ebolavirus infection in adults and children.
e) Screen for and treat co-morbidities and other underlying infections.

1.1.7 OUTBREAK PREVENTION AND CONTROL

Outbreak control relies on applying a package of interventions, including:

a) Train HCWs in early detection, isolation, treatment, infection prevention and control
b) Early detection, isolation, and case management of infected persons (Chap. 3)
c) Infection prevention and control in health facilities, ETUs, and community (Chap. 7)
d) Surveillance for active case search, contact tracing, and quarantine of high-risk contacts
e) Good laboratory services (section 1.1.4 & 2.1.1)
f) Safe and dignified burials (Chap. 7)

g) Community engagement, social mobilization, and risk-reduction communication
h) Vaccination of HCWs and other high-risk exposed groups (Section 2.5.3).

1.1.7.1 Controlling Infection in Health Facilities

- Practice standard precautions when caring for patients, regardless of their presumed diagnosis. These include hand hygiene, respiratory hygiene, use of personal protective equipment, safe injection practices and safe burial practices (Chap. 7).
- Implement additional IPC measures when caring for EVD patients (e.g., face protection, non-sterile long-sleeved gown, and gloves) (Chap. 7).

1.1.8 CARE FOR PEOPLE WHO RECOVER FROM EVD

- EVD survivors undergo convalescence during which they suffer sequelae (Section 6.2).
- EVD survivors can experience uveitis, impaired vision, joint pains, headache, memory loss and other neurologic and mental health issues.[2, 7-11]
- Post Ebola sequelae wean gradually over several years for most survivors. However, late complications can develop or last months after recovery from the initial illness.
- The Ebola virus may persist in immune-privileged body fluids, (e.g., semen, eyes, CNS, amniotic fluid, fetus, breastmilk, etc.) for variable duration.[2, 10, 12, 13] Relapse-symptomatic illness is rare but has been documented after recovery.[14]
- Male survivors should remain abstinent or practice safe sex until their semen is negative for EBOV. Testing is advised up to 3 years after infection.[10]

2 CLINICAL MANAGEMENT

The mainstay of treatment of EVD involves aggressive supportive care to maintain adequate organ function, correct volume losses from vomiting and diarrhea, correct electrolyte abnormalities, and prevent shock. EVD specific treatment for *Zaire ebolavirus*

infection should be administered in addition to optimized supportive care (see Section 2.4).

2.1 CLINICAL ASSESSMENT AND MONITORING

An initial systematic clinical assessment should be performed immediately upon arrival at the ETU followed by regular re-assessments of clinical signs, symptoms, and vital signs to allow early recognition and treatment of patients at high risk of complications.

Assess every patient with EVD systematically each day using the daily monitoring checklist (see Appendix A, B, C, E, F, & I), including history of patient passing urine at least over 24 hours. Frequency of monitoring will depend on the condition of the patient. Severely ill patients will require more intense monitoring. The main assessment and monitoring shall include:

- **Vital signs:**
  - Vital signs: Temperature, Heart rate (HR), Blood pressure, Respiratory rate
  - Peripheral oxygen saturation (SpO_2)
  - Mental status: AVPU (Alert, Voice, Pain, Unresponsive) or Glasgow Coma Scale
  - Body weight

- **Physical examination:**
  - General status:
    - is patient able to eat or drink without support?
    - is patient able to sit or walk independently?
    - signs of dehydration: delay capillary refill time, weak peripheral pulse, reduce or no urine output, poor skin turgor (is there mottling?)
    - signs of bleeding: IV sites, gums, skin (petechiae), vaginal, GI
    - pallor, hyperemic sclera and jaundice
    - peripheral edema
  - Signs of renal injury or other complications
  - Pain assessment: scale of 1-10 (patient will grade his/her pain)
  - Neurological status: AVPU, pupil reactivity,
  - Signs of organ enlargement (hepatomegaly, splenomegaly etc.)

- Nutritional status

- **Fluid status:**
  - Look for signs of dehydration and/or shock: fluid loss greater than intake (through vomiting, diarrhea, insensible losses); hypotension, cold extremities, delayed capillary refill and poor skin recoil.
  - Patients with complication: Urine Output (e.g., in acute renal injury, shock, bleeding, coma, convulsions etc.)
  - Monitor and record daily fluid input and output.
    - daily weights, especially in children
    - total volume administered both oral and intravenous
    - total volume out (urine, vomiting, stool, monitor nappy change or weigh nappies in children)

Urine and stool (ml) = Wet nappy weight (g) – Dry nappy weight (g)

2.1.1 LABORATORY INVESTIGATION

Laboratory testing will be dependent on the diagnostic capacity of the individual laboratory units at each Ebola Treatment Unit (see Appendix I). At the bare minimum, the below point-of-care testing kits should be made available at each ETU:

- Malaria Rapid Diagnostic Test (RDT)
- Blood glucose
- Urine pregnancy
- Urine dipstick
- Typhoid
- Hepatitis A, B, & C
- HIV screening
- Urea/BUN
- Creatinine
- Liver enzymes – AST, ALT
- Prothrombin Time (PT)/International Normalized Ratio (INR)

- Electrolytes – Na, K, HCO^{-}_{3}, Mg, Cl^{-}, $Ca^{2+,}$

Patients at High Risk of Complications

Any patient with one or more of the following parameters is at high risk of complications. Resuscitation should be initiated immediately for these patients, and they should be placed in the treatment unit designated for the care of the critically ill.

- Low systolic pressure (SBP) in either adults or children
- Delayed capillary refill and cold extremities in a child
- Altered mentation, delirium, or seizure
- Tachypnea (fast respiratory rate)
- Weak or rapid pulse
- Oliguria (urine output $<$ 0.5 ml/kg/hour in adults; $<$ 1.0 ml/kg/hour in children) or
- Anuria
- Hemorrhagic manifestations
- Severe hypoglycemia (glucose $<$ 54 mg/dl or $<$ 3 mmol/l)
- $SpO_2 < 92\%$
- Severe electrolyte, metabolic, acid-base abnormalities
- Severe vomiting and/or diarrhea
- Severe weakness with inability to ambulate or eat/drink.

Where feasible, a staffing ratio of ONE CLINICIAN for up to TWO CRITICAL patients is recommended; and patients should be reassessed at least every two hours or more frequently.

2.2 OPTIMIZED SUPPORTIVE CARE FOR EVD PATIENTS

The key principles of supportive care of an EVD patient include:

1. **Fluid resuscitation**
    - oral rehydration in patients who can drink
    - parenteral administration of clinically appropriate fluids in those who are unable to drink or who have severe dehydration or shock

2. **Electrolyte monitoring and correction**
    - daily biochemistry labs during acute phase of illness and hematology on admission and as needed
    - appropriate and timely correction of electrolyte abnormalities

3. **Glucose monitoring and management**
    - serum glucose checked at least three times a day with vital signs
    - intravenous (IV) glucose management as needed

4. **Treatment of potential co-infections**
    - empiric combination antibiotics on admission with re-assessment after 48 hours
    - empiric antimalarial medication until the treatment course is finished or malaria testing is negative

5. **Nutrition**
    - enteral nutrition should be provided and advanced as tolerated
    - IV dextrose for patients with hypoglycemia and those who cannot take oral food.

6. **Symptomatic care and prevention of complications**
    - symptomatic care of fever, pain and nausea, and other symptoms
    - prevention of catheter associated infections and pressure ulcers

7. **Management of complications**
    - Manage complications detected during initial and regular follow-up physical and laboratory assessments

2.2.1 FLUID RESUSCITATION

2.2.1.1 Definition

Patients with EVD often present with or develop one or more of the following:

i. dehydration from volume depletion (e.g., vomiting, diarrhea, insensible loss, etc.)
ii. sepsis from dysregulated immune response associated with organ dysfunction
iii. hemorrhage: GI or other sites
iv. shock: commonly hypovolemic due to large GI losses; however, some patients may develop septic shock with or without GI losses or hemorrhagic shock from GI or other bleeding. However, hemorrhagic shock is a rather uncommon etiology in EVD.

2.2.1.2 Assessment

- Look for signs of dehydration and classify the degree of dehydration (Table 3 below).
- Determine if patient can drink orally
- Reclassify the dehydration at each evaluation and select the appropriate treatment plan.

Table 3: Classification of dehydration

	Mild (3–5% volume depletion)	Moderate (6–9% volume depletion)	Severe (> 10% volume depletion)
Pulse	Normal	Rapid	Rapid and weak or thready
Systolic blood pressure	Normal	Normal to low	Low
Buccal mucosa	Slightly dry	Dry	Parched
Skin turgor	Normal		Reduced
Urine output	Normal (> 0.5 ml/kg/hour adult; > 1 ml/kg/hour child)	At or below (< 0.5 ml/kg/hour adult; < 1 ml/kg/hour child x 3 hours)	Markedly reduced to anuric (< 0.5 ml/kg/hour x 3 hours)
Respiratory rate	No change	Increased	Increased
Ins and outs	Outs > ins	Outs > ins	Outs >> ins
Other	Increased thirst	Increased thirst	In infant, depressed fontanelle; cold skin

2.2.1.3 Treatment of hypovolemia without shock

PLAN A: – Volume loss with no signs of dehydration

- Water or ORS on demand and after each watery stool/vomiting at 5-10ml/kg
- Administer Zinc in patients with diarrhea
    i. Age < 6months: 10mg/day for 10 days
    ii. Age > 6 months: 20mg/day for 10 days
- Counsel patient to drink extra water and continue eating.
- Aid with drinking if needed

Table 4: Composition of WHO Oral Rehydration Salt (ORS) solution

	Na^+ mmol/l	K^+ mmol/l	Cl^- mmol/l	Bicarbonate mmol/l	Glucose g/l	Magnesium mmol/l
WHO ORS	90	20	80	30	111	-

PLAN B: – Patients with mild-moderate dehydration

- Determine volume of ORS to give in first 4 hours if tolerated (Table 5 below)

- Administer IV fluids if the patient is unable to drink sufficient water to maintain hydration.
    i. Adults: alternate between 0.9% normal saline and Ringer's lactate
    ii. Children: Ringer's lactate (RL). Monitor serum electrolytes regularly.
- Additionally, encourage patient to drink ORS after each watery stool/vomiting to compensate for ongoing fluid losses
- After the 4 hours or each clinical round:
    i. Reassess the patient and reclassify the dehydration
    ii. Select the appropriate plan to continue treatment
    iii. Begin feeding as soon as able

Table 5: Volume of ORS to administer per body weight in Kg during first 4 hours:

To determine the approximate amount of ORS required (ml), multiply the patient's weight (kg) by 75.

Recommended volume of ORS within the first 4 hours to treat dehydration						
Weight of patient	< 5 kg	5–8 kg	8–11 kg	11–16 kg	16–30 kg	> 30 kg
Volume of ORS	200–400 ml	400–600 ml	600–800 ml	800–1200 ml	1200–2200 ml	2200–4000 ml

PLAN C – Patients with severe dehydration

- If patient can drink orally, give ORS by sips while IV access is being established
- Determine amount of fluid to be given at **100ml/kg**
- Start IV fluid therapy with 0.9% Saline with dextrose or RL with dextrose
- In children, determine rate of fluid administration based on age (Table 6 below)
- Reassess patient every 15-30minutes and reclassify dehydration at each evaluation
- Give ORS as soon as they can drink (Table 5 above)
- If patient is weak or vomits, give frequent small sips from a cup.

Table 6: Recommended fluid volume for severe dehydration in children under 5 years

Recommended volume of IV fluid and type to treat severe dehydration			
Age	First fluid bolus, 30 ml/kg	Second fluid bolus, 70 ml/kg	Fluid composition
Infants < 12 months	1 hour*	5 hours	RL with 10% dextrose or NS with 10% dextrose
12 months to 5 years	30 minutes*	2.5 hours	RL with 5% dextrose or NS with 10% dextrose

2.2.1.4 Hypovolemia with sepsis and shock

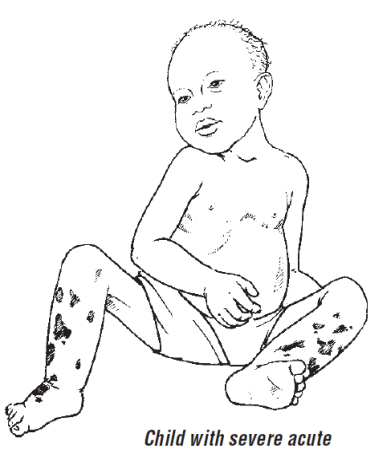
Management of sepsis and shock are discussed in section 4.1

2.2.1.5 Considerations for Malnourished Children

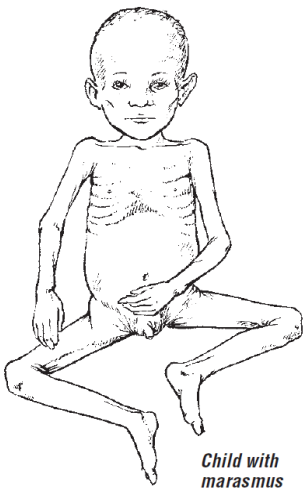
a. Definition:

Severe Acute Malnutrition (SAM) is defined by:

- a very low weight-for-height (below -3z scores of the median WHO growth standards – visit: http://www.who.int/childgrowth/standards/chts_wfa_girls_p/en/), by visible severe wasting,
- presence of nutritional edema
- a very low mid-upper arm circumference.



Child with severe acute malnutrition oedema



Child with marasmus

Children with SAM and severe edema (+++) have increased risk of mortality compared to children without SAM or with SAM and mild-moderate edema.

b. If signs of dehydration or shock are present:

- Water or RESOMAL on demand plus RESOMAL at 5-10ml/kg with every loose stool/vomiting in addition to scheduled feeding
- Moderate dehydration:
    - RESOMAL at 10ml/kg/h in the first 2 hours given as 5ml/kg every 30 minutes by mouth or nasogastric tube then 5-10ml/kg/hr
    - If the dehydration persists past 2-3hours; alternate ReSoMal with F-75
- If child will not tolerate oral or NG feeding, consider maintenance fluids if needed.

Table 7: Solute composition of WHO standard oral rehydration fluids and RESOMAL

	Old WHO ORS	Standard (hypo-osmolar) WHO ORS	RESOMAL
Osmolarity	311	245	300
Sodium mmo/l	90	75	45
Potassium mmol/l	20	20	40
Chloride mmol/l	80	65	76
Glucose mmol/l	111	75	125
Citrate mmol/l	10	10	7
ReSoMal also contains Magnesium, Zinc, and Copper (*https://www.ichrc.org/chapter-743-dehydration)*			

Attention: in case of massive diarrhea, administration of large volumes of RESOMAL can be associated with hyponatremia.

c. Resuscitation targets:

- Adults:
    - Target systolic BP >100mmHg or MAP > 65mmHg
    - Urinary output >0.5ml/kg/hr.
    - Evaluate peripheral perfusion and level of consciousness
- Children:
    - Central and peripheral pulses are palpable
    - Capillary refill time < 3 seconds
    - Improved level of consciousness
    - Urine output >1.0ml/kg/hr.

d. Maintenance fluids

After initial resuscitation, patient may still need fluids to maintain hemodynamic stability

- Estimate ongoing fluid losses (i.e., vomiting, diarrhea, ongoing insensible loss, etc.)
- Determine if patient can tolerate enteral fluids and reduce IV fluids accordingly
- Estimate daily fluid requirement (see Table 8 below)
- Choice of fluids:
    - Oral fluid therapy using ORS is recommended and should be encouraged for patients that can tolerate oral fluids or via NG tube but should be supplemented with IV infusions as necessary.
    - Isotonic fluids such as normal saline or Ringer's lactate should be used as maintenance to avoid hyponatremia.
    - Avoid hypotonic fluids like D5W for the risk of precipitating hyponatremia.

Table 8: Maintenance fluid volume calculation

Total fluid intake = daily maintenance fluid + replacement fluid for ongoing losses

- Calculate maintenance fluid requirement using the **4-2-1 rule:**
    - 100ml/kg/day or 4ml/kg/h for first 10kg (1 litre)
    - 50ml/kg/day or 2ml/kg/h for second 10kg (1.5 litre)
    - 20ml/kg/day or 1ml/kg/h for any additional weight above 20kg
- Estimating daily replacement fluid for ongoing losses:
    - **Volume of replacement fluid = volume loss (urine + stool + vomit + blood loss) + insensible loss**

2.2.2 MANAGEMENT OF ELECTROLYTE DISORDERS

2.2.2.1 Definition

Frequent electrolyte abnormalities in EVD include hyponatremia hypokalemia, hypocalcemia, hyperkalemia, hypernatremia, and hypomagnesemia. Main causes in EVD:

- Enteral losses - Diarrhea, vomiting, dehydration
- Fluid overload
- Administration of hypotonic fluids like D5W

- Complications such as Acute Kidney Injury

Prevention of electrolyte imbalances:

- Rehydration with ORS, orally if possible or via NG tube
- Use adequate isotonic fluids with Dextrose; avoid hypotonic fluids like D5W
- Measure and monitor serum electrolytes if available
- Correct specific abnormalities as soon as they are detected

Treatment of specific abnormalities:

2.2.2.2 Hyponatremia

General considerations

- Hyponatraemia is often seen in the EVD patient and may be associated with mental status changes and/or seizures.
- Management should be guided by the volume status, the duration of hyponatraemia and the severity of symptoms.
- In EVD, the acute nature of the disease, makes hypovolaemic hyponatraemia the most likely etiology; individual clinical assessment is warranted.

Acute management

- Avoid administration of free water or hypotonic fluids as this will worsen hyponatraemia. Use isotonic or balanced solutions for IV resuscitation. Use ORS for oral rehydration.
- Determine etiology of hyponatraemia based on volume status: hypovolaemic, euvolaemic, hypervolaemic. For hypovolaemic patient: give fluid resuscitation (as described above). For euvolaemic patient: avoid free water. Treat underlying disease. For hypervolaemic patient, diuretics can be given.
- **Do not correct sodium rapidly as overly rapid correction can cause complications including central pontine myelinolysis. The maximum correction rate is 9 mmol/l in 24 hours.**
- Any clinical change must prompt repeat assessment of sodium level.

2.2.2.3 Hypernatremia

General considerations

- Hypernatraemia represents a net water loss or a hypertonic sodium gain. In EVD this is most often due to net water loss (dehydration) from diarrhoea/vomiting.
- Early symptoms include anorexia, muscle weakness, restlessness, nausea and vomiting. More serious signs follow, with altered mental status, lethargy, irritability, stupor and coma.
- Water deficit (in litres) = (current sodium/target sodium – 1) x .6 (body weight in kg); must eliminate the existing water deficit and replace ongoing water losses.
- **The rate of correction should not exceed 9 mmol/l per day.**

2.2.2.4 Hypomagnesemia

- Concomitant magnesium deficiency occurs in approximately 40% of patients with hypokalaemia and should be considered when replacing potassium.
  - » Magnesium should be replaced first in concomitant magnesium and potassium deficiency.
- For refractory hypokalaemia or for hypomagnesemia, give magnesium sulphate 2 g IV over 1 hour in adult patients. In children, give 0.2 mmol/kg (maximum 10 mmol) over 1 hour.

2.2.2.5 Hypokalemia:

- Oral intake if possible; never give IV potassium as bolus

Table 9: Management of hypokalemia in EVD

Potassium level	Adult dosing
3.3–3.5	40 mmol oral dose. Re-check serum K level and repeat dose if needed.
2.5–3.2	60–80 mmol oral dose. Re-check serum K level and treat if necessary.
< 2.4 (severe)	10 mmol per hour IV/ for 4 hours. Re-check serum K level. Give additional dose at 2–4 hours, if still needed. Always re-check serum K level between dosing.
	Paediatric dosing
K 2.5–2.9 mmol/l	0.5–1.0 mmol/kg oral dose. Re-check serum K level. Can repeat every 6–12 hours. Can repeat to a total of 2–4 mmol/kg/day in 2–4 divided doses.
K < 2.5 mmol/l	0.5 mmol/kg/hour IV for 2 hours + 2 mmol/kg oral dose. Re-check serum K level. Can repeat every 12 hours.

2.2.2.6 Hyperkalemia

- Stop all medications that could potentiate hyperkalemia

Table 10: Management of hyperkelemia in EVD

Potassium level	
K 5.5–6.4 mmol/l	Repeat test and monitor. Obtain ECG. If K > 5.5 and hyperkalaemia ECG changes, treat as below. Eliminate K through kidneys and GI tract (ensure euvolaemia and establish good urine output). If hypovolaemic: administer fluid bolus. Can consider furosemide only if hypervolaemic.
K > 6.5 mmol/l or ECG changes	
	Adult dosing
	1. Calcium gluconate 10% 10 ml over 10 minutes (may need one to three ampoules to achieve the same effect as calcium chloride); or calcium chloride 10% 5–10 ml IV over 10 minutes, repeat if necessary until ECG changes improve. Calcium chloride may cause local irritation at injection site; use larger vein. 2. Insulin: administer IV 10 units Humulin R insulin with two ampoules 50% glucose. 3. Bicarbonate IV 50 mEq slow push over 2 minutes. 4. Consider use of sodium polystyrene sulfonate 15 or 30 g once and can repeat every 8 hours in patients WITHOUT copious diarrhoea. Caution: does not have immediate effect and DO NOT use in patients with constipation. 5. Dialysis for refractory hyperkalaemia if available.
	Paediatric dosing
	1. 10% calcium gluconate: dose 0.11 mmol/kg (= 0.5 ml/kg) IV slow push over 5 minutes. Maximum 20 ml. 2. IV insulin and dextrose infusion: insulin 0.05 units/kg (maximum 10 units) + 1 ml/kg 50% glucose IV or 5 ml/kg 10% glucose or 2 ml/kg of 25% glucose. 3. Bicarbonate 1 mmol/kg IV slow push over 10–15 minutes. 4. Dialysis for refactory hyperkalaemia if available.

2.2.3 TREATMENT OF HYPOGLYCEMIA

Hypoglycemia is frequently seen in patients with EVD and should be managed to avoid complications. Suspect hypoglycemia if:

- Nervousness
- Tachycardia
- Diaphoresis
- Prostration or lethargy
- Altered mentation

Diagnose hypoglycemia if the blood glucose is < 3mmol/l or <54mg/dl. If unable to measure glucose, give empiric therapy with dextrose.

2.2.3.1 Acute Management of Hypoglycemia:

- **Choice of fluids:**
    - D50% contains 25 g of glucose in 50 ml

- D10% contains 10 g of glucose in 100 ml
- D5% contains 5 g of glucose in 100 ml.

A. Adults:

- Give 50ml of D50% as a slow intravenous infusion in 1min
- Start maintenance infusion of glucose using one of the following options:
  - Add 100mls of D50 in 900mls of 0.9% Saline OR
  - 100mls of D50% to 400mls of RL
- Recheck glucose in 15minutes
- If glycemia is still low, give Second bolus of D50%
- If the patient can tolerate oral fluids, offer a carbohydrate meal as appropriate (e.g., juice, porridge, rice, etc.) or appropriate nasogastric/enteric feed.
- Recheck the glycemia every hour until 4 normal measures (i.e., > 80mg/dl) then check every 4 hours.
- Plan the control of glycemia for the next 12-24hours

B. Children:

- AVOID D50%: causes hypoglycemic rebounds
- Use D10% at 2-5ml/kg slowly over 2-3min/min to avoid acute hyperglycemia which may cause rebound hypoglycemia
- Then start maintenance fluids with Ringer/Dextrose 5% at 4-6mg/kg/min or 5g/kg/day
  - To get Ringer/dextrose 5%:
    - Add 50ml of D50 to 450ml of Ringer's lactate
  - In Neonates, use D10 at 6-8mg/kg/min
- Recheck glucose level in 15minutes after correcting
  - If still low, repeat bolus of D10 at 2ml/kg
- If the patient can tolerate oral fluids, offer a carbohydrate meal as appropriate (e.g., juice, porridge, rice, etc.) or breastfeed (neonates and other breastfeeding infants), or appropriate nasogastric/enteric feed.

2.2.4 NUTRITIONAL SUPPORT

General considerations:

a. Conduct nutritional assessment for each patient on admission and daily (Appendix E&F):
    - Measure weight, height, mid-upper arm circumference on admission
    - Look for signs of malnutrition: generalized wasting, bilateral pitting oedema, change of hair color (flag sign).
    - Assess daily appetite status to determine the amount of food the patient is able to eat. Adequate caloric intake is necessary for the patient's recovery.

b. Encourage the daily consumption of nutritious food as patients need sufficient energy and essential nutrients in addition to fluid and electrolytes

c. If patient is well enough and can tolerate oral food intake:
    - Offer nutrient dense therapeutic foods and diversify diet to the patients
    - Allow family members to bring food to the patient if they wish

d. If food intake is limited:
    - Offer anti-emetic medication to improve intake if nauseated or vomiting.
    - A health care provider or caretaker should assist the patient with feeding

e. If patient is unable to tolerate oral food or has reduced levels of consciousness:
    - Do not force to eat
    - Insert an NG Tube for feeding
    - IV Supplementation with 10% glucose infusion

f. If SAM is present; refer to the National Guideline for the Management of SAM (adapted from WHO guidelines).

g. For Children: see Table 11 below.

Table 11: Nutritional support recommendations for children

Phase	Recommendation
Rehydration	ORS if able to take oral or IV fluid. For malnourished children, Use RESOMAL
Maintenance (Poor or no appetite)	Milk-based fortified diet: • Infants < 6 months: ready to use infant formula has an advantage overpowered milk formula. It does not require reconstitution with water. • Infants > 6 months: if animal milk is used then liquid whole fat pasteurized or UHT milk is preferred over powdered milk as it does not require reconstitution with water. Add hygienically prepared and appropriate complementary food.
Transition (Some appetite; may or may not have eating difficulties)	No eating difficulties, any one or combination: • Ready to use fortified, nutrient rich foods (paste, porridge, biscuits/bar). • One or two porridges of fortified cereal legume blends with added sugar and milk for children. • Common family meal plus micronutrient powders (if no fortified food is given), preferably offer lipid-based nutrient supplements (LNS) in addition as separate meal. However, avoid micronutrient powders if a malnourished child is already on therapeutic feeds. Eating difficulties, as above except that: • Common family meal as mashed food or soups. • LNS are not suitable for patients with swallowing difficulties. • Ready to use fortified, nutrient rich biscuit/bars/porridge. • In addition, can also use milk-based, fortified diet.
Boost (Good appetite)	Any one or combination of the following: • Ready to use fortified, nutrient rich foods (paste, porridge, biscuits/bar). • One or two porridges of fortified cereal legume blends with added sugar and milk for children. • Common family meal plus micronutrient powders (if no fortified food is given), preferably offer LNS in addition as separate meal. • And snacks such as high energy biscuit. Convalescent patients usually want more food. Do not limit their intake and provide nutrient dense and diversity foods.
Note: LNS refers to any range of fortified, lipid-based spreads, including ready to use therapeutic food to treat severe acute malnutrition, ready to use supplementary food to treat moderate acute malnutrition, and others that are used for fortification.	

Source: WHO Optimized Supportive Care Manual

2.2.5 SYMPTOMATIC CARE

Table 12: Symptoms and recommended management in EVD

Symptom	Recommendation	Comments
Fever	**Paracetamol** PO/IV every 6-8hours: ▪ Adults: 1g PO/IV (Max. 4g in 24hours) ▪ Neonate: o 7.5mg/kg IV 6hourly (Max. 30mg/kg/day) o 10-15mg/kg 6hourly PO (Max. 40mg/kg/day) ▪ Older child: 10-15mg/kg 6hourly PO/IV (Max 60mg/kg/day)	Use 5-7.5 mg/kg for malnourished children because their liver function is compromised
Pain	Assess pain using a standardized pain scale before and after administration of analgesics Mild pain: **Paracetamol** PO/IV (as above) Moderate pain: **Tramadol** PO/IV every 4 – 6 hours as needed: a. Adults: 50 – 100mg (Max. 400mg/day) b. Children > 6months: 1–2mg/kg (Max. 400mg/day) Severe pain: **Morphine** a. Adult: 10mg PO Q4H prn (max. 60mg/day) OR 1-4mg IV/SC b. Child: 0.2-0.4mg/kg/dose PO q4h OR 0.05-0.1mg/kg/dose q4-6	NSAIDS should be **AVOIDED** given their effects on platelet function and risk of gastritis
Nausea and Vomiting	**Metoclopramide** for adults (1st choice in adults. Use with caution in children due to allergic reaction) **Ondansetron** PO/IV (1st choice in children) ▪ Adults: 8mg PO every 12hrs OR 4mg IV every 8hrs ▪ Children: 0.15mg/kg PO/IV every 12 hrs (Max) **Promethazine** (*Only adults*): 12.5–25mg PO every 4-6hrs as needed **Metopimazine** (VOGALENE) PO/IM/IV/Suppo ▪ Adults (>12years): 5-10mg IM/IV every 8 hrs OR 1-2 Suppo every 8 hrs ▪ Children 6-12 year: 2.5-5mg IM/IV every 8 hrs OR ½ - 1 Suppo every 8 hrs ▪ Children <6 years: Syrup 1mg/Kg/jour	
Diarrhea	Manage conservatively. See fluid and electrolyte management ▪ Child <6mon: Zinc sulfate 10mg qd x 14 days ▪ Child >6 mon: Zinc sulfate 20mg qd x 14 days ▪ Abdominal pain (see f pain above & dyspepsia below)	Antimotility agents are **NOT** recommended given the potential for ileus
Dyspepsia	Give **Omeprazole** PO/IV every 24hours ▪ Adults: 40mg once daily ▪ Children and adolescents: - 5–10kg: 5mg once daily - 10 – 20kg: 10mg once daily - ≥ 20kg: 20mg once daily	

Symptom	Recommendation	Comments
Anxiety	First line: Talk with a mental health counsellor Moderate to severe anxiety: mental status exam and **Diazepam**: ▪ Adults: 5–10 mg PO Q8 hr PRN long mentation is unaffected ▪ Children: 0.05 – 0.1 mg/kg PO Q6hrs as needed	- Benzodiazepines should not be given in patients with altered mentation
Agitation	Adults: ▪ **Diazepam** 2–10mg PO/IV every 6–8hours as needed ▪ **Haloperidol** 0.5 – 5mg every 4–6hours as needed Children: ▪ >6 years: Haloperidol 1–3mg IM Q4–8hours as needed ▪ 3–6 years: Haloperidol 0.01–0.03mg/kg once daily	Haloperidol is associated with QT prolongation. Monitor regularly with ECGs if available

2.3 TREATMENT OF CO-MORBIDITIES

2.3.1 MALARIA

A. General considerations:

- Malaria is the leading cause of morbidity and mortality, accounting for about 42% of all clinical consultations and 44% of all inpatient deaths among children under five years of age.[15]
- The clinical presentation of malaria mimics EVD.
- Malaria (mRDT) testing should be done for all patients.
- Start empirical anti-malarial therapy in all febrile patients with suspected and confirmed EVD (even in the absence of malaria testing).
- Treat uncomplicated malaria when there are no signs of severe malaria.
- Treat complicated malaria when one or more signs of complicated malaria.
- Stop treatment once malaria testing is negative or treatment course is finished.
- Severe malaria manifests as one or more of the following:[16]

Table 13: Clinical presentation of severe malaria

Impaired consciousness or coma	Acute renal failure
Multiple convulsions (>2 in 24 hours)	Circulatory collapse or shock
Severe anemia (HB <7g/dL or ≤6g/dL in children)	Acute pulmonary edema and ARDS
Hypoglycemia	Deep breathing or respiratory distress (acidosis)
Clinical jaundice PLUS other vital organ failure	Abnormal bleeding
Prostration-unable to sit, stand or walk	

B. Treatment of uncomplicated malaria:

a. Treat uncomplicated malaria according to the standard national guideline:

3-day course of Artesunate-Amodiaquine or Pyronaridine-Artesunate according to body weight and age (Table 14 below)

Table 14: Oral Artesunate-Amodiaquine dosing by age group/body weight

Body weight (age)	Dose
4.5–9 kg (2–11 months)	25/67.5 mg tablet: one tablet once daily
9–18 kg (1–5 years)	50/153 mg tablet: two tablets once daily
19–35 kg (6–13 years)	100/270 mg tablet: one tablet once daily
≥ 35kg (≥ 14 years)	50/153 mg tablet: four tablets once daily OR 200/540 mg tablet: one tablet once daily

b. Second Option:

3-day course of Artemether-Lumefantrine according to body weight and age:

Table 15: Oral Artemether-Lumefantrine dosing

Body weight (age)	Dose
0-15kg	20/120mg tablet: one tablet twice daily
15-24kg	20/120mg tablet: two tablets twice daily
25-40kg	20/120mg tablet: three tablets twice daily
>40kg	80/480mg tablet: one tablet twice daily

C. Treatment options of complicated malaria:

a. Treat complicated malaria according to the standard national guideline:

- IV Artesunate
    - Adults and children >20kg:

        - 2.4mg/kg/dose at 0,12, 24, and 48hours after initial dose for a total of 4 doses over a period of 3 days
    - Children and infants <20kg:
        - 3mg/kg/dose at 0,12, 24, and 48hours after initial dose for a total of 4 doses over a period of 3 days
- Transition to oral therapy at least 4 hours after last dose of Artesunate
- Continue IV Artesunate for additional 4 days if patient is still critically ill and unable to transition to oral therapy.

2.3.2 BACTERIAL CO-INFECTIONS

A. General considerations:

- Clinician should try to localize the infection and treat as appropriate.
- Empiric treatment with broad spectrum antibiotics is recommended in EVD taking into consideration coverage for ETU acquired secondary infections and development of resistant gram-negative bacteremia or clostridium difficile.
- If available, monitor white blood cell counts and/or other inflammatory markers to assist in de-escalation of antibiotics
- Caution should be taken with use of fluoroquinolones and macrolides due to QT prolongation with these agents

B. Treatment options:

i) Adults:

- Severe disease:
    a. IV Ceftriaxone 2g once daily 5 days AND
    b. IV Metronidazole 500mg three times daily (usually 7 days)
    c. **Note:** If suspect bacterial meningitis, then give ceftriaxone 2g BID
- Mild disease:
    a. PO Cefixime 200mg twice daily for 5 days

ii) Children >4-week-old to 17-year-old:

- Severe disease:
    a. IV Ceftriaxone usually 5 days

- > 4 weeks – 10 years: 50–100 mg/kg once daily
- 10 – 17 years: 1–2 g once daily

b. +/- IV Metronidazole 7.5mg/kg (maximum dose 500mg) 8 hourly

iii) Neonates:

- Ceftriaxone is not recommended for use in neonates due to the increased risk of kernicterus especially in presence of elevated bilirubin.
- Treatment options:

- IV Ampicillin OR IV Cloxacillin OR IV Cefotaxime **PLUS**
- Gentamycin IV for 7–10 days but may be prolonged if meningitis present

Table 16: Antibiotic dosing in neonates

	Ampicillin IV	Cefotaxime IV	Cloxacillin IV	Gentamycin IV
Premature/LBW		50mg/kg 12hourly		3mg/kg once daily
First week of life	50mg/kg twice daily	50mg/kg 8hourly	25–50mg/kg 12hourly	5mg/kg once daily
Weeks 2–4	50mg/kg thrice daily	50mg/kg 8hourly	25–50mg/kg 8hourly	7.5mg/kg once daily
After Week 4	50mg/kg 6hourly	50mg/kg 8hourly	25–50mg/kg 6hourly	

2.3.3 HIV/AIDS

- Ask all patients about HIV history and/or screened for HIV according to the national guidelines
- Patients co-infected with EVD and HIV must continue their antiretroviral and other related medications if already on treatment.
- Start cART for all newly-diagnosed patients according to the national guidelines.
- Before discharge, all EVD-survivors living with HIV should receive HIV counselling and referred to HIV treatment and care by an HIV clinical of their choice. Patients already enrolled in care pre-EVD should be referred to their primary care provider.
- Infants of mothers who are receiving ART should be given prophylaxis according to the national HIV treatment guidelines.

2.3.4 OTHER INFECTIONS

Assess the patient during triage, initial and follow-up assessments the patient for other common infections and treat appropriately according to national guidelines.

2.3.5 NON-COMMUNICATBLE DISEASES

- Reassess patients and review their medications in line with EVD-specific considerations E.g., ASA/warfarin in EVD can potentiate risk of hemorrhage.
- Patients with pre-existing conditions such as cardiovascular diseases (e.g., hypertension, diabetes mellitus) should continue their prescriptions unless contraindicated. Patients with newly diagnosed NCDS while admitted to the ETU should be treated according to national recommendations.

2.3.6 PREVENTION OF COMPLICATIONS

General considerations:

a. Feeding:
   - Encourage early enteral nutrition

b. Mobility:
   - Early mobility and ambulation to prevent pressure injuries and thrombotic events
   - Aid patient to sit up, dangle on side of the bed, then to stand and walk
   - If unable to mobilize, turn patient in bed every 2–4 hours to prevent decubital complications (e.g., bed ulcers, UTI, pneumonia, etc.).

c. Stress gastric ulcer prophylaxis:
   - Use a proton-pump inhibitor or H2-receptor blocker in critically ill patients at high risk of bleeding
     i. **Omeprazole:**
        - Adults:
          - 40mg PO every 24hours.
        - Children and adolescents:
          - 5–10kg: 5mg once daily

- 10 – 20kg: 10mg once daily
- ≧ 20kg: 20mg once daily

- Neonates: 0.7mg/kg/dose once daily

ii. Ranitidine:

- Adults:
  - 150mg PO twice daily or 50mg three times daily
- Children:
  - 1mg/kg IV every 6–8 hours all ages, Max. 50mg
  - 2 – 4 mg/kg 12 hourly all ages, Max. 300mg/day

2.4 EBOLA SPECIFIC TREAMTMENT

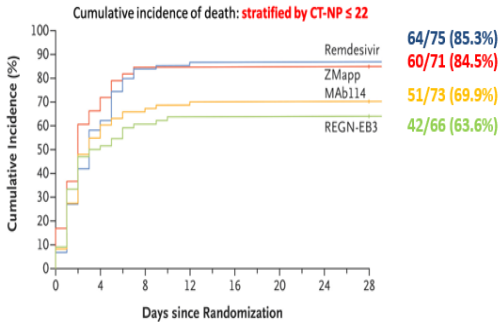
A multicenter, open-label, randomized controlled multidrug trial (PALM Trial) conducted during the 2018 EVD epidemic in DRC evaluated the efficacy of three experimental therapies: Remdesevir (an antiviral agent); mAb114 (a single monoclonal antibody); and REGN-EB3 (a triple monoclonal antibody) in comparison to ZMapp (a triple monoclonal antibody used during the 2013–16 EVD outbreak). Both mAb114 and REGN-EB3 were superior to ZMapp in reducing mortality rates due to EVD by 35% and 33%, respectively (Table 17). The mortality rate was 9.9% and 11.2%, respectively in patients with low viral loads. The study also demonstrated the importance of early treatment, with an 11% increase in the odds of death for each day that symptoms persisted before study enrolment.[17] FDA approved Inmazeb (REGN-EB3) for EVD (EBOV) treatment in adult and children on October 14, 2020.[18]

Table 17: Comparison of Death at 28 Days According to Treatment Group

Table 2. Comparison of Death at 28 Days According to Treatment Group.

Population	ZMapp	Remdesivir	Difference, Remdesivir vs. ZMapp	MAb114	Difference, MAb114 vs. ZMapp	REGN-EB3	ZMapp Subgroup	Difference, REGN-EB3 vs. ZMapp Subgroup
	no. of deaths/ total no. (%)	*no. of deaths/ total no. (%)*	*percentage points (95% CI)*	*no. of deaths/ total no. (%)*	*percentage points (95% CI)*	*no. of deaths/ total no. (%)*	*no. of deaths/ total no. (%)*	*percentage points (95% CI)*
Overall	84/169 (49.7)	93/175 (53.1)	3.4 (−7.2 to 14.0)	61/174 (35.1)	−14.6 (−25.2 to −1.7)*	52/155 (33.5)	79/154 (51.3)	−17.8 (−28.9 to −2.9)*
Patients with high viral load†	60/71 (84.5)	64/75 (85.3)	0.8 (−15.3 to 17.2)	51/73 (69.9)	−14.6 (−33.0 to −0.5)	42/66 (63.6)	56/65 (86.2)	−22.5 (−41.8 to −5.1)
Patients with low viral load†	24/98 (24.5)	29/100 (29.0)	4.5 (−9.1 to 19.1)	10/101 (9.9)	−14.6 (−32.4 to −2.6)	10/89 (11.2)	23/89 (25.8)	−14.6 (−32.6 to −2.3)

* The result is significant according to the interim stopping boundary of P<0.035 for the MAb114 group and P<0.028 for the REGN-EB3 group.
† Patients with a high viral load had an EBOV nucleoprotein Ct value of 22.0 or less. Patients with a low viral load had an EBOV nucleoprotein Ct value of more than 22.0. The total number is the total number of patients in this category for each group.



2.4.1 REGN-EB3 (INMAZEB)

A. Overview

- Triple-monoclonal antibody containing Atoltivimab, Maftivimab, and Odesivimab
- Binds to three epitopes on EBOV surface glycoprotein (GP), causing virus neutralization and immune effect.

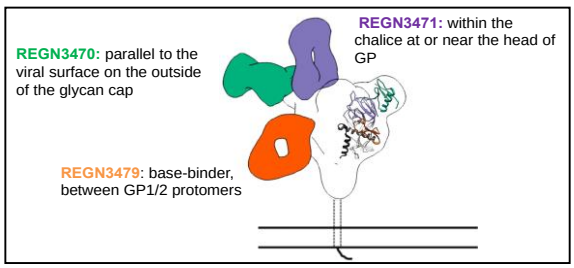


Figure 3: Molecular targets of Enmazeb

B. Indication:

- Treatment of EBOV in adult and pediatric patients including newborns of mothers who have tested positive for the infection

C. Contraindications:
   - None
   - The patient should not receive another anti-Ebola virus investigational product **within 30 days** of infusion of REGN-EB3
   - REGN-E3B may interfere with the activity of Ebola vaccines.

D. Limitations:
   - Efficacy of REGN-EB3 has not been established for other species of Ebolavirus.
   - Zaire ebolavirus changes all the time, available information on drug susceptibility patterns for circulating strains should be considered when deciding to use REGN-EB3

E. Dosing and preparation
   - Supplied as 20ml glass vial containing 750mg or 14.5ml of REGN (50mg/ml)
   - Recommended dosing: 150mg/kg reconstituted with 0.9% saline solution [**Neonates:** use D5W solution] administered as a single IV infusion over 2-4hours [**Neonates:** infuse over 4 hours].
   - Monitor the patients closely for adverse effects: e.g., allergy, hypersensitivity.
   - Examine at baseline, q15 mins during, and q4hr up to 48 hr after infusion.
   - Lab examination at baseline, three and seven days after infusion.
   - Ensure strict preparation and administration by trained staff.

Example: Calculate the dose of REG-E3B for a 73kg EVD patient

- Calculate Dose: 73kg * 3ml/kg = 219 mL REG-E3B needed
- Calculate # vials: 219mL ÷ 14.5mL/vial = 15.1 → ALWAYS ROUND UP → 16 vials
- DISCARD the remaining 13mL from the last vial
- Add to prepared infusion bag: add needed volume (219 mL) of REGN solution from the 16 vials to the 1L IV infusion bag of 0.9% sodium chloride and administer as a slow IV infusion over 4 hours.
- Mix: Invert bag 10 times to mix

- The clinical staff should be trained in the preparation, storage, administering REGN, and monitoring of patients, documenting, and reporting any potential adverse effects.

F. Infusion protocol:

- Cannula: 22 G 1inch (adult) or 25G 1 inch (child)
- For children with body weight ≤ 20 kg, a pediatric syringe pump is recommended to ensure the low infusion rate.
- Set the drop rate to deliver dose over the course of 2-4 hours depending on weight.
- When few mLs left in the infusion bag:
  - Hang a 250 mL 0.9% sodium chloride flush bag, or
  - Inject at least 50 mL of 0.9% of sodium chloride into the IV infusion bag
- Record post-infusion vital signs
- Discard the tubing and the IV bag in the biohazard waste container
- In patients <20 kg use 5% Dextrose or Lactated Ringer's to avoid hypoglycemia.
- Clinician should use medical judgement based on the patient's clinical status.

Table 18: INMAZEB Infusion Volume and Times by Body Weight (dosing table)

Body Weight (kg)	Volume of INMAZEB per kg of Body Weight[a]	Total Infusion Volume After Dilution (mL)[b]	Infusion Time
0.5 to less than 1	3 mL per kg of body weight	7	4 hours
1 to 1.9		15	
2 to 3.9		25	3 hours
4 to 7		50	
8 to 15		100	
16 to 38		250	2 hours
39 to 79		500	
80 to 149		1,000	
150 and above		2,000	4 hours

[a] The dose is 50 mg of atolivimab, 50 mg of maftivimab, and 50 mg of odesivimab per kg of body weight (a volume of 3 mL/kg).

[b] The recommended infusion volume ensures the final concentration of the diluted solution is 9.5 mg/mL to 23.7 mg/mL. 5% Dextrose Injection, USP is recommended for neonates.

G. Shipping and storage

- Drug will be shipped to the clinical sites at 2°C – 8°C and refrigerated at 2°C – 8°C in the original carton.
- Discard prepared solutions after 4 hours (or 24 hours if in refrigerator).
- Protect from light, do not shake, and do not freeze. Report all temperature excursions and discard the affected batch according to the national guidelines.

2.4.2 ANSUVIMAB (MAB114 OR EBANGA)

A. Overview
   - A single Ig G1 monoclonal antibody isolated from a Zaire ebolavirus survivor (Kikwit strain) 10 years after infection
   - It targets the EBOV GP glycan cap and GP1 domains and neutralizes the virus

B. Indications:
   - Treatment of infection caused by Zaire ebolavirus in both adult and pediatric patients including pregnant women and neonates born to a mother with EVD.

C. Contraindications:
   - None
   - Patients vaccinated with Ebola vaccines can be treated with Ebanga.

D. Limitations:
   - Efficacy of Ebanga has not been established for other species of the Ebolavirus.
   - Zaire ebolavirus mutates all the time, available information on drug susceptibility patterns for circulating strains should be considered when deciding to use Ebanga

E. Dosing and preparation:
   - Supplied as 20ml glass vial containing 400mg/vial of Ebanga
   - Recommended dosing: 50mg/kg served as a single IV infusion over 60 minutes
   - Ebanga solution must be reconstituted with sterile water for injection and further diluted with 0.9% sodium chloride or lactated ringer's fluid prior to infusion
   - Obtain informed consent.
   - Weigh patient and take vital signs.
   - Calculate required dose of MAb114 (*refer to dosing table*).

- Remove the required number of vials from 2-8°C storage and equilibrate to room temperature for >20 minutes.
- In a limited access, biological safety cabinet with laminar flow using aseptic technique, add 7.7 mL of SWFI to each vial.
- Gently mix the vial by swirling, stopping every 30 seconds. Let the vial sit on the counter for 10 seconds, until reconstitution is complete. Proceed until vial is free of visible particles.
- After reconstitution, MAb114 must be administered within 4 hrs.
- Fill 250mL empty sterile IV bag with 100mL of sterile 0.9% sodium chloride solution, using sterile syringe and needle and standard aseptic technique.
- Transfer required amount of reconstituted MAb114 from the glass vials into the sterile IV bag containing 100mL of sterile 0.9% sodium chloride solution.
- Administer over the course of 60 minutes.
- Take vital signs 15min into the infusion and at the end of the infusion.
- Physicians should complete the safety evaluations completed by physician using the standard Case Report Form.

Table 19: EBANGA Dosing Table

Weight in kg	Volume of EBANGA	Diluent Volume (mL)[a,b]	Final Infusion Volume (mL)	Syringe or Infusion Bag Volume for IV Administration
0.5 kg	1 mL/kg	2.5 mL	3 mL	10 mL syringe compatible with IV infusion pump
1 kg		5 mL	6 mL	
2 to 10 kg		10 mL	12 to 20 mL	25 mL IV bag
11 to 25 kg		25 mL	36 to 50 mL	50 mL IV bag
26 to 50 kg		50 mL	76 to 100 mL	100 mL IV bag
51 to 100 kg		100 mL	151 to 200 mL	250 mL IV bag
101 kg and above		150 mL	251 mL and above	500 mL IV bag

[a] The recommended diluent volume ensures the final concentration of the diluted solution is approximately 8-30 mg/mL.

[b] For IV bag administration, the diluent volume column includes the volume of diluent needed to remain in the infusion bag.

F. Shipping and storage:

- Same as REGN-EB3

2.5 EBOLA VACCINATION

The following vaccines were approved for use during outbreak settings to protect against EVD in high-risk individuals and contacts

2.5.1 4.3.1. RVSV-ZEBOV (ERVEBO)

A. Overview
   - Ervebo is a live attenuated vaccine using a genetically engineered vesicular stomatitis virus to carry an Ebola virus glycoprotein gene insert.
   - The vaccine was found to be 100% effective in preventing EVD in people who took the vaccine more than 10 days after high risk exposure to Ebola infection.[17, 19] The FDA approved the vaccine for vaccination adults.[17]

B. Indications:
   - Persons ≥18-year-old at high risk of contracting EBOV in outbreak settings including frontline HCWs, HREGs, including pregnant women.

C. Dose
   - Ervebo is administered under sterile procedure as a single 1-mL intramuscular dose, preferably in the deltoid area of the non-dominant arm.
   - Do not mix the vaccine in the same syringe with any other vaccines or drug.

D. Side effects
   - It is safe. However, a small proportion of recipients experience a reaction such as fever, headache, nausea, arthralgia, mild flu, and pain, swelling, and redness at the injection site. Anaphylaxis is rare.[20]

E. Contraindications:
   - Persons with a history of severe allergic reaction (e.g., anaphylaxis) to rice protein should not receive Ervebo. There is insufficient data on the safety in immunocompromised individuals. The benefits should be weighed against the risk of disease.
   - Ervebo is a live attenuated vaccine and has been detected in the saliva and blood of vaccinated person (i.e., a small potential risk of transmission within 14 days).

2.5.2 TRIAL THERAPEUTIC AND VACCINES

Two trial Ebola vaccines (AD26.ZEBOV and Mvabea) received emergency use approvals. Under normal circumstances, investigational products undergo testing through rigorously conducted clinical trials. Clinical trials generate reliable data to determine the safety and efficacy of new interventions. The high mortality of EVD (18-93%) creates the ethical imperative to offer individual patients experimental interventions that are safe. The WHO approved their use under the Monitored Emergency Use of Unregistered and Investigational Therapeutics (MEURI) because they are still undergoing investigation for their safety and efficacy. Under the MEURI protocol, the decision to use an experimental product must meet the following criteria:

- No proven effective treatment exists
- It is not possible to initiate clinical studies immediately
- Data providing preliminary support of the intervention's efficacy and safety are available, at least from laboratory or animal studies, and use of the intervention outside clinical trials has been suggested by an appropriately qualified scientific advisory committee on the basis of a favorable risk–benefit analysis
- The relevant country authorities, as well as an appropriately qualified ethics committee, have approved such use
- Adequate resources are available to ensure that risks can be minimized
- The patient's informed consent is obtained; and
- The use of the intervention is monitored, and the results are documented and shared in a timely manner with the wider medical and scientific community.

2.5.3 AD26.ZEBOV/MVA-BN-FILO VACCINE.

A. Overview
   - The European Medicines Agency (EMA) granted marketing authorization to the two-dose vaccine series (recombinant adenovirus AD26.ZEBOV; sold as Zabdeno) and modified vaccinia Ankara (MVA-BN-Filo; sold as Mvabea) for individuals aged ≥1 year.[21] Zabdeno and Mvabea were approved to be used in Liberia by WHO and LMHRA under the MEURI protocol.

B. Constituents:
   - Recombinant human adenovirus 26 virus encodes the Zaire ebolavirus glycoprotein; Ad26.ZEBOV (sold as Zabdeno)
     - Modified vaccinia Ankara virus (Mvabea) encodes the glycoproteins of three ebolaviruses, *Zaire*, *Sudan ebolavirus,* and Marburg Musoke virus, and the nucleoprotein of the *Tai Forest ebolavirus.*

C. Vaccination strategy
   - The Zabdeno/Mvabea vaccination strategy is a prime-boost approach, administered in 2 doses, 8 weeks apart:
     a. Dose 1: Ad26.ZEBOV, $5x10^{10}$ vp
     b. Dose 2: MVA-BN-Filo, $1x10^{8}$ Inf.U, 8 weeks or 56 days after dose.
   - The EMA found both vaccines to be safe and immunogenic both separately and in combination.[21] Prime-boost vaccination is expected to provide more lasting immunity than the single dose Ervebo.[22]
   - WHO recommends a booster vaccination with MVA-BN-Filo of individuals who completed the two-dose vaccination regimen, more than four months ago but are at risk of exposure to EVD (e.g., HCW, people in regions with ongoing EVD outbreak).[23]

3 MANAGEMENT OF COMPLICATIONS

The main complications of EVD include:

- Sepsis and septic shock.
- Seizures
- Altered mental state and encephalopathy
- Hemorrhage
- Acute renal failure/kidney injury
- Metabolic acidosis
- Hypoxic respiratory failure

3.1 SEPSIS AND SHOCK

A. Definitions:

- Sepsis is defined as life threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection.
- Sepsis in children is defined as suspected or proven infection with Quick Sequential Organ Failure Assessment Score (QSOFA)≥2. [24, 25] Septicemia should be considered in child with acute fever who is severely ill, when no other cause is found.
- Shock is a life-threatening condition characterized by circulatory dysfunction causing inadequate oxygen delivery to meet metabolic needs and oxygen consumption requirements resulting in cellular and tissue hypoxia.
- Septic shock on the other hand in adults is defined as persisting hypotension despite volume resuscitation, requiring vasopressors to maintain mean arterial pressure (MAP) ≥65 mmHg and serum lactate level > mmo/L.[25] Septic shock is severe infection and circulatory dysfunction

B. Principles of Management:

a) Early recognition of patients with sepsis and shock

- Suspect shock in an adult if:
    - SBP < 100mmHg and any of the following:

        - Weak of fast pulse
        - Respiratory distress
        - Delayed capillary refill
        - Altered level of consciousness
- Suspect Sepsis if:
    - Suspected or documented infection and any of the following:
        - Acute alteration in mental status or GCS <15
        - Tachypnoea > 22counts per minute
        - SBP < 100mmHg
        - Urine output <30ml/hr
- Suspect septic shock if:
    - Signs of sepsis AND persistent hypotension (SBP<90mmHg) despite adequate fluid resuscitation.

b) Targeted fluid resuscitation during first 6 hours:

- Give CRYSTALLOID IV fluids RL or NS as a fluid challenge (bolus or loading):
    - Avoid hypotonic solutions
    - Adults:
        - If shock with no respiratory distress:
            - give initial fluid challenge at 20 – 30ml/kg over 30–60 minutes or faster
        - if shock with severe respiratory distress:
            - give initial fluid challenge at 10–15ml/kg over 30–60 minutes
        - If shock persists, repeat fluid boluses of 500mls over 30minutes up to 60ml/kg over first 2 hours
    - Children:
        - Start initial bolus at 10 – 20ml/kg over 30 – 60minutes or faster
        - If shock persists, repeat bolus at 10ml/kg over 60minutes
        - Maximum fluid at 1 hour – 30ml/kg
- Reassess vital signs every 30minutes for fluid responsiveness, markers of perfusion and fluid losses.

- Start vasopressors if patient is not responsive to fluids after one hour of resuscitation.

c) Vasopressors

- Vasopressors maintain a minimum perfusion pressure and adequate flow during life-threatening hypotension
- Adults:
    - **Norepinephrine** is the drug of choice
    - Dose: 0.01 – 3.3mcg/kg/min as an infusion
    - If not available, give **Epinephrine/Adrenaline** at 0.05–0.1mcg/kg/min
- Children:
    - Epinephrine is preferred
    - Dose: 0.05 – 0.5mcg/kg/min
    - If child has hypotension (warm shock), add norepinephrine 0.05 – 0.3mcg/kg/min

d) Inotropes if available

- Add inotropes if patient shows continued signs of hypoperfusion despite adequate fluid loading and use of vasopressors to reach target MAP
- **Dobutamine** is the first-choice inotrope
    - Dose: start at 2.5µg/kg (Max. 20) and titrate to improve clinical markers of perfusion and cardiac output

e) Appropriate antimicrobials within 1 hour

- Give appropriate, combination of empiric broad-spectrum antimicrobials within one hour of recognition of patient with sepsis or septic shock (in the emergency area when possible).
- Each hour delay in administration of effective antimicrobial therapy in septic shock is associated with increased mortality.
- Combination Therapy preferred i.e., using two antibiotics of different antimicrobial classes aimed at most likely bacterial pathogen:
    - Adults:
        - Ceftriaxone 2g q12 [or Cefotaxime] PLUS Metronidazole 0.5g iv q8h

          OR

        - Ampicillin 2g iv q12h PLUS Gentamicin 120mg qd PLUS Metronidazole
    - Child
        - Ceftriaxone 50mg/kg q12h [or Cefotaxime] (± Metronidazole 7.5g/kg iv q8h)
        - Ampicillin 50mg/kg iv q6h PLUS Gentamicin 5mg/kg qd (± Metronidazole).
    - Neonates:
        - Ampicillin 50mg/kg iv q6h PLUS Gentamicin 5mg/kg iv qd

f) Transfusion if severe anemia

- Give packed RBCs transfusion when there is severe anemia (Hb < 7.0g/dl)

g) Frequent reassessment and monitoring

- Resuscitation targets within 6hours
    - SBP >100mmHg
    - Urine output ≥30ml/hr
    - Heart rate <100/min
    - Capillary refill <3 seconds
    - Absence of skin mottling
    - Warm extremities
- Monitor for signs of fluid overload:
    - Increased JVP, elevated pulse, new onset/worsening respiratory distress,
    - Basal crepitations on auscultation
- Limit infusion to daily output (urinary and insensitive loss)

3.2 ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS)

A. **Definitions:**

- New or worsening respiratory symptoms with onset within one week of a known clinical insult excluding pulmonary edema of cardiac origin.
- Where arterial blood gas analyzer is not available, pulse oximeter should be used and ARDS is diagnosed using the Kigali modification of the Berlin definition of ARDS i.e., $SPO_2/FiO_2 < 315$ [26].
- Assess the patient (e.g., vital signs, RR >24 cycles per minute with hypoxemia).
- Oxygen saturation (SPO_2) on room air is <94%
- Evidenced by increased work of breathing despite oxygen delivery

B. **Causes:**

- If hypoxemia is not present, then rapid breathing can be associated with acute/severe pain, hyperpyrexia, shock state, and/or metabolic acidosis.
- When hypoxemia is present, consider underlying pulmonary condition such as:
    - Volume overload/pulmonary edema from congestive heart failure
    - Secondary bacterial pneumonia
    - Hemothorax
    - Bronchospasm from anaphylaxis.
    - Sepsis or shock

C. **Management:**

- Review symptoms and signs (ABC) and vital signs
- Assess for co-morbidities and clinical laboratory (e.g., blood chemistry, complete blood count, blood glucose, rapid test for malaria, typhoid, etc.)
- Provide support treatments outline below:

D. **Oxygen therapy in adults**

- Provide supplemental oxygen to achieve $SPO_2 \geq 94\%$, unless the patient is at risk of hypercapnia [27, 28]. Going higher promote formation of atelectasis, fibrosis and uses up supplies without any added benefit.
- Titrate oxygen to lowest flow rate to reach target $SpO_2 > 94\%$
    - In the patient requires1-5L/min (20-40% oxygen): use a nasal cannula connected to an oxygen concentrator or cylinder titrated to

the flow rate. Reassess the patient every 1-4 hours. A patient who is unable to achieve target saturation should be reassessed for complications and switched to 6-9L/min.

- In the patient requires 6–9L/min: use a simple face mask (without reservoir) or a red venturi mask connected to oxygen cylinder. This will deliver up to 40-60% oxygen. Oxygen delivered from a cylinder should be passed through a humidifier to avoid drying and injury to the airways mucosal. Under exceptional situation where higher concentration of oxygen is required and cylinders are not available, two oxygen concentrators can be combined using a "Y" connector. Reassess the patient every 1-2 hours. Patients who are unable to achieve target saturation should be switched to 10-15L/min and reassess for complications.
- If the patient requires 10–15L/min: use non-rebreather mask (facemask with reservoir). Non-rebreather mask delivers 85-90% oxygen at 15L flow rate from oxygen cylinder or liquid oxygen source. Saturations should be maintained between 94-96%. Green venturi mask can deliver up to 10-15L/min (40-60% oxygen). Avoid if unable to prevent aerosol spread.

- Reassess patients on oxygen every 1-2 hours (SPO_2, vital signs, basic respiratory exams), and provided other supportive care.

i. Positive Pressure non-invasive ventilation (NIV)

If severe hypoxemia persists, consider Bubble CPAP (Continuous positive airway pressure) or high flow oxygen systems if available:

- **CPAP** provides high pressure oxygen with a tight-fitting mask and maintain positive pressure all the time to help keep the airways open. Patients with pulmonary edema may require CPAP and other treatment of volume overload/edema. If no improvement, increase the CPAP pressure to 10-15 cm.H_2O if tolerated. Titrate FiO_2 against oxygen saturation. Falling FiO_2 requirements indicate recruitment, whereas rising FiO_2 requirements suggests CPAP failure.

- **BiPAP** (bilevel positive airways pressure) ensures high positive pressure on inspiration and lower positive pressure on expiration. BiPAP is useful in patients with ARDS and those presenting with COPD exacerbation.

Adequate ventilation and oxygenation, correction of respiratory failure and the patient's tolerance and comfort are the main goals of Non-Invasive Ventilation (NIV). The initial setting should focus on achieving adequate tidal volumes (5-7 mL/kg) and additional support to reduce the respiratory rate to less than 26 cpm and achieve a pulse oximetry goal of >90% on room air. Where available, serial arterial gas measurements are essential to monitor response to therapy and guide further adjustments of the ventilator. Initial settings starting at 10 cm.H_2O or 5 cm.H_2O) and adjustments based on level of improvement in patient status.

- Proper fitting of the mask is key for successful NIV. NIV should be provided by trained staff.
- Nasal mask is suited for patients who are cooperative, have aspiration risk with emesis, less severe disease and patients who are not claustrophobic.
- Orofacial mask is suited for less cooperative patients, patients with higher severity and provides more effective ventilation.
- If status deteriorates, pre oxygenate with 100% FiO_2 for 5 minutes, via a face mask with reservoir bag/bag-valve mask/HFNO/NIV
- Institute mechanical ventilation (endotracheal intubation) while maintaining strict IPC practices (refer to IPC section) by a trained and experienced provider. A rapid sequence intubation is appropriate after an airway assessment that identifies no signs of difficult intubation.
- Implement lung protective ventilation (LPV) using lower tidal volumes (6ml/kg predicted body weight) and lower inspiratory pressures (plateau pressure <30cmH_2O), respiratory rate of 35 cycles per minute, PEEP < 10 mmH_20 and FiO_2 of 100% in ARDS. Deep sedation may be required to control respiratory drive and achieve tidal volume targets.[29]

- NIV is only suited for patients who have inspiratory effort. NIV is contraindicated in patients with coma (Glasgow Coma Score <7), cardiac arrest, respiratory arrest, gasping for air, shock (SBP<90 mm Hg), increase in encephalopathy, inability to protect the airway (e.g., impaired swallowing or cough, depressed sensorium, status epilepticus, etc.) or another condition that requires immediate intubation.

ii. Invasive ventilation:

- Patients with critical disease NOT improving on NIV require invasive ventilation (i.e., a ventilation bag or machine is attached to an artificial airway [i.e., endotracheal tube or tracheostomy tube] to ventilate the lungs.
- Invasive ventilation allows for fully controlled delivery of 100% oxygen. It is required for critically ill patients who are not improving with lower oxygen support. A trained staff with skill is required. These patients require 24-hour monitoring. In the absence of skilled staff and mechanical ventilation, patients in this category should continue oxygen therapy with non-rebreather mask combined with prone positioning if not contraindicated.

E. **Oxygen therapy in children:**

- Nasal cannula is preferred as may be easier to tolerate (See Table 18).

Table 20: Oxygen flowrate in children

Age	< 1 month	1 – 12 months	Preschool age	School age
Oxygen flow rate	0.5 – 1.0L/min	1 – 2 L/min	1 – 4 L/min	1 – 6 L/min

3.2.1 PULMONARY EDEMA

- For patients with evidence of chest congestion or pulmonary edema (e.g., anxiety, SOB, feeling of drowning, tachypnea, diffuse crackles, hypoxemia, etc.):
  - Furosemide:

- Adult: 60-120 mg IV 6-8 h
- CHILDREN: 1mg/kg.

- Reassess the patient q1-2 hours to prevent dehydration or hypotension.
- Provide respiratory support as described above.
- Treat other underlying causes of pulmonary edema (e.g., cardiogenic or pulmonary)

3.3 ACUTE KIDNEY INJURY

A. Definitions

- Increased serum creatinine > 0.3mg/dl (or >26.5mmol/l within 48 hours)

OR

- Reduced urine output
  - Adults: < 0.5ml/kg/hr for 6 hours
  - Children: < 1ml/kg/hr for 6 hours

B. Management:

- Early recognition is crucial: Monitor and record urine output at every shift:
  - Insert a foley catheter if patient is very weak, unconscious or has altered level of consciousness or anuric.
- Evaluate and treat for reversible causes of AKI
- Ensure good volume status with adequate fluid resuscitation and vasopressors to maintain renal perfusion and prevent further injury
- Do not use diuretics to stimulate production in a dehydrated patient
- Prevent further injury by:
  - Avoiding nephrotoxic drugs (e.g., NSAID, aminoglycoside, ACE Inhibitor)
  - Use appropriate doses of drugs
- If resources are available, consider renal replacement therapy

3.4 SEIZURE, ALTERED MENTAL STATUS & ENCEPHALOPATHY

A. General considerations:

- Position patient in recovery position
- Provide supplemental oxygen
- Establish IV/IO access if safe to do so or treat with pharmacotherapies delivered rectally or intramuscular IM first and then establish IV/IO access
- Check for hypoglycemia and treat accordingly
- Treat underlying causes:
    - Sepsis, electrolyte imbalances (hyponatremia), Acidosis, Drugs, Uremia, EVD associated meningoencephalitis, Intracranial hemorrhage, underlying seizure disorder, Hepatic encephalopathy, Viral encephalopathy etc.
- If patient is delirious:
    - Assess for, treat, or prevent secondary infections (see section on antibiotics)
    - Avoid centrally acting medications
    - Administer an antipsychotics like haloperidol as needed

B. Treatment options

- First line:
    - Diazepam at 0.15–0.3mg/kg IV/IO Max. 10mg/dose
        - If no IV/IO access, give rectal diazepam at 0.5mg/kg
    - Midazolam Buccal/ IM
- Second line: If repeated seizures:
    - Phenobarbital OR Phenytoin OR Levetiracetam (Keppra): [see Table 19].

Table 21: Diazepam, Phenobarbital, and Phenytoin Dosing Recommendation by age

Age	Diazepam rectal gel*	Diazepam IV	Phenobarbital IV		Phenytoin IV	
			Loading dose	Maintenance dose	Loading dose	Maintenance dose
Neonates	2 mg	0.3 mg/kg/dose, maximum 10 mg/dose	20 mg/kg at maximum rate 1 mg/kg/min	2.5–5 mg/kg 1–2 times a day	20 mg/kg	2.5–5 mg/kg twice a day
< 1 year	5 mg					
2–11 years	5–10 mg					
12–17 years	10–20 mg		20 mg/kg, maximum dose 1 g. Maximum rate 1 mg/kg/min	300 mg twice daily	20 mg/kg	100 mg 3–4 times a day
17+ years	10–20 mg	0.15 mg/kg over 3–5 minutes, every 5–10 minutes. Maximum dose 10 mg/dose. NOT to exceed 30 mg	10 mg/kg. Maximum dose 1 g IV. Maximum rate 100 mg/min diluted 1:10 with water for injection		20 mg/kg, maximum dose 2 g IV	100 mg every 8 hours

3.5 HEMMORHAGE

A. **General considerations:**

- Typically, bleeding is a sign of severe disease and occurs in combination with septic shock, acute renal injury, ARDS, or neurologic complications.
- Assess all patients for signs of occult or overt bleeding (e.g., red eyes, petechiae, from injection sites, gum, bloody stool/urine, genital, peripartum hemorrhage, etc.)
- Insert two large bore IV lines (16-18-gauge canula in adults)
- Measure vital signs – T, P, RR, SPO_2, BP, etc.), and other ABCs.
- Assess for other co-morbidities or complications and manage.
- Measure CBC or hemoglobin, blood type and cross match and clotting profile (PT).
- Keep the patient warm with a blanket.

B. **Treatment options**

a. Transfuse fresh whole blood, platelet concentrate, or clotting factors if patient is actively bleeding and hemodynamically unstable or Hb < 7 g/dl:

- Adults: One unit over 2-4 hours. Reassess every hour
- Children: 20ml/kg over 3-4 hours. Reassess every 15 minutes.
- Monitor the patients for transfusion reaction

        - Arrest bleeding and treat other underlying sources of bleeding.
        - Treat sepsis or DIC (see section on sepsis).

b. Tranexamic acid:
    - Adult: 1g in 100ml 0.9% NS over 10 mins followed by 1g over 8 hours
    - Child: 15mg/kg IV load (Max. 1g) then 10 – 15 mg/kg 8 hourly
    - Vitamin K: Adult: 5–10mg IV. Child: 1 – 2 mg IV. Neonates: 1mg IV

c. If GI bleeding: Give a high dose proton pump inhibitor:
    - Pantoprazole:
        - Adult: 80mgIV X 60mins then 8mg/hr X 72 hrs continuous infusion
        - Child: 0.5–3 mg/kg in 1-2 divided doses daily (max 80mg/day), OR
    - Omeprazole (Adults): 40mg twice daily IV/PO

d. Other causes of anemia:
    - Treat other causes of anemia (e.g., iron deficiency, sickle cell anemia, etc.) occurring in the absence of hemorrhage according to national standard of care.

4 SPECIAL POPULATIONS: PREGNANT WOMEN AND CHILDREN

4.1 PREGNANCY AND NEWBORN CARE

Pregnant women do not appear to be more susceptible to EBOV infection compared to the general population. However, pregnant women are more susceptible severe disease and death due to the increased risk of hemorrhage and high rate of obstetric complications.[30] Management of pregnancy, labor and delivery with EVD challenged by the high transmission risk due to exposure to infectious material (e.g. blood, amniotic fluid, placenta, fetus, etc.).

4.1.1 CLINICAL MANAGEMENT OF EVD PREGNANCY:

Clinical management for all pregnant women should include optimized supportive care similar to non-pregnant EVD patients. However, for infection control and labor and delivery, the following recommendations should be considered:

A. **Skilled birth attendant and resources**

- Delivery and management of pregnancy complications in women with ongoing or recovered EVD, should occur within the ETU in an area designated for the care of pregnant women. The area should allow for privacy and dignity, and safe access.
- ETUs should have skilled obstetric providers (e.g., midwife, physician, obstetrician).
- Have additional staff present for extra support during labor in the ETU.
- The ETU should be equipped with adequate essential medicines, supplies and equipment for management of pregnancy and perinatal complications.
- All the anticipated drugs and equipment needed, are best placed near the patient in the designated delivery/obstetrics area. Ideally, a pre-prepared "obstetric-box" or similar, with relevant drugs and equipment should be readily available.
- Establish IV access early

- A safe delivery kit: plastic umbilical cord clamps, blunt-nosed disposable scissors, absorbent drapes with plastic lining, menstrual pads, misoprostol for prevention of postpartum hemorrhage (PPH) should be available to mitigate risks around delivery.

B. Pregnancy Screening

- Female patients of reproductive age should be questioned about pregnancy status (e.g., ask about the last menstrual period and home urine pregnancy test result).
- A pregnancy test should be performed on all women of reproductive potential.

C. Labor and delivery:

- Labor and delivery should be conducted according to the national guidelines for the management of labor and delivery. The following consideration are critical.
- Spontaneous vaginal delivery should be anticipated.
- Labor should not be induced for fetal indications
- Minimize vaginal examinations and avoid artificial rupture of membranes.
- Invasive obstetric procedures such as caesarean delivery, vacuum extraction, artificial rupture of membranes, episiotomy, etc. should only be performed for maternal indications (i.e., to reduce maternal morbidity/mortality), not for fetal indications.
- Invasive procedures on critical maternal indications need careful considerations from the HCW and patients' perspective. If needed, such procedures should only be performed by a person with clinical expertise and confident to do so with the physical restrictions of full PPE PLUS consideration for the safety of the entire clinical team (e.g., cleaner, scrub nurse, anesthetist, etc.).
- Perform active management of labor according to standard guidelines (e.g., use oxytocin or misoprostol 400mcg SL) to prevent post-partum hemorrhage.

- Clamp the cord using disposal plastic cord clamps and cut with disposable scissors and apply chlorhexidine 4%.
- The newborn is assumed EVD-positive and cared for in the ETU (red zone).
- Immediately perform RT-PCR Ebola testing of the newborn.
- If the fetus is not alive, the cord does not need to be clamped or cut. Seek further guidance on safe and dignified burials of a patient who has died from suspected or confirmed Ebola or Marburg virus disease.
- Post-mortem caesarean to surgically remove fetal tissue from the uterus following maternal demise from EVD is strongly discouraged.

D. Immediate Postpartum management

- To prevent PPH, give misoprostol 600mcg PO or 400mcg SL after delivering.
- Confirm that there is no undiagnosed second twin before giving the misoprostol.
- Potential side effects of misoprostol (e.g., fever, chills, nausea, vomiting and diarrhea, etc.) are similar to EVD. However, they are often self-limiting.
- If feasible, perform external uterine massage with protective covering (e.g., blue pads/adult diaper) on the patient's abdomen.
- Stand to the patient's right/left side to avoid exposure to blood and body fluids.
- Start management of shock and hemorrhage (section 2.2.1 and section 3.5) if bleeding is excessive, and the clinical condition deteriorates further.
- Use a non-pneumatic anti-shock garment as a temporary measure.

E. Pregnant women who recovered from EVD (with conception prior to EVD):

- Patients discharged with intact pregnancy should be instructed to return to an ETU or maternity isolation ward for delivery or management of pregnancy complications.
- Arrange immediate transfer from home/hospital when labor/complications occur.
- Childbirth and pregnancy complications including invasive surgical procedures, should be managed at the ETU.
- The newborn is assumed EVD-positive, and care providers should use full PPE.

- Perform RT-PCR Ebola testing of the newborn on cord blood and swabs of the products of conception (neonate, placenta, and amniotic fluid).

F. Treatment of incomplete abortion/miscarriage

- Pregnant patients with EVD are at increased risk for spontaneous abortion.
- Serve Misoprostol 600 mcg orally or 400mcg SL to treat incomplete abortion.
- Repeat the Misoprostol dose every 3-4 hours, if necessary, if the uterine size at the time of treatment is equivalent to a pregnancy of more than gestational age 13 weeks.
- If bleeding is excessive and the clinical condition deteriorates, consider management of shock and hemorrhage (section 3.5 and 2.2.1).

G. Women who become pregnant following recovery

- There is no evidence that women who become pregnant after they have recovered from EVD are at risk of EVD in the developing Pregnancy.
- Pregnancy, childbirth and postnatal care should be provided according to national recommendations.
- Only standard IPC precautions should be followed.
- The pregnant woman should be assessed frequently in the ANC for fetal wellbeing with ultrasound when available.

H. Breastfeeding

- Breastfeeding should be stopped if acute EVD is suspected or confirmed in lactating women or in a breastfeeding child.
- Separate the child from the breastfeeding woman and feed breastmilk substitute.
- Donor breastmilk or Ready-to-Use Infant Formula (RUIF), if available, may be an acceptable substitute (refer to MOH guideline on nutritional care).
- Isolate and monitor the child for 21 days.
- Children without confirmed EVD exposed to breastmilk of women with confirmed EVD should be considered as contacts.
- Vaccination can be considered for children exposed to breastmilk of women infected with EBOV on a case-by-case basis.

- If a breastfeeding woman and her child are both diagnosed with EVD, breastfeeding should be discontinued, the pair should be separated, and appropriate breastmilk substitutes provided, unless not separating poses less risk than the separation.
- The virus may still be present in the breast milk after active infection. A woman who has recovered from EVD, cleared viremia, and wants to continue breastfeeding should wait until after two consecutive negative EBOV breastmilk tests by RT-PCR, separated by 24 hours.

I. Ebola Vaccine use in pregnant women

- Pregnant and breastfeeding women should be offered vaccination with the prequalified Ervebo vaccine during an active EBOV outbreak in affected areas.
- Obtained informed consent before offering vaccination.

4.1.2 NEWBORN CARE DURING ISOLATION

To date, there is no report of a healthy newborn delivered by a woman with EVD. However, if a woman with EVD has a newborn, provide standard newborn care in risk-appropriate PPE.

- Separate an asymptomatic and negative infant from the mother.
- Perform clinical and nutritional assessment and provide replacement feeding.
- The Infant should be cared for under isolation for 21 days and perform RT-PCR.
- Delay immunization and circumcision for 21 days.
- Start ART for newborn of HIV-positive women according to the national guidelines.
- Chlorhexidine 7.1% should be applied to the umbilical cord immediately and daily.

4.1.3 CHILDREN AND ADOLESCENTS

- Principles of management of EVD in pediatric patients is similar to that of adults.
- However, children are more susceptible to electrolyte abnormalities and hypovolemia therefore early recognition and treatment should be the standard of care.
- Some children will be admitted unaccompanied or may become orphaned during admission. In addition, the psychological impacts of EVD on children are significant.

Clinical evaluation for children

- Measure weight on admission or estimate by Broselow tape (Table 22) or similar tool, or based on age (estimation can pose a risk of under dosage in unhealthy children).
- Evaluate nutritional status (i.e., height, weight, head circumference [<1-year-olds], and mid-upper arm circumference [children $\geq$ 6 months-5 years old]) (Appendix E).
- Plot the growth on a UNICEF country-specific growth chart (Appendix F)

Table 22: Broselow-Luten Zones for the estimation of children's weight for age

Zone	Patient weight	Age
3 kg, 4 kg, and 5 kg zones	3 kg, 4 kg, and 5 kg	< 3 mos
Pink	6–7 kg	3–5 mos
Red	8–9 kg	6–11 mos
Purple	10–11 kg	12–24 mos
Yellow	12–14 kg	2 yrs
White	15–18 kg	3–4 yrs
Blue	19–23 kg	5–6 yrs
Orange	24–29 kg	7–9 yrs
Green	30–36 kg	10–11 yrs

Source: Michelle et al. 2019. A Tale of Two Tapes: Broselow-Luten Tapes (2011 Vs 2017). J E Medical Services

5 PSYCHOSOCIAL AND PALLIATIVE CARE

5.1 IMPACT ON HEALTHCARE WORKERS

- HCWs may experience fatigue while in PPE. To minimize fatigue, time spent with patients in the red zone must be limited to sessions not exceeding four (4) hours.
- HCWs will be concerned about the risks of acquiring EVD and transmitting the infection to their families and others. If appropriate IPC precautions are followed, the risk of transmission to HCWs is very low (refer to the National IPC Guidelines).
- Frontline HCWs should monitor their temperature twice daily, commencing 48 hours after their first patient contact until 21 days after their last contact with the patient.
- If they develop symptoms consistent with EVD, they should isolate themselves and notify their supervisor and public health unit immediately.
- The potential psychological impact is described below.

5.2 PSYCHOSOCIAL SUPPORT FOR PATIENTS AND PROVIDERS

EVD causes considerable stress for patients, their families and the providers who care for them.

For patients

a. Each patient should be assessed upon admission and daily for both physical, social and psychological well-being.
b. All patients and survivors should have access to psychological counselling.
c. The ETU should have psychosocial support personnel (e.g., social workers, mental health clinicians, psychiatrists, etc.) on the team.
d. Limit the risks of patients feeling the emotional pain of isolation and dying alone such as by deploying adequate number of staff and ensuring frequent care encounters. Ensure non-abandonment by administering frequent treatment and psychosocial support.
e. Ensure culturally-acceptable approach to care provision.

f. Provide means of communication to patients who wish to communicate with family.
g. Connect the patient with their loved ones outside the ETU. Plan time and resources for HCP provision of updates via phone to family of patients
h. Where possible, encourage and help coordinate family visits, even if at a distance.
i. One source of support is friendship in the ETU among the patients and staff.
j. Opportunity for brief pre-burial rituals that are culturally appropriate. After death, the ETU staff should allow dignified burial. The staff should support customary post-mortem burial rituals such as allowing few family members to offer prayer over the body from the green zone and remain present at a distance to witness these final rites supported by the staff. Loved ones who are able should be allowed to accompany the burial team in a separate vehicle to observe burial and mark the internment site.
k. Passing final messages to family members including disinfecting and returning valuable belongings such as electronics, jewellery, identification cards, phones, etc.

For Healthcare Workers

- HCWs providing care to EVD patients should also be supported. Stressors may include:
    - Fear of contracting the illness
    - Concern for infecting family members
    - Prolonged periods in PPE
    - Social isolation & stigmatization
    - Fatigue from long working hours and poor patient outcome
- HCWs should be provided psychosocial support or counselling on a weekly basis by trained counsellors such as through group and individual sessions.
- HCWs who feel depressed or stressed should seek support from the psychosocial team.

5.3 PALIATIVE CARE OF EVD PATIENTS

Definition

Palliative care focused on prevention and relief of the debilitating physical, psychological, social or spiritual suffering associated with life-threatening illness. The goal of palliative care is to improve the quality of life of patients and their families. Even with current advent of effective therapeutics and optimized supportive care, EVD remains associated with immense physical and psychological suffering and a high likelihood of a fatal outcome.[4] A substantial number of patients develop severe complications and die.

Key principles of palliative care in EVD include:

a. Palliative care should be started early and continued through all stages of illness, and after a patient's death. It should be integrated in optimized supportive care.
b. Palliative care should be combined with psychosocial care as described in section 5.2.
c. Plan for and aim to maintain adequate and appropriate medications and supplies to alleviate patient pain and suffering.
d. Aim to prevent and relief suffering through early identification, serial assessment and treatment of pain and other debilitating symptoms (e.g., dyspnea, restlessness, seizures, vomiting, respiratory distress, seizures, bleeding, etc.), while discontinuing therapies or interventions which may be painful.
e. Promotion of comfort and dignity can relieve psychological and physical suffering.
f. Protect against contamination of the patient's immediate environment
g. Discontinue all therapies or interventions which may be painful.
h. Training staff in palliative care/trauma informed care, opioid usage as part of a palliative approach, IV use, and critical/difficult communication.
i. Maintain a safe environment so that witnessing of extreme suffering and death by staff and conscious and mildly ill patients is minimized.

6 DISCHARGE AND CONTINUITY OF CARE

6.1 EVD DISCHARGE CRITERIA

The decision to discharge should be made for patients who meet the below criteria:

a. Asymptomatic for 72hours and able to eat and carry out daily routine activities without assistance, AND
b. Two negative RT-PCR tests 48hours apart.

6.1.1 PRE-DISCHARGE CONSIDERATION

- With permission, involve the survivor's caretaker(s) in the discussion. Educate them on what is known about convalescent transmission, post-Ebola sequelae and the psychosocial and mental issues and on how they can be supportive helps build psychosocial support for the survivor.
- Education and counselling regarding for survivors:
    - Possible sequalae and psychosocial challenges faced during convalescence
    - Infection prevention and control considerations during convalescence
    - Viral persistence in immune privileged sites (see section on post-Ebola sequelae)
    - Convalescent transmission, and sexual health counselling
    - Where and when to seek medical care if they encounter any health problem
    - Issues such as confidentiality, avoiding stigmatization and how the loved ones can be supportive of the survivors' special needs should be addressed.
- Transfer of care or discharge summary documents should be given indicating their demographic, treatment details, and RT-PCR result (Appendix D).

6.1.2 ROUTINE FOLLOW UP CARE

EVD survivors require a program to address their medical and psychosocial needs. Services should include psychological counselling, management of post-Ebola symptoms, screening for viral persistence and infection control practices to prevent convalescent transmission, and where available, supporting their reintegration into the community. Medical services for EVD survivors can be integrated into existing routine health facilities

or standalone. Where the necessary services are inaccessible to EVD survivors, establishment of EVD survivor-specific services may be necessary or linkages established with services closest to the locality. Create a well-defined referral pathway illustrating linkages with specialized services.

6.1.2.1 Follow-up schedule

Regular follow up care is recommended according to the following schedule:

a) Post-Ebola sequelae – at least one year regardless of the presence of symptoms at discharge and longer based on the survivor's specific needs. The follow-up schedule:
   - Two weeks after discharge, monthly X 6, and Q3 months X 6 months.
   - Continued follow-up as needed and agreed upon by the patient and provider

6.1.2.2 Follow-up evaluation and care

- General medical history and physical examination, including vital signs (temperature, blood pressure, heart rate, respiratory rate), and nutritional evaluation.
- Evaluation of the following:
  - Neurologic examination: ocular, auditor, neurologic assessment
  - Musculoskeletal for joint points
  - Mental health
  - Sexual health: sexual health counselling and safe sex promotion, testing for EBOV of semen, breastmilk, cervical fluid, and other bodily fluid.
- Consultation with social worker to discuss and offer support for the following:
  - Stigma issues and social support (family, friends, religious community)
  - Economic status, employment, shelter, and food security
  - Substance misuse or dependency (e.g., alcohol, marijuana, cocaine, heroin, etc.)
  - Support for vulnerable individuals (children, disability, domestic abuse, etc.).

- Routine lab tests: CBC, chemistry, pregnancy test, UA, MS, HIV, HBV, syphilis, etc.
- Body fluid screening according to the indication: (e.g., Ebola RT-PCR or IgG)
    - Male survivors should continue EBOV semen screening up to ≥3 years.
    - Female survivors: Breastmilk and other body fluid when recommended.
- Care providers should reference the EVD Survivor Guidance on the care of survivors.

6.2 POST-EBOLA COMPLICATIONS

Patients who survived the disease undergo a long convalescent period during which they continue to experience a spectrum of clinical and psychosocial sequelae commonly called post-Ebola sequelae. The conditions reported include the following categories:

- **Post-Ebola clinical sequelae:**
    - EVD survivors can experience uveitis, impaired vision, arthralgia, headache, urinary symptoms, memory loss, other neurologic issues.[2, 7-11]
    - Post Ebola sequelae wean gradually over several years for most survivors, while others persist or develop late complications with manifestations months after they have recovered from the initial illness.

- **Ebola virus persistence:**
    - The Ebola virus may persist in immune-privileged body fluids, including semen, eyes, central nervous system, pregnancy-related fluids (e.g., amniotic fluid, blood, fetus, etc.) and breast milk for variable duration.[2, 10, 12, 13]
    - Viral persistence poses risk of remote transmission events causing sporadic EVD outbreaks long after an outbreak is declared ended.
    - Male survivors should obtain sexual counselling and remain abstinent or practice safe sex (e.g., use condoms) until their semen has twice tested negative six weeks apart. However, intermittent detection occurs in a small proportion of males. It is not known whether viral particles detected

intermittently are infectious. Testing is advised up to 36 months after Ebola virus infection.[10]

- **Relapse of Ebola Virus Disease:**
  - Relapse or recurrence of acute EVD after recovery is very rare but has been documented, likely due to increased replication of the virus in specific site.[14, 31] Any EVD survivor who presents with clinical symptoms suggestive of EVD within one year of their acute EVD diagnosis should be isolated and be evaluated for EVD according to the national guidelines. The patients should be treated with respect and without stigma.

7 INFECTION PREVENTION AND CONTROL

Infection control recommendations for patients who present with acute infection include isolation of hospitalized patients with known or suspected Ebola virus disease; proper hand hygiene; the use of standard, contact, and droplet precautions; and the correct use of appropriate personal protective equipment (PPE). This section provides guidance on only the most salient features of IPC that can be applied to all health care settings managing patients with suspected or confirmed EVD. Frontline HCWs should reference should be made to the new Liberia National IPC Guidelines [32] more details.

7.1 KEY PRINCIPLES

A. IPC training for ETU staff

- Train HCWs rigorously and repeatedly in IPC and correct donning and doffing of PPE.
- HCWs should demonstrate competency in performing Ebola-related infection control practices and procedures. As an example, HCWs should perform frequent disinfection of gloved hands using an alcohol-based hand rub, particularly after touching body fluids. In addition, they should immediately disinfect any visibly contaminated PPE using approved disinfectant wipes.
- Contact with an EVD case should be minimized to essential staff only.
- Each step of every PPE donning/removing procedure must be supervised by a trained observer to ensure proper completion of established PPE protocols.

B. Patient placement

- Patients with suspected or confirmed EVD should be isolated in single rooms. If unavailable, patients should be kept in specific confined areas keeping suspected and confirmed cases separate. Patient spaces should allow for privacy and dignified care.
- Access to these areas should be restricted including visitors and should be one-way flow from low risk to high-risk areas.

C. Personal Protective Equipment (PPE)

- Practice standard precaution including hand hygiene with soap and water.
- Train HCWs on the selection, donning, doffing, decontamination or disposal of PPE.
- All HCWs must demonstrate competence on the types of PPE, what PPE is necessary for each care activity.
- Select PPE based on a complete risk assessment before exposure and used in combination with administrative and engineering controls (adequate and regular supplies, staff training, hand hygiene, and appropriate human behavior, etc.).
- The key components of enhanced PPE for EVD management include:
    - Double gloves
    - Boot
    - Fluid-impermeable gown or coveralls
    - Single use disposable hoods (if available) that cover the head and neck
    - Face shields or Goggles
    - N95 respirator masks
- Do not re-use disposable PPE.

D. Aerosol generating procedures

- Whenever possible, aerosol generating procedures (AGP) should be avoided when caring for EVD patients.
- If an AGP (e.g., BiPAP, bronchoscopy, sputum induction, suctioning, vomiting, etc.) is essential, the following steps should be undertaken:
    - PPE should be worn as recommended PLUS hood.
    - The number of HCWs present during the procedure should be limited to those essential to patient care and support.
    - AGP should be undertaken with less risk to others or the environment.

E. Hand hygiene

- Hand hygiene should be performed using either an alcohol-based hand rub (ABHR) or soap and running water applying the correct technique.
- Make ABHRs available at every point of care and are the standard of care
- Wash hands with soap and water when hands ABHRs are unavailable, or hands are visibly soiled.

- If gloves become soiled, HCWs should immediately perform hand hygiene using the ABHR on the gloved hands, then proceed to remove and replace the outer gloves before continuing patient care activities.

F. Environmental cleaning and disinfection

- Standard operating procedures (SOPs) for environmental cleaning should be available and displayed at the appropriate stations.
- Preferred disinfectant solution is 0.5 % Sodium hypochlorite solution
- Preferred cleaning process is the same as for routine cleaning
- Contaminated environmental surfaces or objects should be cleaned and then disinfected as soon as possible using 0.5% chlorine solution.
- Floors and horizontal work surfaces should be cleaned at least once a day with clean water and detergent.
- Do not spray (i.e., fog) occupied or unoccupied clinical areas with disinfectant as it is a potentially dangerous practice with no proven disease-control benefit.

G. Waste management

- All waste generated during the care of an EVD patient should be managed as infectious waste and should be placed in double biohazard bags and collected at a designated waste collection point
- Segregate the waste at point of generation to enable appropriate and safe handling.
- Collect all solid, non-sharp, infectious waste in leak-proof waste bags and covered bins.

H. Sharp safety

- Sharp devices expose HCWs to the risk of injury and blood-borne infectious agents.
- Limit the use of phlebotomy, procedures, and laboratory testing to the minimum necessary for essential diagnostic evaluation and patient care.
- All needles and sharps should be handled with care and disposed of in puncture-proof, sealed disposable containers.
- Observe the following precautions if the use of sharp objects cannot be avoided:

- Use medical devices that incorporate safety engineered protection mechanisms where available and practical:
  - safety syringes
  - retractable cannula
  - needless IV giving sets
  - blood collection units
  - safety lancets for blood glucose measurements.
- Staff must never recap a used needle.
- Never direct the point of the used needle towards any part of the body.
- If necessary to remove the sharp, staff must use a sharps removal system (e.g., scalpel blade removers).
- The person who has used the single-use sharp must be responsible for its immediate safe disposal.

I. Linen management

- Disposable linen is the first choice for use with suspected, probable or confirmed EVD cases. These include patient clothing, sheets, pillowcases, blankets, towels, etc.
- Place all non-soiled linen from a suspected, probable or confirmed EVD case into clearly labelled, leak-proof bags. Place any soiled linen in a plastic leak-proof biohazard bag. Linen should be managed according to the national IPC guidelines.

J. Patient care equipment

- Patient care equipment (e.g., electronic thermometers, sphygmomanometers, glucometers, etc.) may be a source of transmission when shared between patients. Therefore, to reduce the risk of transmission equipment should be disposable (preferable), or at a minimum, dedicated to that patient for exclusive use
- As a rule, facilities should limit personal items of the patient entering the room, especially if the items cannot be readily cleaned or disinfected (e.g., laptop computers, children's toys etc.).
- All items leaving the patient room should be moved to the PPE removal area and placed in a space designated for the decontamination of equipment.

K. Patient care considerations

- Staff allocation:
  - Staff rosters should include adequate numbers of staff to avoid staff fatigue
  - Staff with certain health conditions should not be allocated to provide care to EVD patients. Such conditions include:
    - Seizure disorder, hypoglycemia
    - Claustrophobia, anxiety disorder, Mobility issues
    - Non-intact skin from dermatitis, abrasions, wounds etc.
    - Underlying Immune suppression
    - Pregnancy
- Patient movement
  - Wherever possible, protect patients from wandering into unsafe areas including through education, barriers, labels, and easy access to services and other needs. Provide appropriate PPE to the patient if transfer is necessary, (e.g., a correctly fitting surgical mask and disposable gown on the patient during transfer).
- Food services
  - Non-essential staff should be restricted from entering the EVD patient care area.
  - Food services staff should deliver food to a designated clean area.
  - HCWs directly caring for the patients should deliver their food and beverages
  - Water should be supplied in disposable bottles with disposable cups.
  - Reusable crockery and cutlery should NOT be used. Disposable crockery and cutlery should be used where possible and placed into clinical waste in the patient room after use.

L. Transmission-based precautions

- In addition to using standard precautions, all individuals accessing the treatment unit should use **contact and droplet precautions** before entering the room and corridors of suspected or confirmed EVD patients.
- This set of additional measures are meant to compliment the standard precautions.

M. Additional precautions for HCWs in the ETU

- All persons working in the ETU should change into scrubs and store away all their personal belongs including jewelry in a safe space.
- When leaving the ETU for their homes or public areas, HCWs should remove their scrubs, shower, and change into their personal clothes.
- Soiled clothes should be stored away in a safe space and cleaned at the first opportunity.

N. Implementing Administrative controls

Administrative controls refer to work policies and procedures that prevent pathogen exposure:

- The ETU should have a designated IPC focal point
- Ensuring adherence/compliance to IPC policies and procedures for all aspects of health care and providing mechanisms for improvement as needed
- Conducting periodic IPC risk assessment, document, and report issues in a timely manner, to appropriate authority and addressed accordingly.
- Establishing sustainable IPC infrastructures and activities, for example, triage stations, hand washing facilities etc. at key locations in the facility
- Ensuring an adequate patient-to-staff ratio
- Educating staff, patients and their caregivers on safe IPC practices
- All staff should be fully aware of all protocols, guidelines, and job aides
- Ensuring adequate supplies of PPE; and
- Developing, post at workstations, and monitor the use of SOPs for each IPC activity (e.g., cleaning of low-risk zones, high risk environment, etc.).

Other environmental and engineering Controls

- Correct patient placement as described above
- Care of the infrastructure and medical equipment as described.

O. IPC barriers:

- Distinction with visible labels and barriers maintained between the three risk zones of the ETU (low/green, intermediate/orange, and highest/red).
- Medical personnel should follow all the safety and IPC precautions in place.

Table 23: Location of services in the ETU

GREEN	• Staff rooms for sitting and paperwork, nurse working station, doctors etc. • Staff-Dressing- Room + shower for females / males separately • Kitchen for distributing patient food / for staff • Staff-toilets female / Staff-toilet male in working area • Other rooms including Storage room clean laundry, Cleaner's room • Laundry room for washing machine, dryer • Stock room materials /equipment/drugs/treatments
YELLOW	• Doffing room • Storeroom for used laundry
RED	• Patients Bedroom • Entry / Patient Reception • Waste collection area • Mortuary • Back-up Laboratory

P. Care of the deceased

- Ebola viremia is highest in people with progressive severe illness and at death. The virus may survive for several days in the body, and on surfaces contaminated with blood or other body fluids. General precautions for handling patients who died of EVD include the following:
  - Autopsies should be avoided. An autopsy should only be done if directed by the coroner and following discussion with the public health unit.
  - Handling of human remains should be kept to a minimum.
  - Only HCWs trained in handling infected human remains and appropriate use of PPE should touch or move the body of any patient who died from EVD.
  - The PPE and precautions for handling a person who has died from EVD are the same as those required for contact with living EVD patients. Wear an apron over the PPE because of the increased likelihood of contamination with body fluids.

- The number of staff involved in handling, or in the same room as, the body should be kept to a minimum.
- The body should be properly prepared at the site of death. It should only be moved after this has been completed, and the outer surface of the body bag or other outer covering has been decontaminated.

Q. Monitoring of potentially exposed personnel

- HCWs with percutaneous or mucocutaneous exposure to blood, body fluids, secretions or excretions from a patient with suspected, probable or confirmed EVD should immediately and safely stop any current tasks, leave the patient care area and safely remove PPE.
- Wash the affected skin surfaces or the percutaneous injury site with soap and water immediately after leaving the patient care area. Irrigate mucous membranes with copious amount of water or an eyewash solution.
- The exposed person should have an immediate consultation with a physician.
- Counselling should also be made available as needed
- The exposed person will be asked to stay in voluntary home restriction for 21 days after the exposure and to monitor their temperature twice daily and report these to the designated person daily or immediately if they become unwell or febrile (temperature greater than or equal to 37.5°C).

R. Monitoring and management of visitors

- Establish procedures for monitoring, managing and training visitors
- Ensure that wherever possible, visitors are excluded from entering the EVD patient's room. Exceptions to this recommendation may be considered on a case-by-case basis for those who are essential to the patient's wellbeing (e.g., in the case of a child).
- If a visit from someone other than immediate healthcare staff is required, for any reason, they must be trained and supervised during the visit in the correct use and safe removal of the same PPE as used by the health care staff
- It is recommended that visitor movement within the facility is restricted to the patient care area and an immediately adjacent waiting area.

S. Infection control during convalescence

- For most survivors who have recovered and discharged after acute illness, only standard precautions are needed during routine care visits.
- There is no evidence that survivors of EVdD pose any special risk to HCWs when their care involves contact with intact skin, sweat tears, conjunctivae, and saliva.
- However, for survivors who present with late-stage manifestations of EVD such as acute neurological or ocular symptoms, IPC practices are recommended.
- For female survivors who become pregnant after clearing the Ebola virus from the blood, only standard precautions are recommended during delivery as the fetus is presumed not to be infected
- Male survivors should refrain from unsafe sex until the semen has tested negative for Ebola virus twice by RT-PCR six weeks apart.
- If semen testing is unavailable, men should practice safe sex for at least three years from onset of illness.

8 RESEARCH

Research shall be integrated in responding to EVD outbreaks. Research during outbreaks is associated with additional ethical considerations including safety of staff, requirement for community engagement and partnership, requirement for government and/or community consent, data sharing, use, and ownership. Researchers must ensure the following conditions:

1. Research should be in line with the national research priority, ethical approval process and should facilitate and not impede emergency response efforts
    - Research should be well coordinated by a research committee (MoH/NPHIL), to avoid duplication and ensure reliable and valid results.
    - There should be accurate and complete documentation of all response activities, a transparent and fair process in place for access to data and facilitate the ethical approval process to ensure compliance GCP.
2. Ethical standards that protect the rights of participants and frontline health workers
    - Ensure independent ethical review by the National Research Ethics Board (NREB) in a timely manner except in special circumstances (e.g., public health response or secondary data available in the public domain).
    - Individual informed consent should be required unless waived by the IRB. Some research may require community consent and agency approval.
3. Community engagement and participation
    - Fair, meaningful engagement and inclusive decision-making should occur.
    - Community participation is required for clinical trials during emergencies.
4. Selection of research participants and consent during emergencies
    - Participants should be treated fairly, with respect, and selected in a way that minimizes risk and protects vulnerable populations without

routinely excluding them from participation without reasonable scientific justification.

5. Sharing of research data and samples during emergencies
    - Participants and regulatory authorities should be informed about the collection, storage, future use, or export of biological material.
    - Data should be quickly reviewed and shared without delay.
    - Seek prior approval of the MOH, NPHIL, and NREB for the use public health samples for research.

9 PRINCIPLES OF ETU MANAGEMENT

All Institutions, facilities, staff and health managers planning on running an ETU should become familiar with the Liberia ETU Operational Manual, 2015. The considerations in this section are a brief overview only.

A. Definition of ETU operations

- The ETU is a very complex system of people, supplies and equipment, processes, procedures, activities, all functioning in an environment with serious nosocomial risks.
- During non-EVD outbreak the ETU can be appropriately decontaminated, made safe, and use for the isolation and care of patients diagnosed with other highly contagious diseases (e.g., Lassa fever, severe COVID-19, extra drug resistant TB, (XDR TB, etc.).
- Coordination and communication are essential to all the activities in the ETU.

B. Facility readiness assessment

The first step is to conduct an ETU assessment using a standardized checklist to ensure response readiness (Appendix A-N). One way to cross check preparedness is by doing dry runs and simulations. In addition to clarifying patient flow, different pathways, and staff orientation, the facility assessment, simulations measure facility capacity for EVD case management. It helps determine that appropriate barriers are in place and infrastructure and essential supplies and lab are available inadequate quantities to supports the ETU function.

The simulations should be conducted before admission begins and annually during pre-outbreak situations to assist local teams address issues prior to the **Joint External Evaluation (JEE).** The JEE assure adherence to minimum standards set-up by the WHO for safe operation and allows for broad input into safe and quality services delivery.

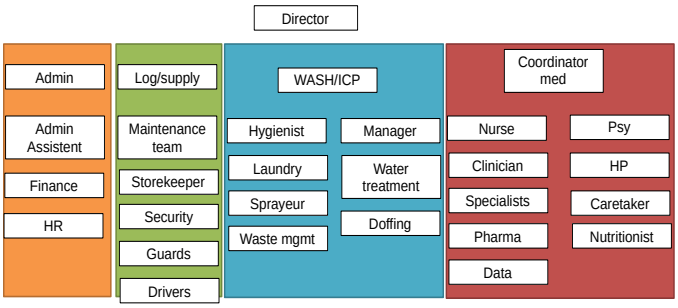
C. Training

All staff working in an ETU should be trained on the minimum competencies set out by the MOH and WHO. The MOH-WHO ETU training program typically include three components:

- Phase 1: Participatory classroom training – didactics, skill stations and vignettes on the principles of EVD clinical management, IPC, and WASH in EVD.
- Phase 2: Mock ETU –reinforces the theoretical learning through simulated patient scenarios, acted out by expert patient trainers (whom are EVD survivors)
- Phase 3: 'Hot' training' - involves real ETU experience and the opportunity to demonstrate competencies learnt from phases 1 and 2.

D. ETU Operations

The organizational structure and management team must be in place prior to opening an ETU. The primary goal is staff safety, and optimized patient care and safety. In order to coordinate diverse activities and achieve these goals, the following elements are required: a well-designed ETU that support the ETU functions skilled and confident staff, and protocols and supplies. The ETU environment requires servant leadership, creating trust and instilling confidence in staff. Each ETU requires a medical director, manager and supervisors. All staff should receive orientation and briefing, both individually and as a group on their roles and responsibilities and workflows.



Checklists and SOPs for different operational activities should be established and familiarized by each responsible supervisor. It also simplifies management and reporting, identifying gaps and timely follow-up.

E. Communication

It is essential to ensure clear and effective communication within the ETU. Many activities require interdepartmental collaboration which means complex communication interaction. The communication can be:

- Internal communication: handover between shifts, team meeting to plan daily activities, coordination and communication between the different departments, etc.
- External communication: coordination and communication with the lab, rapid response teams, dead body management, and other pillars of the response.

F. Staffing

Staffing composition may vary across ETUs to reflect the patient census, ETU size and layout, experience, staff member comfort and supervisory requirements. It should typically include a director, manager, clinicians (ID clinicians, physicians, nurses, midwives, physician assistants, lab techs, pharmacist/dispenser, respiratory therapists, mental health clinicians, etc.), IPC lead, hygienists and WASH staff, securities, data management, the facility team, nutritionist, psychosocial staff, logistician, manager, etc.

All staff should be trained and deployed in adequate numbers to the ETU functions so that staff safety and patient care is not compromised. Staff work plans and shift schedules need to be determined and activity schedules (i.e., patient feeding, ward cleaning, general area cleaning, chlorine mixing and testing, and staff, supervisor, or scientific meetings) properly outlined.

G. Logistics and supplies

During the response, different types of supplies needed for ETU operations are provided from diverse sources. Standard supply checklists (e.g., essential drugs and supplies, clinical lab, IPC and WASH, electrical, equipment, etc.) [see Appendices A-O]. The warehouse should be checked against the standard listing to ensure all materials needed

for normal daily functioning are available in the minimum stock for at least one month. It is critical to institute a quality assurance process for supplies, and ETU operations. Verifying supplies and warehouse sources to ensure minimum stock, reviewing lab results to ensure they are accurate are important procedures for quality health services.

H. Bed capacity scale-up

It is advised to begin with few patient beds when opening an ETU and gradually increase the number until the maximum bed capacity is achieved. The recommendation is a 5-bed capacity and until maximum capacity is reached.

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11 APPENDICES

Appendix A: EVD Admission Form

ADMISSION FORM

World Health Organization

I. CASE IDENTIFICATION/ DEMOGRAPHIC DETAILS

Patient Name:	ETU Number:	Patient address:
EPI ID:		
☐ Male ☐ Female	**Patient occupation** ☐ Healthcare worker. Please specify: _____ ☐ Non-Healthcare worker. Please specify: _____	
Date of birth: (dd/ mm/ yyyy) ____/____/_____	If date of birth unavailable, please indicate age in month or years (*mark an X by one*): Age: _____ ☐ Years ☐ Months	
Date of admission: (dd/mm/yyyy) ____/____/_____	Was patient transferred from another facility? ☐ Yes ☐ No ☐ Unknown. If yes, name of facility _____	

II. VITALS AT TRIAGE:

Heart rate (bpm): _____	Respiratory Rate (/min): _____	Temperature (°C): _____
BP (mmHg):_____(systolic)_____(diastolic)	O_2 saturation room air (%):_____	Mental status: A / V / P / U
Capillary refill > 3 sec? ☐ Yes ☐ No	Weight (kg): _____ Self-reported height (cm): _____	Mid-upper arm circumference (MUAC) (mm) _____

III. CLINICAL DETAILS (on admission)

Date onset first symptoms (dd/mm/yyyy):____/____/_____	If female patient, is she pregnant? ☐ Yes ☐ No ☐ ND
Date of admission to isolation unit (dd/mm/yyyy): ____/____/_____	Admitted to what type of bed? ☐ Ward ☐ ICU
Comorbid conditions Tuberculosis ☐ Yes ☐ No ☐ Unknown Asplenia ☐ Yes ☐ No ☐ Unknown Hepatitis ☐ Yes ☐ No ☐ Unknown Diabetes ☐ Yes ☐ No ☐ Unknown HIV ☐ Yes and on ART ☐ Yes and not on ART ☐ No ☐ Unknown Chronic liver disease ☐ Yes ☐ No ☐ Unknown	Malignancy/Chemotherapy ☐ Yes ☐ No ☐ Unknown Chronic heart failure including congenital disease ☐ Yes ☐ No ☐ Unknown Chronic pulmonary disease ☐ Yes ☐ No ☐ Unknown Chronic kidney disease ☐ Yes ☐ No ☐ Unknown Chronic neurologic condition ☐ Yes ☐ No ☐ Unknown Other, specify _____

Symptoms (on presentation) Fever ☐ Yes ☐ No ☐ Unknown Fatigue ☐ Yes ☐ No ☐ Unknown Weakness ☐ Yes ☐No ☐ Unknown Malaise ☐ Yes ☐ No ☐ Unknown Myalgia ☐ Yes ☐ No ☐ Unknown Anorexia ☐ Yes ☐ No ☐ Unknown (i.e. loss of appetite) Sore throat ☐ Yes ☐ No ☐Unknown	Headache ☐ Yes ☐ No ☐ Unknown Nausea ☐ Yes ☐ No ☐ Unknown Chest pain ☐ Yes ☐ No ☐ Unknown Joint Pain ☐ Yes ☐ No ☐ Unknown Hiccups ☐ Yes ☐No ☐ Unknown Cough ☐ Yes and productive ☐ Yes and not productive ☐ No ☐ Unknown	Chest pain ☐ Yes ☐ No ☐ Unknown Difficulty breathing ☐ Yes ☐ No ☐ Unknown Difficulty swallowing ☐ Yes ☐ No ☐ Unknown Abdominal pain ☐ Yes ☐ No ☐ Unknown Diarrhoea ☐ Yes ☐ No ☐ Unknown Vomiting ☐ Yes ☐ No ☐ Unknown Irritability / Confusion ☐ Yes ☐ No ☐ Unknown

Signs (on presentation) Pharyngeal erythema ☐ Yes ☐ No ☐ Unknown Pharyngeal exudate ☐ Yes ☐ No ☐ Unknown Conjunctival injection/bleeding ☐ Yes ☐ No ☐ Unknown Oedema of face/neck ☐ Yes ☐ No ☐ Unknown Tender abdomen ☐ Yes ☐ No ☐ Unknown Sunken eyes or fontanelle ☐ Yes ☐ No ☐ Unknown Tenting on skin pinch ☐ Yes ☐ No ☐ Unknown Palpable liver ☐ Yes ☐ No ☐ Unknown Palpable spleen ☐ Yes ☐ No ☐ Unknown Rash ☐ Yes ☐ No ☐ Unknown Jaundice ☐ Yes ☐ No ☐ Unknown	Enlarged lymph nodes ☐ Yes ☐ No ☐ Unknown Lower extremity oedema ☐ Yes ☐ No ☐ Unknown Bleeding ☐ No ☐ Unknown ☐ Nose ☐ Mouth ☐ Vagina ☐ Rectum ☐ Sputum ☐ Urine ☐ IV site ☐ Other, specify _____

IV. SPECIMEN COLLECTION AND RESULTS

Specimen collection done for EVD patients? ☐ Yes ☐ No. If yes, what samples? ☐ Blood ☐ Urine ☐ Buccal swab Other_____

Ebola testing	Collection date (dd/mm/yyyy)	Result		
Ebola RDT: ☐ Not done ☐ Oraquick ☐ Others: _____	____/____/_____	☐ Pos ☐ Neg ☐ indeterminate.		
Ebola PCR (admission): ☐ Not done ☐ GeneXpert ☐ Others: _____	____/____/_____	**GP** ☐ Pos. ☐ Neg. Ct :_____	**NP** ☐ Pos. ☐ Neg. Ct :_____	☐ indeterminate
Malaria RDT	____/____/_____	☐ Pos ☐ Neg ☐ indeterminate		
Blood culture	____/____/_____	☐ Pos ☐ Neg ☐ indeterminate		

Did patient test positive for any other infection? ☐ Yes ☐ No If Yes, specify_____

Other clinical laboratory tests done on admission (ND = not done)

Haemoglobinuria ☐ Pos ☐ Neg ☐ ND
Proteinuria ☐ Pos ☐ Neg ☐ ND
Hematuria ☐ Pos ☐ Neg ☐ ND

Blood Gas ☐ ND ☐ Arterial ☐ Venous
Results: pH_____, pCO2_____, PaO2___HCO3_____
Oxygen therapy at time of blood gas (L/min) _____

Laboratory tests on admission or Hospital Day 1(HD1). (ND = not done)

Biochemistry	Values	Not Done	CBC & Clotting panel	Values	Not Done
ALT/SGPT (U/L)		☐ ND	Glucose (mmol/L)		☐ ND
AST/SGO (U/L)		☐ ND	Lactate (mmol/L)		☐ ND
Creatinine (µmol/L)		☐ ND	Haemoglobin (g/L)		☐ ND
Potassium (mmol/L)		☐ ND	Total bilirubin (µmol/L)		☐ ND
Urea (mmol/L)		☐ ND	WBC count (x10⁹/L)		☐ ND
Creatinine kinase (U/L)		☐ ND	Platelets (x10⁹/L)		☐ ND
Calcium (mmol/L)		☐ ND	PT		☐ ND
Sodium (mmol/L)		☐ ND	aPTT (seconds)		☐ ND

V. Complications on admission

Bleeding ☐ Yes ☐ No ☐ Unknown
Shock ☐ Yes ☐ No ☐ Unknown
Meningitis* ☐ Yes ☐ No ☐ Unknown
Confusion ☐ Yes ☐ No ☐ Unknown
Seizure ☐ Yes ☐ No ☐ Unknown

Coma (P/U in AVPU scoring) ☐ Yes ☐ No ☐ Unknown
Bacteraemia ☐ Yes ☐ No ☐ Unknown
Hyperglycemia ☐ Yes ☐ No ☐ Unknown
Hypoglycemia ☐ Yes ☐ No ☐ Unknown
Other, specify _____

***meningitis defined either clinically or with lumbar puncture**

VI. TREATMENT INFORMATION PRIOR TO ARRIVAL: (please indicate units)

Type	Dose	Route	Frequency
Antibacterial: ☐ Yes ☐ No Specify: ☐ amoxicillin ☐ ceftriaxone ☐ cefixime ☐ other_____		☐ IV ☐ oral	
Antimalarial: ☐ Yes ☐ No			
Select all that applies: ☐ Artesunate		☐ IV	
☐ Arthemeter		☐ IM	
☐ Arthemeter/Lumefantrine	/	☐ oral	
☐ Artesunate/Amodiaquine	/	☐ oral	
Other: Specify: _____		☐ IV ☐oral	

Ebola experimental treatment: ☐ Yes ☐ No
Indicate if yes: ☐ZMapp. ☐ Remdesivir (GS-5734). ☐ REGN3470-3471-3479. ☐ Favipiravir ☐ mAb114

At the time of admission, did the patient receive any of the following?

Oral/orogastric fluids? ☐ Yes ☐ No ☐ Unknown. To specify:
☐ ORS:_____ml
☐ Water:_____ml
☐ Others:_____& Vol____ml

IV fluid therapy ☐ Yes ☐ No ☐ Unknown
If yes, specify:_____ml using
☐ Ringer's lactate ☐ Normal Saline
☐ Others, specify_____

Access type ☐ Intra-osseous ☐ PIV ☐ CVC ☐ Unknown

Blood transfusion ☐ Yes ☐ No ☐ Unknown

Oxygen therapy ☐ Yes ☐ No ☐ Unknown
If yes, specify:_____L/min with
☐ Nasal cannula ☐ Face mask
☐ face mask with reservoir bag

Vasopressors/inotropes ☐ Yes ☐ No ☐ Unknown

Renal replacement therapy ☐ Yes ☐ No ☐ Unknown

Invasive mechanical ventilation ☐ Yes ☐ No ☐ Unknown

Form completed by: _____

Appendix B: EVD Daily Clinical Monitoring Form



EVD – DAILY CLINICAL DATASET

DATE (DD/MM):____/____ YEAR 20_____

PATIENT IDENTIFICATION NUMBER: [_____]

Time of assessment (HH:MM, 24-hour clock)	*Morning* ____:____	*Afternoon* ____:____	*Evening* ____:____
Temperature *(33 – 42°C)*	_____°C	_____°C	_____°C
Respiratory Rate *(0-100)*	_____*BPM*	_____*BPM*	_____*BPM*
Heart Rate / Pulse *(30-200)*	_____*BPM*	_____*BPM*	_____*BPM*
Systolic Blood Pressure *(50-200)*	_____*mmHg*	_____*mmHg*	_____*mmHg*
Diastolic Blood Pressure *(20 – 200)*	_____*mmHg*	_____*mmHg*	_____*mmHg*
SpO_2	_____%	_____%	_____%
LOWEST Consciousness Alert, Verbal stimuli, Painful stimuli, Unresponsive	*A V P U*	*A V P U*	*A V P U*

Latest Ebola PCR Results	Date *(dd/mm/yyyy)*	Results
☐ Not done ☐ GeneXpert ☐ Others: _____	____/____/____	GP : ☐ Pos. ☐ Neg. Ct :_____ NP : ☐ Pos. ☐ Neg. Ct :_____ ☐indeterminate

Latest Laboratory results (ND=Not done)

ALT/SGPT (U/L)		☐ ND	Glucose (mmol/L)		☐ ND
AST/SGO (U/L)		☐ ND	Lactate (mmol/L)		☐ ND
Creatinine (µmol/L)		☐ ND	Haemoglobin (g/L)		☐ ND
Potassium (mmol/L)		☐ ND	Total bilirubin (µmol/L)		☐ ND
Urea (mmol/L)		☐ ND	WBC count ($x10^9$/L)		☐ ND
Creatinine kinase (U/L)		☐ ND	Platelets ($x10^9$/L)		☐ ND
Calcium (mmol/L)		☐ ND	PT		☐ ND
Sodium		☐	aPTT		☐

At this assessment, does the patient have? (circle)			
Fatigue?	Yes No	Yes No	Yes No
Weakness?	Yes No	Yes No	Yes No
Myalgia?	Yes No	Yes No	Yes No
Anorexia?	Yes No	Yes No	Yes No
Headache?	Yes No	Yes No	Yes No
Nausea?	Yes No	Yes No	Yes No
Dysphagia?	Yes No	Yes No	Yes No
Vomiting?	Yes No	Yes No	Yes No
Difficulty Breathing?	Yes No	Yes No	Yes No
Diarrhea?	Yes No	Yes No	Yes No
Unusual Bleeding/bruising?	Yes No	Yes No	Yes No
Signs of dehydration?[2]	Yes No	Yes No	Yes No
Signs of shock?[3]	Yes No	Yes No	Yes No
Anuria?[4]	Yes No	Yes No	Yes No
Disorientation?	Yes No	Yes No	Yes No
Agitation?	Yes No	Yes No	Yes No
Seizure?	Yes No	Yes No	Yes No

Medications given today

Type	Dose	Route	Frequency
Antibacterial: ☐ Yes ☐ No Specify: ☐ amoxicillin ☐ ceftriaxone ☐cefixime ☐ other		☐ IV ☐ oral	
Antimalarial:			
Select all that applies:			
☐ Artesunate _____		☐ IV	
☐ Arthemeter		☐ IM	
☐ Arthemeter/Lumefantrine	/	☐ oral	
☐ Artesunate/Amodiaquine	/	☐ oral	
☐ Other:		☐ IV ☐ oral	

Ebola experimental treatment: ☐ Yes ☐ No	Indicate if yes: ☐ZMapp ☐ Remdesivir (GS-5734) ☐REGN3470-3471-3479 ☐ Favipiravir ☐mAb114

Did the patient receive any of the following today?

Oral/orogastric fluids? ☐ Yes ☐ No ☐ Unknown. To specify: ☐ORS :_____ml ☐ Water:_____ml ☐ Others:_____& Vol____ml	**IV fluid therapy** ☐ Yes ☐ No☐ Unknown If yes, specify:_____ml using ☐Ringer's lactate ☐ Normal Saline ☐ Others, specify _____	**Access type** ☐ Intra-osseous ☐ PIV ☐ CVC ☐ Unknown
Blood transfusion ☐ Yes ☐ No ☐Unknown	**Oxygen therapy** ☐ Yes ☐ No ☐ Unknown If yes, specify:_____L/min with ☐Nasal cannula ☐ Face mask ☐face mask with reservoir bag	**Vasopressors/inotropes** ☐Yes ☐ No ☐Unknown
Renal replacement therapy ☐ Yes ☐ No ☐ Unknown	**Invasive mechanical ventilation** ☐ Yes ☐ No ☐ Unknown	

Form filled in by: _____

CLINICAL NOTES

Name of Physician: _____ **Telephone:** _____

Appendix C: EVD Lab Slip

Specimen collection done for EVD patients? ☐ No. If yes, what samples? ☐ Blood ☐ ☐ Buccal swab Other_ ☐ Yes Urine				
Ebola testing	**Collection date** (dd/mm/yyyy)	**Result**		
Ebola RDT: ☐ Not done ☐ Oraquick ☐ Others: _____	____/____/____	☐ Pos ☐ Neg ☐ indeterminate.		
Ebola PCR (admission): ☐ Not done ☐ GeneXpert ☐ Others:	____/____/____	**GP** ☐ Pos. ☐ Neg. Ct :_____	**NP** ☐ Pos. ☐ Neg. Ct :_____	☐ indeterminate
Malaria RDT	/____/____	☐ Pos ☐ Neg ☐ indeterminate		
Blood culture	/____/____	☐ Pos ☐ Neg ☐ indeterminate		
Did patient test positive for any other infection? ☐ Yes ☐ No If Yes, specify_____				
Other clinical laboratory tests done on admission (ND = not done)				
Haemoglobinuria ☐ Pos ☐ Neg ☐ ND Proteinuria ☐ Pos ☐ Neg ☐ ND Hematuria ☐ Pos ☐ Neg ☐ ND		Blood Gas ☐ ND ☐ Arterial ☐ Venous Results: pH_____, pCO2_____, PaO2 _____HCO3_____ Oxygen therapy at time of blood gas (L/min) _____		

Laboratory tests on admission or Hospital Day 1(HD1). (ND = not done)

Biochemistry	Values	Not Done	**CBC & Clotting panel**	Values	Not Done
ALT/SGPT (U/L)		☐ ND	Glucose (mmol/L)		☐ ND
AST/SGO (U/L)		☐ ND	Lactate (mmol/L)		☐ ND
Creatinine (µmol/L)		☐ ND	Haemoglobin (g/L)		☐ ND
Potassium (mmol/L)		☐ ND	Total bilirubin (µmol/L)		☐ ND
Urea (mmol/L)		☐ ND	WBC count ($x10^9$/L)		☐ ND
Creatinine kinase (U/L)		☐ ND	Platelets ($x10^9$/L)		☐ ND
Calcium (mmol/L)		☐ ND	PT		☐ ND
Sodium (mmol/L)		☐ ND	aPTT (seconds)		☐ ND

Appendix D: EVD Patient Discharge Form

DISCHARGE FORM

World Health Organization

I. CASE IDENTIFICATION/ DEMOGRAPHIC DETAILS

Patient Name:	ETU Number:	Patient ID:
EPI ID:		
Contact #:		
Residential address:		
Secondary contact:		

II. DISCHARGE DETAILS

Date of Discharge/transfer from health facility/death (dd/mm/yyyy):____/_____/_____

Final Diagnosis: ☐ Ebola virus disease ☐ Other (specify)

Outcome at discharge

☐ Full recovery withOUT sequelae at time of discharge

☐ Full recovery WITH sequelae If yes, specify: ☐ hearing loss ☐ if pregnant, spontaneous abortion ☐ ocular complications ☐ extreme fatigue ☐ arthralgia ☐ neurologic complications, specify_____. ☐other: _____

☐ Dead

☐ Referred to another facility. If yes, which facility: _____

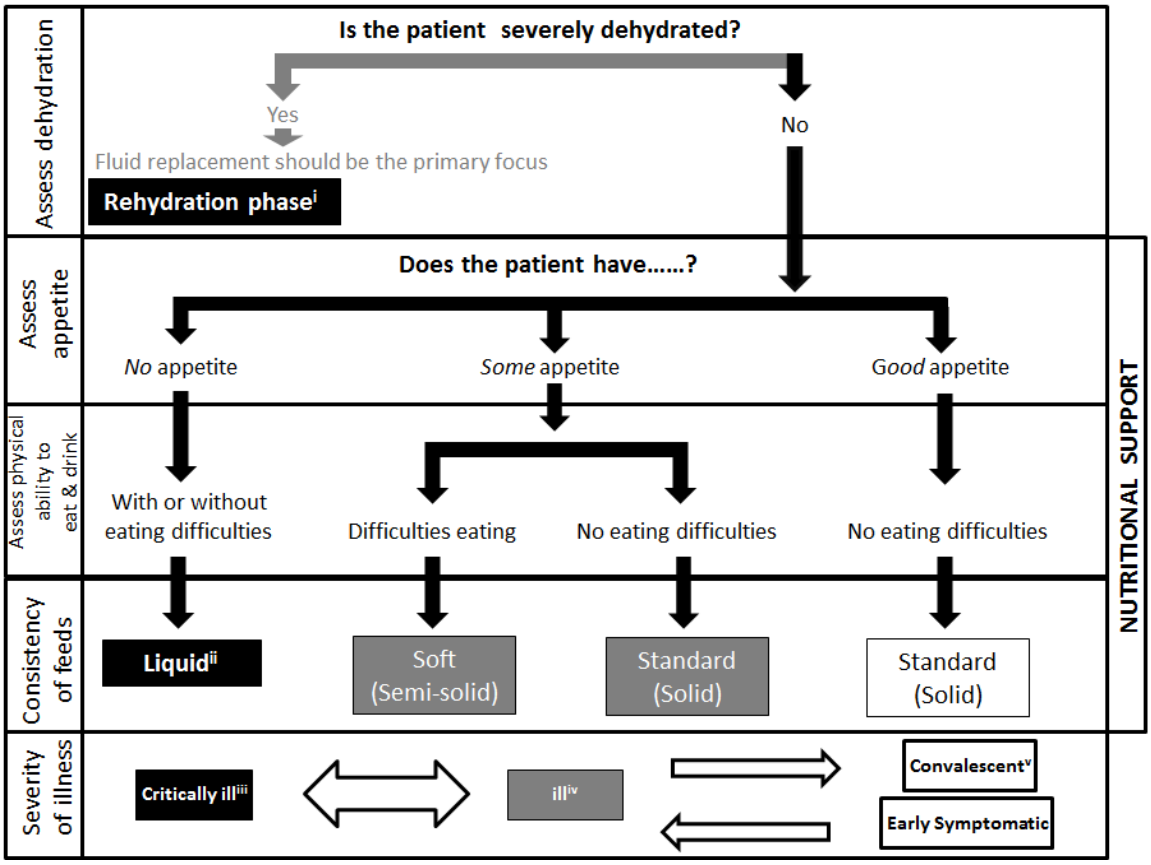
☐ Left against medical advice

☐ Survivor counselling provided.

Name of the physician: _____ **Contact details:** _____

Form completed by: _____

Appendix E: Criteria used to assess Nutrition



[i]These patients would only have IV fluids and ORS solution if possible.

[ii]It is very important to maintain hydration with ORS solution, particularly in critically ill patients (liquid diet).

[iii]It is particularly important critically ill patients (liquid diet), only receive low osmolarity, low renal solute load options (i.e.: F75).

[iv]It is important that ill patients (soft and solid diet), receive low osmolarity, low renal solute load options.

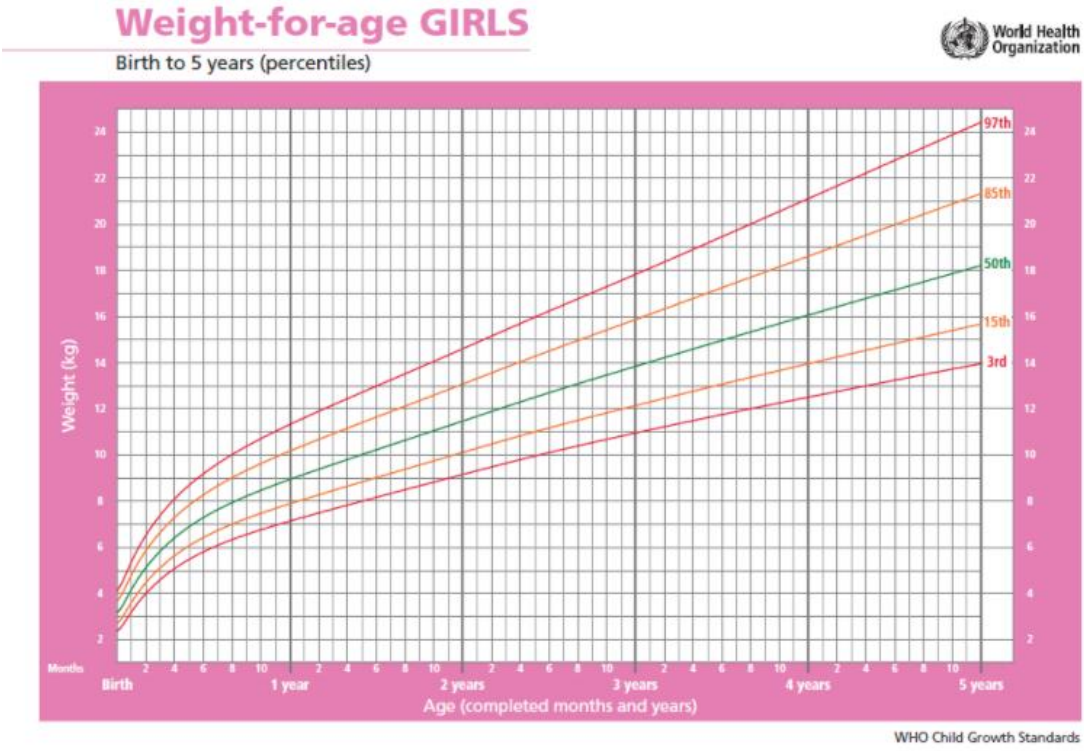
[v]For convalescent patients do not limit the quantity of food and provide extra snacks.

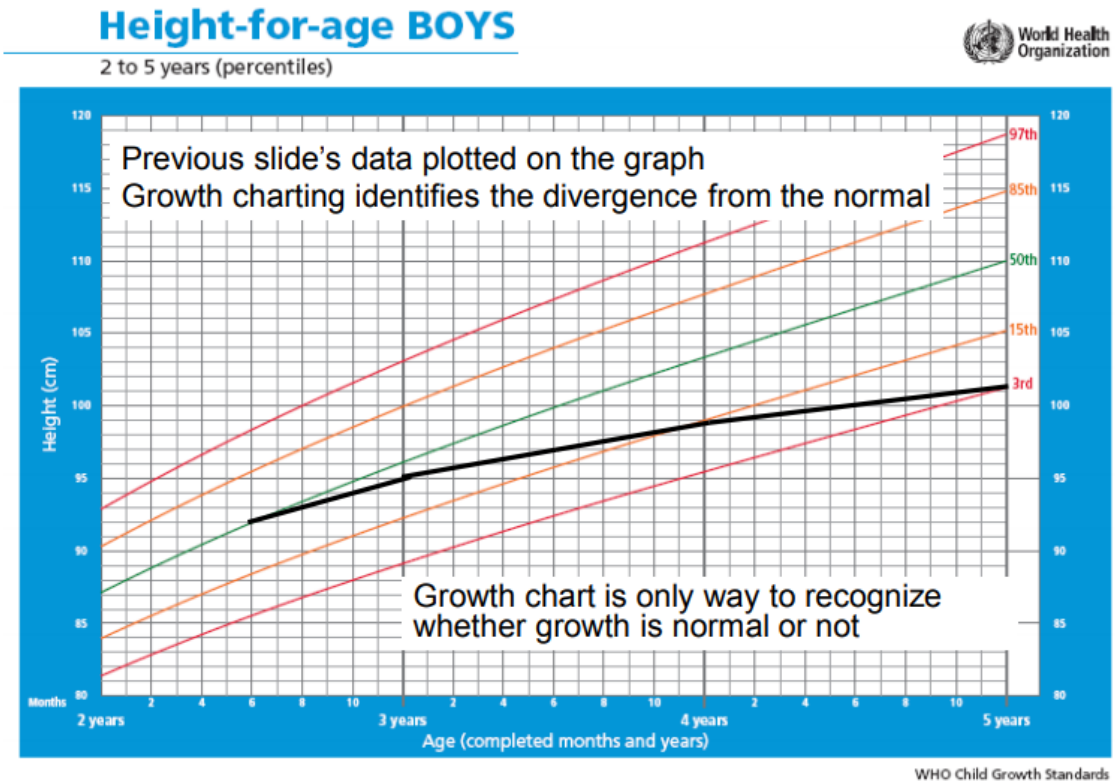
Adults in ETU		*Daily Recommended Energy and Nutrient Intake: 1,800kcal to 2,400kcal*						
Phases of Nutrition-Related Conditions of EVD Patients				Management				
Severity of Illness	Presence or Absence of Severe Dehydration	Level of Appetite	Presence or Absence of Eating Difficulties	Diet and Consistency of Food	Food Commodities	Quantity per Day	Estimated Kcal	Fluid Intake
Criticality ill	Severely dehydrated	Rehydration using ORS solution is the first priority. No nutrition intake during this phase. Nutritional support should not interfere with the strategies for volume and electrolytes repletion as meeting nutrition requirements will be temporarily be of a lower priority.						IV fluids, with ORS solution if possible
	Not severely dehydrated	No appetite	With/without difficulty eating	Liquid	F-75	80 - 100kcal/kg/day		ORS solution
Ill	Not severely dehydrated	Some appetite	Difficulty eating	Soft diet - Semi-solid	Catered mashed food/soup[i], and	3 meals (1 meal = 250 kcal)	750	*ORS solution *Water, *Low osmolarity beverages * RUTF/ RUSF should be given only to those who are able to drink sufficient water by themselves (a minimum ratio of 1ml of water for each kcal of the diet)
					RUTSF biscuit (as a porridge) and	1.5 sachet (1 sachet = 500 kcal)	750	
					Supercereal[ii]	1 serving (100g dry product)	380	
			No eating difficulties	Standard diet - Solid	Catered food[i]	3 meals (1 meal = 300 kcal)	900	
					RUTSF biscuit and	2 sachets (1 sachet = 500 kcal)	1,000	
					Supercereal	1.5 serving (150g dry product)	570	
Convalescent[iii] or early symptomatic	Not severely dehydrated	Good appetite	No eating difficulties	Standard diet - Solid	Catered food[i]; and	3 meals (1 meal = 300 kcal)	900	
					RUTSF biscuit and	2 sachets (1 sachet = 500 kcal)	1,000	
					Supercereal[ii]	1.5 serving (150g dry product)	570	

Note: If RUTF is not available, ready to use supplementary food (RUSF) can be used with the same quantity per day as for RUTF. All food commodities listed for each category should be offered to the patient, not either or.

Note: If RUSF is not available, RUTF can be used with the same quantity per day as for RUSF. All food commodities listed for each category should be offered to the patient, not either or

Appendix F: WHO Growth Standards





Source: http://www.who.int/childgrowth/standards/chts_wfa_girls_p/en/

Appendix G: Some Essential Medicines List for the ETU

#	Item	Category			
1	Ceftriaxone, injectable, 500mg	Antibiotic			
2	Gentamicin, 20mg in 1ml or 40mg in 2ml	Antibiotic			
3	Ciprofloxacine, 400mg, injectable	Antibiotic			
4	Ampicillin, powder, injectable, 500mg	Antibiotic			
5	Amoxicillin, 500mg	Antibiotic			
6	Azithromycin, 250mg	Antibiotic			
7	Doxycycline tablets, 100mg	Antibiotic			
8	Ciprofloxacine, 500mg, tablets	Antibiotic			
9	Cefixime caps, 400mg	Antibiotic			
10	Metronidazole infusion, 500mg	Antibiotic			
11	Metronidazole 500mg and 200mg tablets	Antibiotic			
12	Cotrimazole tablets, 480mg	Antibiotic			
13	Tetracycline eye ointment, 1%	Antibiotic			
14	Artesunate, injectable, 60mg	Antimalarial			
15	Arthemeter, injectable, 40mg in 1ml	Antimalarial			
16	Arthemeter-Lumefantrine, adult dose	Antimalarial			
17	Arthemeter-Lumefantrine 20mg +120mg	Antimalarial			
18	Fluconazole, 200mg tabs	Antifungal			
19	Dolutegravir (DTG) +Tenofovir+Lamivudine FD	ART or HIV			
20	Ranitidine injectable, 50mg vial	Gastrointestinal			
21	Ranitidine tablets, 150mg	Gastrointestinal			
22	Omeprazole tablets, 20mg	Gastrointestinal			
23	Omeprazole injectable, 40mg	Gastrointestinal			
24	Metoclopramide injectable, 5mg/ml in 2 ml	Gastrointestinal			
25	Metoclopramide tablets, 10mg	Gastrointestinal			
26	Ondansetron injectable, 2mg/ml in 2 ml	Gastrointestinal			
27	Mebendazole tablets, 100mg	Gastrointestinal			
28	Antiacids, Assorted	Gastrointestinal			
29	Vitamins, multivitamin	Gastrointestinal			
30	Oral rehydration salts	Gastrointestinal			
31	Vitamins, Ascorbic acid, 50mg tablets	Gastrointestinal			
32	Vitamins, Phytomenadione injection, 10mg/ml	Gastrointestinal			
33	Zinc sulfate tablets, 20mg	Gastrointestinal			
34	Vitamin, ferrous sulfate	Gastrointestinal			
35	Vitamin, Retinol (Vitamin A), 50,000 IU capsules	Gastrointestinal			
36	Paracetamol tablets, 500mg	Antipyretic-analgesic			
37	Paracetamol tablets or suppository, 100mg	Antipyretic-analgesic			
38	Paracetamol injection	Antipyretic-analgesic			
39	Naloxone I jection, 400mcg in 1 ampoule	Antipyretic-analgesic			
40	Morphine injection, 10mg in 1 ampoule	Antipyretic-analgesic			
41	Morphine, immediate release, 10mg	Antipyretic-analgesic			
42	Dextrose in water, 5%, 500ml	Fluids and electrolyte			
43	Detrose in water, 10%, 500ml	Fluids and electrolyte			
44	Glucose in water, 50%, 50ml	Fluids and electrolyte			
45	Ringers, lactated, 500ml	Fluids and electrolyte			
46	Saline, 0.9%, 500ml	Fluids and electrolyte			
47	Water for injection	Fluids and electrolyte			
48	Oral rehydration salts	Fluids and electrolyte			
49	Potassium chloride, tablets	Fluids and electrolyte			
50	Sodium bicarbonate injectable, 8.4%, 1mEq/ml, 20ml	Fluids and electrolyte			
51	Potassium chloride solution, 11.2% in 20ml	Fluids and electrolyte			
52	Sodium chloride , 0.9% isotonic	Fluids and electrolyte			
53	Calcium tablets	Fluids and electrolyte			
54	Calcium gluconate, injectable	Fluids and electrolyte			
55	Zinc sulfate, 20mg tablets	Fluids and electrolyte			
56	Dexamethasone injection, 4 or 6mg	Steroid			
57	Hydrocortisone injection, 100mg vial	Steroid			
58	Prednisolone tablets, 5mg	Steroid			
59	Salbutamol 100mcg	Respiratory			
60	Oxygen, concentrator or cylinder	Respiratory			
61	Oxygen giving sets, assorted-masks, canulas,	Respiratory			
62	Ambumag and tubes, assorted	Respiratory			
63	Diazepam tablets and gel/suppository, 2mg or 5mg	Anxiolytic			
64	Diazepam injection, 5mg/ml	Anxiolytic			
65	Phenobarbital sodium injection, 200mg/ml	Anxiolytic			
66	Chlorpromazone tablets, 25mg	Anxiolytic			
67	Chlorpromazone injection, 25mg	Anxiolytic			
68	Haloperidol injectible, 5mg/ml ampoule	Anxiolytic			
69	Furosemide tablets, 20mg	Antihypertensive			
70	Furosemide injectable, 20mg in 1ml or 10mg in 1ml	Antihypertensive			
71	Hydrochlorothiazide tablets, 25mg	Antihypertensive			
72	Atenolol tablets, 50mg	Antihypertensive			
73	Nifedipine, 20mg tabs	Antihypertensive			
74	Hydralazine, injection	Antihypertensive			
75	Lisinopril tablet, 10mg	Antihypertensive			
76	Metformin, 500mg	Hypoglycemic			
77	Insulin, Regular 100u/ml in 10ml vial	Hypoglycemic			
78	Insulin, Long acting, 100u/mlx10ml	Hypoglycemic			
79	Oxytocin injection, 10IU in 1ml	Obstetric emergency			
80	Misoprostol, 200mcg tab	Obstetric emergency			
81	Magnesium sulfate, 10% and 20% 500mg/ml in 2 ml & 10ml	Obstetric emergency			
82	Calcium gluconate, injectable	Obstetric emergency			
83	Ergometrine ijection, 200mcg in 1 ml	Obstetric emergency			
84	Mannual vacuum extractor	Obstetric emergency			
85	Delivery set	Obstetric emergency			
86	Suture set and #0 Vicryl suture	Obstetric emergency			
87	Uterine set, EOU	Obstetric emergency			
88	Dopamine hydrochoride injection, 40mg/ml in 5ml vial	Cardiovascular			
89	Adrenaline (Epinephrine) injection, 1mg in 1ml	Cardiovascular			
90	Lidocaine injection, 1% or 2%	Cardiovascular			
91	Plasma and fresh whole blood	Cardiovascular			

Appendix H: Some Essential EVD Medical Supplies

#	Item	Category	Unit	Description
1	Nebulizer	Respiratory		
2	Oxygen cylinder, with guage, valve, meter	Respiratory		
3	Oxgen concentrator with humidifier (10 liters)	Respiratory		
4	Oxygen giving set, nasal prungs and tubes, assorted	Respiratory		
5	Oxygen giving set, face mask and tubes	Respiratory		
6	Oxygen giving set, non-rebreather and partial rebreather mask, assorted	Respiratory		
7	CPAP Machine	Respiratory		
8	Ambubag, assorted sizes	Respiratory		
9	Incubator, baby	Respiratory		
10	Mechanical Ventilator, transport (pneumatic)	Respiratory		
11	Ventilator, portable/Mobile, and assessories set	Respiratory		
12	Laryngoscope, assorted sizes	Respiratory		
13	Bronchoscope, assorted	Respiratory		
14	ET tubes, assorted sizes	Respiratory		
15	Suction machine	Respiratory		
16	Suction tips, assorted sizes	Respiratory		
17	Intubating aids	Respiratory		
18	Cardio-respiratory monitor	Respiratory		
19	Defibrillator	Respiratory		
20	ECG machine	Respiratory		
21	ICU bed	Respiratory		
22	Central venous cathers, assorted	Respiratory		
23	Blood gas analyzer	Respiratory		
24	BTM Swap	Respiratory		
25	Needles and Syringes, 5cc	Injection equipment		
26	Needles and Syringes, 10cc	Injection equipment		
27	Needles and Syringes, 2cc	Injection equipment		
28	Needles, 19G, disposable	Injection equipment		
29	Needles, 21G, disposable	Injection equipment		
30	Needles, 23G, disposable	Injection equipment		
31	IV canulas, 24G	Injection equipment		
32	IV canulas, 22G	Injection equipment		
33	IV canula, 20G	Injection equipment		
34	IV canula, 18G	Injection equipment		
35	IV Canula, 16G	Injection equipment		
36	Scalp vein infusion set with IV canula, 25G	Injection equipment		
37	Nasogastric tubes	Feeding tubes		
38	Infusion sets/tubings	Injection equipment		
39	IV stands/poles	Injection disinfection		
40	Iodine, povidine	Skin disinfection		
41	Adhesive tapes	IV giving equipment		
42	Adhesive bandage,flexible			
43	Scissors assorted sizes			
44	Dressing sets/trays			
45	Medication/Procedure trays			
46	Gauze, rolls			
47	Gauze, sterile packs 4x4			
48	Cotton for swabs			
49	Tourniquets			
50	suture , assorted (vicryl, monocryl, pds, nylon, prolene, polysorbs,etc)			
51	Dressing sets/trays			
52	Condoms			
53	suture sets			
54	Blade, surgical (assorted sizes)			
55	Sharps containers/Safety boxes			
56	Medication cups			
57	neonatal heat blankets			
58	Urethral catheter, folley catheter			
59	Urine bag			
60	Bed pan			
61	Urinal			
62	Dispensing bags, assorted sizes			
63	Pulse oximeters			
64	Thermometer, electronic			
65	Thrmometer, Thermoflash			
66	BP Cuff, electronic			
67	Stethoscope, manual, Litmann			
68	Stethoscope, electronic			
69	Wall clocks			
70	Cordiorespiratory monitor			
71	ECG machine			
72	Echo machine			
73	Medication trolleys			
74	Dispensing bag, medication, assorted sizes			
75	Forceps			
76	Kidney dish			
77	Stretcher, washable, disinfectable,			
78	Medicination trays			
79	wheel chair			
80	Delivery Table with stirups			
81	Autoclave			
82	OT stools/chairs			
83	Examination lamp, standing			
84	Instrument stand			

Appendix I: EVD Essential Diagnostic Supplies

#	Item	Category	Unit	Description	Baseline stock
1	Glucometer and strips			pieces	0
2	Rapid diagnostic test, Malaria			Packs of 100	0
3	Rapid diagnostic test, HIV (Alere determine			Packs of 100	0
4	Rapid diagnostic test, HIV, Unigold			Packs of 100	0
5	Rapid diagnostic test, HBV			Packs of 100	0
6	Rapid diagnostic test, HCV			Packs of 100	0
7	Rapid diagnostic test, Syphilis			Packs of 100	0
8	Rapid diagnostic test, Typhoid			Packs of 100	0
9	Rapid diagnostic test, Urine dip stick			Packs of 100	0
10	Rapid diagnostic test, Pregnancy test			Packs of 100	0
11	Hemotubes			Packs of 100	0
12	Vacutainer, red top			Packs of 100	0
13	vacutainer, purple top			Packs of 100	0
14	Hemoglobinometer			pieces	0
15	Glassware set, assorted			pieces	0
16	Sample transport box (vaccine transport box)			pieces	0
17	Blood chemistry machine			pieces	0
18	Hematology machine			pieces	0
19	Calorimeter			pieces	0
20	Autoclave s/s			pieces	0
21	Hematology Analyzer			pieces	0
22	Ultrasound machine, portable			pieces	0

Appendix J: Other Essential Obstetrics Supplies for the ETU

1	Bed pan			
2	Dispensing bags, assorted sizes			
3	Birthing chair			
4	Thermometer, electronic			
5	Thrmometer, Thermoflash			
6	BP Cuff, electronic			
7	Electronic fetal doppler			
8	Stethoscope, electronic			
9	Wall clocks			
10	Ultrasound machine			
11	delivery table			
12	Medication trolleys			
13	Forceps			
14	Stretcher, washable, disinfectable,			
15	Medicination trays			
16	Wheel chair			
17	Anesthesia Machines			
18	Operating Table with stirups			
19	OT Cabinets			
20	Autoclave			
21	OT stools/chairs			
22	OT trays			
23	OT lamps			
24	Instrument table			
25	Instrument stand			
26	Neonatal resuscitation table with incubater, oxygen concentrator, mask, tubings, ambubag, and medication tray			
27	Roller bets or carrier beds			
28	Surgical sets, caesarean			
29	Surgical set, laparotomy			
30	Surgical set, Hysterectomy			
31	Surgical set, gyne			
32	surgical set, MVA			
33	Surgical set, EOU			
34	Surgical set, Dressing set			
35	Surgical supplies, assorted (lap towels, gauze roll, field sheet, gowns, table cover			

Appendix K: ETU WASH and IPC Supplies List

#	Item	Priority	Unit	Description
1	Body Bags (L)			carton
2	Body Bags (S)			carton
3	Chlorine Powder			KG
4	Bleache, household L/S			carton
5	Chlora (1L)			liter
6	Chlora (4L)			liter
7	Plastic tub (large)			piece
8	Plastic Bucket w/ faucet			pieces
9	PPE Suit - Hooded Coverall			carton
10	PPE Suit - Coverall (no hood)			carton
11	PPE Hood			carton
12	Examination Gloves (S)			carton
13	Examination Gloves (M)			carton
14	Examination Gloves (L)			carton
15	Examination Gloves (XL)			carton
16	Gloves, sterile surgical size 6.5			carton
17	Gloves, sterile surgical size 7			carton
18	Gloves, sterile surgical size 7.5			carton
19	Gloves, sterile surgical size 8			carton
20	Gloves, gynecology			carton
21	Face Mask (N95)			carton
22	Goggles			carton
23	Heavy Duty Plastic Gloves			carton
24	Boots, rubber, size 7			carton
25	Boots, rubber, size 8			carton
26	Boots, rubber, size 9			carton
27	Boots, rubber, size 10			carton
28	Boots, rubber, size 11			carton
29	Boots, rubber, size 12			carton
30	Hand Sprayer (1.5L)			carton
31	Backpack Sprayer (12-16L)			carton
32	Anti Fog Cleaner (12 fl Oz)			carton
33	Alcohol (Isopropyl) 70%			carton
34	Hand Sanitizer			carton
35	Apron - Disposable Plastic			carton
36	Disposable Surgical Gown (Sterile)			carton
37	Face Mask - Surgical			carton
38	Face Shield (flexible, disposable)			carton
39	Sterile Surgical Gown			carton
40	Surgical Cap			carton
41	1.5L Hand Sprayer			piece
42	Knapsack Sprayer (12L-16L)			piece
43	Apron - Heavy Duty Plastic Reusable			piece
44	Apron - Thin Plastic disposible			piece
45	Rain Gear - set (top & bottom)			piece
46	100L Drum			piece
47	Jerry cans (plastic, 20 L)			piece
48	Jerry cans (plastic, 5 L)			piece
49	Plastic Hand Scrubbing Brush			piece
50	Plastic Tub (large)			piece
51	Scrubs, assorted sizes			sets
52	Scrub slippers, assorted			pairs
53	Tarpaulin			piece
54	Mop set			piece
55	Plastic Barrel w/ faucet			piece
56	Plastic Bucket w/lid, no faucet			piece
57	Safety Box - 2L			piece
58	Safety Box - 4L			piece
59	Safety Box - 5L			piece
60	Trash Bag			piece
61	Trash can - Large w/lid and tires			piece
62	Yellow bucket with lid for waste			piece
63	Shovel			piece
64	Dustpans, with long handle			piece
65	Broom, soft & hard			piece
66	Wheelbarrow			piece
67	Rake			piece
68	Plumbing tool kit			piece
69	Bleach			piece
70	Plungers			piece
71	Commode brush			piece
72	Floor wipes/rags			piece
73	Electrical tool box			piece
74	Household ladder			piece
75	Soap, laundry/powder			boxes
76	Liquid Soap			carton
77	Laundry machine, industrial			
78	Dryer, laundry, industrial			

Appendix L: Some ETU Essential non-medical supplies

#	Item	Unit	Descriptio
	Consumables, non-medical essentials		
1	Pampers, assorted	packs	
2	Gowns, patient, assorted sizes	piece	
3	Linens, hospital bed	piece	
4	Paper towels	cartons	
5	Hospital slippers	piece	
6	Sanitary pads, assorted sizes	piece	
7	Toilet rolls	piece	
8	Tooth paste	piece	
9	Tooth brushes	piece	
10	Soap, shower	piece	
11	Soap, laundry	piece	
12	Towels,, shower,	piece	
13	Vaseline	piece	
14	Clothes, assorted, adult	piece	
15	Clothers, assorted, children	piece	
16	Blankets	piece	
17	Slippers, patient	pairs	
18	Spoons, disposable	piece	
19	Cups, disposable	piece	
20	Plates, disposable	piece	
21	ReSoMal	packs	
22	Plumpy nuts	box	
23	F75	box	
24	Infant formular	kg	

Appendix M: Some ETU Essential operational

#	Item	Priority	Description
1	Lap top computer		
2	Desktop computer		
3	Printer-phtocopier-scanner		
4	Catridges/toner, printer-photocopier		
5	Plain papers		
6	White board writers		
7	File folders, manilla		
8	Pins, stapler		
9	Internet modem/router		
10	Pens		
11	Scotch tapes		
12	Calculator, potable		
13	Extension cords		
14	note books, spiral		
15	Binders		
16	Perforators		
17	Cabinet, filing		
18	Scotch tape holder		
19	Patient papers-meicatin sheet		
20	Papers-inventory		
21	papers-nursing notes		
22	Ledgers/log books		
23	Mobile credits/data		
24	Mobile phones		
25	Desk phones		
26	Chairs, plastic		
27	Desk, waterproof		
28	Universal adaptor		
29	Power stabilizer		
30	Discharge certificate		
31	Discharge summary		
32	Box files		
33	Bedside lamps		
34	Ruler		
35	Shelves		
36	Public address system - six sets		
37	Adroid tablets		
38	Clipboards, plastic, paper holder		

Appendix N: ETU Operational Readiness Assessment Tool

National Public Health Institute of Liberia (NPHIL)

Ebola Isolation Capacity (Case Management) Assessment Checklist

County: _____ ETU Name:_____ Date: _____

Name of Assessment Team Lead: _____ Phone #:_____

Category	#	Tasks/Activities	Response	Comments	Follow up required
SOPs/ Guidelines	1	Treatment guideline (hard/electronic) observed at ETU			
	2	ETU Operational manual or SOPs observed			
	3	Job aids/labels posted at appropriate locations			
Staff	4	Sufficient number of health workers designated to ETU			
	5	Total # of staff (clinicians and non-clinicians)			
	6	All ETU staff trained on relevant guidelines/SOPs			
	7	A dead body management team is available in the county			
	8	The burial team is trained on dignified burial & IPC			
	9	Psychosocial team trained			
	10	Lab team trained			
Isolation unit, WASH, IPC, etc.	11	At least one functional ETU available for EVD			
	12	ETU has complete perimeter fencing			
	13	The total bed capacity of the ETU			
	14	Green zone entrance has EVD screening point			
	15	ETU has beds, chairs, mattresses, secure doors/barriers			
	16	IPC barriers exist between green and red zones allows unidirectional flow from green-to-red-to-green zone			
	17	Patient screening area has hand hygiene, waiting & toilet and allows adequate distancing between patient and staff			
	18	separate entrance for patients, staff, and visitor entrance present and limited by a barrier			
	19	Appropriate waste management infrastructure (e.g., incinerator/burn pit & waste storage area)			
	20	Dead body management facility			

Category	#	Tasks/Activities	Response	Comments	Follow up required
	21	Designated M&F toilets (1:5 pts) for confirmed patients			
	22	Designated M&F toilet (1:5 pts) for suspected patients.			
	23	Ambulance decontamination plan in place at ETU			
	24	At least one EVD ambulance is available in the county			
	25	Access to safe tap water supply available plus storage for at least two days (i.e., at least 15m3 for 20 pts.)			
	26	Designated donning station with shelves for PPE			
	27	Designated PPE doffing area with waste mgt. system			
	28	Designated staff toilet and shower (1:20) in the green zone			
	29	Has laundry and packaging area for reusable PPE			
	30	Has laundry equip. (e.g., laundry machine, barrels) available			
	31	All water taps & sewer system in good working condition			
	32	Access to EVD lab			
	33	Clinical lab available (i.e., chemistry, CBC, UA, M/S, HIV, typhoid, syphilis, HBV), access to a blood bank			
	34	Mental health psychosocial services for patients/staff			
	35	Has SOP to document, manage and report HCW infection			
	36	Referral plan in place for EVD survivors to follow-up care			
	37	Has one or more offices to support operations			
	38	Contains room for staff to store personal effects			
Data Mgt.	39	Database for EVD data reporting available			
	40	Clerk trained in data entry, security, mgt., & reporting			
	41	Standard forms available (e.g., admission, daily monitoring, discharge, lab, death certificate			
Logistics (IPC, WASH, PPE, meds, non-med)	42	The ETU has a storage area for drugs and supplies			
	43	Access to sodium hypochlorite and liquid soap supply			
	44	WASH equipment is available (labeled waste bins, sprayer can, handwashing, chlorine mixing, storage, transport equipment, wheelbarrows, body bags, etc.)			

Category	#	Tasks/Activities	Response	Comments	Follow up required
	45	PPE & IPC supplies available (i.e., boots, gloves, masks, gowns, coverall, goggles, face shield, sharps box, etc.)			
	46	A stock of non-medical supplies is available (e.g., bed linen, gowns, sanitary supplies, discharge kits, etc.)			
	47	Sufficient scrubs and scrub shoes available for ETU staff			
	48	At least one ETU thermometers in stock			
	49	Essential drugs are in stock (e.g., antibiotics, antipyretic, ORS, IV fluids, antimalarial, anti-emetics, NG tubes, etc.)			
	50	Availability WHO-approved EVD therapeutic & vaccine			
	51	Oxygen and pulse oximeters available at ETU			
	52	Access to a stable supply of blood products			
	53	Administrative supplies available (computer, printer, stationery, desks, chairs, etc.			
	54	There is a functional phone & internet router with credits/data to communicate with patients, staff, pillars.			
	55	Has stock mgt. tools (e.g., request forms, spreadsheets)			
	56	ETU has access to tap water supply			
	57	ETU has a functional power source, diesel & service plan			
	58	Access to a vehicle to transport logistics			
	59	Access to a vehicle to transport the ETU staff			
	60	Access to a vehicle to transport lab/biological samples			
	61	Access to a vehicle to transport dead bodies			
	62	There data and supply quality assurance process in place			
Operations	63	Adequate partner coordination with local team ongoing			
	64	Security in place for staff, supplies & infrastructure			
	65	The ETU command structure in place			
Indicator scoring[a] (excluding #5&13)					
ETU Preparedness Score (Indicator score +#5+#13)[b]					

1. a=Responses: Done/Available=Y (2), Partially=IP (1), Not done=N (0). For #5= total staff assigned. #10 write total beds.

2. Follow-up required: Write Yes or No as appropriate

3. Indicator scoring: Total score excluding ETU bed capacity and staffing numbers

4. b=ETU Preparedness Prepared (>140), Partially-prepared (71-140), Not prepared (<70). Scoring should be adapted to the context.

Appendix O: Non-EVD Health Facility Triage & Holding Unit Assessment Tool

National Public Health Institute of Liberia (NPHIL)

Healthcare Facility Ebola Screening & Isolation/Holding Capacity (EVD Case Management) Assessment Checklist

County: _____ District: _____ HCF Name: _____ HCF Type✻: _____ HCF Head: _____

Name of Assessment Team Lead: _____ Phone #:_____ Assess Date: _____

CM Category	#	Tasks/Activities	Response	Remark	Follow-up required
SOPs/ Guidelines	1	EVD screening algorithm posted in HCF Triage			
	2	Approved EVD treatment guidelines/SOP observed			
	3	EVD screening forms available			
Staff/training	4	Patients, staff, visitors screened for EVD on the day of assessment using updated case definitions (e.g., body temperature measurement)			
	5	EVD screener(s) and HU staff observed with appropriate PPE			
	6	EVD screener(s) and HU staff have been trained on protocols			
Holding capacity, IPC and Supplies	7	EVD screening area/triage available at HCF entrance			
	8	At least one functional holding unit available near the HCF triage			
	9	The holding unit allows unidirectional flow			
	10	The total bed capacity of the holding unit			
	11	IPC barrier and signs exist between holding unit and rest of facility			
	12	Patient/visitor queues allow for a 1-meter distance apart			
	13	Adequate distance between screener and patients			
	14	Clear referral flowchart with contact numbers available			
	15	HCF IPC focal point available			
	16	Ambulance service is available/accessible			
	17	Disinfection of non-disposable items carried out			
	18	Dedicated functional toilet available in holding area			

CM Category	#	Tasks/Activities	Response	Remark	Follow-up required
	19	Functional handwashing facility exists in triage & HU			
	20	Access to safe water supply available in HU			
	21	Dedicated donning area available with appropriate PPE			
	22	Dedicated doffing area available with proper barriers			
	23	Functional taps and safe water supply accessible in HU/triage			
	24	Handwashing stations observed at critical locations (POC)			
	25	Waste bin adequate for waste segregation in triage & HU			
	26	Infrastructure and procedure in place to manage HU waste-store, segregate, decontaminate, dispose			
	27	A stock of chlorine chemical and liquid soap available			
	28	Has WASH equipment (sprayer can, handwashing equipment, chlorine mixing, storage, dispensing, transport equipment, waste bins, and sharps box, etc.)			
	29	Access to PPE and IPC supply (e.g., boots, gloves, masks, gowns, aprons, body bags, and goggles).			
	30	At least one thermometer in HU			
	31	Essential drug and supplies available for emergency EVD management (e.g., antipyretic, ORS, IV fluids, drinking water, antibiotics, etc.)			
	32	IPC focal person to conduct HCF/HCW assessment after high-risk exposure +/- isolation/monitoring if indicated			
	33	IPC focal person trained on HCF/HCW assessment after exposure			
	34	Health facility staff on a selected ward were observed in risk-appropriate PPE during the visit			
Coordination	35	Contact of county case manager, burial team, IPC, surveillance, and RRT team available and posted in the screening area			
Total score/Health Facility Preparedness					

1. HCF Type ✻: TH=Tertiary Hosp.; SH=Secondary Hosp.; HC=Health Center; Primary Clinic=PC

2. Response: Done/available=Y (2); Partly done/available=P (1); Not done=0 (For #10 write total beds)

3. Follow-up needed: Write Yes or No as appropriate

4. HCF Preparedness: Prepared (>60), Partially prepared (26-59), Not prepared (0-25). Scoring should be adapted to the context.

HCF Director: Name: _____ Signature: _____ Date: _____