Ebola virus disease

Online Course for Primary Care Staff

DOSSIER

Responsible Partner: ZADIG

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Ebola virus disease – General guidelines

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Summary

1. What has to be known [1-6]

1.1. Epidemiology

EVD, also simply known as Ebola, is a severe disease of humans and nonhuman primates caused by infection with a virus of the family Filoviridae, genus Ebolavirus. Of the five identified species of Ebolavirus, four have been responsible for disease in humans.

The name Ebola comes from a river in the Democratic Republic of the Congo where the first Ebola virus disease (EVD) outbreak occurred, in 1976. Since then, there have been a series of outbreaks. With the exception of the last one, all previous outbreaks occurred in tropical region of Central Africa. The one with the highest mortality rate dates back to 2003 and took place in the Democratic Republic of Congo, where it killed almost 90 percent of the infected persons. The largest is currently raging in West Africa, with 15,145 cases and 5,420 deaths as of November 16th 2014, which is much more than the sum of the victims in all previous outbreaks (see the ECDC epidemiological_updates[7]).

This is the first outbreak of EVD in West Africa and the 25th outbreak globally since the disease was first discovered. Officially reported figures are generally believed to be gross under-estimations of the magnitude of this outbreak since, according to WHO's recently published roadmap, the actual number of cases may be 2 to 4 fold higher than currently reported, and it is estimated that the aggregate count could exceed 20,000 cases over the course of the outbreak.[8]

The outbreak started in Guinea in December 2013 but was only detected in March 2014. Since then, it spread in Liberia and Sierra Leone. In July an infected traveller brought the disease in Nigeria and, by the end of August, a single case was reported in Senegal (a 21-year-old male who recently arrived from Guinea). On October 20th WHO declared Nigeria free of EVD, since no virus transmission had been recorded for 42 days, due to the prompt containment of the disease. No local transmission of EVD was reported in Senegal, therefore the country is currently not among the list of affected countries as far as November 5th.

At the same time, another EVD outbreak started in the Democratic Republic of the Congo. According to viruses identification and sequencing, it is not related to the West Africa one.[5,9]

This outbreak is unprecedented in size, in geographical distribution, and in affecting densely populated urban areas, even if it is not as lethal as some of the previous ones. The most affected rural area is the cross-border area of Gueckedou (Guinea), Lofa (Liberia) and Kenema and Kailahun (Sierra Leone), but transmission in the capital cities is of particular concern, owing to their population density and the repercussions for travel and trade.[10,11]

As a result, this last epidemic was declared an international public health emergency (Public Health Event of International Concern, PHEIC) by the World Health Organization (WHO) on August 8th 2014.

Sporadic cases confined to people returning from West Africa, and further transmission to healthcare workers taking care of them, have been confirmed both in US and EU since September 30th 2014.

The outbreak may spread overland to neighbouring countries, in particular to the Ivory Coast as there is increasing transmission in the neighbouring south-east region of Liberia. As of November 26th, 8 cases and 6 deaths have been reported in Ivory Coast and Mali.[7] It is also likely that there will be more long distance exportations of EVD cases, particularly if foreign personnel and volunteers, as local people who can afford to travel abroad, have little chance of receiving proper care in their home countries. The rate of spread in the region will depend on the effectiveness of the control measures and readiness in West African neighbouring countries.

An EVD genomic surveillance study conducted in Sierra Leone showed that the present outbreak appears to be linked to one single introduction from wildlife. The virus is changing relatively quickly with intra-host and inter-host genetic variations, a factor that have to be closely monitored for its impact on diagnostics, vaccines, and therapies critical to outbreak response.[12,13]

The number of infected healthcare workers and the proportion of healthcare workers among EVD cases are not being systematically reported. However, as of November 23rd WHO reported reported a total of 592 health-care workers infected with EVD, 340 of whom have died.[7] According to WHO early indication a substantial proportion of infections among healthcare workers occurred outside the context of Ebola treatment and care centres. This figure represents an unprecedented high proportion of deaths in healthcare workers.[11] Of particular concern is that healthcare workers seem to continue to become infected long into the outbreak, at a time when standard procedures for prevention of healthcare associated transmission could be expected to be in place. The infection of few nurses that occurred both in Spanish and in USA's hospitals showed that healthcare workers need more and better information and training in order to work safely in this high risk situations.

1.2. Transmission

Ebola is a zoonotic disease and its natural reservoir host is thought to be in several fruit bats. Transmission from animals to humans is rare and is notably related to the handling of infected meat or visiting caves where bats live. In Africa, human Ebolavirus infections have been linked to direct contact with gorillas, chimpanzees, monkeys, forest antelope and porcupines found dead in the rainforest. The preparation of bushmeat, which comes from wild or feral mammals hunted in Africa, Asia and Latin America, has been linked to the transmission to humans of Ebola as well as some other diseases.

Ebola viruses are highly transmissible by direct contact with infected blood, secretions, tissues, organs and other bodily fluids from dead or living infected persons. The principal mode of transmission in human outbreaks is person-to-person transmission through direct contact with a symptomatic or dead EVD case.

This happens when body fluids from an infected person (alive or dead) have touched someone's eyes, nose or mouth, or an open cut, wound or abrasion. Notably, burial ceremonies and handling of dead bodies play an important role in transmission.

The disease could be transmitted by infected droplets (for example when the patient coughs or sneezes near another person) but no evidence of airborne transmission has been found in EVD outbreaks so far. This means that virus particles don't remain in the air after an infected person coughs or sneezes, as happens with measles or flu virus. As far as the potential role of aerosol for transmission is concerned, see the commentary[14] from the Center for Infectious Disease Research and Policy (CIDRAP).

Casual contact with a feverish but ambulant and self-caring patient, e.g. shaking hands, sharing a sitting area or public transportation, is therefore considered low risk.[1,15]

Anyway infection cannot be ruled out if mucosa or skin abrasions of people come in contact with Ebola virus contaminated surfaces and items, or directly or indirectly through contaminated hands. The Ebola virus is not very resistant: it is susceptible to disinfectants as alcohol or bleach (sodium hypochlorite) at the concentration usually suggested for hand hygiene (0.05%) and is destroyed by heat. For the resistance of Ebola Virus in the environment, see Protection.

Those afflicted with Ebola are contagious only during the symptomatic phase of the disease, the risk for transmission being considered low in the early phase of human disease (prodromal phase). However, male survivors may be able to transmit the disease via semen for two up to three months after onset of disease.[16]

1.3. Clinical information [17-19]

Ebola is one of the world's most virulent and lethal diseases. It provokes haemorrhagic fever and may lead to liver and kidney failures, with internal and external bleeding. Death may occur in 7-16 (with an average of 8-9) days after the appearance of the first symptoms and is caused by multiple organ dysfunction syndrome. Mortality rate ranges between 25 and 90 percent, according to virus characteristics, patient's comorbidities, individual immune response, timing and intensity of medical support.

EVD main symptoms are:

- fever
- severe headache
- muscle pain
- diarrhoea
- vomiting
- abdominal (stomach) pain

- unexplained bleeding and/or bruising.

The incubation period ranges from 2 to 21 days, with an average of 8-10 days before the onset of symptoms. Shorter incubation periods are more likely in case of exposure to high contaminated materials (e.g. needles).

The evolution of the disease usually goes through 3 phases:

I. the onset is in most cases similar to a flu-like illness, with sudden fever, malaise, muscle and joint pains and headache, followed by progressive weakness, anorexia , diarrhoea (sometimes containing blood and mucus), nausea and vomiting. This prodromal phase can last up to 10 days

II. in the next stage of the disease **several organ systems** are involved: in addition to gastrointestinal symptoms, there neurological (headaches, confusion), vascular (conjunctival/pharyngeal injections), cutaneous (maculopapular rash), and respiratory (typically cough, chest pain, shortness of breath; moreover hiccups is often reported during the current outbreak) ones , with a complete exhaustion (prostration)

III. after one week , more than half of the patients can show **haemorrhagic manifestations** such as bloody diarrhoea, nosebleeds, haematemesis, petechiae, ecchymosis and prolonged bleeding from needle puncture sites. In some cases profuse internal and external haemorrhages and disseminated intravascular coagulation threaten survival. Death usually comes together with tachypnea, anuria, hypovolemic shock and multi-organ failure.

At the beginning, EVD symptoms – high fever and strong headache – are very similar to those caused by malaria, a very common disease in the same areas where the virus has emerged.

In its early stage, EVD may also be confused with other African endemic diseases such as typhoid fever, dysentery, influenza. Due to this overlap, effective early diagnosis is thus more complicated and alert was generated when travellers from Africa to Europe showed similar symptoms. In this case, cautiousness would be the best approach and Ebola should be also considered and excluded, while bearing in mind that other infectious diseases, such as malaria, are much more likely than EVD. Moreover, a co-infection, in particular EVD and malaria, may occur, as several cases have been reported from affected countries.

In EVD fever and inflammation are triggered by the release of cytokines following viral infections and cell damages. The main targets of the virus are endothelial cells, mononuclear phagocytes and hepatocytes. Also, the infection provokes the secretion of a glycoprotein that can interfere with neutrophile signalling, thus allowing the virus to bypass the immune system.

It is still not fully understood why some people manage to overcome the disease while others do not. Those who recover, however, usually do so completely.

1.4. Risk assessment

1.4.1. Exposure in the community

Since the Ebola virus is transmitted through contact with patients' body fluids and infected animals (bats and nonhuman primates, as far as it is known), groups most at risk of being infected are those more in contact with patients:

- family and friends of infected people
- healthcare workers
- people who attend to corpses (e.g. in ritual funerals).

So far, no evidence of age-related sensitivity to the disease has been found. However, as of August, 55 to 60 percent of the victims across Guinea, Liberia, and Sierra Leone were women, 75 percent if considering Liberia alone. In 2007, a WHO report highlighted the issue of gender role by claiming that "differences in exposure between males and females have been shown to be important factors in transmission of Ebola haemorrhagic fever." This is due to the fact that, in these countries, women are usually the primary caregivers for the sick, whilst males rarely do that.

The risk of infection for residents and visitors to the affected countries through exposure in the community is considered low if people adhere to the recommended precautions.

People visiting friends and relatives in the affected countries tend to have more frequent and closer contacts in the community, and they are more likely than other visitors to participate in burial ceremonies, an activity known to be associated with transmission of the Ebola virus.

Residents and visitors to the affected areas run a high risk of exposure to EVD in healthcare facilities.

1.4.2. Exposure in healthcare settings

The risk of being exposed to the Ebola virus is higher for healthcare workers or volunteers. They are potentially exposed not only through direct contact with cases but also through contaminated hospital materials, medical waste and diagnostic samples.

Transmission to healthcare workers may occur after close contact with EVD patients in settings where infection control measures were either not in place or not strictly adhered to. The high number of infected healthcare workers indicates that infection control measures have not been successfully implemented.[20,21]

Anyway, the infection risk is not limited to hospitals that provide care to known EVD cases because infectious cases may initially seek medical attention at any healthcare provider. Furthermore, the risk of exposure in healthcare settings also exists in areas that have not yet reported cases because it is suspected that not all cases of EVD are being detected and reported. While the risk is very low for a consultation

requiring non-invasive tests and prescription of oral drugs, it may be increased if invasive procedures are required.

The risk of the exposure resulting in infection depends on the availability and consistent use of Personal Protection Equipment (PPE) (see Protection).

1.4.3. Importation to Europe[1,6,22,23]

Risk of importation of EVD to the EU will not be eliminated until transmission stops in affected countries. This risk is linked to the number of patients presenting with symptoms and seeking medical attention in the EU. They may arrive while incubating the disease (i.e. without showing symptoms and not being detectable through screening at points of exit or entry) or when sick because they developed symptoms while travelling.

The risk of Ebola viruses spreading from an EVD patient who arrives in the EU as result of a planned medical evacuation is considered extremely low. If a patient show first symptoms after landing in an EU Member State, secondary transmission to family and friends and in healthcare facilities cannot be ruled out. Once the possibility of EVD has been recognised and healthcare providers have taken precautions to stop transmission, the risk of spread is reduced to a minimum.

Decreasing the risk of Ebola virus transmission is dependent on early detection and isolation of cases, and the early detection and isolation of new EVD cases among their contacts, through contact tracing and monitoring. There is a risk of transmission in the period between the onset of the first symptoms, the recognition of the possibility of EVD by healthcare professionals and the subsequent isolation of the patient. ECDC has published and regularly updates documents to provide guidance on the management of those returning from Ebola affected area and/or having had contacts with EVD cases both there on in the EU.[22,23]

People infected with EVD may arrive in the EU by direct or indirect flights from affected countries or on board freighter or passenger ships. A remote possibility is a chain of transmission along the route used by migrants who end up on the southern shore of the Mediterranean and attempt to reach Europe by sea.

The risk of transmission in Europe through donated blood and substances of human origin is not consistent. In fact, according to the EU Blood Directive, current geographic deferrals for malaria also exclude residents and travellers from EVD-affected countries from donating blood.[24]

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2. What has to be done[1-7]

2.1. Diagnosis [8-11]

Early detection of potential and confirmed cases of EVD is a key step to guarantee adequate care to the patient, protection to his/her contacts and healthcare professionals, contact tracing in order to stop the spread of a possible outbreak.

According to the ECDC classification, the definition of EVD cases relies on clinical, epidemiological, laboratory and high-risk exposure criteria, allowing the identification of:

- a person **under investigation** is a person meeting the clinical and the epidemiological criteria *or* with high-risk exposure and any of the listed symptoms, including fever of any grade
- a **probable case** is a person meeting the clinical and high-risk exposure criteria
- a **confirmed case** is a person meeting the laboratory criteria.

The definition of **possible case** is not applicable.

Only confirmed cases are to be reported at the European level using the EWRS.

Clinical criteria:

- any person currently presenting or having presented before death fever ≥38.6°C

and any of the following:

- severe headache
- vomiting, diarrhoea, abdominal pain
- unexplained haemorrhagic manifestations in various forms
- multi-organ failure

or

- a person who died suddenly and inexplicably

Laboratory criteria, any of the following:

- detection of Ebola virus nucleic acid in a clinical specimen and confirmation by sequencing or a second assay on different genomic targets
- isolation of Ebola virus from a clinical specimen

Epidemiological criteria, in the 21 days before the onset of symptoms:

- having been in an area with community transmission

  or

- having had contact with a probable or confirmed EVD case

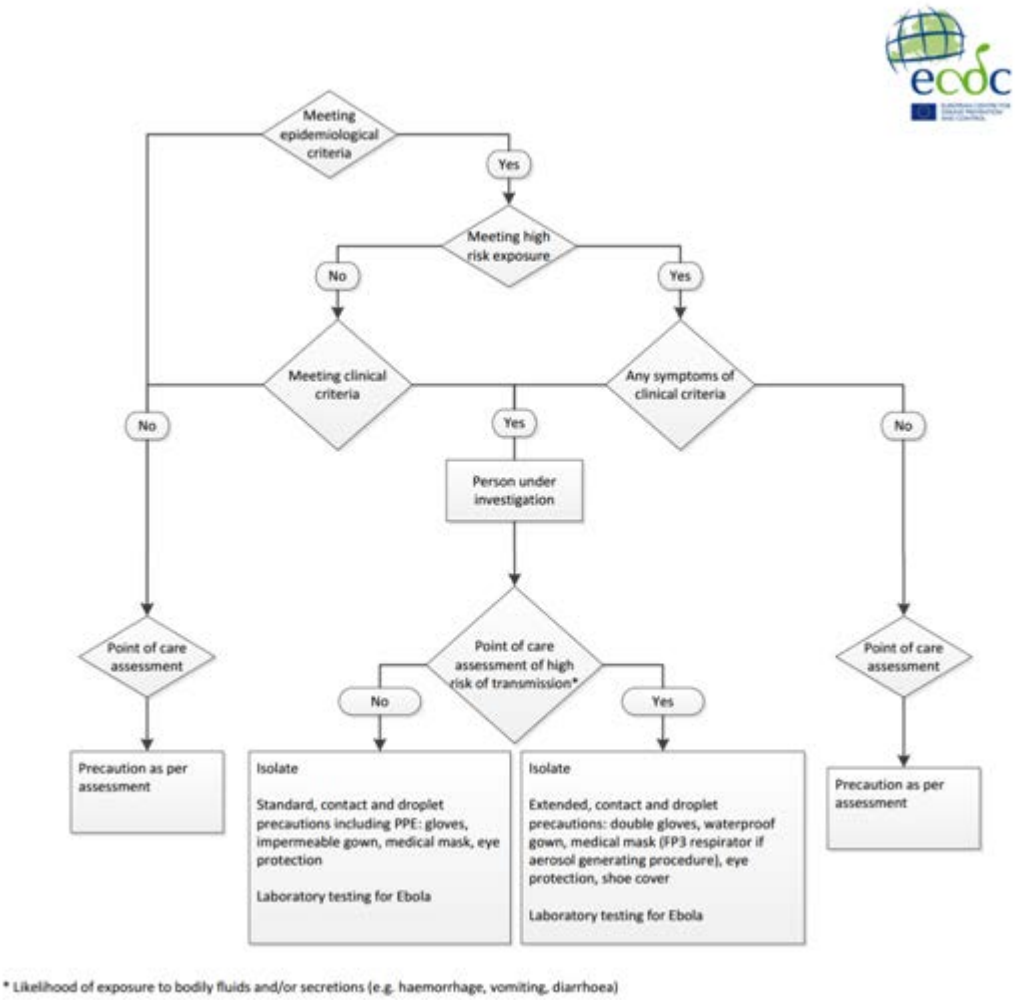
High-risk exposure criteria, any of the following:

- close face-to-face contact (e.g. within one metre) without appropriate personal protective equipment (including eye protection) with a probable or confirmed case who was coughing, vomiting, bleeding, or who had diarrhoea; or had unprotected sexual contact with a case up to three months after recovery
- direct contact with any material soiled by bodily fluids from a probable or confirmed case
- percutaneous injury (e.g. with needle) or mucosal exposure to bodily fluids, tissues or laboratory specimens of a probable or confirmed case
- participation in funeral rites with direct exposure to human remains in or from an affected area without appropriate personal protective equipment
- direct contact with bats, rodents, primates, living or dead, in or from affected areas, or bushmeat.

The early detection of potential EVD cases corresponding to the criteria of patient under investigation[8] is crucial. In parallel, additional investigations of common causes of febrile illness upon return from tropical areas should be performed with priority to malaria diagnosis. However, malaria positivity does not exclude an EVD infection. It is expected that a significant number of people will be investigated for EVD in the EU/EEA but that the likelihood of identifying a confirmed EVD case will be very low (low positive predictive value). This is because most people who meet the criteria for patient under investigation for EVD will have other infections explaining their symptoms.

ECDC has made available algorithms for case identification (laboratory diagnosis)[12] and case management[13] of EVD (Table 1).

Table 1. ECDC algorithm for assessment and management of patients for EVD



2.2. Prevention

Previous experiences showed that Ebola outbreaks could be contained, even without a vaccine or cure, but, as far as current outbreak is concerned, implemented measures have been so far unsuccessful in controlling it in West Africa. However, an apparent reduction of EBV incidence is being reported in latest weeks (end of October-November).[14] The biggest challenges have been encountered in Sierra Leone and Liberia[1] probably because of poor health facilities, wide geographical spread, ineffective contact tracing[15] and monitoring which has allowed infected people to travel during the incubation period.

2.2.1. Affected areas

Due to the virus features, identifying the infected persons, isolating them and treating them in proper facilities can break the chain of human-to-human transmission, thus stopping further spread of the disease in affected areas. The principle strategies to achieve the above are to :[5,16]

- instruct community leaders about the disease, ways of transmission and how to protect against infection, and to engage them in communicating this information to community members

- quickly identify and isolate suspected EVD cases for laboratory diagnosis confirmation and supportive treatment
- identify all contacts of each EVD case, actively monitor their health for the maximum incubation period of 21 days, and isolate, diagnose and treat all contacts who develop symptoms
- minimise the risk of transmission in healthcare settings through the consistent and appropriate use of personal protective equipment (PPE) and handling of hospital waste
- ensure safe removals and burials of deceased EVD cases
- raise public awareness and promote adherence to protective behaviour.

More specifically, in order to prevent infection in communities, visitors and residents in EVD-affected areas, the following precautions are recommended to:

- avoid contact with symptomatic patients and their bodily fluids
- avoid contact with corpses and/or bodily fluids from deceased patients
- avoid contact with wild animals (including primates, monkeys, forest antelopes, rodents and bats), both alive and dead, and consumption of bush meat
- wash hands regularly, using soap or antiseptics.

2.2.2. Travellers

The most obvious option for risk reduction is reducing the risk of infection by avoiding non-essential travels into the affected areas. Twenty-four EU/EEA countries have recommended this option for their citizens, 20 recommending avoiding or postponing non-essential travels and four advising against all travels in the affected areas. On the other hand, until November 2014, WHO did not issue any recommendations concerning travel or trade restrictions to countries involved in this outbreak.[7]

A number of international airlines have reduced or stopped operations to EVD-affected countries, and these restrictions in international transport have already resulted in delays in the shipment of medical supplies to the affected population, including personal protection equipment. In addition, due to these measures, the affected countries are starting to suffer shortages of fuel, food and other basic supplies.

Given the increased risk of infection in healthcare facilities, visitors to the EVD affected countries should identify appropriate in-country healthcare resources prior to travelling there. In addition, it is advisable to have a travel insurance covering medical evacuation in the event of any illness or accident in order to limit exposure to local health facilities.

The same above listed EVD prevention measures have to be strictly adhered to, in addition to preexisting generic precautions for travellers listed below:

- practice careful hygiene
- wash and peel fruit and vegetables before consumption
- practice ‘safe sex’

- avoid habitats which might be populated by bats, such as caves, isolated shelters, or mining sites.

It is important to self-monitor health both locally and for 21 days after return, immediately seeking medical care in case of symptoms. Until November 2014, only some US States had imposed a mandatory quarantine on healthcare workers who had direct contact with Ebola patients in West Africa, while in Europe no such policy has been introduced.

2.2.3 Importing Ebola to Europe

To reduce the risk of importing Ebola viruses **from** affected countries into the EU, WHO recommendations in the declaration of a PHEIC should be applied. Screening at the point of departure (**exit screening**) has been implemented in all affected countries supported by US CDC. Since October 12th 2014 all three of the mainly affected countries have implemented exit screening, supported by the US Centers for Disease Control and Prevention (CDC). Until that date no EVD was confirmed out of the 77 who were identified among the 36,000 screened travellers. Screening at point of entry in EU/EEA countries (**entry screening**) has an even lower predictive value, being less effective and costing more.[7,13,17-20] Therefore entry screening is being considered for direct flights originating from EVD-affected countries only in some EU countries, but most EU ministers of health disagreed with this choice.

Affected countries are requested to conduct exit screening of all persons at international airports, seaports and major land crossings for **unexplained febrile illness** consistent with potential Ebola infection. There should be no international travel of Ebola cases or contacts of cases, unless the travel is part of an appropriate medical evacuation. To be fully effective, this measure should **restrict asymptomatic contacts of EVD cases** from leaving the EVD-affected country on an international flight until the 21-day incubation period has passed, but, as the ratio of contacts to cases is high, this measure is a significant logistic challenge. Moreover, it may also prevent foreign health professionals engaged in outbreak control from going back home leaving the EVD-affected country, discouraging their necessary support and turnover.

Exit screening could potentially prevent a febrile EVD case from boarding a flight but it would not detect an **incubating passenger** who has not yet developed fever.

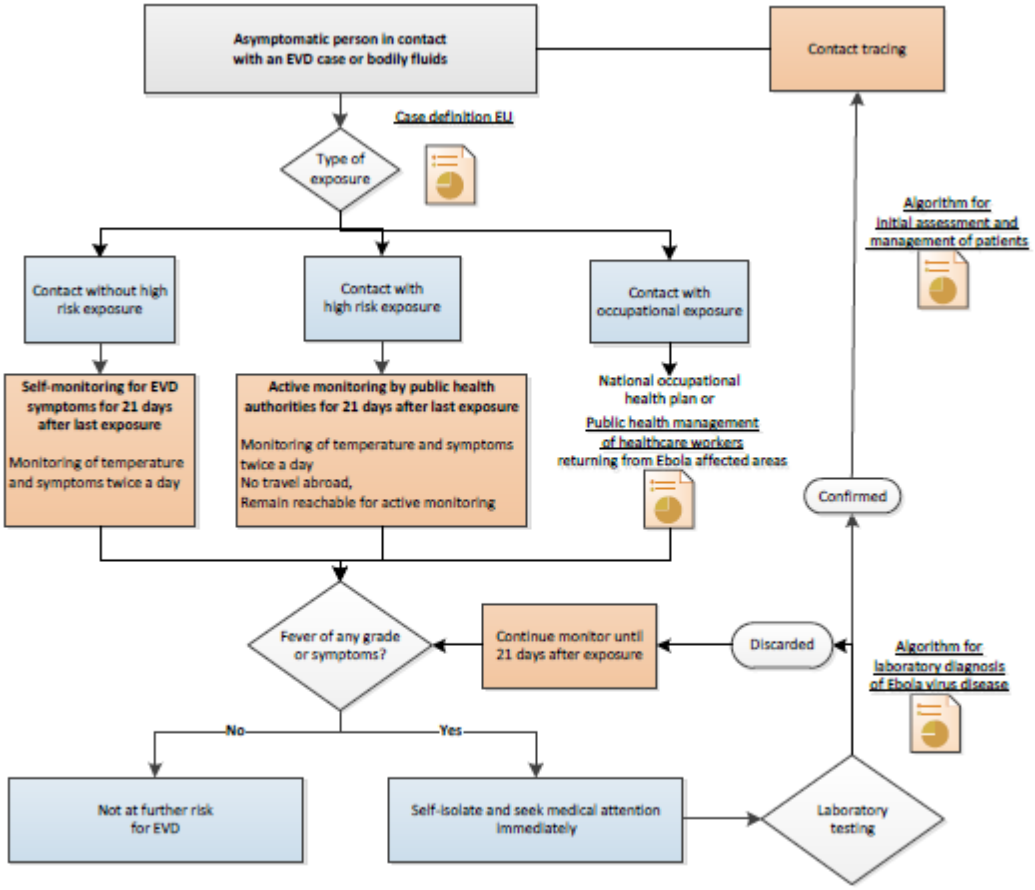
To reduce the risk of transmission of Ebola viruses **within** the EU, information and communication to travellers departing and arriving from EVD-affected countries was enhanced. Healthcare providers in the EU were informed and made more aware of the disease, receiving resources that will help them to identify and manage potential cases.[13,19]

The risk of EVD transmission depends on the early detection of suspected case imported into the EU. The time window between the onset of first symptoms and the detection by healthcare systems should be minimised. Investigation of individuals who present to healthcare providers with EVD-like symptoms and meet the criteria for 'persons under investigation'[8] should be swiftly and safely conducted in order to allow

timely detection of EVD cases. In addition, investigations should consider other possible aetiologies of a febrile illness upon return from tropical areas (see Diagnosis).

After identification and management of confirmed and/or probable EVD case(s) and potential chain of transmission in EU, effective contact tracing and contact management should reduce the risk of spreading EVD in the EU (Table 2). The aim is to identify all contacts of each EVD case, assess their level of exposure, actively monitor their health for the maximum incubation period of 21 days, and isolate, diagnose and treat all contacts who develop symptoms.

Table 2. ECDC algorithm for EVD contact management[19]



There are increasingly frequent reports of expatriate healthcare workers being repatriated from the EVD-affected countries for monitoring following exposure to Ebola viruses. Such repatriations should be executed timely, i.e. early after the potential exposure, while the risk of transmission is minimal if the exposed person turn-out to be infected. This applies particularly for personnel engaged in contact tracing, patient care and other outbreak control.

Healthcare workers should undergo an individual exposure assessment as early as possible upon returning. Additional measures can be considered on the basis of the results of the exposure assessment (Table 3).

Table 3. Healthcare worker individual management based on exposure assessment[21]

Type of exposure	Proposed option(s) for measures
No direct contact with EVD patients or their bodily fluids (e.g. involved in training local HCW)	Passive monitoring
Appropriately protected contact with bodily fluids of EVD patients (e.g. laboratory worker), fomites (e.g. bed linen) or during clinical activities	Active monitoring
Unprotected, inappropriately protected contact or known breach of protection while caring for an EVD patient, handling bodily fluids of a patient or fomites	Active monitoring Restriction of engagement in clinical activities No travel abroad
Mucosa or parenteral direct contact with bodily fluids of a patient (e.g. pricking a finger with a needle used for a patient or getting bodily fluid projection in the eyes).	Active monitoring Restriction of engagement in clinical activities Restriction of social interactions Restriction of movement

Indeed, according to ECDC, a series of potential measures can be considered for the management of asymptomatic healthcare workers returning from affected areas:[21]

- registration: a register of healthcare workers engaged in providing care for EVD patients in affected countries and areas can facilitate contact with them and potential monitoring of their status on return
- information to returning healthcare workers, including general information on EVD, advice on general protective measures for contacts (specific attention has to paid to family and close friends contact as well as co-workers), advice on the monitoring regime recommended after deployment, procedures and information on how to report symptoms and seek medical help in case of need (number of the responsible public health office, available 24 hours a day, in case of onset of symptoms)
- individual exposure assessment (Table 3). The assessment represents an opportunity to offer psychological support to returning healthcare workers
- monitoring of symptoms and body temperature twice a day for 21 days after the last possible exposure. Monitoring can be passive (self-monitoring by returning healthcare worker) or active (the returning healthcare worker having to report daily the result of the monitoring to a health authority or to the employer) or direct active (monitoring is done through direct observation of the healthcare worker by a health officer). Forms and checklists can be used to ensure consistency with different healthcare workers over time.
- restriction of engagement in clinical activities
- restriction of social interactions, that imposes voluntary social interaction limitations and may require non-attendance at the workplace during the monitoring period
- restriction of movement (limitation of use of public transport and attendance to public events and celebrations)

- quarantine (self/mandatory): this measure imposes that the returning healthcare workers remains confined at home (self-quarantine) or in a dedicated facility (mandatory quarantine) for the duration of the monitoring. This measure results in a minimal number of interactions with contacts. This measure should be accompanied by psychosocial support and financial compensations should be considered.

It has to be pointed out that the scientific evidence underlining the effectiveness of the above mentioned measures is limited.

In addition to ECDC recommendations on measures to be taken by healthcare workers upon returning from Ebola affected areas, several agencies and organisations have developed and issued their own guidance.[21]

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

A traveller on-board an airplane may be already ill or become ill during the flight, showing symptoms compatible with EVD. In this situation, the possibility of transmission to co-passengers and crew should be assessed using the ECDC RAGIDA guidelines.[22]

If an investigation concludes that the passenger has symptoms compatible with EVD and was exposed to EVD in the previous 21 days, all passengers and crew who report direct contact, as well as all passengers seated one seat away from the sick person, should be monitored for 21 days. In addition, all passengers, crew members and cleaning staff who had direct contact with the suspected case's bodily fluids or potentially contaminated fomites such as contaminated clothing, towels, or utensils should be investigated and monitored.

Any person who was exposed to Ebola viruses and develops symptoms while on board a freighter/passenger ship sailing to the EU should be declared in a Maritime Declaration of Health form and in accordance with article 37 of the 2005 International Health Regulations.[23] Affected crew members or passengers should be taken care of appropriately in order to prevent any further spread of the disease.

2.3. Protection

Ebola viruses are biosafety level-4 pathogens (BSL-4; risk group 4) and require special containment measures and barrier protection, particularly for healthcare workers.[24] The viruses can survive in liquid or dried material for many days. They are inactivated by gamma irradiation, heating for 60 minutes at 60°C or boiling for five minutes, and are sensitive to sodium hypochlorite (bleach) and other disinfectants. Freezing or refrigeration will not inactivate Ebola viruses.[22,25-27]

Healthcare workers' risk can be controlled by consistent and appropriate use of infection control precautions and strict barrier nursing procedures.[17,28,29]

The specialised treatment centres for infectious diseases in Europe are characterised by a high technical standard and a staff continuously training in the use of protective equipment and barrier nursing. The number of High-level Isolation Unit available in Europe is surely sufficient for the management of imported Ebola patients in the current situation.[30] However, a large majority of hospitals are not specialised for Infectious Diseases of High Consequences (IDHC) and will face some serious challenges when attempting to build emergency capacity for such cases. In order to work with confidence in an IDHC scenario, healthcare workers need to continuously assess the 'invisible' risk of secondary contamination.

First contacts between healthcare workers and possible or probable cases can happen at several locations, for example in hospital waiting areas, emergency rooms, rescue service vehicles, outpatient clinics, primary healthcare settings, public institutions, and ports of entry. At the time of first contact, the staff should immediately assess the transmission risk and take appropriate precautions to avoid secondary infections.
A combination of awareness, distancing measures, and the use of appropriate PPE effectively reduces the infection risk. By using distancing measures (more than 1.5 metres), common materials and procedures, such has accurate hand hygiene, the infection risk can be significantly reduced. Another measure is limiting the number of staff that come in contact with the patient.
Two recent updated guidance published by Public Health England for primary care staff and acute trusts provide clear and practical information on how to manage a suspected case presenting to primary care or emergency services [29,31]

Triage processes in surgeries, emergency rooms, ambulance services and any other health premises need to be able to quickly identify patients at risk so that they can be isolated and a risk assessment completed, involving an infection specialist.
If a patient contacts his/her doctor or a surgery by phone, reporting being unwell after visiting an affected area in the previous 21 days *AND* reports a fever of >38°C or fever within the past 24 hours he/she must be told not to visit the surgery or walk-in centre. The patient should be recalled as soon as possible by the GP or duty doctor to risk assess prior to discussion with the local infection specialist.

Transfer to the hospital should then be managed after alerting the ambulance service and the hospital to the possibility of Ebola, as they will need to put special precautions in place to ensure the vehicle and Personal Protective Equipment (PPE) are appropriate to the condition of the patient. Some countries (Italy, Germany, Sweden) are equipped with vehicles with special technical features, suitable for the bio-containment during transport of these patients.[30]
Cleaning and decontamination of any rooms in which a suspected or confirmed Ebola patient has been isolated or any facilities used by the patient should be discussed with the local Health Protection Team. In

the event of a case being confirmed, identification and follow up of contacts will be undertaken by the local Health Protection Team.

ECDC published a technical document and an interactive tutorial presenting the fundamental concepts of personal protective equipment (PPE) and barrier nursing to support preparedness in hospitals across Europe and providing practical information on the proper use of PPE at the point of care, including technical requirements and procurement aspects.[32] These materials, along with similar resources produced by CDC,[33] are aimed at strengthening preparedness and capacities for the safe use of PPE in hospitals in Europe and other countries with equivalent standards in healthcare. Basic key messages are summarized herein.

2.3.1. PPE components[32]

Standard, contact, and droplet precautions are recommended for management of hospitalized patients with known or suspected Ebola virus disease (EVD), but the same measures are applicable to any healthcare setting.

The standard PPE components include respiratory protection, eye protection, hand protection, body protection, and foot protection (Table 4). All the materials, except for the boots, clogs, scrubs, sometimes the goggles and some parts of the Powered Air Purifying Respirators (PAPRs), are single-use, disposable materials, so they need to be disposed of following the established procedures for highly infectious waste.

Table 4. PPE and waste management materials

	Material	Specifiable aspects
	Respirators	Different sizes and models; FFP3 and FFP2 (US occupational safety and health standards: N99 and N95)
	Goggles	Different sizes and models; anti-fog coating; no or covered ventilation openings preferred
	Heavy duty gloves	Different sizes and materials
	Gloves	Different sizes, materials and models; latex and nitrile; sterile (medical interventions) and non-sterile (nursing)
	Coveralls	Different sizes; single-use (disposable); integrated hood; fluid- and particle-proof; zipper covered by adhesive flaps
	Hospital scrubs	Different sizes
	Cotton socks	Different sizes
	Clogs or boots	Different sizes, preferable with non-slip soles; mark or colour-code clogs or boots if only for use in specific areas (e.g. in the patient treatment zone = 'red zone')
	Boot covers	Fluid-proof; have to be mechanically resistant if used as outer cover; non-slip soles are preferable

	Material	Specifiable aspects
	Shoe covers	Non-slip soles are preferable
	Hand disinfectant	Placed at the point of care, in donning and in the doffing areas
	Hair covers	Different models
	Waste management material	Big, leak-proof waste bag for solid infectious waste and clearly-labelled leak-proof bags or containers for linen
		Leak-proof container for solid infectious waste
		Container for sharp, pointed objects (e.g. needles, syringes, glass articles, tubing, etc.)
	Adhesive tape to use with PPE	Tape without textile layer is preferred; quality parcel tape or chemical resistant tape works fine
	Apron	Single-use, disposable aprons

Most PPE components (coveralls, respirators, goggles, gloves, and boots) should always come in different sizes. A good fit and a tight seal are essential for the protective functions of many PPE components, and poor fit is an underestimated risk factor for PPE users.

- The **coveralls** of the PPE ensemble have to be particle-tight and fluid-proof. The zipper of the coveralls needs to be covered by a particle-tight and splash-proof strip or flap.
- **Hair covers** should be worn under the hood of the coveralls to prevent hair from hanging out, where it can get easily contaminated with bodily fluids from the patient.
- There are two options for foot protection, each with different advantages and disadvantages: boots or clogs (Table 5).

Table 5. Properly choosing footwear and coveralls

Coveralls with integrated foot section		Coveralls *without* integrated foot section	
			
Combined with:		Combined with:	
Boots	Clogs	Boots	Clogs*
			

- The choice of **gloves** always needs to balance tactility and the level of protection. PPE users should always use a minimum of two pairs of gloves (the inner pair covering the skin 'like a second skin', the outer pair being the 'working gloves', Table 6). According the ECDC recommendations, the inner pair of gloves should have a longer sleeve than the outer pair of gloves.

Table 6. Combination of inner and outer gloves

Different combinations of inner and outer gloves		
		
Inner gloves + outer nursing gloves: For patient care	Inner gloves + outer surgical gloves (sterile if required): For medical interventions	Inner gloves + rough outer working gloves: For waste management or cleaning

- Different kinds of **masks** and **respirators** offer different levels of protection. Whether to use surgical masks or respirators depends on the level of exposure. A risk- and hazard-assessment for the different settings and activities is essential.

  Surgical face masks mainly protect from exhaled droplets. If marked 'IIR' (surgical masks Type IIR), surgical face masks are also splash-resistant and protect the wearer from fluid splashes. This level of protection, even when combined with distancing measures, is only safe for first contact precautions and not sufficient for EVD patient care. A respirator also protects from splashes but adds protection from the inhalation of droplets and particles.

  The European standard EN 149 defines 'filtering half masks' (also called 'filtering face pieces' - FFP) in three classes, according to their capacity to filter particles. In an enhanced-care setting for EVD patients where secondary aerosolisation cannot be excluded, FFP3 is the respirator class of choice.
- **Full-face respirator**s ('gas mask') provide a high level of protection and have good antifogging properties.
- Eye protection: **goggles** must have a close fit to the face so no liquids can enter and do not fog up while being worn. **Glasses** can be worn under the goggles if the seal fit is fully preserved. Using additional anti-fogging spray can help.

2.3.2. PPE use

Assessing the necessary level of PPE protection is the key to allocating staff in the most effective and appropriate way for the identified risk level.

When using PPE, the following indications are to be taken into account:

- personal clothing should not be worn while working in the patient care areas. PPE users should wear scrubs under their coveralls
- consider sports underwear and single-use cotton socks for comfort
- wearing makeup impairs user comfort due to facial sweat and is not recommended when using respirators
- consider using the toilet before putting on the PPE
- drink 1–2 litres of water before putting on the PPE to prevent dehydration: profuse sweating is unavoidable while working with PPE so this won't cause the healthcare worker to need to use the toilet
- fasting is not recommended before working with PPE
- check the PPE items before starting the donning process, looking for irregularities like holes and cracks.

The use of additional taping of PPE and its impact on the level of safety is controversial and, however, proper taping requires regular training and lots of experience.

There are many different ways of putting on (**donning**, Table 7) and removing (**doffing**, Table 8), but not a gold standard. It is more important to understand the rationale behind the chosen approach for donning and doffing. The most critical aspects in the process are how to avoid disease transmission to healthcare workers involved in patient care and avoid self-contamination while doffing. According to ECDC recommendations, both processes, donning and doffing, need active assistance by a trained member of the team following a check list and wearing the proper PPE, and require sufficient time without any distraction.

PPE components have to be put on properly and in a precise order to produce an integrated protection system.

Table 7. Suggested steps for donning

Steps	Action
1	Putting on scrubs and hair cover
2	Hand hygiene
3	Putting on the coveralls
4	Foot protection
5	Hand protection
6	Respiratory protection and orientation fit test
7	Hood
8	Zipper
9	Flaps
10	Eye protection
11	Inner glove disinfection and outer gloves
12	Apron (optional)
13	Testing the PPE components
14	Ready to pass through the yellow zone and to enter the red zone.*

Table 8. Suggested steps for doffing

Steps	Actions Contaminated staff (PPE user)	Actions Assistant (clean)* (Dark yellow zone)
1	Removing the optional apron. (Red zone)	
2	Step out of the red zone.	PPE inspection of the HCW ready for doffing to identify cuts or contamination; disinfection of the PPE (wipe with disinfectant)
3	Removing the outer gloves.	Use new pair of outer gloves.
4	Stay relaxed and stand still so the assistant can easily access the components.	Removing tape from face area if present.
5		Removing the goggles.
6		Open the flaps.
7		Use new pair of outer gloves.
8		Open the zipper.
9		Removing the hood.
10		Roll down the coveralls.
11		Roll down the sleeves with the integrated gloves (taped).
12	Step out of the coveralls (with integrated foot section) and put on the light yellow-zone clogs.	Hold the coveralls and stay in the dark yellow zone.
13		New pair of outer gloves
14	Stand still in the light yellow zone while the assistant removes your mask from the dark yellow zone.	Removing the PPE user's respirator.
15	Hand hygiene and step into the green zone	
16	Take off the hair cover, re-hydrate and take a shower.	

2.3.3. Working under PPE

Wearing PPE heavily affects the work routines. The biggest challenge for many healthcare dealing with IDHC is a change of mindset: from patient focus and patient care activities to self-protection, the protection of other staff members, and the prevention of spread to the community.

Beside the physical constraints (heat, dehydration, and intensive duty rosters), there are several psychological aspects to prepare for:

- full clinical pictures of IDHC like EVD may be traumatic, even for experienced healthcare workers
- the normal patient-healthcare worker model of interaction/communication is disrupted
- the fear of undetected contamination or secondary transmission to relatives and friends results in increased stress levels.

Hand disinfection dispensers are needed at the point of care and diagnosis, in the doffing area, and in the donning area. The sanitizer dispensers in the red zone and in the dark yellow zone are to be considered as contaminated.

Performing hand hygiene according to international recommendations (WHO) is a critical aspect in this setting. Hand hygiene has to be performed before the donning, after each change of gloves (if necessary), and after the doffing and according to the 'WHO five moments for hand hygiene': 1) before touching a patient; 2) before clean/aseptic procedures; 3) after bodily fluid exposure/risk; 4) after touching a patient;

and 5) after touching patient surroundings. When working with PPE, 'hand hygiene' becomes 'glove hygiene'.

2.4. Treatment

As to October 2014, no approved drugs or vaccines against EVD were available.

There is evidence that early and effective treatment of symptoms – like the use of supportive care, in order to prevent dehydration – may significantly reduce the fatality rates and improve the chance of recovery. However, such a timely intervention is challenging due to the difficulties of an effective diagnosis and, in Africa, to the lack of healthcare resources and facilities.[34]

The Centre of Disease Control and Prevention (CDC) listed some basic interventions that, if timely applied, might increase the chances of survival:

- providing intravenous fluids and balancing electrolytes
- maintaining oxygen status and blood pressure
- treating other infections if they occur.

Potential new Ebola therapies and vaccines were reviewed during two WHO meetings on September 4-5th and 29-30th 2014 and further assessed by scientific review.[35,36] Several of these potential drugs have in the past month been used in experimental treatment of individual EVD cases.

During the first WHO consultation meeting, there was consensus that the use of whole blood therapies and convalescent blood serums needs to be considered as a matter of priority.[37]

The severity of the situation in West Africa raised some controversies about the possible use of experimental drugs. A number of candidate treatments have shown promise in non-human primate models, although none of these drugs are licensed for treatment of EVD and their availability is currently limited. An expert panel of the WHO[38] concluded that "there is a moral duty to also evaluate these interventions (for treatment or prevention) in the best possible clinical trials under the circumstances in order to definitively prove their safety and efficacy or provide evidence to stop their utilization".

The European Medicines Agency (EMA) has started to review available information on a larger panel of Ebola treatments currently under development in order to support fast-track authorisation in the EU/EEA and decision-making by health authorities.[39]

So far, the treatment being mostly considered are:

- ZMapp, a monoclonal antibody vaccine produced by a small American biotech company in very limited quantity, which has proved highly effective in monkeys. So far, first tests on humans cannot be considered significant

- TKM-Ebola, a drug aimed to block the replication of the virus through RNA interference. It is still in Phase I clinical trial but the US Food and Drug Administration (FDA) approved its compassionate use in people infected with Ebola
- favipiravir, a drug produced in Japan against influenza that also proved effective against Ebola in mice
- AVI-7537, a drug produced by an American company that support the immune system in its fight against the virus by interfering with its replication. It has been tested on monkeys but never on humans and only a few doses are currently available.

In addition, the first WHO consultation meeting identified two vaccines in advanced stages of development:

• a recombinant vesicular stomatitis virus vaccine expressing a Zaire surface glycoprotein (rVSV-ZEBOV), which induces a Zaire ebolavirus specific immune response

• a non-replicative chimpanzee adenovirus type 3 vaccine (cAd3-ZEBOV) also containing the gene for the Zaïre ebolavirus surface glycoprotein.

Phase 1 and 2 trials have been initiated worldwide to assess immunogenicity and safety. It is unlikely that efficacy data will be available before a fast-track authorisation of the vaccines. If proven safe, a vaccine could be available in the coming months for priority use in healthcare workers. However, it should be noted that if the vaccines are rolled out, they will have undergone limited testing in humans, and post-authorisation monitoring of safety and efficacy will be important.

2.5. Information and communication

Raising awareness among returning travellers from affected areas or any person having had a contact with probable or confirmed cases about disease symptoms and appropriate actions (self-isolation and seeking medical care mentioning potential exposure) should be considered to reduce the time between the onset of illness and isolation, in order to reduce the opportunity for further transmission to other persons and the generation of new chains of transmission. Moreover a proper and objective communication on the disease may be helpful to avoid stigmatization and fear.

The following interventions are considered:

• informing travellers departing from EVD-affected countries and travellers arriving in the EU on direct flights from EVD-affected countries about:

- the possibility of exposure to Ebola while in the affected countries
- the clinical presentation of the disease
- the need to seek immediate medical care if symptoms develop
- the need to immediately disclose their travel history when seeking medical care and to indicate any possible contact

- how to contact public health authorities for support if infection is suspected (leaflets, phone numbers, telephone hotline).

• informing and sensitising healthcare providers in the EU about:

- the possibility of EVD among returning travellers from affected areas
- the clinical presentation of the disease
- the need to inquire about travel history and contacts with family and friends visiting from EVD-affected countries
- the availability of protocols for the ascertainment of possible cases and procedures for referral to healthcare facilities
- the imperative need for strict implementation of barrier management, use of personal protective equipment and disinfection procedures, in accordance with specific guidelines and WHO infection control recommendations when providing care to suspected EVD cases.[34,40]

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3. How to communicate

This chapter is extracted from the TELL ME online course focused on communication in epidemics and pandemics: see it for further details on these topics

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3.1. Communicating risks and preventive measures

As of November 2014, the risk of an Ebola outbreak in Europe is low, although not null. Fears and prejudice, on the other hand, are spreading. Providing people with reliable information about the disease and its risk through effective communication is therefore very important in this phase.

Prevention is essential in order to contain possible Ebola future outbreaks and communication is one of the key preventive strategies: educating and informing citizens about healthy practices, raising their awareness about diseases, involving patients and avoiding the spread of misinformation is crucial.

Healthcare workers are the interface between institutions and citizens, which is why they play a crucial role in preventive activities. They are easily accessed and have high credibility in the public's view. Patients often put greater trust in their general practitioners (GPs) than in government communication, meaning that their doctors serve as example for health prevention. GPs could further personalize communication. Knowing how to speak about prevention is crucial for healthcare professionals.

Moreover, a proper communication contributes to counteract the rise of stigmatisation. This risk doesn't concern only African people or European citizens of African origin, but healthcare workers as well, since they are a group at risk for the disease.

Healthcare workers therefore first need to be informed and updated about existing preventive measures and their efficacy. Then they should be able to explain what people should do to protect themselves from potential exposure to Ebola virus in a simple and straightforward manner. Explanations and advice should not be perceived as "just more reassurance" and are more successful when they include practical instructions.

3.2. The approach

The communication flow should not be one-directional: as suggested by TELL ME project framework model for public health communication, members of the community are not a passive receivers and the public sphere is in our focus. It is important for health professionals to listen, since people may express concerns and beliefs that need to be considered.

Listening, along with empathy, skills and experience, honesty and frankness, dedication and engagement, are one of the key factors which reliability and trust rely on.[1] Within the interpersonal context, it is possible to use a specific method called empathic mirroring which can help the listening process , through adequate communicative techniques, thus favouring the focusing on the point of view of the other and on risk perception[2]. Crucial techniques of empathic mirroring are as follows: reformulation, clarification, ability in questions, use of first person messages ("I think that", 'I believe that', "According to me").

Risk communication has to be tuned on the perception of the risk itself. According to Peter Sandman, perception of risk by people does not depend only on the actual hazard, but also, and even more, on the outrage linked to it.[3] This depends on the danger being domestic or exotic, coerced or voluntary, chronic or acute, and so on. The studies on factors influencing risk perception highlight that this is basically related to emotional factors to such an extent that a series of components corresponding to the "perceived offence" (outrage), more than the real hazard that is the cause of the hazard itself, contribute to determine the perceived risk. Healthcare professional, as well as institutions, must receive and "actively listen" to people's worries (especially those of the weakest categories such as, for example, children and pregnant women or socio-economic disadvantaged people) and be aware of offence "determinants" characterizing the perceived risk, so as to have greater opportunities to understand the origin of perception and be able to deal with it.[4,5]

Communication must therefore follow the participatory model based on the interactive exchange assessment among all the parties,[6] concerning the attention to the emotional component of individual and collective perception,[7] as well as the understanding of social and personal issues, that is crucial to make scientific data a useful knowledge for citizen.

3.3. Dealing with uncertainty in communication

Empathic listening may favour "uncertainty communication", a key process especially when, such as in an emerging outbreak, a crisis occurs while information is often incomplete and sometimes contrasting.

People must understand and are informed even in an uncertain way, by declaring "what is known and what is unknown". The same is true at an individual level.

When people receive detailed explanations on hypothesis and/or paths chosen because considered, at the current level of knowledge, most likely or adequate, they have the chance to assess the situation with a greater serenity and "competence" and to arrange the choices within their life context. At the time of the emergency, they are more likely to be collaborative, willing to face difficult situations. Declaring and supporting uncertainty, it is possible to shorten the distance between a risk scientific-probabilistic assessment and a subjective personal assessment determined by the perception of risk, which increases when the emotional level increases.

3.4. Dealing with new media

Since many people look for information on the Web[8], healthcare workers should pay attention to it for two reasons: on the one hand, knowing the kind of information that flows through the Net could be useful to pre-empt possible criticism. On the other hand, social media and Facebook groups may be extremely valuable tools to keep patients up to date with advice and to promptly address false or ambiguous knowledge they may have found on the Web.

"In the past when someone became ill, he or she would immediately go see a doctor. Nowadays people often turn first to the Internet and use the gathered information to formulate their thoughts."[9]

McNab[10] suggests that: "Until recently the predominant communication model was "one" authority to "many" – i.e. a health institution, the ministry of health or a journalist communicating to the public. Social media has changed the monologue to a dialogue, where anyone with ICT access can be a content creator and communicator."

According to a study by the Oxford Internet Institute,[11] the average U.K. user now considers the Internet as their most important source for information. Moreover, *confidence* in the reliability of information found on the Internet has also increased.

One major peculiarity of social media is that it can share "real-time" information regarding a public health crisis or other emergency scenario. For example, not only could a user receive information from an organization (eg, ECDC), a public figure, but also their friends and associates. Because the individual self-selects the source of their own information, such sources are likely to shape beliefs, attitudes, and behaviours. While this is great for sharing information, it can also be challenging, since people may receive not reliable and/or conflicting information, which can lead to mistrust and confusion. In addition, it makes relatively easy for messages to get distorted or used out of context. Because of this, misinformation can rapidly spread amongst social media.

One of the key role of healthcare professional in crisis should therefore be to address their patients towards reliable online sources such as ECDC, CDC and WHO websites, that continuously update their contents for the public, answering doubts and fears about Ebola as well as other infectious outbreaks.

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4. How to avoid stigmatization

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The term "stigma" refers to identifying individuals as not belonging to the normal social class of persons, thus indicating that they merit a higher level of concern than individuals considered normal.[1]

Stigmatised individuals can perceive themselves of being thought of in such way with psychological harms that can influence behaviour.

Individuals suspected to be carrying infectious disease are at high risk of stigmatisation. Differential treatment of individuals in the healthcare process can cause or worsen an already pre-existing situation of stigmatisation due to the individual being part of a minority group. Such groups can range from the classic examples that are prone to stigmatising and discriminatory behaviour (e.g. ethnic, religious, sexual orientation, age) to more specific groups that only arise in specific healthcare contexts.

4.1. Negative effects of stigmatisation

Stigmatisation can create and exacerbate healthcare inequalities. This is because stigmatised individuals can often act differently in seeking healthcare than others. Such behaviour often results from the negative self-judgment that these individuals have made as a result of their stigmatisation and could lead them not to seek help.[2] For instance, an individual with a particular diagnosis – typically of an infectious disease – could be scared by the expected social reaction that is likely to result from his/her condition and could thus feel the need to hide such condition from not only the public but also healthcare professionals.

In addition, during the context of an epidemic, marginalised groups that are already the source of stigmatisation (HIV again being a prominent example), may often be more at risk of contracting the condition itself, thus reinforcing the stigmatisation that such groups feel by both the epidemic and the healthcare response to it.[3,4] Authorities should, during the context of an epidemic, aim in so far as is possible not to further worsen such problems.

4.2. Stigmatisation during epidemics or pandemics

In the context of epidemics, groups that are prone to stigmatisation include people that have a perceived connection with the geographic and/or animal origin of the outbreak, healthcare professionals, those who

are part of pre-stigmatised groups and those individuals who actually become infected themselves. It is important to note that stigmatisation can occur even where there is no actual discrimination occurring.

The existence of such individuals and their susceptibility to stigmatisation must be taken into account when taking care of patients as well as planning public health responses to epidemic situations. During an epidemic, the individuals experiencing the most stigmatisation issues are those who become infected. The stigmatisation of other groups (other than those who are infected) in an epidemic situation is based on assumptions that, because of their various characteristics, they are at increased risk of infection and therefore pose a threat. Individuals who are actually infected obviously pose a greater 'threat' than those who may be infected and so will be subject to a higher level of stigmatisation. Individuals who become infected therefore suffer from two conditions, the disease itself and the stigmatisation that comes with infection.[5]

Stigmatization plays a major role in EVD, since it may strengthen community mistrust and resistance and affect timely case detection and the monitoring. In addition, local funeral rites, the stigmatisation of patients, and denial of the disease are thought to play an important role in the propagation of the outbreak.[6,7]

4.3. The role of healthcare professionals

Healthcare workers should be aware of the existence of such groups at risk of stigma and should foster communication with them, in order to encourage individuals to maintain "self-respect", thus being more likely to continue to seek access to the required public goods such as public healthcare. Such an approach has shown itself to be very efficacious in the reduction of stigmatisation for those individuals who are HIV positive. The engagement of such groups could be optimised not only through the identification of such groups (where possible) long in advance of an epidemic but also through constructive dialogue in the planning of a response to a potential epidemic.

Communication strategies aimed to tackle risks of stigmatisation should not be targeted only at those persons belonging to minority groups; it is of great importance to remind all the people that the risks of contracting the disease from individuals from the minority group is not usually higher than from someone in the general population and that, in any case, stigma can only increase the risk of contagion.

It is thus important for healthcare workers to be perceived as trustworthy; during an emergency, such perception will make people, even those at risk of stigmatisation, more likely to ask them for medical help and advice. In fact, individuals are less likely to seek treatment from individuals that hold stigmatising views. Healthcare professionals should be aware of the individual factors favouring stigmatisation in order to identify potentially (stigmatising) issues in advance and face them properly.

Effective communication (see section 3) may help healthcare professionals to get acquainted with patients' histories, which is one of the best ways to pre-empt stigmatisation.

Healthcare professionals must be aware of the main rumours and conjectures that are circulating about a disease, to better debunk them, thus decreasing the risk of stigmatisation they may provoke. They should also report any case of misinformation to medical authorities, allowing them to act by targeting the release of more accurate information designed to dispel any harmful unfounded rumours that may be circulating.

4.4. At risk groups

Some categories of individuals are more likely than others to suffer stigmatization during the context of an epidemic. These include:

- pre-stigmatised groups e.g. the poor, homeless, immigrants, the old, individuals with conditions that result in reduced immunity, ethnic minorities;
- patients actually infected, even after recovery;
- individuals associated with the perceived origin of the outbreak in question;
- individuals that are to be vaccinated;
- health professionals.

In popular perception, infectious disease epidemics have often been linked to groups of individuals of a particular origin, as proven by several recent experiences, e.g. the great influenza pandemic at the end of the First World War, which was mistakenly given Spanish origins;[8] the H1N1 pandemic in 2009, named the "Mexican flu" or the "swine flu";[9,10] the SARS outbreak in 2003 when the Chinese community around the world being the source of negative attention,[11] the new SARS, renamed Middle East Respiratory Syndrome (MERS) due to the location of its first cases.

Health authorities have to be very careful when attributing origins to outbreaks of an infectious disease due to the relevant perception of the "origin issue".

Medical professionals are not immune to stigmatisation. The large amounts of time they spend with individuals that are suspected of being at higher risk of infection or are indeed actually infected, can make them prone to stigmatisation. This is a problem for them, for their families and for their relationship with patients.[12] Healthcare workers may also face the threat of quarantine under certain circumstances, as it is now happening to volunteers going back home from EVD affected countries.[13] Stigmatisation may also come from colleagues who have not had the same contact with infected individual and can be long-term, even after the disease in question has disappeared. In addition, healthcare workers involved in the treatment of individuals during the early stages of an outbreak can feel blamed by other colleagues for allowing the infection to proliferate[14] Negative media reports and new stories over the performance and behaviour of healthcare workers can add to this sense of stigmatisation and stress.

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