



UPDATED RAPID RISK ASSESSMENT

Outbreak of Ebola virus disease in West Africa

2nd update, 5 June 2014

Main conclusions

The outbreak of Ebola virus disease (EVD) in West Africa with onset in early December 2013 in Guinea now involves three countries: Guinea; Liberia and most recently Sierra Leone. This is the first documented EVD outbreak in these countries. By week 14 of 2014, it looked like the control measures would bring the outbreak a halt but the situation has now evolved in another direction. In week 22 of 2014, there was an unexpected surge in the number of new cases and the outbreak spread to previously unaffected areas in Guinea and Sierra Leone. As of 4 June 2014, the outbreak situation is the following:

- in Guinea, 328 clinically compatible cases (193 of which were laboratory-confirmed by PCR) including 208 deaths;
- in Liberia, one new suspected death clinically compatible with EVD resulting in 13 cases including nine deaths reported since March 2014; and
- in Sierra Leone, 98 cases (24 confirmed, 3 probable and 71 suspected) including six deaths.

The surge in cases in weeks 22 and 23 of 2014 and the expanding geographical spread involving previously unaffected areas are reasons for concern. Media reports and personal accounts indicate that the outbreak response operation may have failed to gain the trust and community support required to effectively trace and monitor all contacts of EVD patients and to isolate contacts who develop symptoms. A new wave of human-to-human transmission is currently unfolding and it is therefore likely that additional cases will be identified in the coming weeks.

For tourists, visitors or residents in affected areas, the risk of infection is still considered very low if elementary precautions are followed: avoiding contact with symptomatic patients or dead bodies and their bodily fluids. In addition, generic precautions for travelling in West African countries also apply for preventing infection with Ebola virus, e.g. avoiding close contacts with live or dead wild animals and consumption of 'bushmeat', washing and peeling fruits and vegetables before consumption, practising 'safe sex' and following hand-washing routines.

People who provide medical care in the outbreak area are advised to wear protective clothing, including masks, gloves, gowns, and eye protection, and to practice proper infection prevention and control measures. The risks associated with seeking medical care in affected countries depend on how well the precautionary measures are implemented those settings.

Source and date of request

ECDC internal decision to update the rapid risk assessment: 2 June 2014.

Public health issue

To re-assess the risk of introduction and transmission of ebolavirus in the EU associated with the evolving outbreak of Ebola virus disease in West Africa that was first detected in Guéckédou in the forested region of south-eastern Guinea in February 2014, and has since spread in Guinea and to Sierra Leone and Liberia.

Consulted experts

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Disease background information

Infections with Ebola viruses originating from Africa cause a severe disease in humans called Ebola virus disease (EVD). Since the first documented EVD outbreak in the Democratic Republic of Congo in 1976, five species of the genus *Ebolavirus* (Filoviridae family) have been identified: *Zaire ebolavirus* (EBOV), *Sudan ebolavirus*, *Reston ebolavirus*, *Tai Forest ebolavirus* and *Bundibugyo ebolavirus* [1][2][3]. Ebola virus is a biosafety level 4 pathogen (BSL-4; risk group 4) and requires special containment measures and barrier protection, in particular for healthcare workers.

The current EVD outbreak was first assessed in the ECDC Rapid Risk Assessment "[Outbreak of Ebola haemorrhagic fever in Guinea](#)" dated 23 March 2014 [4]. Detailed information about the Ebola virus and the epidemiology of EVD can be found in the second Rapid Risk Assessment "[Outbreak of Ebola virus disease in West Africa](#)" published on 8 of April 2014 [5].

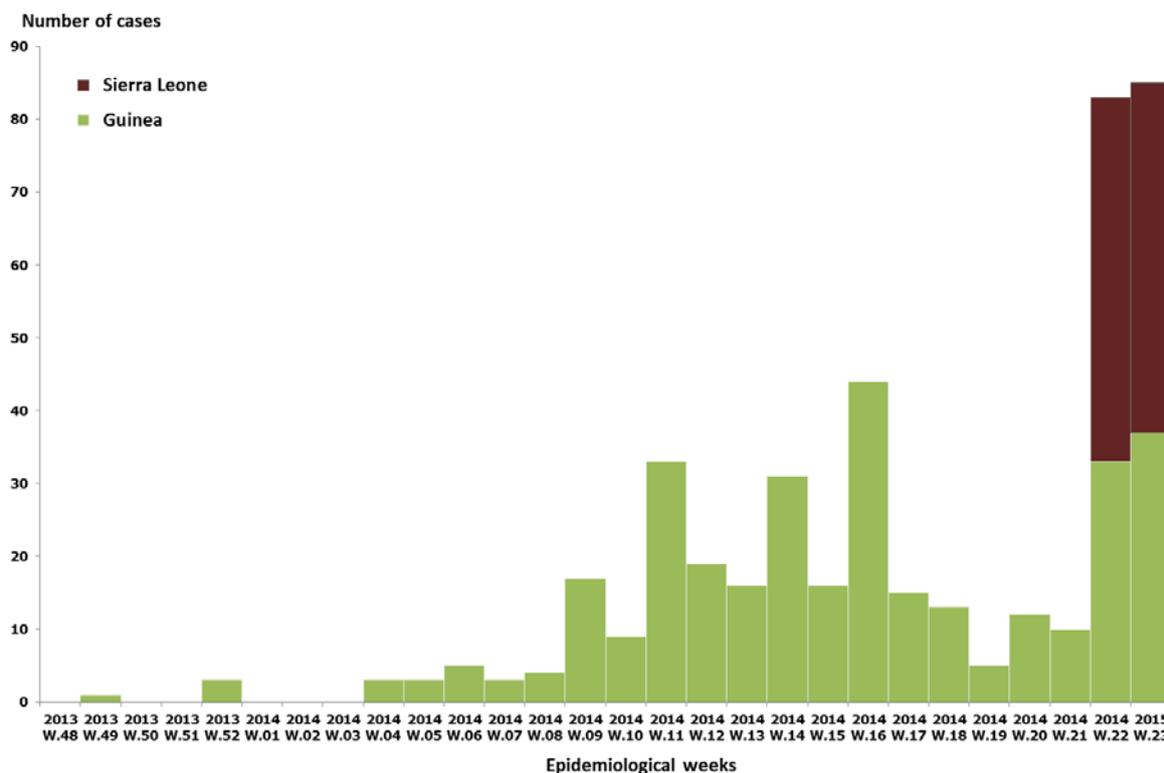
Event background information

There is an on-going outbreak of haemorrhagic fever due to Ebola virus in Guinea, Liberia and Sierra Leone, with onset in early December 2013. The first cases were reported from the forested region of south-eastern Guinea in Guéckédou prefecture near the border with Liberia and Sierra Leone. The Ebola viral aetiology was confirmed on 22 March 2014 by the National Reference Centre for Viral Haemorrhagic Fevers (Institut Pasteur, INSERM BSL4 laboratory, Lyon, France) [6]. Complete genome and subsequent phylogenetic analysis revealed that the Ebola clade (variant) from Guinea is closely related but nevertheless distinct from the viruses that have been isolated from outbreaks in central Africa (Gabon and Democratic Republic of Congo) and clearly distinct from the Tai Forest Ebola virus isolated in the Ivory Coast [3][7][8].

The epidemiological investigation has identified a 2-year-old girl from Guéckédou prefecture as the first suspected case. The girl died in early December 2013. In February 2014, EVD transmission chains were identified around infected health workers in several prefectures in Guinea (Macenta, N'Zérékoré, and Kissidougou). These findings are in favour of an emergence of a new Ebola strain in early December in Forested Guinea with further spread in surrounding areas. Case-fatality has been high and similar to the case-fatality ratios reported from outbreaks with closely related viral strains in Central Africa.

Active case-finding, contact tracing and isolation of symptomatic patients appeared to be successful in controlling the outbreak as just a handful of new cases were reported during week 14 of 2014. However, a surge of new cases were reported during week 22, involving previously unaffected areas, and cases were reported from Sierra Leone. The local transmission chains reported from Sierra Leone have been linked to on-going transmission in Guéckédou in Guinea.

Figure 1: Distribution of suspected and confirmed cases of EVD by week, Guinea and Sierra Leone, week 48/2013 to 23/2014 (as of 3 June 2014).



Sources: Adapted from WHO Regional Office for Africa and Baize et al. [8] [9]. The thirteen cases from Liberia are missing epidemiological week information and therefore do not appear on the epidemic curve.

Guinea

As of 1 June 2014, the Ministry of Health of Guinea has reported 328 cumulative cases, of which 208 have died (CFR=63%). Of these cases, 193 (59%) have been laboratory confirmed, 80 (24%) classified as probable and 55 (17%) as suspected. Countrywide, 604 contacts are currently being followed.

According to WHO, the cases and deaths by currently affected areas are as following:

- Conakry, 56 cases and 27 deaths;
- Guéckédou, 190 cases and 140 deaths;
- Macenta, 44 cases and 24 deaths;
- Boffa, four cases and two deaths; and
- Téliélé 22 cases and five deaths.

Prior to week 22, three additional prefectures were reporting cases:

- Kissidougou, seven cases and five deaths;
- Dabola, four cases and four deaths;
- Djingiraye, one case and one death [10] [11].

Outbreaks in Kissidougou, Dabola and Djingiraye are considered over because two incubation periods (42 days) have passed since the isolation of the last reported cases.

This recent upsurge of cases, from 22 during weeks 20–21 to 70 cases in weeks 22–23, indicates that community and nosocomial transmissions are still occurring in Guéckédou, Macenta and Conakry and that the new areas of Boffa and Téliélé prefectures are affected.

Liberia

On 23 May 2014, a patient who had travelled from Sierra Leone to Liberia was admitted to Foya Borma hospital, Foya district, Lofa County. The patient was discharged against medical advice and died on 25 May 2014. The body was returned to Sierra Leone for burial. No blood samples were taken. Eleven contacts including five health workers and six relatives of the deceased are being followed [12].

As of 4 June 2014, Liberia reported 13 cases:

- Eight cases in Lofa County: 2 suspected, 2 probable and 4 confirmed;
- Two suspected cases in Nimba County;
- One suspected case in Bong County;
- Two confirmed cases in Margibi County.

The number of EVD-related deaths is ten overall [12].

Sierra Leone

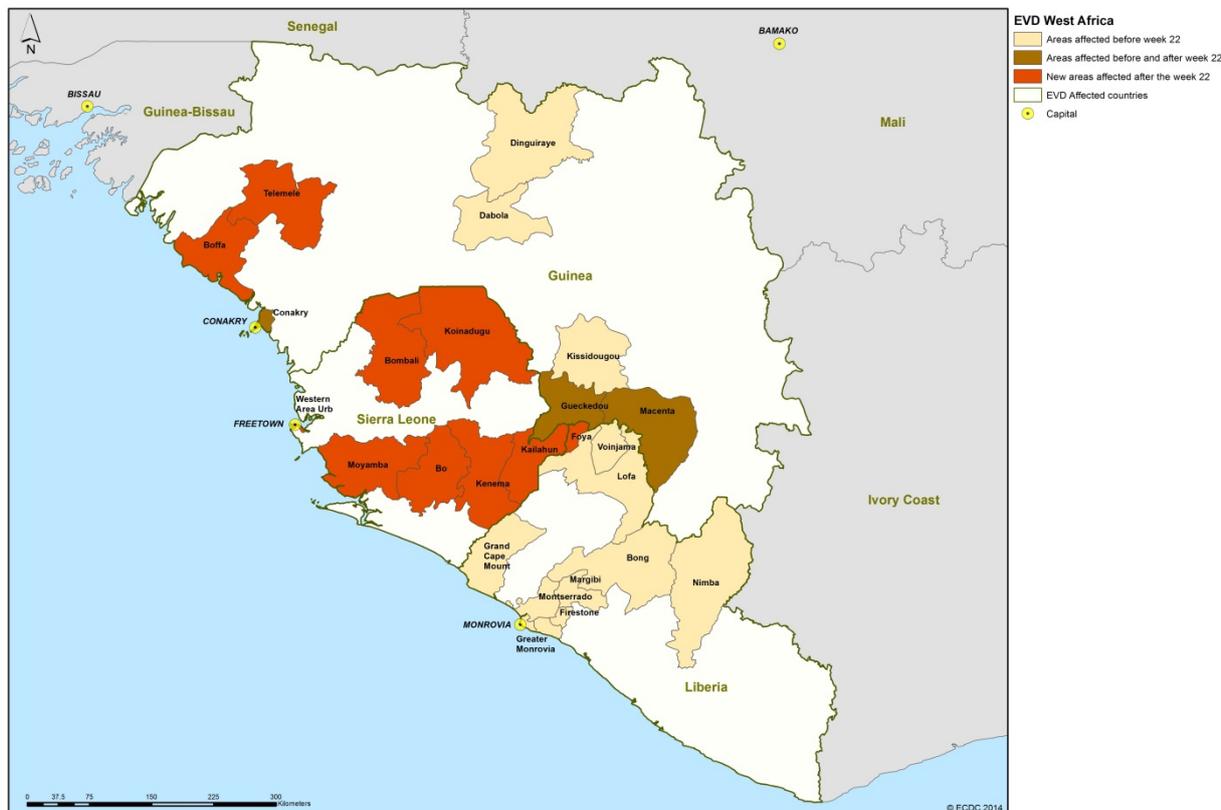
As of 3 June 2014, according to the Ministry of Health, the number of clinical EVD cases has risen to 98 (24 confirmed, 3 probable and 71 suspected) including six deaths (three confirmed, three probable).

The geographical distribution by county is reported as follows:

- Kailahun: 69 cases and six deaths;
- Kenema: five cases and no death;
- Koinadugu: two cases and no death;
- Bombali: one case and no death;
- Bo 13 cases and no death;
- Moyamba: one case and no death;
- Freetown: seven cases and no death [10,11].

Figure 1 presents the epicurve of suspected and confirmed cases of EVD in Guinea and Sierra Leone from week 48/2013 to 23/2014. It shows a sharp increase in number of cases in the past two weeks. While the outbreak is quickly evolving, the number of EVD cases could vary in the coming weeks due to retrospective epidemiological investigation, laboratory confirmation and data consolidation by local health authorities.

Figure 2: Distribution of EVD cases by affected areas, as of 3 June 2014



Sources: Adapted from WHO Regional Office for Africa [9]

The origin of this outbreak is still unknown. However, exposure to bush meat has been suspected for the primary cases, as well as transmission through close contact with blood, secretions, organs or other biological fluids of

infected animals. Genetic studies suggest that the Guinean EBOV strain has evolved in parallel with the strains from Central Africa from a recent ancestor. It should be noted that fruit bats of the species known to be potential reservoirs of EBOV are present in the initial outbreak foci as in sub-tropical regions of West Africa. Most of the secondary cases participated in funeral ceremonies and were in direct contact with infected or deceased patients or had handled these corpses. This led local health authorities to consider human-to-human transmission as the main mode of transmission in the current outbreak.

The Ministries of Health in the three affected countries have issued recommendations for early case detection, prevention of transmission in healthcare settings and preventive individual and community measures (educational public health messages for risk reduction) to prevent further transmission. Control activities supported by WHO, UNICEF and Médecins Sans Frontières and numerous partners are being implemented, including contact tracing, enhanced surveillance and strengthening of infection control practices, free-of-charge access to healthcare for suspected cases, case isolation and management and social mobilisation. A team of scientists from the EU-funded project 'European Mobile Laboratory' (EMLab) has established a field laboratory in Guéckédou (Guinea) to test suspect cases.

Information and education materials have been developed and distributed, intensive multimedia communications are underway and psychosocial support is being provided to patients, their families and the affected communities. There is ongoing training for carers in safe practices and for the community in safe burials.

In summary, three countries, Guinea, Sierra Leone and Liberia have reported confirmed cases of Ebola viral disease. Local transmission from person-to-person has occurred in several areas of Guinea, Sierra Leone and Liberia. This recent increase in the number of cases highlights that community and nosocomial transmission are re-occurring thought to be partially linked to community resistance to prevention and control measures.

WHO and its partners have deployed experts in Sierra Leone, Liberia and Guinea, including anthropologists, to support prevention and response measures, build capacity for response, notably for epidemiological investigation, coordination and case management in collaboration with Health authorities. Social mobilization targeting the resistant communities is still a priority together with isolation of cases and complete contact tracing to stop the recent transmission chains in affected districts.

ECDC threat assessment for the EU

This is the first documented outbreak of EVD in West Africa. It is not unexpected as the affected countries share an ecological system known to be conducive for *ebolavirus* transmission, and there is serological evidence, although limited, that *ebolavirus* has infected humans in the area before [13].

It is assumed, but has not been confirmed, that the first human cases had contact with bodily fluids of wild animals. The chain of transmission in the human population has been maintained through contact with bodily fluids of sick humans in health care settings, in peoples' homes and during funeral ceremonies.

The epidemiological curve until week 19 of 2014 indicated that the control measures put in place were effective, that most of the chains of human-to-human transmission were being interrupted and that the outbreak had started to fade out. The surge in cases in weeks 22 and 23 and the expanding geographical spread are reasons for concern. Media reports and personal accounts indicate that the outbreak response operation may have failed to gain the trust and community support required to effectively trace and monitor all contacts of EVD patients and to isolate contacts who develop symptoms. A new wave of human-to-human transmission is currently unfolding and it is therefore likely that additional cases will be identified in the coming weeks.

It is not clear if all recent cases have a documented epidemiological link to previous human cases and therefore multiple zoonotic introductions cannot be ruled out as a driver in this outbreak until molecular information is available.

These developments are putting additional pressure on the health systems in the affected countries and increase the need for regionally coordinated control measures and external logistical and technical support for the coming months.

Increasing case numbers and extended geographical spread increases the risk for EU citizens working and living in affected areas to become exposed to the virus, particularly those engaged in humanitarian aid and health care delivery. However, the risk scenarios presented in the previous rapid risk assessment and annexed to this document remain valid.

Risk for the EU

The capacity to detect and confirm cases of EVD in the EU is considered to be sufficient. The risk of EVD patients presenting in the EU can be assessed against the following possible situations:

Tourists returning from affected countries

There are two non-stop EU destinations from Conakry International Airport: Paris and Brussels. Monrovia International Airport has direct connections to Brussels, London and Paris. However, other EU destinations can be reached through a Royal Air Maroc hub in Casablanca, which offers connections to Paris, Nice, Lyon, Marseille, Toulouse, Barcelona, and Milan [14]. Other non-stop destinations from Conakry include Senegal, Côte d'Ivoire, Mali, The Gambia, Mauritania, and Guinea-Bissau. Freetown Lungi International Airport has two non-stop EU destinations: London (Heathrow) and Paris, and connection to Côte d'Ivoire, Ghana, The Gambia, Morocco, Senegal, Nigeria and Liberia. [15].

The risk of a tourists becoming infected with Ebola virus during a visit to the affected countries and developing disease after returning to the EU is extremely low, even if the visit included travel to the local areas from which primary cases have been reported. Transmission requires direct contact with blood, secretions, organs or other bodily fluids of dead or living infected persons or animals – all unlikely exposures for the average tourist.

Visiting families and friends

The risk for travellers visiting friends and relatives in affected countries is similarly low, unless the traveller has direct physical contact with a sick or dead person or animal infected with Ebola virus. Active contact tracing would identify the exposure and prevent further spread of the disease through active contact monitoring.

Exposed persons seeking medical attention in the EU

People who suspect that they have been exposed to Ebola virus may seek medical attention in the EU while incubating the disease. Examples include EU volunteers who worked in healthcare settings in the affected districts. These persons are likely to seek immediate medical attention and should be taken care of immediately if they develop any symptoms in order to prevent any further spread of the disease.

Patients presenting with symptoms and seeking medical attention in the EU

There is a possibility that persons who were exposed to an Ebola virus and developed symptoms board a commercial flight to seek medical attention in the EU. It is highly likely that such patients would seek immediate medical attention upon arrival in the EU and then be isolated to prevent further transmission.

Aircraft passengers exposed to an Ebola case during a flight

A traveller on board an airplane may be or become ill during the flight, presenting with symptoms compatible with EVD. The possibility of transmission to co-passengers and crew on board the aircraft should be assessed using the guidance provided in the ECDC RAGIDA guidelines [16]. If the investigation concludes that the passenger has symptoms compatible with Ebola fever and had risk exposure in an affected country in the past 21 days, all passengers seated one seat away from the infected traveller, as well as crew members, may be at risk if they have been in direct contact with bodily fluids or heavily contaminated fomites such as contaminated clothing, towels or utensils.

Risk for EU residents in affected countries

The risk for EU citizens resident in the affected countries can be considered as very low, unless they are directly exposed to bodily fluids of dead or living infected persons or animals. There is a risk of transmission through unprotected sexual contact with a patient that has recently recovered from the disease.

Risk for healthcare workers in affected countries

There is a specific risk for healthcare workers and volunteers, especially if involved in caring for Ebola viral disease patients. However, if the recommended level of precaution for such settings is observed, it should effectively prevent the transmission of the disease.

Laboratory samples shipped to EU laboratories

There is a theoretical risk that an improperly labelled and packed biological sample is sent to an EU laboratory for further testing, without proper indication of a possible connection to *Ebolavirus*. However, compliance with sample shipment regulations and universal precautions in the receiving laboratory should mitigate this risk [17].

WHO does not recommend that any travel or trade restrictions be applied to countries involved in the outbreak.

Options for prevention and control

Prevention of infection for tourists, visitors and residents

For tourists, visitors or residents in affected areas, the risk of infection is considered very low if some elementary precautions are followed:

- Avoiding contact with symptomatic patients and/or their bodily fluids;
- Avoiding contact with corpses and/or bodily fluids from deceased patients.

In addition, generic precautions for travelling in West African countries also apply for preventing infection with Ebola virus:

- Avoiding any form of close contact with wild animals (including monkeys, forest antelopes, rodents and bats), both alive and dead, and consumption of any type of 'bushmeat';
- Washing and peeling fruits and vegetables before consumption;
- Strictly practising 'safe sex';
- Strictly following hand-washing routines.

It is advised to avoid habitats which might be populated by bats such as caves, isolated shelters, or mining sites.

Prevention for healthcare workers

In healthcare settings, the risk level can vary from very low to low. However, the risk is high in the event of mishaps that result in skin penetrations or mucosal exposure to contaminated materials (e.g. needle stick injuries).

Preventive approaches for healthcare workers include:

- Full compliance to vaccinations (notably yellow fever) and malaria prophylaxis as recommended for the target region (including documentation as a vaccination record);
- sensitisation for viral haemorrhagic fever symptoms before working in endemic countries; and
- strict implementation of barrier management, use of personal protective equipment, and disinfection procedures, as per specific guidelines [18] [19].

Possible scenarios for the EU/EEA

Scenario for the EU/EEA are reported in annexe I as developed into rapid risk assessment "[Outbreak of Ebola virus disease in West Africa](#)" has been published the 8 of April 2014 as follow:

- Scenario 1: Suspicion of exposure to Ebola virus;
- Scenario 2: Person presenting with symptoms compatible with EVD;
- Scenario 3: Passenger with symptoms compatible with EVD on board of an airplane;
- Scenario 4: Patients and healthcare workers having been exposed to an unrecognised Ebola patient.

Annex I: Possible scenarios for the EU/EEA

This annexe is presenting possible scenarios for the EU/EEA as developed in the second rapid risk assessment “[Outbreak of Ebola virus disease in West Africa](#)” published the 8 of April 2014.

Scenario 1: Suspicion of exposure to Ebola virus

An EU citizen travelling to or residing in an affected country who suspects having been exposed to Ebola virus should be evaluated and assigned a ‘level of risk of transmission’, using the criteria described in Table 1.

If the risk of transmission is considered low or moderate, the person should be reassured and asked to monitor his/her temperature for 21 days.

If the risk of transmission is deemed high, e.g. a healthcare worker having experienced a needle stick injury, active monitoring of health status should be implemented immediately and a medical evacuation should be considered at an early stage by specialised air providers under high containment provisions.

Scenario 2: Person presenting with symptoms compatible with EVD

Symptoms compatible with EVD include flu-like symptoms with fever, muscle aches, myalgia, weakness, headache and sore throat at the prodromal phase which may develop into various clinical manifestations with gastrointestinal symptoms (vomiting, diarrhoea, anorexia and/or abdominal pain), neurological symptoms (headaches, confusion, prostration), vascular symptoms (conjunctival/pharyngeal injections), cutaneous symptoms (rash) and respiratory symptoms (cough, chest pain, shortness of breath).

An EU citizen residing or visiting an affected area who develops such symptoms with EVD should be assessed for possible exposure:

- If the person did not experience an exposure or experienced an exposure at low risk, other pathologies such as malaria should be investigated.
- If the person experienced an exposure of moderate or high risk level, a medical evacuation should be considered at an early stage, carried out by specialised air providers under high containment provisions; investigations for other possible causes of disease should be initiated immediately.

Scenario 3: Passenger with symptoms compatible with EVD on board of an airplane

Cabin crew identifying a sick passenger with suspicion of infectious disease on board, as well as ground staff receiving the passenger at the destination, should strictly follow the [IATA guidelines for suspected communicable diseases](#). These guidelines provide information on how to handle a sick passenger during the flight, how to reduce the risk of transmission on board the aircraft, how to communicate the event to the destination airport, and how to record contact details on passenger locator cards for the passengers in the two rows around the case. Public health authorities and emergency medical services at the airport of destination should be informed in advance of arrival. On arrival, the sick passenger should be put in a separate room awaiting medical assessment. The assessment of possible exposure to *ebolavirus* and of the compatibility of the symptoms with Ebola virus disease is out of the scope of the airline crew's actions and should be performed by medically trained ground staff.

The population incidence of Ebola virus infection is low, even during an outbreak, and it is considered highly unlikely that a passenger infected with Ebola virus boards an airplane. In addition, the prodromal presentation of the disease is not characteristic enough to distinguish an Ebola virus infection from many other viral diseases. The public health response to a sick passenger on an aircraft should be based on a thorough assessment of the patient's possible exposure to *ebolavirus* rather than on the clinical presentation. The evaluation of the exposure should check if, within the past three weeks, the passenger has:

- visited a country where ebolavirus disease has been confirmed (for the current outbreak: Guinea and Liberia);
AND
- been in contact with a sick or dead wild animal (particularly bats) while there;
OR
- cared for and touched a severely ill or dead person.

A ‘yes’ to question 1 and to either question 2 or 3 would signify that the ill passenger has been potentially exposed to Ebola virus in an affected country in the past three weeks. If the investigation does not conclude a significant risk of exposure to *ebolavirus* (no specific exposure for the sick traveller, no symptoms during the flight), contact tracing is not indicated. If the passenger experienced a risk exposure to Ebola virus, the following epidemiological measures based upon proximity to the index patient should be considered (ECDC RAGIDA guidelines):

- **Passengers and crew with reported direct contact**
Co-travellers and crew members who had reported direct body contact with the index case should be traced-back. To gather this information, any records of significant events on the flight should be obtained from the airline.
- **Passengers seated one seat apart from the index patient**

As direct contact is the main route of transmission for Ebola virus, only passengers who were seated one seat apart from the index case in all directions should be included in the trace-back. If the index case occupied an aisle seat, the three passengers seated directly across the aisle from the index case should also be traced-back.

- **Crew members of plane section**

Crew members who provided in-flight service in the section of the aircraft where the index case was seated should be included in the trace-back, as well as other crew members who had direct contact with the patient.

- **Cleaning staff of plane section**

The staff that cleaned the section seat where the index case was seated and the toilet facilities (if used by the index case) should be traced-back.

Traced-back passengers, crew members and cleaning staff who have been identified should be assessed for their specific level of exposure. The risk for transmission is considered low if no direct contact with the passenger or with material potentially contaminated by the passenger's bodily fluids has occurred. Self-monitoring of temperature should be considered for 21 days for all contacts. The same measures should be considered when a patient reports symptoms during a flight but fails to alert the crew.

There is no reason to quarantine the airplane upon arrival when a passenger presents with symptoms during the flight.

Further reading

- ECDC Guidance. Risk assessment guidelines for diseases transmitted on aircraft (Part2): http://ecdc.europa.eu/en/publications/publications/1012_gui_ragida_2.pdf [16].
- IATA guidelines: <http://www.iata.org/whatwedo/safety/health/Documents/health-guidelines-cabin-crew-2011.pdf> [20].
- Interim guidance about Ebola virus infection for airline flight crews, cargo and cleaning personnel, and personnel interacting with arriving passengers: http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/ebola/Ebola_airline.pdf [21].

Scenario 4: Patients and healthcare workers having been exposed to an unrecognised Ebola patient

Unrecognised Ebola virus fever has a high potential for spreading within a healthcare setting. This is caused by close person-to-person contacts and possible exposure to bodily fluids as occurring during nursing, diagnostic and treatment procedures, including the manipulation of biological samples. The risk for other patients and/or healthcare workers may rise to 'moderate' or 'high', depending on the conditions of an undiagnosed patient. The minimisation of time lag in suspecting and subsequently diagnosing EVD in a symptomatic patient is essential for containing outbreaks in a healthcare setting.

Once a case of EVD is suspected, the procedures in the healthcare facility are carried out as if the EVD was already confirmed. The responses include:

- Contact tracing among staff and patients who have been in contact with the suspected patient;
- Medical monitoring of identified contacts (fever and prodromal symptoms);
- Immediate notification of the competent public health authorities;
- Improved barrier management in all areas where the suspected patient has been treated (contaminated zone, transition or sluicing zone, 'clean' zone);
- Patient handling under droplet hygiene precautions; in case of invasive, potentially aerosol-generating procedures: airborne transmission precautions;
- Retaining waste and any type of bodily fluids from the patient in the contaminated zone until appropriate decontamination and disposal provisions are in place;
- Handling and shipment of patient samples according to the international procedures for 'transport of category A infectious substances assigned to UN 2814 or UN 2900' [17].

Hospital preparedness measures promoting early detection and safe handling of viral haemorrhagic fever cases:

- Sensitisation of staff working in 'ports of entry' in a healthcare setting (emergency departments, ambulance services, GP offices) for early and advanced symptoms of viral haemorrhagic fever;
- Focussing on systematic recording of travel history and vaccinations received;
- Establishing a standard diagnostic procedure for ruling out common differential diagnoses at an early stage (e.g. malaria, yellow fever, dengue, Lassa fever, rickettsia and leptospirosis);
- Establishing a protocol for notification of the competent public health authorities at an early stage if suspecting an EVD case;
- Knowing of, and establishing contact to, reference laboratories able to perform viral haemorrhagic fever diagnostics;
- Knowing of, and establishing contact to, specialised treatment centres with high containment facilities;
- Delivering basic training to healthcare workers on principles of provisional barrier nursing and use of personal protective equipment for droplet transmission precaution.

Further reading

ENIVD guidance on management and control of VHF: <http://www.enivd.de/NETZ.PDF> [18].

VHF assessment chart for patients in emergency departments:
http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317135155050 [19].

RKI guidance on Ebola and Marburg virus (updated on 25th March 2014, German):
<http://www.rki.de/DE/Content/InfAZ/E/Ebola/Uebersicht.html?nn=2370426> [22].

Public Health Canada: Pathogen safety data sheet on Ebola virus: <http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/ebola-eng.php> [23].

Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings:
<http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf> [24].

Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence: http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947382005 [19].

International guidelines for shipment of infectious substances: http://www.who.int/ihr/infectious_substances/en/ [17].

WHO Guidance on regulations for the Transport of Infectious Substances 2013–2014:
http://apps.who.int/iris/bitstream/10665/78075/1/WHO_HSE_GCR_2012.12_eng.pdf [25].

Guidance on public health management of epidemics from unusual and high consequences diseases (pages 385-520, German):
http://www.bbk.bund.de/SharedDocs/Downloads/BBK/DE/Publikationen/PublikationenForschung/BioGef-I_3Auflage.pdf [26].

Guidance on clinical treatment of VHF (pages 191-203, German):
<http://www.bbk.bund.de/SharedDocs/Downloads/BBK/DE/Publikationen/PublikationenForschung/BioGefahren-II-MedVers.pdf> [27].

References

1. Li YH, Chen SP. Evolutionary history of Ebola virus. *Epidemiol Infect.* 2013 Sep 16:1-8.
2. European Centre for Disease Prevention and Control. ECDC fact sheet: Ebola and Marburg fever [internet]. ECDC; 2014 [cited 2014 Mar 20]. Available from: http://www.ecdc.europa.eu/en/healthtopics/ebola_marburg_fever/pages/index.aspx.
3. World Health Organization. Ebola virus disease - Fact sheet [internet]. WHO Media centre; 2014 [cited 2014 Mar 20]. Available from: <http://www.who.int/mediacentre/factsheets/fs103/en/>.
4. European Centre for Disease Prevention and Control. Outbreak of Ebola haemorrhagic fever in Guinea [internet]. Stockholm: ECDC; 2014 [cited 2014 Mar 24]. 7]. Available from: <http://ecdc.europa.eu/en/publications/Publications/ebola-guinea-rapid-risk-assessment.pdf>.
5. European Centre for Disease Prevention and Control. Outbreak of Ebola virus disease in West Africa [internet]. Stockholm: ECDC; 2014 [cited 2014 Apr 9]. Available from: <http://www.ecdc.europa.eu/en/publications/Publications/Ebola-RRA-West-Africa-8April2014.pdf>.
6. National Reference Center for Viral Hemorrhagic Fevers - Unit of Biology of Emerging Viral Infection. Institut Pasteur / INSERM. BSL4 Laboratory (Sylvain Baize and Delphine Pannetier). Ebola virus disease - West Africa: Guinea, Zaire Ebola virus suspected. [internet]. Promed; 2014 [cited 2014 Mar 23]. Available from: <http://www.promedmail.org/direct.php?id=2349865>.
7. Muyembe-Tamfum JJ, Mulangu S, Masumu J, Kayembe JM, Kemp A, Paweska JT. Ebola virus outbreaks in Africa: past and present. *Onderstepoort J Vet Res.* 2012;79(2):451.
8. Baize S, Pannetier D, Oestereich L, Rieger T, Koivogui L, Magassouba N, et al. Emergence of Zaire Ebola Virus Disease in Guinea - Preliminary Report. *N Engl J Med.* 2014 Apr 16.
9. WHO Regional Office for Africa. Epidemic & Pandemic alert and Response (EPR) [internet]. 2014 [cited 2014 Jun 1]. Available from: <http://www.afro.who.int/en/clusters-a-programmes/dpc/epidemic-a-pandemic-alert-and-response/outbreak-news.html>.
10. WHO Regional Office for Africa. Ebola virus disease, West Africa (Situation as of 30 May 2014) [internet]. 2014 [cited 2014 Jun 3]. Available from: <http://www.afro.who.int/en/clusters-a-programmes/dpc/epidemic-a-pandemic-alert-and-response/outbreak-news/4154-ebola-virus-disease-west-africa-30-may-2014.html>.
11. WHO Regional Office for Africa. Ebola virus disease, West Africa (Situation as of 01 June 2014) [internet]. 2014 [cited 2014 Jun 4]. Available from: <http://www.afro.who.int/en/clusters-a-programmes/dpc/epidemic-a-pandemic-alert-and-response/outbreak-news/4157-ebola-virus-disease-west-africa-1-june-2014.html>.
12. UNICEF-Liberia. Ebola virus disease, SitRep#22 (Situation as of 02 June 2014) [internet]. 2014 [cited 2014 Jun 2]. Available from: <http://reliefweb.int/sites/reliefweb.int/files/resources/UNICEF%20Liberia%20SitRep%20%2322%20Ebola%20Viral%20Disease%20%20June%202014.pdf>.
13. Boiro I, Lomonossov NN, Sotsinski VA, Constantinov OK, Tkachenko EA, Inapogui AP, et al. [Clinico-epidemiologic and laboratory research on hemorrhagic fevers in Guinea]. *Bull Soc Pathol Exot Filiales.* 1987;80(4):607-12.
14. Kinkaa.fr. Conakry Airport [internet]. 2014 [cited 2014 Mar 22]. Available from: http://www.kinkaa.fr/aeroports/Conakry_CKY.
15. Wikipedia. Lungui International Airport [internet]. 2014 [cited 2014 Jun 3]. Available from: http://en.wikipedia.org/wiki/Lungui_International_Airport.
16. European Centre for Disease Prevention and Control. Risk assessment guidelines for diseases transmitted on aircraft [internet]. [updated 2010; cited 2]. 2nd:[Available from: http://ecdc.europa.eu/en/publications/publications/1012_gui_ragida_2.pdf.
17. World Health Organization. A Guide for Shippers of Infectious Substances, 2013 [internet]. 2014 [cited 2014 Mar 22]. Available from: http://www.who.int/ihr/infectious_substances/en/.
18. European Network for Diagnostics of Imported Viral Diseases. Management and Control of Viral Haemorrhagic Fevers and other highly contagious viral pathogens [internet]. 2001 [cited 2014 Jun 3]. Available from: <http://www.enivd.de/NETZ.PDF>.
19. Department of Health UK. Advisory Committee on Dangerous Pathogens. Management of Hazard Group 4 viral haemorrhagic fevers and similar human infectious diseases of high consequence. [internet]. 2012 [cited 2014 Jun 3]. Available from: http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947382005.
20. IATA. General Guidelines for Cabin Crew [internet]. 2011 [cited 2014 Jun 3]. Available from: <http://www.iata.org/whatwedo/safety/health/Documents/health-guidelines-cabin-crew-2011.pdf>
21. CDC. Interim guidance about Ebola virus infection for airline flight crews, cargo and cleaning personnel, and personnel interacting with arriving passengers [internet]. [cited 2014 Jun 3]. Available from: http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/ebola/Ebola_airline.pdf.

22. Robert Koch Institut. Übersicht Ebola-Fieber / Marburg-Fieber [internet]. 2014 [cited 2014 Jun 3]. Available from: <http://www.rki.de/DE/Content/InfAZ/E/Ebola/Uebersicht.html?nn=2370426>.
23. Public Health Agency of Canada. Pathogen Safety Data Sheet - Infectious substances. [internet]. 2010 [cited 2014 Jun 3]. Available from: <http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/ebola-eng.php>.
24. Siegel JD RE JM, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee,. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2014 [cited 2014 Jun 3]. Available from: <http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf>.
25. Organization WH. Guidance on regulations for the transport of infectious substances 2013–2014 [internet]. 2013 [cited 2014 Jun 3]. Available from: http://apps.who.int/iris/bitstream/10665/78075/1/WHO_HSE_GCR_2012.12_eng.pdf.
26. Robert Koch Institut. Handbuch zum Bevölkerungsschutz [internet]. Berlin2007. Available from: <http://www.bbk.bund.de/SharedDocs/Downloads/BBK/DE/Publikationen/PublikationenForschung/BioGef-I-3Auflage.pdf>.
27. Robert Koch Institut. Entscheidungshilfen zu medizinisch angemessenen Vorgehensweisen in einer B-Gefahrenlage [internet]2007. Available from: <http://www.bbk.bund.de/SharedDocs/Downloads/BBK/DE/Publikationen/PublikationenForschung/BioGefahren-II-MedVers.pdf>.