# Ebola and Viral Hemorrhagic Fevers

<table>
<thead>
<tr>
<th>Signs and symptoms</th>
<th>Fever AND additional symptoms: severe headache, muscle pain, vomiting, diarrhea, abdominal pain, unexplained hemorrhage, other applicable symptom (rash, chest pain)</th>
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</thead>
<tbody>
<tr>
<td>Incubation</td>
<td>Ebola 2-21 days (typically 3-10) with very low infectious dose; other agents vary</td>
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</tbody>
</table>
| Case classification| **Clinical criteria:** fever > 38.6°C (101.5°F) for Ebola (or > 40°C [104°F] for other agents) AND other symptom(s): severe headache, muscle pain, vomiting, diarrhea, abdominal pain, unexplained hemorrhage; for some agents low platelets, rash, pharyngitis, chest pain, proteinuria.  
**Exposure criteria:** direct contact with body fluids (includes semen extended time) or body; residence in high risk area; handled risk laboratory specimens; handled wild animal in risk area |
| Case classification| **Confirmed:** Clinical and exposure criteria AND any diagnostic test from a reference laboratory (PCR, ELISA, viral culture, IgM, IgG, immunohistochemistry)  
**Suspect (person under investigation):** Consistent clinical and exposure criteria |
| Differential diagnosis | Any infectious encephalitis, transverse myelitis, psychosis, brain tumor, atropine poisoning; rule out malaria, influenza, enteric infection, arboviral infection, sepsis, leukemia, toxins/medication |
| Treatment         | Supportive (IV fluids, balance electrolytes, maintain oxygen status and blood pressure, dialysis etc. as needed ); experimental vaccines, medications and protocols available from CDC |
| Duration          | 3-15 days, longer with intensive supportive care; survivors can have long term sequelae |
| Exposure (criteria from 2014) | **High risk:** direct contact with patient or body in any setting without PPE; percutaneous or mucous membrane exposure; laboratory processing without PPE; household/sexual contact  
**Some risk:** in country with widespread transmission; direct contact or laboratory processing with PPE; any patient care in any healthcare setting  
**Low risk:** brief direct contact or brief proximity to case; travel on aircraft with case |
| Laboratory testing | LHJ and OCDE arrange testing if suspected case is being hospitalized – **emergency**. Test if exposure (outbreak region or contact of case) and consistent symptom(s)  
- Institute infection control measures immediately including during specimen collection  
- **Best specimens:** Two duplicate samples of > 4mL whole blood [best specimen] or plasma in lavender-top EDTA plastic tubes or > 4mL spun down red top plastic tubes, preferably taken 3 days or later into illness; do not transfer from original collection tubes  
  - Store at 2-8°C or if shipping is delayed for more than 72 hours should be frozen at -70°C.  
  - CDC will accept whole blood, serum, and tissue specimens  
- Pack and ship as Suspected Category A according to USDOT and ICAO/IATA regulations  
**Specimen shipping (Section 4):**  
- Keep all specimens **cold, ship cold (or on dry ice if frozen)** with Serology/Virology form [https://www.doh.wa.gov/Portals/1/Documents/5230/302-017-SerVirHIV.pdf](https://www.doh.wa.gov/Portals/1/Documents/5230/302-017-SerVirHIV.pdf)  
| Public Health Actions | LHJ immediately contacts CDE 877-539-4344 for diagnosis and treatment  
- If symptoms transport to designated emergency department or hospital and arrange testing  
- Coordinate contact tracing (shared case exposure or exposed to case) with DOH and CDC  
- Monitor person under investigation x21 d; restrict travel/public contact if high risk exposure |

*Infection Control: Immediate standard, contact, and droplet precautions; single room with toilet; monitor and log entries PPE use; minimize testing and aerosol-generating procedures*
Ebola Virus Disease and Viral Hemorrhagic Fever

1. DISEASE REPORTING

A. Legal Reporting Requirements

1. Health care providers and facilities: immediately notifiable to local health jurisdiction
2. Laboratories: immediately notifiable to local health jurisdiction; specimen submission requested – positive specimens (2 business days) (Sections 3 and 4).
3. Local health jurisdictions: immediately notifiable to Washington State Department of Health (DOH) Office of Communicable Disease Epidemiology (CDE).

B. Local Health Jurisdiction Investigation Responsibilities

1. Immediately recommend infection control measures if agent is transmissible.
2. Immediately report all cases, potential cases and exposed persons to CDE: 1-877-539-4344 or 206-418-5500. Conduct a rapid assessment to determine whether bioterrorism is a possibility or if there is potential healthcare facility transmission.
3. Facilitate the transport of specimens for reference testing.
4. Determine the source of infection.
5. Identify other persons exposed and recommend monitoring as indicated.

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent:

Agents of Ebola virus disease or viral hemorrhagic fever include four main viral families (filoviruses, arenaviruses, bunyaviruses, flaviviruses). Well-known agents are Ebola, Marburg and dengue viruses (also see Hantavirus and Yellow Fever guidelines).

B. Description of Illness

Abrupt onset of nonspecific symptoms of fever, headache, muscle or joint aches, and anorexia. After about 5 days disease progresses to watery diarrhea, abdominal pain, and vomiting; there may be sore throat, desquamating rash, chest pain, miscarriage, seizures, confusion, or hiccups. Damage to liver, adrenal glands or spleen results in coagulopathy, hypotension, and impaired steroid synthesis. Hemorrhage (petechiae, bruising, bleeding from mucous membranes or small injuries) occurs in 5-10% of Ebola cases. Case fatality rate, due to multi-organ failure and shock, is 40-90%, higher in pregnancy. Most deaths occur by 10 days. Convalescence can be extensive. Supportive laboratory findings include thrombocytopenia (platelets < 150,000) and elevated hepatic transaminases (AST > ALT). With disseminated intravascular coagulation, prothrombin (PT) and partial thromboplastin (PTT) times are prolonged. Leukopenia, elevated amylase, and proteinuria may occur. Differential diagnoses include malaria, typhoid, arboviral diseases, influenza, sepsis, Coumadin use, and leukemia.
C. Ebola Virus Disease in Washington

Washington has had no cases. September 2014 a traveler from an Ebola-affected region of West Africa was diagnosed in Texas with Ebola and two healthcare workers were infected during care of that patient. Rare cases of Ebola, Lassa and Marburg fever acquired elsewhere and imported into this country have not had subsequent transmission.

D. Reservoir

Animals such as bats or rodents are suspected or known viral reservoirs. Outbreaks include Marburg in Democratic Republic of Congo (DRC; formerly Zaire) and Angola; Ebola in the DRC (location of the Ebola River), southern Sudan and West Africa. A large outbreak during 2013-15 affected West Africa (Guinea, Liberia, Sierra Leone.) A large outbreak in Democratic Republic of the Congo starting in 2017 is ongoing during 2019.

E. Modes of Transmission

Rare direct transmission occurs from reservoir or other animals; bush meat (bats) may be a risk. Transmission of filoviruses (e.g., Ebola) from patients or corpses occurs by contact with body fluids/excreta (blood, urine, diarrhea, vomit, semen, milk) by percutaneous or mucous membrane routes. Airborne or fomite spread has not been seen in outbreaks. Ebola is an enveloped virus and is susceptible to hospital-grade disinfectants but may remain viable for several days in organic matter (e.g., dried blood) on surfaces, bedding, equipment, or bodies (https://wwwnc.cdc.gov/eid/article/21/5/15-0041_article). Most Ebola cases in West Africa were household or healthcare contacts. Flaviviruses (e.g., dengue, yellow fever) are mainly vector-borne. Ebola is a potential bioterrorism agent.

F. Incubation period

Incubation for Ebola is 2-21 days, typically 3-10 days.

G. Period of Communicability

All body fluids and excreta are infected from Ebola symptom onset. Infectious dose is very low. Urine remain infectious for weeks and semen for a year after recovery.

H. Treatment

Supportive care to maintain volume, electrolytes, blood pressure, and oxygenation. Antiviral and experimental medications may be used when available.

3. CASE DEFINITIONS


A. Clinical description

Fever greater than 40° C (104° F) AND additional symptom(s): severe headache, muscle pain, derythematosus maculopapular rash on the trunk with fine desquamation 3–4 days after rash onset, vomiting, diarrhea, abdominal pain, unexplained internal or external hemorrhage, or as applicable symptom of another suspected VHF agent (low platelets, rash, or only for arenavirus pharyngitis, retrosternal chest pain, or proteinuria).
B. Laboratory criteria for diagnosis of Ebola or VHF

Any positive diagnostic evidence from a reference laboratory including:

- Detection of viral antigens in blood by enzyme-linked immunosorbent assay (ELISA) antigen detection
- Viral isolation in cell culture for blood or tissues
- Detection of specific genetic sequence by reverse transcription-polymerase chain reaction (RT-PCR) from blood or tissues
- Detection of viral antigens in tissues by immunohistochemistry

C. Epidemiologic risk factors for Ebola or VHF

One or more exposures within the three weeks before onset of symptoms:

- Contact (including household, sexual, healthcare) with blood or other body fluids or human remains of a known or suspected case
- Residence in—or travel to—an area where transmission is active
- Work in a laboratory that handles specimens
- Work in a laboratory that handles bats, rodents, or primates (or bush meat) from any disease-endemic area
- Exposure to semen from a confirmed acute or convalescent case (up to a year)

D. Case classification (Ebola 2014 criteria)

Person under Investigation (PUI) or Suspect (for 2014 outbreak):

1. Elevated body temperature or subjective fever or consistent symptoms, including severe headache, fatigue, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage; AND
2. An epidemiologic risk factor within the 21 days before the onset of symptoms

Confirmed: A PUI with laboratory-confirmed diagnostic evidence of VHF infection.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Laboratory Diagnosis

Diagnosis depends on clinical suspicion based on symptoms and risk of exposure. Hemorrhage may not occur and nonspecific initial presentation may resemble other tropical illnesses, so testing for malaria or other conditions should be considered. Commercial testing is available for arboviruses such as dengue and chikungunya virus.

Appropriate diagnostic tests in early Ebola disease are polymerase chain reaction (PCR), antigen-capture enzyme-linked immunosorbent assay (ELISA), IgM ELISA, and viral isolation. Later in the disease IgM and IgG antibodies can be tested. Autopsy tissue can be tested by immunohistochemistry, PCR, or virus isolation.

A negative RT-PCR test result for Ebola virus from a blood specimen collected less than 72 hours after onset of symptoms does not necessarily rule out Ebola virus infection. If the patient is still symptomatic after 72 hours, the test should be repeated. If the patient has recovered from the illness that brought them to medical attention, a repeat test is not required. A negative RT-PCR test result for Ebola virus from a blood specimen collected more than 72 hours after symptom onset rules out Ebola virus infection.
Ebola laboratory testing must be performed by a reference laboratory such as the Washington State Public Health Laboratories (PHL) or Centers for Disease Control and Prevention (CDC). PHL will test for Ebola only with CDC pre-approval.

B. Tests Available at the Washington State Public Health Laboratories (PHL)

PHL rRT-PCR testing detects Ebola Zaire virus (2014 outbreak strain). Presumptive positive PCR results require confirmatory testing at CDC. Prior to submitting specimens, local health jurisdictions should obtain approval from Office of Communicable Disease Epidemiology (206-418-5500 or 877-539-4344). Test a patient with consistent symptoms and suspected exposure to Ebola.

Note that PHL require all clinical specimens have two patient identifiers (e.g, name and date of birth) on both the specimen label and submission form. Also include specimen source and collection date. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. See: https://www.doh.wa.gov/ForPublicHealthandHealthcareProviders/PublicHealthLaboratories/MicrobiologyLabTestMenu

C. Specimen Collection


If symptom onset is within 3 days, repeat testing may be needed. Optimal specimens are freshly-collected, shipped refrigerated and received within 72 hours. For testing guidance see: https://www.cdc.gov/vhf/ebola/laboratory-personnel/specimens.html

The following specimen types are acceptable for Ebola virus testing at PHL:

- Two duplicate samples each a minimum volume of 4mL whole blood [preferred specimen] or plasma in lavender-top EDTA plastic collection tubes. Specimens taken 3 days or later into illness are preferred. Do not submit serum. Do not use glass containers or heparin tubes. Store and ship at 2-8° C; if shipping is delayed over 72 hours, freeze at -70° C and ship with dry ice.

The following specimen types are acceptable for Ebola virus testing at CDC:

- Serum, blood, or tissue (e.g, autopsy or frozen specimens from affected organs), may be submitted upon Department of Health consultation with the CDC.

Key points for specimen collection:

- Collect specimens using appropriate infection control procedures to protect staff.
- Label vial or container with patient’s name and a second identifier, specimen source, and date obtained.

PHL can receive Ebola specimens 24/7. Make prior arrangements before shipping:

Washington State Public Health Laboratories
Attn: BT Lab
1610 NE 150th Street
Shoreline, WA 98155
It is the shipper’s responsibility to correctly package and label specimens. Anybody shipping packages containing medical specimens must have documented shipping training (USDOT and USPS Regulations for Packaging and Labeling Infectious Substances). For assistance call PHL 206-418-5458 or Emily.Nebergall@doh.wa.gov

- Ensure patient’s name and second identifier are on the specimen tube and match information on the BT specimen submission form.
- Complete a BT form at: https://www.doh.wa.gov/Portals/1/Documents/5230/302-018-BioterrorismSpecimen.pdf. Specimens will not be processed until ALL following information is known:
  o Patient name, second identifier, and county of residence
  o Specimen type, date of collection, and test requested
  o Submitter name, address, and telephone/FAX numbers
- Put completed forms in the outer pouch of biohazard bag (one specimen and one submission form per bag). Do not put any papers in the inner specimen pouch.
- Follow packing and shipping directions from CDC: https://www.cdc.gov/vhf/ebola/laboratory-personnel/index.html

Currently, there are two options for shipping suspect Ebola specimens to the PHL:

- Transport for noncommercial purposes is permissible by federal, state or local government employees including but not limited to staff from: local health jurisdictions (LHJ), State Department of Health, Washington State Patrol (WSP), or local police or sheriff offices.
  All category A shipping regulations still apply to government couriers.
- Private couriers (including MedEx). All category A shipping regulations still apply to couriers. The Declaration for Dangerous Goods “Proper Shipping Name” is: suspected Category A infectious substance”. The Authorization code is A140.

D. PHL testing procedures

Test results turnaround time: Results for Ebola testing will be phoned within 6-8 hours of testing initiation at PHL. PHL finalizes all negative Ebola results. Positive Ebola virus RT-PCR results are presumptive until confirmed by CDC. These results will be reported in coordination with CDC up to five business days from specimen receipt.

5. ROUTINE CASE INVESTIGATION

Viral hemorrhagic fever (VHF) agents are potential agents of bioterrorism. Immediately report any suspect VHF cases to Office of Communicable Disease Epidemiology (206-418-5500 or 877-539-4344). Also notify CDE of potentially exposed persons, such as travelers from an affected region or contacts of a case.

For the most recent Ebola information from Centers for Disease Control and Prevention check: https://www.cdc.gov/vhf/ebola/index.html Planning tips for public health are at: https://www.cdc.gov/vhf/ebola/outbreaks/preparedness/planning-tips-top10.html

Immediately interview the suspect or confirmed case, and others such as family, friends, coworkers, or employer who may be able to provide pertinent information.
A. General Approach to Assessment

Early recognition is key. Always use standard precautions. If there are concerns the patient could meet the criteria for Ebola, immediately separate the patient from others.

The links below provide the current CDC guidances and will be updated as needed.

Assess exposure and symptoms

- Evaluating a traveler: https://www.cdc.gov/vhf/ebola/clinicians/evaluating-patients/evaluating-travelers.html
- Differential diagnoses for a returning traveler with fever: https://www.cdc.gov/vhf/abroad/diagnosis-considered-returning-traveler.html
- General provider guidance: https://www.cdc.gov/vhf/ebola/clinicians/index.html

For more on evaluating travelers see:

- Transmission, persistence, and risk to pets or livestock: https://www.cdc.gov/vhf/ebola/transmission/

If the patient requires in-hospital management, base decisions regarding infection control precautions on the patient’s clinical situation with consultation from the hospital infection prevention office and the local health jurisdiction’s policy. When Ebola virus disease is a concern, implement isolation and staff use of personal protective equipment:

- Infection prevention in hospitalized patients: https://www.cdc.gov/vhf/ebola/clinicians/evd/infection-control.html
- Personal protective equipment: https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html
- Infection control: https://www.cdc.gov/vhf/ebola/clinicians/evd/infection-control.html
- Guidance for laboratories testing routine clinical specimens: https://www.cdc.gov/vhf/ebola/laboratory-personnel/safe-specimen-management.html
- Cleaning and disinfecting healthcare environments: https://www.cdc.gov/vhf/ebola/clinicians/cleaning/index.html
- Safe handling of waste: https://www.cdc.gov/vhf/ebola/clinicians/cleaning/handling-waste.html and https://www.cdc.gov/vhf/ebola/clinicians/cleaning/waste-management.html
- Viral survivability in medical waste: https://www.cdc.gov/vhf/ebola/clinicians/cleaning/ebola-virus-survivability.html
The healthcare facility and public health agencies (DOH and LHI) will jointly decide need for Ebola virus testing and possible transport of a suspect case.

The provider should consider alternative diagnoses to provide timely appropriate patient care, particularly for potentially serious conditions. It may be appropriate to empirically treat with hydration, anti-pyretics, anti-emetics, an antibiotic (covering suspect conditions such as meningococcal disease or typhoid) or anti-malarial medications.

A Person Under Investigation (PUI) may be discharged by a joint decision from the healthcare provider and the local health jurisdiction considering these criteria:

- The medical team determine the illness no longer appears consistent with Ebola.
- The PUI is afebrile off antipyretics for 24 hours.
- Consistent symptoms (for example, fever, diarrhea or vomiting) have either resolved or can be accounted for by an alternative diagnosis.
- There are no clinical laboratory results consistent with EVD. Note that a negative RT-PCR collected within 72 hours of onset is not definitive.
- The PUI understand the plan for accessing medical care if symptoms recur.

B. Evaluate for Testing

Compatible symptoms are fever, severe headache, muscle pain, vomiting, diarrhea, abdominal pain, and in 5-10% of patients unexplained hemorrhage and shock (petechiae, bruising, oozing from cuts, mucosal bleeding). Enteral symptoms start around day 5.

**Laboratory testing for transmissible viral hemorrhagic fever such as Ebola must be performed by a reference laboratory such as the Washington State Public Health Laboratories (PHL) after approval from CDC. Facilitate transport of specimens to PHL for confirmatory testing (see Section 4). Include a full travel history with a request.**

**Testing for Ebola virus disease:**

Ebola testing is **recommended** for persons with symptoms below and exposure, but also consider testing for malaria or other tropical infections as indicated. After approval from the local health jurisdiction and Department of Health consultation with CDC, PHL will test cases with any risk of exposure who develop either fever or compatible symptoms:

- Fever
- Compatible symptoms (severe headache, diarrhea, vomiting, muscle pain, abdominal pain, impaired kidney or liver function, internal or external bleeding, or other symptom a healthcare provider considers consistent).

Optional testing for other patients may be considered after consultation.

**Other testing**

Test as indicated by symptoms and exposure history for dengue or other agent of VHF. See Section 6 for discharging persons under investigation for Ebola virus disease.

Consider testing a febrile patient for malaria, the most common cause of fever after travel in an affected region or, as indicated, other infections such as pneumonia, influenza, meningococccemia, cholera, typhoid fever, and other bacterial and parasitic agents.
C. Patient Management

Medical treatment of a case includes providing intravenous fluids (IV), balancing electrolytes, maintaining oxygen status and blood pressure, addressing organ failure (e.g., providing dialysis for kidney failure) and treating any other infections. For transmissible agents, always follow strict infection control measures:

https://www.cdc.gov/vhf/ebola/clinicians/evd/infection-control.html

D. Identify Potentially Exposed Persons for Ebola and Transmissible VHF Agents

Contact traceback and management are key for disease control and will be done in coordination with the Centers for Disease Control and Prevention (CDC). Avoid exposure for public health personnel (i.e., interview by telephone). Immediately identify potentially exposed persons for evaluation of level of risk and appropriate public health actions such as fever watch or home quarantine for 21 days (maximum incubation period). See: https://www.cdc.gov/vhf/ebola/pdf/contact-tracing.pdf

1. Identify persons sharing a case patient’s exposure, such as co-travelers or co-workers.

2. Identify contacts of a case patient during the communicable (symptomatic) period, including household members, friends, coworkers, persons sharing a travel vehicle, EMS staff, healthcare workers, and other patients in the same healthcare facility.

3. Evaluate persons with identified exposures. If symptomatic, manage as a Person Under Investigation (Section 5). If asymptomatic, see Section 6 for monitoring.

6. MANAGING SPECIAL SITUATIONS

A. Managing persons potentially exposed to Ebola or transmissible VHF agents.

Local health jurisdictions (LHJs) will manage potentially exposed persons according to available Centers for Disease Control and Prevention (CDC) recommendations. Obtain information about exposure to patients and travel to affected countries, including details of exposures (patients, healthcare settings or reservoir animals) and date of last exposure.

B. Special healthcare situations when Ebola virus disease is suspected

- Handling human remains: https://www.cdc.gov/vhf/ebola/clinicians/evd/handling-human-remains.html
- Acute hemodialysis: https://www.cdc.gov/vhf/ebola/clinicians/evd/acute-hemodialysis.html
- Pregnant women: https://www.cdc.gov/vhf/ebola/clinicians/evd/pregnant-women.html
- Neonatal care: https://www.cdc.gov/vhf/ebola/clinicians/evd/neonatal-care.html

7. ROUTINE PREVENTION

A. Prevention Recommendations

Experimental Ebola virus vaccines exist but are being used only in outbreak settings.

Meticulous attention to personal protective equipment (PPE) and environmental cleaning during patient care are essential to avoid exposure in healthcare settings. Use particular care to avoid contamination when removing PPE.

• Organizations sending workers to areas with outbreaks: https://wwwnc.cdc.gov/travel/page/recs-organizations-sending-workers-ebola

• Humanitarian workers traveling to an outbreak area: https://www.cdc.gov/vhf/abroad/humanitarian-workers.html

• Travelers to an outbreak area: https://www.cdc.gov/vhf/ebola/prevention/index.html

ACKNOWLEDGEMENTS

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UPDATES

Created October 6, 2014.

Updated October 29, 2014 based on new CDC recommendations for case definition, patient screening, and infection control.

Updated November 7, 2014, based on new CDC recommendations for evaluating ambulatory patients.

Updated December 23, 2014, based on updated laboratory shipping requirements and new CDC recommendations for medical waste and sewage.

Updated March 23, 2015 to include more detail about clinical laboratory handling of specimens.

Updated May 2016: front page added

Updated March 2018: revised and shortened in absence of outbreak cases.

Updates August 2019: material specific to 2014 outbreak removed
2014 Criteria for Risk Categories

Identify potential sources of exposure in the prior 21 days, including travel to currently affected countries or previous endemic areas, or contact with a person having such travel.

1. **High risk:** direct contact with a VHF case patient without use of appropriate personal protective equipment (PPE); percutaneous or mucous membrane exposure to blood or body fluids of symptomatic case; laboratory processing of blood or body fluids of symptomatic case without use of appropriate PPE; direct contact with dead body without use of appropriate PPE; living in household and providing direct care to symptomatic case

2. **Some risk:** In a country with widespread VHF transmission or cases in an urban area with uncertain control measures: direct contact while using appropriate PPE with a symptomatic VHF case or the person's body fluids or any direct patient care in any healthcare setting OR close contact (< 3 feet) in households, healthcare facilities, or community settings with a symptomatic VHF case (i.e., contact for a prolonged period while not using appropriate PPE)

3. **Low (but not zero) risk:** In a country with widespread VHF transmission or with cases in an urban area with uncertain control measures and no known exposures; brief direct contact (e.g., shaking hands) with a VHF case in early stage of disease while not using appropriate PPE; brief proximity (such as briefly being in the same room) with a symptomatic case; in a country without widespread transmission having direct contact with symptomatic VHF case or the person’s body fluids while using appropriate PPE; or traveled on an aircraft with a symptomatic case

4. **No identifiable risk:** being a contact of a contact of a VHF case, having contact with a case before symptoms develop; being present in an affected country or area but remaining on an aircraft and having no contact with anyone from the community; or having exposures more than 21 days prior to onset of illness