STEP CARE

FOR EBOLA/VIRAL HEMORRHAGIC FEVER PATIENTS: GUIDANCE FOR INTERNATIONAL FIELD HOSPITALS

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

ASPR
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Purpose:

This document is intended to help organizations who want to provide care for Ebola virus disease (EVD)/viral hemorrhagic fever (VHF) patients determine an appropriate level of medical care that they can provide and anticipate the supplies that may be needed. This guidance may be applicable to other diseases where dehydration and electrolyte imbalance are key contributors to mortality.

Setting:

This guidance applies to resource-restricted settings that may be found in low- and middle-income countries. It is **not** designed for application in the domestic United States.

Scope:

This guidance provides suggested levels of medical care, as well as potential necessary supplies for patient care using a tiered approach. It is not designed to be comprehensive, and the resources available in the affected country, as well as supply chain integrity, will affect supply decisions. It does not account for the resources needed to support team members and suspect or convalescent isolated patients, nor does it consider the communications, command, and coordination elements that are critical to a successful mission. This guidance also does not cover infection control; training; site layout, including intake/assessment, suspect case testing, patient care (which may be organized by levels), feeding areas, convalescent care, and visiting areas; behavioral health; or other issues necessary for a safe and successful mission. The care of specialized populations, such as pediatric or obstetric patients, may require different expertise and resources, as well as specific changes to clinical care. Please see the references at the end of this document for further information.

Background:

Prior to making a commitment to the provision of care for EVD/VHF patients in an austere environment, organizations should consider their goals, staffing, infrastructure, and supply possibilities, and determine what level of interventions they are reasonably able to provide. Many lives will be saved through basic interventions that may be provided by laypersons or those with minimal training (base of pyramid; see page 5: Escalating Levels of Care). As the complexity of care increases (up the pyramid), so do logistical requirements and costs, as well as provider expertise requirements and exposure risk. Increased potential for equipment breakdown should also be considered. Provision of advanced care for fewer patients may risk exacerbating inequity unless the lower levels of the pyramid are thoroughly addressed. Comprehensive provision of basic care also limits the progression of illness and, thus, the requirements for advanced care. Arrangements should be made to accommodate convalescent patients for a period of at least one week following the resolution of symptoms, during which time these patients may contribute to patient care activities.

Although intensive care is listed as the tip of the pyramid, it is seldom relevant in austere environments due to the logistics and expense (in time, caregiver, and treatment investment) relative to the lives saved. Evacuation of critically ill patients to areas with better patient care resources may be appropriate and represent a better use of resources when available and justified.

Safety:

Any organization that wants to provide EVD/VHF patient care must commit to employing a safety officer who is well versed in such missions. Examples of environmental hazards include high heat (exacerbated by personal protective equipment [PPE]), sanitation, water contamination, sharps management and disposal, and trip/slip/fall hazards. Infectious disease transmission to caregivers is a significant threat, and plans for strict attention to PPE doffing and donning practices, work cycles, decontamination, and patient management protocols that minimize exposure potential are critical. Decedent management; interpreter services; site security; and behavioral health issues for providers, patients, and families are other critical elements that must be thoroughly addressed to provide safe care. Staff monitoring systems must be in place to maintain caregiver health and identify potential caregiver infection.

Medical care principles:

Guidelines and operating procedures for clinical care must be in writing, and providers must be fully trained on them prior to conducting a medical care mission. The care of EVD/VHF patients is beyond the scope of this document; however, a few key considerations, based on available resources and discussions with subject matter experts, include the following:

- Provider safety and health is paramount to successful care. Safety officers should accompany all deployed teams and have broad experience with international deployments, provider/workplace safety, and PPE.
- Oral rehydration should be performed whenever feasible.
- Parenteral (intravenous [IV]) hydration is preferred when oral is not possible. (Placement and maintenance of nasogastric [NG] or orogastric [OG] tubes are difficult and carry a significant risk of both failure and provider exposures.)
- Because of the frequency of electrolyte abnormalities in EVD/VHF patients, electrolyte monitoring and repletion should be performed, if possible.
- Use of dextrose-containing IV fluids may be helpful to maintain blood glucose, but could be harmful if hyperglycemia occurs, particularly in patients with encephalopathy.
- Nutrition is critical. Standard, mashed, and liquid diets should be available and culturally appropriate. Food handling and preparation should follow standard safety guidelines to prevent provider and patient illness.
- The addition of macronutrients/supplements to the usual EVD/VHF care is controversial and updated guidance should be sought prior to and during deployment.
- Broad-spectrum antibiotics should be administered to severely ill patients. Strong consideration for empiric treatment of malaria should be given in endemic areas.
- Convalescent serum and other blood product administration may be helpful, but is not included in the recommendations or accounted for in the supply lists. Expert guidance should be sought prior to and during deployment for recommendations on safe and effective practices.

- Patient vital signs should be monitored at least every 8 hours and documented.
- Clinical providers should be available in the patient care area whenever possible.
- Charting is difficult in the care environment; however, a process for written documentation of signs, symptoms, vitals, and results is critical. Basic bedside information may be conveyed by whiteboards; however, a process for charting within and outside the infectious area must be in place to render effective care.
- Severely ill patients require additional caregivers. An expert panel has recommended a 1:4 staff-to-patient ratio in these settings.
- Past outbreaks do not necessarily predict the clinical profile of future epidemics, and teams must be prepared to adjust medical care and required supplies as dictated by patient needs.
- Behavioral health/mental health support for patients, family members, and staff is critical to successful EVD/VHF care. The stress of illness is compounded by common perceptions of EVD/VHF and the isolation and marginalization experienced by patients. Appropriate trained personnel must be part of each deployed team.

ESCALATING LEVELS OF CARE

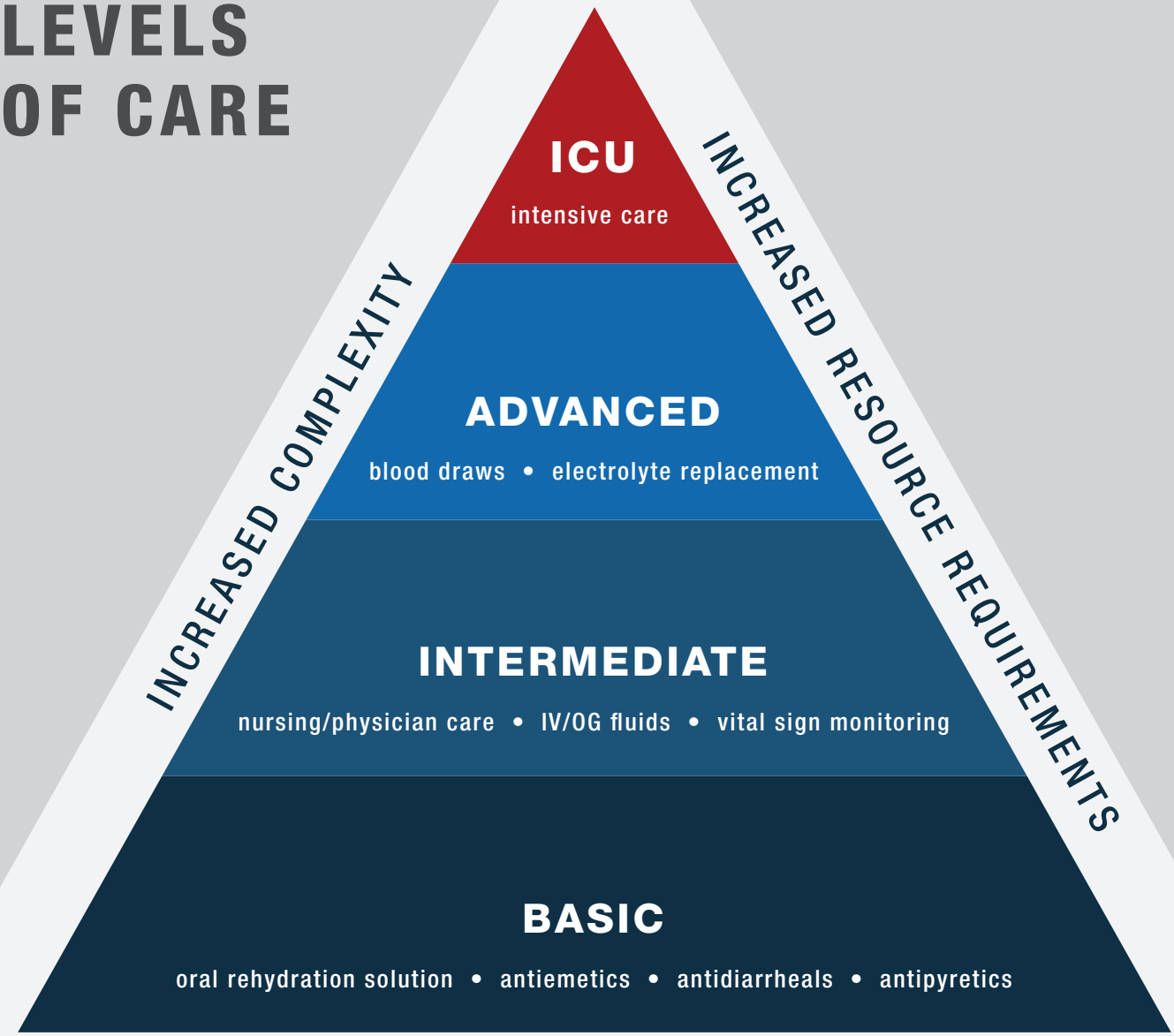

TABLE 1:
RESOURCE DESCRIPTIONS FOR ESCALATING LEVELS OF CARE

LEVEL ONE: BASIC	
Definition:	Supportive care that could be provided by a layperson when basic resources and instruction are provided.
Staffing Requirements:	Caregivers and translator(s) required. No professional staff required other than trainers (locals who have been trained or local medical staff/expatriates). Staff must be trained in the use of PPE, infection control practices and care processes, mixing and administration of rehydration solutions, and indications for oral medications at a minimum.
Supply Requirements:	Minimum: Clean water (as usually consumed by the local population, at a minimum); oral rehydration (World Health Organization or equivalent) solution/powder; 1-liter bottles or pails marked to 1-liter volume; chlorine bleach; provider PPE (see PPE table); impermeable waste bags; 5-gallon waste buckets; cot (consider cholera cot) with impermeable surface; bedding (if cool temperatures); pillow; mattress optimal, but must have impermeable surface; mosquito nets or, ideally, screens on windows.
Pharmaceutical Requirements:	Oral medications (antipyretics, antiemetics, and antidiarrheals) (need to ensure compliance with local dispensing requirements).
Equipment Requirements:	Thermometers; sprayer; lamps/lighting; incineration mechanism for waste; fans to circulate air and disperse chlorine should be available in patient care and decontamination areas whenever possible (if electricity available – may include low-voltage solar).
Facility Requirements:	May be located in any protected, controlled-access residence or shelter. The potential exists for home care in selected cases. If there is home care, may need to multiply logistics as supplies cannot be pooled.
Other/Notes:	Does not preclude supervision and provision of care by medical personnel but should be able to be accomplished with layperson care. VHF screening may be difficult; testing could be conducted by visiting teams/personnel, but may have to accept the risk of cohorting suspect VHF cases with VHF cases while providing supportive care to all patients. Behavioral health and information support is critical for both patients and providers, as well as family members. Rapid malaria testing should be offered, if possible.

LEVEL TWO: INTERMEDIATE

Definition:	Care provided under the direction of a physician or advanced practice provider (APP) by nursing and other paraprofessional medical staff involving invasive procedures (IV hydration). In addition to the supportive care provided under the basic level, this care level includes additional oral and IV/intramuscular (IM) medications and vital signs monitoring.
Staffing Requirements:	Physician or APP, nursing and/or paraprofessional medical staff, including paramedic. 1:10 provider to patient ratio per shift may be sufficient, but 1:5 is optimal given the intensity of the care requirements and the limited time that can be spent in PPE. Additional personnel for routine decontamination, waste removal, feeding, housekeeping/cot turnover, decedent management, and patient care assistance are required and may be assigned in shifts – number of personnel is dependent upon the intensity of illness in the unit (e.g., ambulatory vs. non-ambulatory patients). All personnel must work in teams of two (although there may be pairing of provider and non-provider). Training must include all elements of Level 1, as well as competency for IV placement in PPE and related safety practices, the types and indications for the available IV solutions, and use and interpretation of urine dipsticks, as well as indications/contraindications and safety precautions surrounding medication use.
Supply Requirements:	Minimum: Prior level plus IV catheters (safety shield type); skin prep; tape/IV dressings; needles and syringes; IV locks; consider NG/feeding tubes; bed pans/basins; basic documentation/medical chart; towels and washcloths; skin soap; IV supply buckets; sharps containers; dipstick urinalysis strips to monitor specific gravity and for the detection of ketones and evidence of renal injury; urinalysis cups.
Pharmaceutical Requirements:	Crystalloid solutions including normal saline (NS) or Lactated Ringers; dextrose-containing solutions (e.g., D5NS, D5 ½ NS, D5 ¼ NS); injectable antiemetics; injectable antipyretics; sedation (e.g., benzodiazepines, antipsychotics); analgesia (e.g., morphine and equivalents); topical anesthetics; bronchodilator inhalers (metered-dose inhaler [MDI]); consider RhoGam for miscarriages; oral diuretics; oral potassium powder/tablets; oral antimalarials; oral antibiotics for pneumonia, urinary tract infection, suspected tuberculosis, and possible sepsis (e.g., oral quinolones, isoniazid, extended-spectrum penicillins/cephalosporins); oral vitamin/nutritional supplements; oral infant formula.
Equipment Requirements:	Diagnostic equipment – thermometers, blood pressure cuffs, stethoscopes (including electronic, when possible), IV poles, flashlights.

Facility Requirements:	Secured, controlled-access environment with boundary fencing and screening area; cohorting by suspected, confirmed, and convalescent.
Other:	Patients and laypersons may need to be trained to "lock" IV lines after completion of IV fluid administration to prevent the need for constant attendance by medical personnel during infusion. Testing and separation of patients into suspected and confirmed VHF categories may be conducted via onsite personnel or visiting teams. When possible, this may be conducted by team personnel, depending on assay requirements, and combined with rapid malarial testing.

LEVEL THREE: ADVANCED

Definition:	Care provided under the direction of a physician by nursing and other medical staff. Includes care at the basic and intermediate levels, but also includes laboratory testing and may include radiological tests such as ultrasound and management of specific electrolyte abnormalities.
Staffing Requirements:	Physician plus nursing and allied health providers and layperson support providers optimally in a 1:4 provider to patient ratio. Staff must be trained to Level 2 competencies with the addition of the safe use of point-of-care (POC) testing, quality assurance procedures, and indications/safe administration of electrolyte replacement.
Supply Requirements:	As per prior levels plus POC testing (e.g., i-STAT, EPOC – consider storage requirements for test cards/cartridges), with capability for hemoglobin, urinalysis, and electrolytes (Chem 8), at a minimum; reagent packs; POC glucose monitor/test strips. Also should include diagnostic testing for EVD-specific VHF and rapid malaria assay.
Pharmaceutical Requirements:	As per prior levels plus IV potassium chloride (KCl), magnesium, bicarbonate, hypertonic saline, injectable broad-spectrum antibiotics (e.g., extended-spectrum penicillins, third-generation cephalosporins), buretrols, and piggyback IV fluid bags and tubing.

Equipment Requirements:	Temperature-controlled storage for lab testing packs and other materials, if needed (consider solar-powered/low-voltage coolers for "room temperature" reagents); headlamps/portable lighting. Supplemental oxygen is an optional intervention at this level based on the resources available. Ultrasound should be strongly considered, and providers trained on its use for cardiopulmonary and volume status assessment.
Facility Requirements:	As per prior level – consider additional division of patients between those requiring blood draws/closer monitoring and interventions.
Other:	Maximum level of care defined for effective field hospital practice. The key distinction between Intermediate and Advanced care is the use of lab analysis to direct fluid and electrolyte repletion. This comes with requirements to maintain storage and operating temperature ranges for analysis equipment and reagents, as well as the need for quality control of the analyzers and the clinical knowledge to interpret and apply the laboratory results to specific patients.

LEVEL FOUR: INTENSIVE CARE

Definition:	**NOT** recommended for field-based teams due to high commitment of resources per patient served. Included for those areas where referral to critical care is possible. Care provided by critical care physicians and critical care nursing and medical staff. Includes all care provided in the previous levels, but also includes advanced interventions, such as those available in an ICU environment up to and including advanced life-saving techniques and end-organ failure support.
Staffing Requirements:	Physician and nursing staff – 1:4 physician to patient (per 24 hours) and 1:2 nursing to patient (per 3–4 hours). Training requirements include Level 4 plus specific knowledge and competencies for critical care techniques and equipment available.
Supply Requirements:	Minimum: As above plus cardiac monitor; oximeter; ventilator (at a minimum, should meet Centers for Disease Control and Prevention's Strategic National Stockpile requirements [e.g., basic functions, alarms]); Foley catheters; pigtail chest tubes and one-way valves; surgical instruments; oxygen supply; suction; basic and advanced airway management equipment. Optimal: Invasive monitoring capacity (central venous pressure, arterial lines), dialysis capability.

Pharmaceutical Requirements:	As above plus epinephrine and other vasoactive medications, paralytics, additional sedative medications, cardiac resuscitation medications.
Equipment Requirements:	Extension cords, fuel, lighting, supplemental oxygen (concentrators vs. Dewar-based system), optimally ultrasound.
Facility Requirements:	Electricity – local or generator; strongly suggest climate-controlled environment such as a field hospital (Expeditionary Medical Support System [EMEDS], Combat Support Hospital, or equivalent).
Other:	Because of the diversity of intensive care services and profound differences in resource and equipment needs, a list of equipment is not specified for ICU services. These services should be provided by pre-existing hospitals or well-equipped field teams deploying with appropriate full-spectrum equipment that should be used in parallel with efforts to provide lower levels of care, with priority placed on supplies for fluid resuscitation and electrolyte correction.

RESOURCE REQUIREMENTS

- The initial priority should be to provide basic-level care with appropriate provider protections, with added levels of care as resources allow. This ensures saving the most lives with the least resources, while maintaining equity of care.
- The pyramid assumes that all patients require care at the specified level of care. Therefore, as care capabilities advance up the pyramid, there is a need to plan for step-down care for the larger number of patients who do not require higher levels of intervention. A much smaller percentage of patients will need more advanced levels of care.
- Austere/Field conditions are assumed, although requirements may help inform other responses. Basic personal care and staff care requirements are not included.
- The following tables (see Tables 2, 3, and 4) concentrate on medical supplies and logistics. Teams will need to ensure that appropriate infrastructure is available to support the medical mission, including site and personnel safety/security, transportation, washing area (for bedding and clothing), documentation/administration/office supplies, waste incineration, human remains management, shelter/housing for staff and patients, queuing and screening area (including perimeter control – rope, fencing, posts, etc.), potable water, staff and patient nutrition support, human waste disposal and treatment process, and electricity/refrigeration/climate control as required, including basic tools/repair capacity. Whenever possible, minimal, versatile, and washable/reusable or biodegradable supplies and materials should be chosen to reduce the volume of refuse.

- Resource requirements are additive (e.g., need basic plus intermediate requirements to provide intermediate care).
- Intensive care requirements are not specified as they are generally inappropriate for a disaster environment because of the great cost of resources and the fact that relatively few individuals benefit. When possible, ICU services may be added to the other levels of care, but due to the complexities of even large-scale supplemental oxygen in a field environment, strong consideration should be given as to whether this is a reasonable investment of resources relative to the number of patients who are likely to benefit. Effective addition of ICU services likely involves pre-trained and resourced teams (e.g., military EMEDS, Combat Support Hospital units) that are prepared to travel with the requisite infrastructure and supply lines necessary to provide and maintain services.
- Each site of care needs to account for an intake/screening process and then cohort by suspected vs. confirmed cases, with the priority on maintaining separation of suspected patients from one another. Whenever possible, even basic levels of care should be supported by malaria and VHF testing to facilitate appropriate patient treatment and disposition. The supply list does not account for supplies needed for screening and for convalescent care.
- Patients presenting for care may have complex medical needs that cannot be met. Whenever possible, an evacuation plan should account for pregnant patients and those with more complex diseases, and palliative care goals should be identified for those with advanced diseases and no alternative options for care.
- Medical care must be integrated with public health efforts to ensure contact tracing for all confirmed cases (and suspected cases if confirmatory testing is not possible), and adequate personnel, transportation, and communications resources must be allocated to public health risk communication and tracing efforts.

TABLE 2:
BASIC LEVEL OF CARE RESOURCE REQUIREMENTS PER 25 PATIENTS FOR APPROXIMATELY 1 MONTH OF OPERATION

Item	Quantity	Type*	Notes
Supply Requirements			
1-liter plastic bottles	30	M	Mixing ORS – may mix in water bottle as well – for bedside
4x4 gauze pads, sterile	500	D	
Absorbent pad – large	15	D	For use inside body bags
Adhesive tape, roll	20	D	
Blanket	25	M	Microfiber/other easily cleanable material, if needed
Body bag	15	D	
Body fluid absorbent powder, containers	20	D	
Bowl, large, 5-gallon	5	M	For foot wash/bathing
Broom	2	M	
Bucket	60	M	Reusable, 5-gallon – one each for waste/ bathing per patient
Bucket with lid and plastic tap, 5-gallon	10	M	For chlorine solution storage
Cart or wheelbarrow	1–2	M	For supplies – large wheels/for uneven surfaces
Cart, large, wheeled	2	M	e.g., “Rapid Rescue” for uneven terrain
Chair	15	M	Folding, plastic/cleanable
Chux	1,000	D	
Cots/Beds	25	M	Consider “cholera cot” – washable surface, heavy-duty
Cups	50	M	
Cutlery/Plates/Cups, washable or disposable	X	M/D	Quantity depends on disposability
Detergent, gallons	2	D	Liquid laundry soap for bedding, scrubs
Duct tape, roll	10	D	
Dustpan/Brush set	4	M	

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Supply Requirements			
Egg crate mattress (or similar) and waterproof cover	25	M	Ensure that zippers are sealed
Eye wash, bottle	4	D	
First aid kit	1	D	Adhesive bandages, minor wound care
Floor squeegee	2	M	
Funnel, large	2	M	
Gowns, patient, fabric	50	M	For non-ambulatory care – need laundry capability
Jerry can, plastic, 5-gallon	5	M	
Markers, permanent, large tip	10	M	Black, green, red
Markers, permanent, medium tip	10	M	e.g., Sharpie – for marking bottles/ medications
Mosquito net	25	M	If no screens – permethrin-impregnated is optimal
Non-stick dressings	100	D	
Oral syringes	30	M/D	Single patient may reuse
ORS (or equivalent)	3,000	C	4 liters per patient/day average
Pillow	25	M	Inflatable, washable preferred
Pillowcase	50	M	
Plastic sheeting roll, 4 ft x 50 ft	3	D	
Plastic taps and tap cutter	10	M	
Pool test strips, bottle	1	D	
Rags-in-a-box	60	D	Boxes – disposable, heavy-duty
Roller gauze, 4-inch	100	D	
Scrub brushes	4	M	With long handle
Sheets	50	M	
Soap, bar, small	100	D	

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Supply Requirements			
Soap, liquid dish	10	D	1 gallon
Spray paint, orange, cans	2	M	
Stretcher, foldable	2	M	
Trash bag, 50-gallon, heavy-duty	1,000	D	
Trash can, plastic heavy-duty with lid	8	M	Consider color-coding red/green for soaking, black/gray for trash
Trauma shears	4	M	
Urinal	5	M	For sample collection
Waste bag (red bag)	360	D	Assumes reuse of coverall PPE
White board – large	1–2	M	For patient notes – outside area of care
White board – small, portable	25	M	For bedside notes
White board markers	30	M	Attached to bedside boards
Zip ties, medium	1,000	M	
Pharmaceutical Requirements			
Acetaminophen, 160 mg/5 mL, bottles	20	C	
Acetaminophen, 325 mg tab	1,500	C	
Antibiotic ointment, 50 g	25	C	
Antidiarrheal	1,500	C	e.g., loperamide
Antiemetic	1,500	C	e.g., ondansetron ODT, prochlorperazine (including suppository form)
Calcium hypochlorite crystals, 500 g	120	D	Or larger supplied quantity, e.g., 5 kg
DEET lotion	X	M	Quantity depends on setting, concentration, size of unit
Ibuprofen, 200 mg tab	1,000	C	Use in EVD is controversial – certainly contraindicated whenever hemostatic dysfunction is present

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Equipment Requirements			
Breast pump, manual	2	M	Plastic
Camera, digital, waterproof	1	M	Ideally standard batteries or ability to recharge via solar
Lantern, solar-powered	4	M	
Pump assembly	6	M	Replacement parts
Pump sprayer, 2.5- to 5-gallon	4	M	Environmental and personnel decontamination
Thermometer, disposable, electronic	100	M	Including for screening – 1 per patient (may use temporal thermometry for screening)
Wall clock with sweep hand, large	2	M	With spare batteries and mounting hardware/adhesive
Facility Requirements			
Water, liters	2,250	D	3 liters per patient/day average, drinking only

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

TABLE 3:
INTERMEDIATE LEVEL OF CARE RESOURCE REQUIREMENTS PER 25 PATIENTS FOR APPROXIMATELY 1 MONTH OPERATION

Item	Quantity	Type*	Notes
Supply Requirements			
4x4 gauze pads	500	D	For venipuncture sites
Adhesive tape/micropore tape, 1-inch, rolls	25	D	For IV sites
Butterfly needles with safety lock, 22 ga	250	C	
Catheter, condom	25	C	
Catheter, Foley 14F kit	25	C	
Chart/Clipboard	35	M	
Conforming bandage roll (Kerlix)	100	D	To secure IV site if patient is confused
Connectors (NG to Luer lock)	X	C	If NG used
Cotton-tipped applicators	1,000	D	
Drainage bag	50	C	And tubing
EZ IO kit/other rapid IO access	1–2	M	Extreme care must be used if performing IO access due to risk of needlestick, and additional lidocaine infusion will be needed unless patient is unresponsive
EZ IO/other IO needles, standard	25	C	
Inhaler spacer – cardboard or plastic tubing	15	C	
IV catheters – safety shield	200	C	Assumes misses and replacements/blown IVs over duration of care (18 and 20 ga as standard for adults)
IV locks	250	C	
IV macrodrip tubing	250	C	
IV site dressing	250	C	
Kevlar gloves/heavy leather, pairs	5	M	Waste management
Needle, 1.5-inch 18 ga, blunt	500	C	
Needle, 1.5-inch 18 ga, sharp	500	C	
Needle, 1.5-inch 22 ga	1,000	C	

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Supply Requirements			
NG tubes (12–16 F)	X	C	Short-term use considered but may be risky
OB/Delivery kit	10	C	
Paper tape, 1-inch, rolls	25	D	
Plastic bags for meds, small, zipper	1,000	D	
Plastic baskets	5	M	For IV fluids and medications – solid bottom, cleanable
Prep pads	1,000	D	Chlorhexidine or equivalent
Sharps container, medium	50	M	May depend on layout – should be with each basket/bin
Skin soap, liquid, 16-oz. bottle	15	D	For bathing
Syringes, gastric tip	X	D	If NG fluid replacement used – may pose significant risk
Syringes, 12 mL	300	C	Luer lock
Syringes, 3 mL with 1.5-inch 22 ga needle	300	C	Luer lock
Tourniquets	50	M	Venous, latex
Towels	50	M	
Urine dipsticks (10 panel or similar)	750	C	
Urine sample cups	25	M	
Vacutainer purple top (EDTA)	100	D	For Paracheck/equivalent malaria kit
Washcloths	100	M	
Item	**Quantity**	**Type***	**Notes**
Pharmaceutical Requirements			
Albendazole, 400 mg tab	100	C	Or equivalent
Albuterol MDI	5	C	
Artemether/Lumefantrine, 20/120 tab	100	C	(Or Atovaquone/Proguanil combination tablets)
Artemether/Lumefantrine, 80/480 tab	50	C	
Azithromycin, 250 mg tab	100	C	

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Pharmaceutical Requirements			
Cefixime, 400 mg/5 mL, bottles	25	C	Pediatric and NG
Ceftriaxone, 1 g injectable	100	C	
Chlorpromazine, 25 mg tab	500	C	Or equivalent
Ciprofloxacin, 500 mg tab	100	C	
Clotrimazole cream, 50 g tube	20	C	
D5 0.25% NaCl 500 mL	100 liters	C	
D5 0.45% NaCl 1,000 mL	600 liters	C	
Dexamethasone, 10 mg/10 mL injection	25	C	May be given orally as well
Doxycycline, 100 mg tabs	100	C	
Ertapenam, 1 g injectable	100	C	Or other broad-spectrum antibiotics – Ertapenam is dosed q24h and may be given IM
Furosemide, 20 mg tab	50	C	
Furosemide, 40 mg injectable	20	C	
Haloperidol, 10 mg	500	C	Or equivalent
IV NS 0.9% or Lactated Ringers	1,000 liters	C	
Ketamine, 100 mg/mL, 10 mL vial	100	C	For sedation and analgesia – providers must be experienced with the use of ketamine. May be a controlled substance.
Lidocaine, 1% plain 35 mL	60	C	For local anesthesia for IO and initial injection to minimize IO pain
Lidocaine gel, 2% (30 g tube), and spray	X	C	If NG use anticipated – may pose unacceptable risk
Lorazepam, 1 mg tab	750	C	Or equivalent
Lorazepam, injectable, 2 mg/2 mL	1,000	C	(Controlled substance)
Morphine, 10 mg/2 mL injection	500	C	Or equivalent (controlled substance)
MS Contin, 40 mg tab	500	C	Or equivalent (controlled substance)
Omeprazole, 40 mg tab	100	C	

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Pharmaceutical Requirements			
Ondansetron, injectable, 4 mg	1,000	C	
Oral concentrated dextrose solution	50	C	
Oral multivitamin	1,000	C	Routine use controversial
Oxycodone tablets, 5 mg	750	C	(Controlled substance)
Oxytocin, 10U/1 mL injection	10	C	
Paracheck malaria test kit	100	C	Or similar
Potassium powder, 20 mEq	750	C	
Quinine, 300 mg tab	100	C	
Raltegravir, 400 mg	100	C	HIV PEP
Sterile saline for injection, 10 mL	500	C	
Sterile water for injection, 10 mL	500	C	
Tenofovir/Emtricitabine, 300/200 mg	50	C	HIV PEP
Tinidazole, 500 mg tab	100	C	
TMP/SMX, 160/800 mg	100	C	
Tramadol, 50 mg tab	750	C	(Controlled substance)
Equipment Requirements			
BP cuff – manual, one-hand adult	1	M	
BP cuff – manual, one-hand, pediatric	1	M	
BP cuff set (standard and child cuff)	2	M	Automatic, battery-powered with spare batteries
Flashlight/Headlamp	4	M	Consider headlamps (worn around neck) – with spare batteries
Manual suction device	4	M/D	May be pump-type or “turkey baster” to clear secretions
Pulse oximeter	3	M	Battery-operated, finger type – with spare batteries
Stethoscope	8	M	Consider Bluetooth or other as unlikely to be able to use standard earpieces in care environment

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

TABLE 4:
ADVANCED LEVEL OF CARE RESOURCE REQUIREMENTS PER 25 PATIENTS FOR APPROXIMATELY 1 MONTH OPERATION

Item	Quantity	Type*	Notes
Supply Requirements			
Butterfly needles, 22 ga	15	C	
Glucose test strips	1,000	C	
Lancets	1,000	C	
Needle, 1.5-inch 22 ga	750	C	For medication draws and IM injections in addition to intermediate supplies
Needle blunt tip draw	750	C	For medication draws – in addition to intermediate supplies
NS 100 mL supplemental medication bag	750	C	
Piggyback IV set	500	C	
Rapid Diagnostic Kit – EVD	100	D	Polymerase chain reaction-based kit
Reagent pack – Chem 8/electrolytes	300	C	
Reagent pack – hemoglobin	50	C	May obtain on Chem 8+ on i-STAT if used and include in above
Syringe, 12 mL Luer lock	750	C	For flushes, medication draws, and waste draws – in addition to intermediate supplies
Syringe, 3 mL Luer lock	750	C	For medication administration and IM injection
Vacutainer green top (lithium heparin)	750	C	For electrolyte determination, also may be used for hemoglobin on i-STAT – other assays may require different tubes
Vacutainer Luer adaptor	750	C	
Vacutainer needle adaptor	300	C	With needle guard
Vacutainer tube holder	1,000	C	

***M = Multiple patient use, D = Disposable, C = Case mix dependent**

Item	Quantity	Type*	Notes
Pharmaceutical Requirements			
5% NaCl, 500 mL	50	C	
10% Calcium gluconate, 10 mL	250	C	May also consider calcium chloride – more bioavailable but also a risk for phlebitis/ necrosis
Dextrose, 25 g in 50 mL	50	C	
IV buretrol	100	C	
KCl, 10mEq for IV use	750	C	
Magnesium, 2 g/10 mL	150	C	
Oral glucose solution	100	C	
Sodium bicarbonate, 50mEq	250	C	
Equipment Requirements			
EPOC, i-STAT, or other POC diagnostic test unit	2	M	Quality Assurance packs also required – check storage requirements – at least one box of Level 1 and Level 3 control packs for i-STAT for example, and batteries/ charging
Fingerstick glucometer	2	M	
Headlamps, LED	15	M	And extra batteries
Mucosal atomizer device	250	C	
Portable lanterns – floor, battery, LED	5	M	And extra batteries

*** M = Multiple patient use, D = Disposable, C = Case mix dependent**

TABLE 5:
PROVIDER PPE

Based on the care level and the number of providers, organizations need to plan for the PPE indicated in the table below. Additional glove types may be desirable.

Item	Quantity	Notes
Scrub top, S		Lightweight blend
Scrub top, M		Lightweight blend
Scrub top, L		Lightweight blend
Scrub top, XL		Lightweight blend
Scrub bottom, S		Lightweight blend
Scrub bottom, M		Lightweight blend
Scrub bottom, L		Lightweight blend
Scrub bottom, XL		Lightweight blend
Gloves, nitrile 6 disposable		Long cuff
Gloves, nitrile 7 disposable		Long cuff
Gloves, nitrile 8 disposable		Long cuff
Gloves, nitrile 6 reusable		
Gloves, nitrile 7 reusable		
Gloves, nitrile 8 reusable		
Boots, heavy butyl, steel toe, S		
Boots, heavy butyl, steel toe, M		
Boots, heavy butyl, steel toe, L		
N95 mask or powered air purifying respirator (PAPR)		
Goggles		Different styles for different faces
Impermeable head cover/drape		Covers head and shoulders – optimally reusable
Impermeable apron		Reusable
Impermeable suit, S		Integrated feet, no hood
Impermeable suit, M		Integrated feet, no hood

Item	Quantity	Notes
Impermeable suit, L		Integrated feet, no hood
Impermeable suit, XL		Integrated feet, no hood
Impermeable suit, XXL		Integrated feet, no hood
Talcum powder	0.5 bottles/day	To facilitate the donning of gloves
No-fog gel	5 bottles	
Boot remover	2	
Household sprayer	2	Pump, 2.5- to 5-gallon, with spare pump parts
Scrub brushes	2	
Step basin/pan	2	

PROVIDER PPE ASSUMPTIONS

These may need to be modified based on local practices, conditions, equipment, and training:

- High ambient heat will limit the time in PPE to 90 minutes or less. Heat stress is extreme, and rehabilitation protocols should be in place. If refrigeration/freezer is available, consider cooling vests for team members to wear under PPE.
- Each provider/staff performs two shifts/day. A buddy system should be used.
- Donning/Doffing time consumes 25 minutes of the 90 minutes (10 min donning, 15 min doffing).
- There is 65 minutes of patient contact time.
- One provider shift/day may be appropriate for basic care, depending on the number of patients.
- Two or three shifts (4 h 20 min – 6 h 30 min) are required for intermediate and advanced care.
- Providers should be judiciously used on care teams. Basic care can be provided by convalescent patients and recovered patients when possible, reserving clinical staff for examinations and procedures.
- Note that some suits run small and size S may not be required. The suit must allow for squatting and bending without binding.
- Doffing monitors/assistants should have PPE and training that are appropriate for their role in the process.
- Chlorine accelerates the corrosion of batteries and electrical systems in PAPRs and other equipment. Particularly in a setting of high heat and humidity, chlorine can cause skin rashes and irritation.
- PAPRs are generally preferred for comfort; however, charging requirements, issues with the duration of use due to chlorine and the decontamination process, and cost/availability may limit availability/applicability.

REFERENCES

ASPR TRACIE. (2016). Topic Collection: VHF/Ebola.

Centers for Disease Control and Prevention. (2014). Guidance on Personal Protective Equipment To Be Used by Healthcare Workers During Management of Patients with Confirmed Ebola or Persons Under Investigation (PUIs) for Ebola Who Are Clinically Unstable or Have Bleeding, Vomiting, or Diarrhea in U.S. Hospitals, Including Procedures for Donning and Doffing PPE.

Centers for Disease Control and Prevention. (2015). For U.S. Healthcare Settings: Donning and Doffing Personal Protective Equipment (PPE) for Evaluating Persons Under Investigation (PUIs) for Ebola Who Are Clinically Stable and Do Not Have Bleeding, Vomiting, or Diarrhea.

Republic of Liberia, Ministry of Health and Social Welfare. (2014). Liberia Ebola Virus Disease Clinical Management Manual.

Sterk, E. (2008). Filovirus Haemorrhagic Fever Guideline. Médecins Sans Frontières (MSF). (NOTE: ASPR TRACIE anticipates that MSF will update this document in 2018 to incorporate lessons learned from the recent Ebola outbreak. Some of the materials in this document and recommendations are outdated compared to practices improved during the 2014 epidemic; however, the guideline still offers a wide variety of operational, clinical, and logistical information, making this an excellent resource.)

World Health Organization. (2015). Manual for the Care and Management of Patients in Ebola Care Units/Community Care Centres. (NOTE: This well-presented document provides a good overview of Ebola patient care considerations; however, some sections need to be updated and some guidance that is referenced as pending is still not available.)

This guide was developed by **John Hick**, MD, HHS ASPR and Hennepin County Medical Center. ASPR TRACIE thanks **Armand Sprecher**, MD, MPH, Médecins Sans Frontières, for providing a wide variety of MSF resources for our review. In addition, ASPR TRACIE thanks the following subject matter experts for their review of this document: **Michael Bourg**, PharmD, ASPR Office of Emergency Management; **Joe Cocciardi**, PhD, MPH, National Disaster Medical System and Cocciardi and Associates, Inc.; RADM **Scott Giberson**, BSPharm, MPH, Centers for Medicare and Medicaid Services and U.S. Public Health Service; CAPT **Jamal Gwathney**, MD, MPH, U.S. Public Health Service and Federal Bureau of Prisons; **Daniel Hanfling**, MD, HHS ASPR, Johns Hopkins Center for Health Security, George Washington University, and George Mason University School of Public Policy; **Kevin Horahan**, JD, MPH, ASPR Office of Emergency Management; **Richard Hunt**, MD, ASPR National Healthcare Preparedness Programs; **Mark Kortepeter**, MD, MPH, United States Army Medical Research Institute for Infectious Diseases; LCDR **Christopher Le**, MS, MLS, U.S. Public Health Service and ASPR Office of Emergency Management; CDR **Amanda Loveless**, RDN, U.S. Public Health Service and Federal Bureau of Prisons; **Daniel Lucey**, MD, MPH, Georgetown University Medical Center and O'Neill Institute for National and Global Health Law; **Paul Reed**, MD, Uniformed Services University of the Health Sciences; **Lewis Rubinson**, MD, PhD, University of Maryland Medical Center/R Adams Cowley Shock Trauma Center and University of Maryland School of Medicine; CAPT **Cynthia Rubio**, PhD, RN, U.S. Public Health Service and ASPR Office of Emergency Management; **Michelle Schwedhelm**, MSN, RN, Nebraska Medicine and National Ebola Training and Education Center; **Sharon Vanairsdale**, MS, APRN, Emory University Hospital and National Ebola Training and Education Center; **Perry Wiseman**, RN, United States Army Medical Research Institute for Infectious Diseases; and **Laura Kwinn Wolf**, PhD, ASPR Office of Emergency Management.

Use of trade names does not imply endorsement or superiority versus similar products, but is intended solely to provide common and readily available examples.

TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS
INFORMATION GATEWAY