



# **Guidelines for Prevention and Control of Ebola Virus Disease (EVD)**

Developed with joint collaboration of  
Directorate General Health Services, Punjab, Lahore  
World Health Organization (WHO)

**August 2014**

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## Ebola Viral Disease

(Also called as African hemorrhagic fever, Ebola virus hemorrhagic fever)

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Ebola virus disease (EVD) or Ebola hemorrhagic fever (EHF) is the most virulent human viral disease in the world caused by the Ebola virus, often fatal illness with a highest fatality rate. Symptoms start 2 days to 3 weeks after contracting the virus, with fever, sore throat, muscle pains, headaches, nausea, vomiting and diarrhea followed by decreased hepato-renal functioning. Later on some people begin to have bleeding problems. [1]

Ebola virus was first isolated in 1976 during 2 simultaneous outbreaks of Ebola hemorrhagic fever in Yambuku, Democratic Republic of Congo (Zaire) [2] and Nzara, Sudan [3] with the highest CFR (50% - 90%) [1][4],[5]. The disease was given the name Ebola because of the location of the affected village of Democratic Republic of the Congo (Zaire) on the Ebola River. [2].

The disease is notifiable or reportable in most Western countries. It is genetically unique zoonotic animal borne, severe and rare disease, which affects human and non-human primate and typically occurs in outbreaks in tropical regions of Sub-Saharan Africa. [1] From 1976 to 2013, about 1,000 people / year have been infected. [1][6] The largest ongoing 2014 West Africa Ebola outbreak, which is affecting Guinea, Sierra Leone, Liberia. [7] and Nigeria. [8] To date as of 12<sup>th</sup> August 2014 more than 1848 suspected cases with 1176 lab confirmed alongwith 1013 deaths (CFR 86%) have been reported. [7,9]

The virus may be acquired upon contact with blood or body fluids of an infected animal (monkeys or fruit bats). [1] Spread through the air has not been documented. [10] Fruit bats are believed to carry and spread the virus without being affected. Once human infection occurs, the disease may spread between people as well. Male survivors may be able to transmit the disease via semen for nearly two months. To confirm the diagnosis blood samples are tested for viral antibodies, viral RNA, or the virus itself. [1]

Prevention includes decreasing the spread of disease from infected animals to humans by checking animals for infection, killing and properly disposing of their bodies, properly cooking meat and wearing protective clothing and washing hands. Samples of bodily fluids and tissues of infected person should be handled with special caution. [1] There is no specific treatment for the disease; however supportive treatment including oral rehydration therapy or intravenous fluids may be helpful. [1] Efforts are ongoing to develop a vaccine; however, none yet exists. [1]

<b>Infectious / Causative agent</b>	<ul style="list-style-type: none"><li>• Genus Ebolavirus is 1 of 3 members of the <i>Filoviridae</i> family (filovirus), along with genus Marburgvirus and genus Cuevavirus. Genus Ebolavirus comprises 5 distinct species: 1) Bundibugyo ebolavirus (BDBV); 2) Zaire ebolavirus (EBOV); 3) Sudan ebolavirus (SUDV); 4) Reston ebolavirus (RESTV); and 5) Tai Forest ebolavirus (TAFV).</li><li>• The BDBV, EBOV, SUDV and TAFV have been associated with large EVD outbreaks in Africa.</li><li>• In Democratic Republic of Congo, Gabon, Sudan and Uganda, 3 different subtypes of Ebola virus have been associated with human diseases.</li><li>• Laboratory tests have identified Marburg virus as the causative agent in an outbreak of suspected viral hemorrhagic fever in Angola.</li></ul>
<b>Clinical features</b>	<ul style="list-style-type: none"><li>• Symptoms may appear anywhere from 2 to 21 days after exposure to Ebola virus though 8-10 days is most common. Which include:<ul style="list-style-type: none"><li>• Fever, headache, joint and muscle aches, weakness, diarrhea, vomiting, stomach pain and lack of appetite</li><li>• Some patients may experience: rash, red eyes, hiccups, cough, sore</li></ul></li></ul>

	throat, chest pain, difficult breathing, difficult swallowing, bleeding inside and outside of the body
<b>Occurrence and geographical distribution</b>	<ul style="list-style-type: none"> <li>• Marburg virus is indigenous to Africa, occurs very rarely and appears to be geographically confined to a small number of countries in the southern part of the African continent.</li> <li>• The Marburg virus disease was recognized on following occasions: <ol style="list-style-type: none"> <li>1. <b>1967</b>, Marburg, outbreak occurred in laboratories in Marburg and Frankfurt, Germany and Belgrade, Yugoslavia (now Serbia). A total of 31 human were infected with 7 fatalities, including lab workers, medical personals and family members. Index cases had been exposed to African green monkeys or their tissues.</li> <li>2. <b>1975</b>, outbreak occurred in Europe, infected 3 cases; the disease agent had arrived with imported monkeys from Uganda.</li> <li>3. <b>1976</b>, outbreak of SUDV occurred in Nzara, Maridi and surrounding areas of South Sudan, affected 284 cases &amp; 151 deaths (CFR 53%).</li> <li>4. <b>1976</b>, outbreak of EBOV occurred in Yambuku, Zaire (DRC), reporting 318 cases &amp; 280 deaths (CFR 88%).</li> <li>5. <b>1977</b>, outbreak of EBOV occurred in same area of DRC, reporting one fatal case (CFR 100%).</li> <li>6. <b>1979</b>, outbreak of SUDV occurred in Nzara, Maridi of South Sudan, reporting 34 cases &amp; 22 deaths (CFR65%).</li> <li>7. <b>1980</b>, two confirmed cases including one fatality (CFR 50%).</li> <li>8. <b>1982</b>, one case occurred in Zimbabwe.</li> <li>9. <b>1987</b>, human infection was recognized when a young man who had traveled extensively in Kenya, including western Kenya, became ill and later died (CFR 100%).</li> <li>10. <b>1994</b>, a new subtype TAFV of Ebola virus was recovered while dissecting an infected chimpanzee, in Cote, d'Ivonce infected only one person (CFR 0%).</li> <li>11. From end <b>1994</b> – 3<sup>rd</sup> trimester of <b>1996</b> three outbreaks reported in Gabon resulted in 150 cases and 98 deaths.</li> <li>12. <b>1995</b>, a major outbreak of EBOV occurred with 315 cases and 254 deaths reported from Kikwit, DRC (CFR 81%)</li> <li>13. <b>1996</b> (Jan-Apr), outbreak of EBOV occurred in Booue area of Gabon, reporting 60 cases &amp; 45 deaths (CFR 75%)</li> <li>14. <b>1996</b> (Jul-Dec), outbreak of EBOV occurred in Booue area of Gabon, reporting 31 cases &amp; 21 deaths (CFR 68%)</li> <li>15. From late <b>1998</b> to late <b>2000</b>, largest outbreak occurred in the DRC, involved 149 cases, of which 123 were fatal. The outbreak was initially concentrated in workers at a gold mine in Durba. DRC. After outbreak subsided, some sporadic cases occurred in the region.</li> <li>16. From August <b>2000</b> to January <b>2001</b>, outbreak of SUDV occurred in Gulu, Masindi and Mbarara districts of Uganda, reporting 425 cases &amp; 224 deaths (CFR 53%)</li> <li>17. From October <b>2001</b> to April <b>2003</b> several outbreaks were reported from Gabon and DRC with a total of 278 cases and 235 deaths.</li> <li>18. <b>2001</b>, outbreak occurred over the border of Gabon and the DRC, reporting 65 cases &amp; 53 deaths (CFR 82%)</li> <li>19. <b>2001</b>, outbreak occurred over the border of Gabon and DRC, reporting 59 cases &amp; 44 deaths (CFR 75%).</li> <li>20. <b>2002</b> (Jan - Apr), outbreak of EBOV occurred in the districts of Mbomo and Kélé in Cuvette of DRC, reporting 143 cases &amp; 128</li> </ol> </li> </ul>

	<p>deaths (CFR 90%).</p> <ol style="list-style-type: none"> <li>21. <b>2003</b> (Nov-Dec) an outbreak of EBOV reported in DRC infecting 35 cases with 29 deaths (CFR 83%).</li> <li>22. <b>2004</b> an outbreak of SUDV reported in Sudan infecting 17 cases with 7 deaths (CFR 41%).</li> <li>23. <b>2004</b> the USSR and the USA reported 2 laboratory infections. Retrospective analysis identified 102 cases with 95 deaths.</li> <li>24. <b>2005</b> an outbreak of EBOV reported in Congo affecting 12 cases with 10 deaths (CFR 83%).</li> <li>25. <b>2007</b>, outbreak occurred Kasai Occidental Province of the Congo, reporting 264 cases &amp; 187 deaths (CFR 71%)</li> <li>26. <b>2007</b>, outbreak of Bundibugyo occurred in Uganda, reporting 149 cases &amp; 17 deaths (CFR 25%)</li> <li>27. <b>2007-08</b>, outbreak occurred in Undibugyo District in western Uganda, reporting 149 cases &amp; 37 deaths</li> <li>28. <b>2008-09</b>, outbreak occurred in Mweka and Luebo Health zones of the Province of Kasai Occidental of DRC, reporting 32 cases &amp; 14 deaths (CFR 44%).</li> <li>29. <b>2011</b>, outbreak of SUDV occurred in Kibaale District of Uganda, reporting one fatal case (CFR 100%)</li> <li>30. <b>2012</b>, outbreak of SUDV occurred in Kibaale District of Uganda, reporting 24 cases &amp; 17 deaths (CFR 71%)</li> <li>31. <b>2012</b>, outbreak occurred in DRC's Province Orientale, reporting 57 cases &amp; 29 deaths (CFR 51%)</li> <li>32. <b>2012-13</b>, outbreak occurred in Luwero District of Uganda, reporting cases &amp; 43 deaths (CFR 57%)</li> <li>33. <b>2014</b> (till 12<sup>th</sup> August), outbreak occurred in Guinea reporting 506 suspected cases, of them 306 were lab confirmed with 373 deaths.</li> <li>34. <b>2014</b> (till 12<sup>th</sup> August), outbreak occurred in Liberia reporting 599 suspected cases, of them 158 were lab confirmed with 323 deaths.</li> <li>35. <b>2014</b> (till 12<sup>th</sup> August), outbreak occurred in Nigeria reporting 13 suspected cases without any lab confirmation but 2 deaths</li> <li>36. <b>2014</b> (till 12<sup>th</sup> August), outbreak occurred in Sierra Leone, reporting 730 suspected cases, of them 656 were lab confirmed with 315 deaths.</li> </ol>
<b>Case definition</b>	<ul style="list-style-type: none"> <li>• Early recognition of Ebola is important for providing appropriate patient care and preventing the spread of infection.</li> <li>• Healthcare providers should be alert to evaluate any patients suspected of having Ebola virus disease.</li> </ul> <p><b>Alert case:</b></p> <ul style="list-style-type: none"> <li>• Illness with onset of fever and no response to treatment of usual causes of fever in or from the endemic area, OR at least one of the following signs: bleeding, bloody diarrhoea, bleeding into urine OR any sudden death</li> </ul> <p><b>Suspected Ebola or Marburg cases for routine surveillance:</b></p> <ul style="list-style-type: none"> <li>• Illness with onset of fever and no response to treatment for usual causes of fever in or from the endemic area, and at least one of the following signs: bloody diarrhea, bleeding from gums, bleeding into skin (purpura), bleeding into eyes and urine. Or</li> <li>• Any person, alive or dead, suffering or having suffered from a sudden</li> </ul>

	<p>onset of high fever and having had contact with:</p> <ul style="list-style-type: none"> <li>○ a suspected, probable or confirmed Ebola or Marburg case;</li> <li>○ a dead or sick animal (for Ebola)</li> <li>○ a mine (for Marburg)</li> </ul> <p><b>Probable case:</b></p> <ul style="list-style-type: none"> <li>• Any suspected case evaluated by a clinician Or</li> <li>• Any deceased suspected case (where it has not been possible to collect specimens for laboratory confirmation) having an epidemiological link with a confirmed case</li> </ul> <p><b>Laboratory confirmed case:</b></p> <ul style="list-style-type: none"> <li>• Any suspected or probably cases with a positive laboratory result i.e. positive for the virus antigen, either by detection of virus RNA by RT-PCR, or by detection of IgM antibodies directed against Marburg or Ebola.</li> </ul> <p><b>Non-case:</b></p> <ul style="list-style-type: none"> <li>• Any suspected or probable case with a negative laboratory result. “Non-case” showed no specific antibodies, RNA or specific detectable antigens.</li> </ul> <p><b>Ebola or Marburg case contacts:</b></p> <ul style="list-style-type: none"> <li>• Any person having had contact with an Ebola or Marburg in the 21 days preceding the onset of symptoms in at least one of the following ways: <ul style="list-style-type: none"> <li>○ Having slept in the same household with a case</li> <li>○ Has had direct physical contact with the case (dead or alive) during the illness</li> <li>○ Has had direct physical contact with the (dead) case at the funeral,</li> <li>○ Has touched his/her blood or body fluids during the illness</li> <li>○ Has touched his/her clothes or linens</li> <li>○ Has been breastfed by the patient (baby)</li> </ul> </li> </ul> <p><b>Contacts of dead or sick animals:</b></p> <ul style="list-style-type: none"> <li>• Any person having had contact with a sick or dead animal in the 21 days preceding the onset of symptoms in at least one of the following ways: <ul style="list-style-type: none"> <li>○ Has had direct physical contact with the animal</li> <li>○ Has had direct contact with the animal’s blood or body fluids</li> <li>○ Has carved up the animal</li> <li>○ Has eaten raw bush-meat</li> </ul> </li> </ul> <p><b>Laboratory contacts:</b></p> <ul style="list-style-type: none"> <li>• Any person having worked in a laboratory in the 21 days preceding the onset of symptoms in at least one of the following ways: <ul style="list-style-type: none"> <li>○ Has had direct contact with specimens collected from suspected Ebola or Marburg patients</li> <li>○ Has had direct contact with specimens collected from suspected Ebola or Marburg animal cases</li> </ul> </li> </ul>
<p><b>Incubation period</b></p>	<ul style="list-style-type: none"> <li>• The average Incubation period is 8 to 10 days, but it can vary between 2 and 21 days. <sup>[11]</sup>.</li> <li>• People remain infectious as long as their blood and secretions contain the virus, a period that has been reported to be as long as 61 days after onset of illness.</li> </ul>

<b>Case fatality rate (CFR)</b>	<ul style="list-style-type: none"> <li>The case fatality rate (CFR) from Ebola infections in Africa has ranged from 50% – 90%, whereas 25% – 80% of the reported cases of Ebola Marburg viral infection have been fatal.</li> </ul>
<b>Reservoir</b>	<ul style="list-style-type: none"> <li>Fruit Bats are considered the most likely natural reservoir of the EBOV.</li> <li>Traces of EBOV were detected in the carcasses of gorillas and chimpanzees during outbreaks in 2001 and 2003, which later became the source of human infections.</li> </ul>
<b>Mode of transmission</b>	<ul style="list-style-type: none"> <li>A person infected with Ebola virus is not contagious until symptoms appear</li> <li>Virus spreads through <b>direct contact</b> with the bodily fluids (blood, urine, feces, saliva, and other secretions) of an infected person, or with objects like needles that have been contaminated with the virus.</li> <li>Ebola <b>do not</b> spread through the air or by food or water. <sup>[10]</sup> However, laboratory generated droplets <sup>[12]</sup> having 0.8–1.2 μm size are breathable. Because of this potential route of infection, of these viruses have been classified as Category A biological weapons. <sup>[13]</sup></li> <li>Can spreads in the community through human-to-human transmission from direct contact (through broken skin or mucous membranes) with the blood, secretions, organs or other body fluids of infected people, and indirect contact with environments contaminated with such fluids.</li> <li>Through burial ceremonies in which mourners have direct contact with the body of the deceased</li> <li>Men who have recovered from the disease can still transmit the virus through their semen for up to 7 weeks after recovery from illness.</li> <li>Health-care workers have frequently been infected while treating patients with suspected or confirmed EVD.</li> <li>In Africa, infection has been documented through the handling of infected chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead or in the rainforest.</li> <li>Nosocomial infections have been frequent.</li> <li>Epidemic potential can spread from person to person, most often during the care of patients, which requires strengthening of strict infection control measures during the management of cases.</li> </ul>
<b>Period of communicability</b>	<ul style="list-style-type: none"> <li>Risk during the incubation is low and can increase with stages of illness as long as blood and secretions contain virus.</li> <li>Ebola virus was isolated from the seminal fluid on 61<sup>st</sup> but not on the 76<sup>th</sup> day after onset of illness in a laboratory acquired case.</li> <li>The primary care providers in Sudan were infected up to 30% while most of other house hold contacts remained uninfected.</li> </ul>
<b>Susceptibility and resistance</b>	<ul style="list-style-type: none"> <li>All ages and genders are susceptible.</li> </ul>
<b>Risk factors for increased transmission</b>	<ul style="list-style-type: none"> <li>Healthcare providers caring for Ebola patients and the family and friends in close contact with Ebola patients are at the highest risk of getting sick because they may come in contact with the blood or body fluids of sick patients.</li> <li>People also can become sick with Ebola after coming in contact with infected wildlife</li> <li>Contacts of cases or individuals with exposure in laboratories are placed under health surveillance for 21 days after their last exposure to infection. If become feverish, should undergo risk assessment and may be admitted to strict isolation pending the results of diagnostic tests.</li> </ul>

	<ul style="list-style-type: none"> <li>• Sporadic (imported or laboratory-acquired) cases are suspected in non-endemic countries, strict isolation and barrier nursing are recommended and handling of biological specimens (for diagnosis and patient management) is carried out according to regulations governing risk assessment and control.</li> <li>• Aerosol transmission has not been described in the clinical setting but it would be unwise to disregard the possibility of this occurring when the patient is seriously ill with pulmonary involvement. Similarly, in the laboratory and other experimental settings, aerosol transmission between animals has not been entirely excluded.</li> </ul>
<b>Lab Sampling</b>	<p><b><u>Recommendations for specimen collection</u></b></p> <ul style="list-style-type: none"> <li>• PPE: Full face shield or goggles, masks to cover all of nose and mouth, gloves, fluid resistant or impermeable gowns. Additional PPE may be required in certain situations.</li> </ul> <p><b><u>Sample collection:</u></b></p> <ul style="list-style-type: none"> <li>• Ebola virus is detected in blood only after onset of symptoms, specially fever. It may take up to 3 days post-onset of symptoms for the virus to reach detectable levels. Virus is generally detectable by real-time RT-PCR from 3-10 days post-onset of symptoms, but has been detected for several months in certain secretions.</li> <li>• Minimum 4mL whole blood preserved with EDTA, clot activator, sodium polyanethol sulfonate (SPS), or citrate in <i>plastic</i> collection tubes is recommended.</li> <li>• Acute phase whole blood is obtained from a patient within 7 days of onset of illness.</li> <li>• Convalescent sera collected from patients at least 14 days after onset of illness. Paired serum samples are ideal, usually collected 7-20 days apart.</li> <li>• Do not try to separate acute phase sera from blood clots to avoid the risk of accidental infection.</li> <li>• To separate serum “and avoid hemolysis which can affect PCR results” just keep the tube stand upright “no movement or shaking” till RBCs are clotted down and serum is separated.</li> <li>• Ebola virus samples are considered as one of category-A samples and should be handled in BSL4 facilities. Specimens should be handled with extreme caution and sent to the National Reference Laboratory and intimate authorities in the lab before sending the shipment of specimens</li> <li>• Relevant clinical and epidemiological information <b>must</b> be attached to the laboratory request form enclosed with the specimens.</li> </ul> <p><b><u>Storage of specimens</u></b></p> <ul style="list-style-type: none"> <li>• Specimens can be stored for two days if preserved in type specific media at 4-8°C. For prolonged storage periods, preservation at –70°C may be indicated.</li> <li>• Specimens for antigen or antibody detection may be stored at 4-8°C for 24-48 hours or at –20°C for longer periods. Sera for antibody detection may be stored at 4-8°C for up to 10 days.</li> </ul> <p><b><u>Packaging &amp; Transport of specimens</u></b></p> <ul style="list-style-type: none"> <li>• Specimens should be packaged as triple packaging system which consists of a primary receptacle (a sealable specimen bag) wrapped with absorbent material, secondary receptacle</li> </ul>

	<p>(watertight, leak-proof), and an outer shipping package</p> <ul style="list-style-type: none"> <li>• Label outer cover with <i>Biohazard label</i>, orientation arrows “<i>keep upright</i>” and with a Declaration “<i>Dangerous Goods</i>”</li> <li>• Notify the receiving laboratory and submit the package to approved courier service.</li> </ul>	
<b>Cleaning &amp; decontamination</b>	<ul style="list-style-type: none"> <li>• Discard used needles directly into sharps box without recapping them.</li> <li>• Work areas and surfaces should be disinfected with 1% household bleach daily or with a change in collection team. Use 10% bleach to clean up spills after wiping the surface clean. Personnel carrying out cleaning or decontamination should wear a protective coat and thick rubber gloves.</li> <li>• Contaminated non-disposable equipment or materials should be soaked in 1% household bleach for 5 minutes. Before use wash in soapy water and sterilize if necessary.</li> <li>• Heavily soiled disposable items should be soaked in 10% household bleach before incineration or disposal.</li> </ul>	
<b>Lab diagnosis</b>	<b>Timeline of Infection</b>	<b>Diagnostic tests available</b>
	<ul style="list-style-type: none"> <li>• Within a few days after symptoms begin</li> </ul>	<ul style="list-style-type: none"> <li>• Antigen-capture enzyme-linked immunosorbent assay (ELISA) testing</li> <li>• IgM ELISA</li> <li>• Polymerase chain reaction (PCR)</li> <li>• Virus isolation</li> </ul>
	<ul style="list-style-type: none"> <li>• Later in disease course or after recovery</li> </ul>	<ul style="list-style-type: none"> <li>• IgM and IgG antibodies</li> </ul>
	<ul style="list-style-type: none"> <li>• Retrospectively in deceased patients</li> </ul>	<ul style="list-style-type: none"> <li>• Immuno-histochemistry testing</li> <li>• PCR</li> <li>• Virus isolation</li> </ul>
	<ul style="list-style-type: none"> <li>• Acute infections will be confirmed using a real-time RT-PCR assay</li> <li>• Serologic testing (IgM and IgG antibodies) are required to monitor the immune response in confirmed EVD patients</li> <li>• The medical history, especially travel and work history along with exposure to wildlife are important to suspect the diagnosis of EVD.</li> <li>• Leukopenia with lymphopenia followed later by elevated neutrophils and a left shift.</li> <li>• Platelet counts are often decreased in the 50,000 to 100,000 range.</li> <li>• Amylase, Hepatic transaminases, fibrin degradation products, Prothrombin (PT) and partial thromboplastin times (PTT) may be elevated</li> <li>• Proteinuria may be present.</li> <li>• Initially exclude common ailments like malaria, typhoid fever, shigellosis, cholera, leptospirosis, plague, rickettsiosis, relapsing fever, meningitis, hepatitis and other viral hemorrhagic fevers.</li> </ul>	
<b>Treatment</b>	<ul style="list-style-type: none"> <li>• No Ebola virus-specific treatment exists. Standard treatment for Ebola HF is still limited to supportive therapy consists of: <ul style="list-style-type: none"> <li>○ balancing the patient’s fluids and electrolytes</li> <li>○ maintaining their oxygen status and blood pressure</li> <li>○ treating them for any complicating infections</li> </ul> </li> <li>• Severely ill patients require intensive supportive care.</li> <li>• Early treatment may increase the chance of survival.</li> </ul>	

	<ul style="list-style-type: none"> <li>Antiviral, cytokine or vasoactive agent has shown influence and Ribavirin is most effective within the first 6 days of illness.</li> </ul>		
<b>Epidemic measures</b>	<b>Exposure Level</b>	<b>Clinical Presentation</b>	<b>Public Health Actions</b>
	<b>High Risk</b> <ul style="list-style-type: none"> <li>Percutaneous (e.g., needle stick) or mucous membrane exposure to body fluids of EVD patient</li> <li>Direct care of an EVD patient or exposure to body fluids without appropriate PPEs</li> <li>Laboratory worker processing body fluids of confirmed EVD patients without appropriate PPE or standard biosafety precautions</li> <li>Participation in funeral rites which include direct exposure to human remains in the geographic area where outbreak is occurring without appropriate PPE</li> </ul>	<ul style="list-style-type: none"> <li>Fever or other symptoms without fever</li> </ul>	<ul style="list-style-type: none"> <li>Evaluation using IPC for suspected EVD, and testing if indicated</li> <li>If transport is indicated, air medical transport only (no public or commercial conveyances permitted)</li> <li>Keep under observation with limited movements until 21 days after last known exposure</li> </ul>
		<ul style="list-style-type: none"> <li>Asymptomatic</li> </ul>	<ul style="list-style-type: none"> <li>Conditional release and controlled movement until 21 days after last known exposure</li> </ul>
	<b>Low Risk</b> <ul style="list-style-type: none"> <li>Household member or other casual contact with an EVD patient</li> <li>Providing patient care or casual contact without high-risk exposure with EVD patients in health care facilities in outbreak-affected countries</li> </ul>	<ul style="list-style-type: none"> <li>Fever with or without other symptoms</li> </ul>	<ul style="list-style-type: none"> <li>Medical evaluation using for suspected EVD, consultation, and testing if indicated</li> <li>If transport is clinically appropriate &amp; indicated, air medical transport only (no public or commercial conveyances permitted)</li> <li>If not found to be probable case, conditional release and controlled movement until 21 days after last known exposure</li> </ul>

		<ul style="list-style-type: none"> <li>Asymptomatic</li> </ul>	<ul style="list-style-type: none"> <li>Conditional release and controlled movement until 21 days after last known exposure</li> </ul>
	<p><b>No Known Exposure</b></p> <ul style="list-style-type: none"> <li>In affected country having no low-risk or high-risk exposures</li> </ul>	<ul style="list-style-type: none"> <li>Fever with other symptoms</li> </ul>	<ul style="list-style-type: none"> <li>Medical evaluation and optional consultation to determine if movement restrictions and infection control precautions are indicated</li> <li>If movement restrictions and infection control precautions are determined not to be indicated: travel by commercial conveyance allowed; self-monitor until 21 days after leaving country</li> </ul>
		<ul style="list-style-type: none"> <li>Asymptomatic</li> </ul>	<ul style="list-style-type: none"> <li>No movement restrictions</li> <li>Travel by commercial conveyance allowed</li> <li>Self-monitor until 21 days after leaving country</li> </ul>
<b>International measures</b>	<ul style="list-style-type: none"> <li>Notification of cases under IHR 2005</li> </ul>		
<b>Safety measures for health workers, contacts and patient's attendants</b>	<ul style="list-style-type: none"> <li>Raising awareness about the risk factors and suggested protective measures <ul style="list-style-type: none"> <li>Avoid close unprotected physical contact with Ebola suspected / confirmed patients</li> <li>Suspected or confirmed patients should be isolated in separate rooms and cared for using barrier nursing techniques and dedicated instruments to prevent nosocomial infection</li> </ul> </li> <li>Only designated medical/ paramedical staff &amp; attendants should attend the patient.</li> <li>Appropriate use of PPEs should be practiced when taking care of patients.</li> <li>All used disposables items &amp; secretions of the patients and clothing should be safely autoclaved &amp; then incinerated.</li> <li>Any instrument or reusable items exposed should be decontaminated and autoclaved before reuse.</li> <li>Regular hand washing is required after visiting as well as after taking care of patients.</li> <li>Avoid spills, pricks, injury and other exposure during patient handling.</li> <li>All surfaces involved in patient care or sampling handling should be decontaminated by liquid bleach.</li> </ul>		

	<ul style="list-style-type: none"> <li>Isolated room should be fumigated after the discharge or death of the patient.</li> </ul> <p><b>Burial of dead body:</b></p> <ul style="list-style-type: none"> <li>Those who have died from the disease should be promptly and safely buried.</li> <li>Preparation for burial of the dead bodies also carries high risks of transmission of virus. The following instructions should be observed for safe burial practices: <ul style="list-style-type: none"> <li>Thick and long rubber gloves or double pair of surgical gloves should be used for washing of the dead body.</li> <li>Dead body should be sprayed with 1:10 liquid bleach solution and then wrapped in the winding sheet. Then place in a sealed plastic bag after spray.</li> <li>Disinfect the transporting vehicle and incinerate all the clothing of deceased.</li> </ul> </li> </ul>
<p><b>Prevention and control</b></p>	<p><b>Animals health sector:</b></p> <ul style="list-style-type: none"> <li>If an outbreak is suspected, the premises should be quarantined immediately. Culling of infected animals, with close supervision of burial or incineration of carcasses may be necessary to reduce the risk of animal-to-human transmission.</li> <li>Restricting or banning the movement of animals from infected farms to other areas can reduce the spread of the disease.</li> <li>Establishment of an active animal health surveillance system to detect new cases is essential in providing early warning for veterinary and human public health authorities. <ul style="list-style-type: none"> <li>Suspected animals should be handled with gloves and other appropriate protective clothing.</li> </ul> </li> <li>Animal products (blood and meat) should be thoroughly cooked before consumption.</li> </ul> <p><b>Human Health sector:</b></p> <ul style="list-style-type: none"> <li>Suspected patients need intensive supportive care including standard infection control precautions.</li> </ul> <p><b>Early recognition:</b></p> <ul style="list-style-type: none"> <li>Early recognition is critical for infection control. Any patient with suspected Ebola needs to be isolated until diagnosis is confirmed or Ebola is ruled out.</li> <li>Healthcare providers should consider travel history, symptoms and risks of exposure before recommending Ebola diagnosis.</li> </ul> <p><b>Patient placement:</b></p> <ul style="list-style-type: none"> <li>Patients should be placed in a single room, containing a bathroom with the door closed.</li> <li>Facilities should maintain a log of all persons entering the patient's room</li> </ul> <p><b>Protecting healthcare providers:</b></p> <ul style="list-style-type: none"> <li>All persons entering the patient room should wear at least: fluid resistant or impermeable gloves, gown, eye protection (goggles or face shield), and a facemask</li> <li>Additional PPE might be required in certain situations e.g., copious amounts of blood, other body fluids, vomit or feces present in the environment, including but not limited to double gloving, disposable</li> </ul>

	<p>shoe covers and leg coverings</p> <ul style="list-style-type: none"> <li>Healthcare providers should frequently perform hand hygiene before and after all patient contact, contact with potentially infectious material, and before putting on and upon removal of PPE, including gloves.</li> </ul> <p><b>Patient care equipment:</b></p> <ul style="list-style-type: none"> <li>Dedicated medical equipment preferably disposable, when possible) should be used for the provision of patient care.</li> <li>All non-dedicated, non-disposable medical equipment used for patient care should be cleaned and disinfected according to the manufacturer's instructions and hospital policies.</li> </ul> <p><b>Patient care considerations:</b></p> <ul style="list-style-type: none"> <li>Limit the use of needles and other sharps as much as possible.</li> <li>Phlebotomy, procedures, and laboratory testing should be limited to the minimum necessary for essential diagnostic evaluation and medical care.</li> </ul> <p><b>Environmental infection control:</b></p> <ul style="list-style-type: none"> <li>Meticulous environmental cleaning and disinfection and safe handling of potentially contaminated materials is vital as blood, sweat, emesis, feces and other body secretions represent potentially infectious materials.</li> <li>Healthcare providers performing environmental cleaning and disinfection should wear recommended PPEs and consider use of additional barriers e.g., shoe and leg coverings, if needed.</li> <li>Face protection i.e. face shield or mask with goggles should be worn while performing tasks such as liquid waste disposal to avoid splashes.</li> <li>Follow standard procedures according to the hospital policy and manufacturers' instructions, for cleaning and / or disinfection of environmental surfaces and equipment, textiles and laundry and food utensils and dishware</li> </ul> <p><b>Duration of precautions:</b></p> <ul style="list-style-type: none"> <li>The duration of precautions should be determined on a case-by-case basis, in conjunction with local, state and federal health authorities.</li> </ul>
<b>Travelers</b>	<ul style="list-style-type: none"> <li>If you travel to any of the four affected countries, make sure to do the following: <ul style="list-style-type: none"> <li>Practice careful hygiene.</li> <li>Avoid contact with blood and body fluids.</li> <li>Do not handle items that may have come in contact with an infected person's blood or body fluids.</li> <li>Avoid funeral or burial rituals that require handling the body of someone who has died from Ebola.</li> <li>Avoid contact with animals or raw meat.</li> <li>Avoid hospitals where Ebola patients are being treated.</li> <li>Seek medical care immediately if you develop fever, headache, bodyaches, sore throat, diarrhea, vomiting, stomach pain, rash, or red eyes.</li> </ul> </li> <li>Pay attention to your health after you return. <ul style="list-style-type: none"> <li>Monitor your health for 21 days if you were in an area with an Ebola outbreak, especially if you were in contact with blood or body fluids, items that have come in contact with blood or body fluids, animals or raw meat, or hospitals where Ebola patients are being treated.</li> <li>Seek medical care immediately if you develop fever, headache,</li> </ul> </li> </ul>

	achiness, sore throat, diarrhea, vomiting, stomach pain, rash, or red eyes
<b>Prognosis</b>	<ul style="list-style-type: none"> <li>• The disease has a high mortality rate: often between 50 -90%.<sup>[1][4]</sup></li> <li>• If an infected person survives, recovery may be quick and complete. <ul style="list-style-type: none"> <li>• Prolonged cases are often complicated by the occurrence of long-term problems, such as inflammation of the testicles, joint pains, muscle pains, skin peeling or hair loss eye symptoms, such as excess tearing, light sensitivity, iritis, iridocyclitis, choroditis etc.</li> </ul> </li> </ul>

## References

1. Ebola virus disease Fact sheet *World Health Organization*.
2. Brown R (2014-07-17). "The virus detective who discovered Ebola in 1976". *News Magazine*. BBC News.
3. Bennett D, Brown D (May 1995). "Ebola virus". *BMJ (Clinical research ed.)* 310 (6991): 1344–1345. doi: 10.1136/bmj.310.6991.1344. PMC 2549737.PMID 7787519.
4. C.M. Fauquet (2005). Virus taxonomy classification and nomenclature of viruses; 8<sup>th</sup> report of the International Committee on Taxonomy of Viruses. Oxford: Elsevier/Academic Press. p. 648. ISBN 9780080575483.
5. King JW (2008-04-02). "Ebola Virus". eMedicine. WebMd. Retrieved 2008-10-06.
6. Ebola Viral Disease Outbreak — West Africa, 2014. CDC. June 27, 2014.
7. CDC urges all US residents to avoid nonessential travel to Liberia, Guinea, and Sierra Leone because of an unprecedented outbreak of Ebola".CDC. July 31, 2014. Retrieved 2 August 2014.
8. Outbreak of Ebola in Guinea, Liberia, and Sierra Leone. CDC. August 4, 2014. Retrieved 5 August 2014.
9. Ebola virus disease, West Africa – update 8 August 2014. WHO. 8 August 2014. Retrieved 8 August 2014.
10. 2014 Ebola Virus Disease (EVD) outbreak in West Africa. WHO. Apr 21 2014. Retrieved 3 August 2014.
11. Ebola Hemorrhagic Fever Signs and Symptoms. CDC. January 28, 2014. Retrieved 2 August 2014.
12. Johnson E, Jaax N, White J, Jahrling P (Aug 1995). Lethal experimental infections of rhesus monkeys by aerosolized Ebola virus. *International journal of experimental pathology* 76 (4): 227–236.ISSN 0959 -9673. PMC 1997182. PMID 7547435.
13. Leffel EK, Reed DS (2004). Marburg and Ebola viruses as aerosol threats. *Biosecurity and bioterrorism : biodefense strategy, practice, and science* 2 (3): 186–191.doi:10.1089/bsp.2004.2. 186. ISSN 1538-7135. PMID 15588056.
14. Ebola Hemorrhagic Fever Diagnosis. CDC. January 28, 2014. Retrieved 3 August 2014.
15. Grolla A, Lucht A, Dick D, Strong JE, Feldmann H (2005). "Laboratory diagnosis of Ebola and Marburg hemorrhagic fever. *Bull Soc Pathol Exot* 98 (3): 205– 9.PMID 16267962.