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Travel/Tropical Medicine and Pandemic Considerations for the Global Surgeon

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KEYWORDS

• Tropical medicine • Travel medicine • Preparation for global surgery • Pandemic • Public health • Food-borne illness • Encephalitis • Tick-borne illness

KEY POINTS

- The traveling health care worker may become exposed to a wide range of tropical infectious diseases that occurs at the community and health care level.
- A pretravel visit and assessment is best performed before global surgical work.
- Universal precautions, including clean water preparations, food preparation, vaccinations, mosquito avoidance, and personal protective equipment use, will reduce risk.
- Some specific diseases, including malaria, arthropod-borne encephalitis, food-borne illness, rickettsia, and multidrug-resistant bacteria, are the most common infections encountered.
- In some cases, emerging pathogens, such as severe acute respiratory syndrome-coronavirus-1, will provide a particular risk for the departure, travel, and return home.

INTRODUCTION

International travel is often required for medical delivery to underserved communities. This travel requires preparation to prevent infectious diseases at the location of travel as well as diseases that can occur upon return.[1,2] Only a minority of illnesses will occur during travel, requiring a premature return to the home country.[2,3] Most of the illnesses will be minor and can be cared for locally. A recent study of 100,000 travelers (of all types) to the developing world stated that roughly 300 travelers will undergo hospitalization, 50 will be air evacuated, and 1 will die.[4,5] Surprisingly, most of the mortality and morbidity associated with travel remain cardiovascular disease and trauma sustained from motor vehicle accidents, not infectious diseases.[4,5] Recent literature suggests that infectious diseases account for less than 5% of travel-associated mortality among travelers and health care workers (HCWs).[2,6] Mostly importantly, these infectious diseases are largely preventable, and a well-prepared HCW will largely have uneventful travel, allowing them to provide the maximal care to their patients. This article focuses on the basic generic preparation, prevention, and treatment of infectious diseases for the global HCW.

DIVERSITY OF TRAVEL AND DIFFICULTY OF PREPARATION

A traveler may be exposed to a wide range of infectious diseases during their global experiences.[6] These infections can come from the environment, community members, or most importantly, the local health care system. As such, the list of potential etiologic agents is very broad and hard to

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differentiate and, most importantly, varies widely from location to location.[1,2] In general, travel-associated infections are acquired via enteral, respiratory, vector-borne, and/or sexual exposures. The most common travel-related infections can be categorized into gastrointestinal, febrile, and dermatologic illnesses.[3]

Thus, preparing for all diseases globally is an impossible task. Preparation must include reviewing the local epidemiology of the country visited. Even in these circumstances, local epidemiology can vary greatly given population migration, weather, vector growth, health care and public health infrastructure, and emerging pathogen presence. Thus, travel medicine must be tailored to the location. A few generic preparation actions can apply globally, and in many cases, a few diseases (eg, malaria, tuberculosis) can appear frequently across locations. In these cases, a broad preparation plan of education, vaccination, and basic disease preparation will provide care in most cases, with a few adjustments to complement the local epidemiology.

IMPORTANCE OF PREPARATION

At least 1 month before travel, an evaluation should be performed by a travel medicine or primary care physician[1] (**Box 1**). The pretravel evaluation should include the following:

- A review of all underlying medication conditions
- Pregnancy or potential pregnancy upon return home
- Allergy review and plans to assess allergies at location of travel (eg, medications)
- A review of the location for all vaccinations required
- A plan to take sufficient supplies of current medications because equivalent drugs may not be available in travel destinations
- An evacuation plan and review of travel insurance

Updates on needed prevention should be obtained via the Centers for Disease Control and Prevention (CDC; https://wwwnc.cdc.gov/travel). Specific country-based information and travel medicine guidance are found here. The evaluation should tailor the risks of the traveler, including comorbidities, to the location (see **Box 1**; **Box 2**, **Table 1**).[1–3] At the end of the session, a pretrip prevention plan should include vaccinations, medication supplies, water and food education, and an evacuation plan should illness occur (this will include obtaining evacuation insurance).

GENERAL PREPARATION

Water Safety

In most locations (not active war zone), bottled water or soft drinks should be present. If traveling to remote areas, clean water sources should be planned (see **Table 3**).[1,7] Travelers who have poor access to clean and safe water should purify water in the following ways[8] (**Table 2**):

- Boiling for 3 minutes followed by cooling to room temperature. Do not add ice to speed cooling.
- Adding 2 drops of 5% sodium hypochlorite (bleach) to a quart of water and letting sit for 30 minutes.
- Adding 5 drops of tincture of iodine per quart of water and letting sit for 30 minutes.
- Compact water filters with iodine impregnation can remove parasitic, bacterial, and viral pathogens.

Non–drinking Water Exposure

Swimming in fresh water can lead to multiple parasitic diseases. In areas of high schistosomiasis

Box 1
Basic pretravel appointment checklist

- Review all underlying medical conditions and comorbidities
- Review all travel locations
- Determine medication limitations at destination. If medication is unavailable, purchase supply of medications for travel
- Review medication and environmental allergies and take appropriate remedy (eg, epinephrine for nut/insect)
- Determine highest-risk activity on travel where infection is greatest (eg, altitude illness, fresh water exposure, personal travel safety and seatbelts)
- Review all vaccinations and determine those needed
- Review malaria risk and need and type of prophylaxis and discuss need for adherence
- Determine need for travel insurance
- Develop an evacuation plan in case of illness
- Plan home quarantine and return to work if returning from a high-risk area (eg, SARS-CoV-2 or Zika virus)
- Determine home-limited activities (eg, sexual activity, travel, avoidance of pregnancy) based on risk of transmission of disease (eg, Zika virus) at travel site

Box 2
General vaccines and prophylaxis required for global travel

Routine vaccinations

- Influenza
- Hepatitis B
- Hepatitis A
- Pneumococcal (If over age 65 years)
- Meningococcal (if age 14–25 years)
- Measles, mumps, rubella
- *Haemophilus influenzae* type b
- Polio
- Tetanus, diphtheria, pertussis
- Varicella
- Zoster if over age 50

Specialized vaccinations

- Typhoid
- Rabies
- Cholera (all areas of active disease)

(Asian, sub-Saharan Africa), fresh water exposure should be avoided, including short exposures such as rafting and boat rides.[9] Avoid walking barefoot or in loose-fitting footwear on beaches, on soil, or in water that may be contaminated with human or canine feces. Such exposure may lead to contact with *Strongyloides* larvae. Acquisition of the larvae can cause cutaneous larva migrans, hookworm, or strongyloidiasis.[2,9] Thus, limiting fresh water contact and wearing closed-toed shoes becomes essential in areas of high prevalence.

Food Safety

As with water safety, food safety is essential in regions where sanitation and personal hygiene are poor. Hands should always be washed before eating with appropriately treated water. Infections transmissible by contaminated food and water include traveler's diarrhea, parasitic infection, and hepatitis A and E.[10]

Raw foods rinsed with tap water should be avoided. Although chlorination may kill most viral and bacterial pathogens, the protozoal cysts of *Giardia lamblia* and *Entamoeba histolytica* and oocysts of *Cryptosporidium* survive and thus can be transmitted easily.[8,10] Basic advice for travelers should include choosing thoroughly cooked food served hot, fruits that the traveler peels just before eating, and pasteurized dairy products only.[8,10] Condiments on the table should be avoided because they can be contaminated. The old adage, "cook it, boil it, peel it, or forget it," is the best advice for food protection broadly.

Mosquito Protection

Global surgery often requires travel to regions with high rates of vector-borne diseases. The HCW should take action to reduce risk of bites from sandflies, ticks, and other mosquito species.[11–14] Basic measures should include the following:

- Avoiding outdoor exposure between dusk and dawn (peak *Anopheles* mosquitoes feed).
- Reducing the amount of exposed skin with clothing.
- Wearing clothing impregnated with insecticide (eg, pyrethrins). They are protective for about 3 washes or 3 weeks.
- Sleeping within bed nets treated with insecticide. These are protective for approximately 3 washes.

Table 1
Vaccines and prophylaxis specific to region of travel

Africa	Asia	South America	North America	Australia and Islands
• Yellow fever • Malaria prophylaxis chloroquine resistant (atrovaquone-proguanil, doxycycline, mefloquine, and tafenoquine)	• Japanese encephalitis • Malaria prophylaxis chloroquine resistant (atrovaquone-proguanil, doxycycline, mefloquine, and tafenoquine)	• Yellow fever • Malaria prophylaxis chloroquine susceptible		• Japanese encephalitis • Malaria prophylaxis chloroquine resistant (atrovaquone-proguanil, doxycycline, mefloquine, and tafenoquine)

Table 2
Basic preparations for environmental pathogen exposure

Water	Food	Insects	Other
• Boiling for 3 min • 2 drops of 5% sodium hypochlorite (bleach)/ quart for 30 min • 5 drops of tincture of iodine/ quart for 30 min • Compact water filters	• Cook it • Peel it • Avoid fresh fruits and vegetables • Hot and well-cooked foods from street vendors • No ice • Pasteurized dairy products only • No tap water for rinsing food	• Avoiding dusk and dawn • Reducing exposed skin with clothing • Insecticide-impregnated clothing (eg, pyrethrins) • Insecticide-impregnated bed nets • Well-screened or air-conditioned rooms • For exposed skin, wearing an insecticide, such as DEET, IR3535, picaridin, or OLE	• No open-toed shoes and fresh water • Avoid fresh water swimming • Seat belt use • Condom use for sexual activity • Avoid needle exposure if intravenous drug user

- Staying in well-screened or air-conditioned rooms.
- For exposed skin, wearing appropriate insecticide. This ideally is *N,N*-diethyl-*m*-toluamide (DEET), picaridin, ethyl butylacetylaminopropionate (IR3535), and oil of lemon eucalyptus (OLE).

Regarding insect repellent, DEET (30%–50%) is generally protective for at least 4 hours, although lower-percentage preparations provide a shorter duration of protection.[11] Picaridin, a synthetic repellant, has similar protection at 20% concentration when compared with DEET (35% concentration) for up to 8 hours. IR3535 (15% or higher) is protective for 8 hours, and OLE in is an effective repellant and can be used in children older than 3 years but has not been tested for efficacy or safety.[12–14]

Hand Hygiene and Personal Protective Equipment

As a global HCW, exposure to bodily fluids and contaminated fomites is common. As such, personal protective equipment (PPE) is paramount for the prevention of disease in both HCWs and their patients.[15–17] Health care systems can become a nidus for drug resistance and emerging infections. As such, the most effective preventive measures in the community include the following[15–19]:

- Performing hand hygiene frequently with an alcohol-based hand rub if hands are not visibly dirty or with soap and water if hands are dirty: 20-second vigorous wash is recommended before rinsing
- Wearing a surgical mask and face shield for contact and any procedures with bodily fluids (standard and contact precautions)
- When limited with mask, avoiding touching face, eyes, and mouth
- Practicing respiratory hygiene by coughing or sneezing into a bent elbow or tissue and then immediately discarding tissue and/or cleaning sleeve of shirt or skin at elbow with a disinfectant
- Masking all patients if they have respiratory symptoms. In resource-limited settings, using a cloth mask is appropriate

Precautions to be implemented by HCWs caring for patients include using PPE appropriately, specifically in how to put on, remove, and dispose of it. Taking these simple measures will protect the global HCW from developing a health care–associated infection while also protecting their patients in difficult resource-limited settings.

For maxillofacial surgery/head and neck surgery, appropriate PPE include the following[15–19]:

1. Surgical mask (level 3 or n95)
2. Eye protection
3. Hair covering
4. Surgical gown
5. Disposable gloves
6. Foot covering
7. Face shield

Antibiotic Resistance

Worldwide, the prevalence of multidrug-resistant bacteria (MDR) is rising rapidly.[20,21] Exposure to MDR occurs largely though food-borne or water contact. MDR strains have been identified in nontyphoidal *Salmonella*, *Shigella* spp, and *Vibrio cholerae*.[21] Gram-negative bacteria, such as *Klebsiella pneumoniae* and other *Enterobacteriales*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*, are the most common bacteria found worldwide.[21–23] Treatment options for HCWs become limited for both their patients and themselves if they acquire disease in many developing countries. As a result, antibiotic treatment choices must be very tailored to the local epidemiology, and given the high rates of resistance, the use of PPE and sterile technique becomes essential in protecting both staff and patients.

Vaccination

The guidelines for recommended vaccinations for travel greatly vary based on the local epidemiology. However, despite this, several basic vaccinations, including yellow fever, meningococcus, typhoid, hepatitis A, hepatitis B, polio, and influenza are recommended.[24–26] **Box 2** and **Table 1** include the major vaccines that are recommended for travel to developing countries as well as some regional recommendations. However, as local epidemiology changes, up-to-date country-specific vaccine requirements can be found at the CDC (https://wwwnc.cdc.gov/travel).[24–26]

SPECIFIC COMMON DISEASES OF ALL TRAVEL FOR TRAVEL TO LOWER- AND MIDDLE-INCOME NATIONS

Malaria

Malaria is the most classic disease associated with travel.[2] Malaria is found worldwide and is common in most developing countries with varying prevalence and incidence. *Plasmodium falciparum* is the most common species to cause severe disease, with *P vivax* and *P malariae* rarely causing severe or respiratory-based symptoms.[27] Most cases can be mild and present both during travel and upon return.[28] All forms of malaria need treatment, except severe malaria require rapid treatment because of the potential for rapid decline and death within 24 hours of onset.[27] Malaria severity is often based on the parasite load, with less severe cases having 1% to 2% parasitemia and severe disease having 5% to 10% parasitemia (5% in low-incidence regions and 10% in high-incidence regions) with signs of organ damage.[29] The most common presentation is fever, headache, malaise, chest and joint pain, and weight loss. More severe cases progress with abdominal pain, jaundice, and splenomegaly and progress to the severe symptoms of altered consciousness with or without seizures, respiratory distress or acute respiratory distress syndrome (ARDS), hypotension and heart failure, metabolic acidosis, renal failure with hemoglobinuria ("blackwater fever"), hepatic failure, coagulopathy, severe anemia, and hypoglycemia.[27–29] Cerebral malaria with encephalopathy and seizures carries the worst prognosis.[27–29]

Artemisinin-based combination therapies for the treatment of uncomplicated malaria caused by the *P falciparum* parasite are the recommended mainstay.[30,31] By combining 2 active ingredients with different mechanisms of action, combination therapy is the most effective antimalarial medicine available today. Artemisinin and its derivatives must not be used as oral monotherapy, because this promotes the development of artemisinin resistance. In low-transmission areas, a single low dose of primaquine should be added to the antimalarial treatment in order to reduce transmission of the infection.[30,31] *P vivax* infections should be treated with an artemisinin-based combination therapies (ACT) or chloroquine in areas without chloroquine-resistant *P vivax.* Parenteral therapy is preferred for rapid treatment.[30,31] There are 2 major classes of drugs available by intravenous administration: the cinchona alkaloids (quinine and quinidine) and the artemisinin derivatives (artesunate, artemether, and artemotil).[30,31] Based on clinical trials, artesunate is superior for treatment of severe falciparum malaria when compared with quinine.[29–31] Additional support with blood transfusions can be considered in cases of altered consciousness, high-output heart failure, respiratory distress, and/or high-density parasitemia.[29–31] Exchange transfusion is additionally an option to reduce parasite load. Blood transfusion and exchange transfusion are largely supportive and have not been shown to reduce mortality.[29–31] Thus, they should not delay the onset of therapy with artesunate or quinine. In rare cases, nonfaciparum malaria can cause severe disease, and in these cases, treatment is identical with artesunate or quinidine.

Traveler's Diarrhea

Although bacterial pathogens predominate as the cause of traveler's diarrhea, viral and parasitic agents are also possible sources. Enteropathogenic *Escherichia coli*, *Salmonella* spp, *Campylobacter jejuni*, and *Shigella* spp constitute most of the worldwide causes of gastrointestinal disease.[32] Hepatitis A, rotavirus, and the parasites *E histolytica*, *Cryptosporidium parvum*, and *G lamblia* are the most common nonbacterial causes worldwide.[8,32] Up to 25% of individuals can have an infection with more than 1 organism.

Overall, the incidence of traveler's diarrhea is approximately 20% to 40% but varies greatly based on destination of travel, but the risk varies considerably based on destination of travel.[8,10] The highest-risk areas include South and Southeast Asia, Africa, South and Central America, and Mexico. Moderate-risk regions include Caribbean Islands, South Africa, Central and East Asia (including Russia and China), Eastern Europe, and the Middle East. Risk of traveler's diarrhea is highest during the first week of travel and then progressively decreases with time. High-risk activities include buying food from street vendors, traveling to visit friends and relatives, and staying in "all-inclusive" lodgings.[8,10]

The symptoms of traveler's diarrhea depend on the microbial cause.[8] The classic findings of enterotoxigenic *E coli* include malaise, anorexia, and abdominal cramps followed by the sudden onset of watery diarrhea.[8,10] Nausea and vomiting also may occur. A low-grade fever is variable. Most episodes of traveler's diarrhea occur between 4 and 14 days after arrival The illness is generally self-limited with symptoms lasting for approximately 1 to 5 days. The development of chronic gastrointestinal symptoms, and in particular irritable bowel syndrome, has been reported in a sizable minority of patients following traveler's diarrhea. Avoidance is the ideal therapy: only use known safe facilities (hotel, hospital, and so forth); never eat or drink from so-called street vendors. Once ill, acute management includes fluid replacement and rest.[32] Antimicrobial therapy shortens the disease duration to about 1 day, and antimotility agents may limit symptoms to a period of hours. Antibiotic treatment is reasonable for travelers with severe diarrhea, which is characterized by fever and blood, pus, or mucus in the stool, or for travelers with diarrhea that substantially interferes with the ability to work.[10,32] Antimicrobial choice depends on the region of travel but includes azithromycin, trimethoprim/sulfamethoxazole, and ciprofloxacin (or another fluoroquinolone). A restricted diet (eg, beginning with only clear liquids to match diarrheal losses during the acute phase of diarrhea) is often recommended.[10]

Encephalitis

Arthropod-borne encephalitis viruses represent a significant public health problem throughout most of the world and are found in all locales. They come from a wide range of families, such as Flaviviridae, Togaviridae, Bunyaviridae, and Reoviridae, and are highly adapted to particular reservoir hosts and region[33,34]. Spread occurs through an infected arthropod bite (usually mosquito or tick) and from animal to animal. The mosquito or tick becomes infected when feeding on the blood of the viremic animal, replicates in the mosquito or tick tissue, and ultimately infects the salivary glands. The mosquito or tick transmits the virus to a new host when it injects infective salivary fluid while taking a blood meal.

As a group, these viruses are found worldwide, but each specific virus has a regional presence. In North America, West Nile, St. Louis encephalitis, and La Crosse encephalitis viruses predominate.[35,36] Venezuelan equine encephalitis virus is of concern in Central and South America, whereas Japanese encephalitis virus affects persons living or traveling to parts of Asia.[33] Dengue is a rare cause of encephalitis throughout the tropical world.[37] **Table 3** outlines the major arthropod-borne viral diseases. Selected encephalitis infections are reviewed in later discussion.

DENGUE FEVER

Dengue viruses are spread through the *Aedes* species (*Aedes aegypti* or *Aedes albopictus*) mosquito. These mosquitoes are the same species of mosquitoes that also spread Zika, chikungunya, and other arthropod-borne viral encephalitis.[37–40] Dengue is common in more than 100 countries around the world with more than 400 million cases reported. Mild symptoms of dengue include a rash, nausea, aches, joint pain, and fever. Given the nonspecific findings, dengue can be confused with other illnesses that cause fever, aches and pains, or a rash. For mild disease, symptoms of dengue typically last 2 to 7 days.[37–40] Most people will recover after about a week. However, a minority of people progress to severe disease, especially in individuals who have had a prior infection with dengue. Symptoms of severe disease include the classic signs of hemorrhagic fever, including abdominal pain, jaundice, mucosal bleeding, and eventually hepatic, renal, and respiratory failure.[37] The diagnosis of dengue virus infection is established via serology or reverse transcription polymerase chain reaction (RT-PCR). Although mild

Table 3
Arthropod-borne viral encephalitis

Disease	Viral Family	Vector	Geography	Symptoms	Treatment	Vaccine
Dengue	Flavivirdae	*Aedes* spp mosquito	Worldwide	Rash, nausea, aches, joint pain, and fever. Occasional progression to renal failure, hemorrhage	Supportive	No
Eastern equine encephalitis	Togavirdae	*Culiseta aedes*, *Coquillettidia*, and *Culex* spp mosquito	North and South America	Fever, headache, nausea, vomiting, minority with coma, stupor. Seizures and focal neurologic signs	Supportive	No
Western equine encephalitis	Togavirdae	*Culex* spp mosquito	North and South America	Headache, vomiting, stiff neck, backache, minority with coma	Supportive	No
Venezuelan equine encephalitis	Togavirdae	*Culex* spp mosquito	South and Central America	Sudden onset malaise, nausea, vomiting, headache, myalgia, nuchal rigidity, seizures, coma, and paralysis	Supportive	Equine vaccine
West Nile virus	Flavivirdae	*Culex* spp mosquito	Worldwide	Majority (80%) asymptomatic. Otherwise fever, headache, body aches, nausea, vomiting, skin rash, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis	Supportive	Equine vaccine
Japanese encephalitis	Flavivirdae	*Culex* spp mosquito	Asia	20% asymptomatic. High fever, headache, neck stiffness, disorientation, coma, seizures, spastic paralysis	Supportive	Human and equine vaccine
Murry Valley encephalitis	Flavivirdae	*Culex annulirostris* mosquito	Australia, Papua New Guinea	Headache, fever, nausea and vomiting, anorexia and myalgias, malaise, irritability, mental confusion leading to cranial nerve palsies, tremor peripheral neuropathy, flaccid paralysis, seizures, and coma	Supportive	No

(*continued on next page*)

Table 3
(*continued*)

Disease	Viral Family	Vector	Geography	Symptoms	Treatment	Vaccine
Zika virus	Flavivirdae	*Ades* species mosquito	Worldwide, tropical	Low-grade fever, maculopapular pruritic rash, arthralgia conjunctivitis, congenital microcephaly, Guillain-Barré syndrome, myelitis, and meningoencephalitis	Supportive	No
Ross River Valley virus	Togavirdae	*Culex* spp mosquito	Australia, Papua New Guinea	Constitutional aches, fever (50%), rash, rheumatic manifestations, splenomegaly, hematuria, glomerulonephritis. Paresthesia, neuropathy, headache, neck stiffness, and photophobia, and encephalitis	Supportive	No
Chikungunya	Togavirdae	*Ades* species mosquito	Africa, Asia, South America	Fever, malaise. Polyarthralgia (bilateral and symmetric), macular or maculopapular rash	Supportive	No

disease is self-limiting, treatment of severe disease is largely supportive. Prevention of arthropod bites through covering and use of insecticides (DEET) is the primary way to avoid dengue.

EASTERN EQUINE ENCEPHALITIS

The eastern equine encephalitis (EEE) viruses (family Togaviridae, genus *Alphavirus*) consist of classic EEE virus found in North America and the Caribbean and Madariaga virus in South and Central America.[41–43] EEE virus is associated with severe clinical disease. In North America, wild birds and *Culiseta melanura*, a mosquito that is found in swampy moist areas, maintain the EEE virus. However, *C melanura* mosquitoes rarely bite humans; thus, some *Aedes*, *Coquillettidia*, and *Culex* species are responsible for transmission to humans. Although infections can occur throughout the year, peak incidence is in August and September in North America, and January and February in South America.[41] The incubation period is usually 4 to 10 days after the mosquito bite. The illness often begins with a prodrome lasting several days, with fever, headache, nausea, and vomiting.[42] A minority of people will progress to encephalitis, but, universally, disease is severe. Once neurologic symptoms begin, patients decline rapidly and progress to a coma or stupor. Seizures, and focal neurologic signs, including cranial nerve palsies, develop in approximately one-half of the patients. The diagnosis of EEE can be made by demonstration of immunoglobulin M (IgM) antibody by capture immunoassay of cerebrospinal fluid (CSF), a 4-fold increase in serum antibody titers against EEE virus, or isolation of virus from or demonstration of viral antigen or genomic sequences in tissue, blood, or CSF. Treatment is supportive. As with other arthropod-borne viruses, prevention focuses primarily on avoiding mosquito bites.[41–43]

WESTERN EQUINE ENCEPHALITIS

Western equine encephalitis (WEE) viruses (family Togaviridae, genus *Alphavirus*) are a complex of closely related viruses found in North and South America.[33] Spread is through *Culex* mosquitoes family, and thus, as flooding and increased standing water occur, regional outbreaks can occur. Incubation is about 7 days from a bite, followed by the onset of a headache, vomiting, stiff neck, and backache.[33] Restlessness, irritability, and seizures are common in children. Although rare in adults and older children, neurologic sequelae are relatively common in infants. The diagnosis of WEE can be made by demonstration of IgM antibody by capture immunoassay of CSF, a 4-fold increase in serum antibody titers against WEE virus, or isolation of virus from or demonstration of viral antigen or genomic sequences in tissue, blood, or CSF. Treatment is supportive.[33]

WEST NILE VIRUS

West Nile virus (WNV) is a member of the *flavivirus* genus and belongs to the Japanese encephalitis antigenic complex of the family Flaviviridae.[35,44] WNV is commonly found in Africa, Europe, the Middle East, North America, and West Asia. WNV is maintained in nature in a cycle involving transmission between birds and mosquitoes. Mosquitoes of the genus *Culex* are generally considered the principal vectors of WNV. Humans, horses, and other mammals can be infected as dead-end hosts and are not part of the life cycle of the virus. The incubation period is usually 3 to 14 days. Most (80%) individuals infected with WNV are asymptomatic. For the minority who develop symptoms, fever, headache, tiredness, body aches, nausea, vomiting, skin rash (on the trunk of the body), and swollen lymph glands predominate.[35,44] Severe disease (also called neuroinvasive disease, such as West Nile encephalitis or meningitis or West Nile poliomyelitis) includes headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis. It is estimated that approximately 1 in 150 persons infected with the WNV will develop a more severe form of disease. Diagnosis is through antibody testing (IgM and IgG) in the serum with an appropriate 4-fold increase in titer or isolation of the virus in the CSF by RT-PCR.[35,44] Care is supportive. For those who develop neurologic disease, sequelae often persist. There is no vaccine at this time in humans.

ZIKA VIRUS

Zika is spread mostly by the bite of an infected *Aedes* species mosquito (*Ae aegypti and Ae albopictus*).[36,45,46] Outbreaks of Zika virus infection have occurred in Africa, Southeast Asia, the Pacific Islands, the Americas, and the Caribbean. In 2015 and 2016, a Zika virus outbreak occurred in the Americas, the Caribbean, and the Pacific. Besides infection through mosquito bites, documented infection has occurred through maternal-fetal transmission, sexual intercourse, organ transplantation, and handling of infected bodily fluids (eg, laboratory personnel).[36,45,46] Zika virus RNA has been detected in blood, urine, semen, saliva, female genital tract secretions, CSF, amniotic fluid, and breast milk.

Clinical manifestations of Zika virus infection occur in approximately 20% of patients and include acute onset of low-grade fever with maculopapular pruritic rash, arthralgia (notably small joints of hands and feet), or conjunctivitis (nonpurulent).[36,45,46] Infection has been associated with neurologic complications, including congenital microcephaly (in addition to other developmental problems among babies born to women infected during pregnancy), Guillain-Barré syndrome, myelitis, and meningoencephalitis. The diagnosis of Zika virus infection is definitively established by RT-PCR for virus RNA (in serum, urine, or whole blood) or virus serology. Treatment of Zika virus is supportive.[36,45,46]

Zika can be passed from a pregnant woman to her fetus. Infection during pregnancy can cause certain birth defects, and thus prevention, both with mosquito bites and with sexual transmission, is essential.[36,45,46] Pregnant women are recommended to prevent mosquito bites and sexual exposure to Zika during and after travel. If traveling without a male partner, one should wait 2 months after return before becoming pregnant. For male partners with a pregnant partner, condoms must be used, or one must abstain from sexual activity during pregnancy. Returning travelers should avoid being bitten for 2 to 3 months (viremic period) because this can establish disease elsewhere.[36,45,46]

CHIKUNGUNYA

Chikungunya virus is an arthropod-borne alphavirus transmitted by mosquitoes that predominately infects humans and nonhuman primates.[37,47–49] Chikungunya virus has spread from its origin in West Africa to Asia, Europe, islands in the Indian and Pacific Oceans, and the Americas. Infected travelers can import chikungunya virus into new areas, where local transmission can occur if competent mosquitoes are present. In Africa, chikungunya virus transmission occurs in cycles involving humans, *Aedes* and other mosquitoes, and animals (nonhuman primates and perhaps other animals).[37,47–49] Outside of Africa, major outbreaks are sustained by mosquito transmission among susceptible humans. Transmission via maternal-fetal route and blood products has been described, but unlike Zika and WNV, transmission through transplantation has not occurred. Incubation lasts from a period of 3 to 7 days followed by an acute infection with fever and malaise.[37,47–49] Polyarthralgia often begins 2 to 5 days after onset of fever and commonly involves multiple joints. The arthralgia is usually bilateral and symmetric, associated with morning stiffness, and involves the distal more than proximal joints. Skin manifestations include macular or maculopapular rash. For most individuals, the duration of acute illness is usually 7 to 10 days; however, the inflammatory arthritis can persist for weeks, months, or years.[37,47–49] The chronic manifestations usually involve joints affected during the acute illness and can be relapsing or unremitting and incapacitating. Severe complications (including meningoencephalitis, cardiopulmonary decompensation, acute renal failure, and death) have been described with greater frequency among patients older than 65 years and those with underlying comorbidities. The diagnosis of chikungunya is established by detection of chikungunya viral RNA by RT-PCR or serology.[37,47–49] Testing for dengue, Zika, and Ross River Valley virus infection should also be considered because they present similarly. There is no known treatment of chikungunya other than supportive care.[37,47–49] Treatment of arthritis with nonsteroidal anti-inflammatories is recommended.

Tick-Borne Diseases

Rickettsia causes a wide range of human diseases across all continents. Rickettsial diseases are transmitted by ticks with a few exceptions: *Rickettsia prowazekii* is transmitted by a louse; rickettsialpox and scrub typhus are transmitted by mites; and *Rickettsia felis* is transmitted by cat fleas.[50]

The number of species of rickettsia is large, and important differences exist in the epidemiology, clinical features, and diagnostic methods.[50–53] However, the antimicrobial treatment is similar across all Rickettsia. **Table 4** outlines the major rickettsial diseases, and they range from African spotted fever to Rocky Mountain fever and scrub typhus.[50] The various clinical illnesses that are seen in association with the individual Rickettsia vary significantly in severity. Some, such as African tick fever, can be self-limiting with minimal symptoms. However, others, such as Rocky Mountain spotted fever, can progress rapidly if not treated and recognized. However, a few features do exist in common with all of them, including the following[54]:

- Rickettsial infections cause fever, headache, and intense myalgias.
- Rickettsial infections are arthropod borne; known or potential exposure to ticks or mites is an important clue to their early diagnosis.
- A rash or a localized eschar occurs in most patients.

After suspecting a rickettsial disease in a patient with a rash and fever, clinical diagnosis can be

Table 4
Most common Rickettsial diseases of travel

Disease	Agent	Vector	Geography	Symptoms	Treatment
Rocky Mountain spotted fever	*R rickettsii*	Dog tick (*Rhipicephalus sanguineus*, *Dermacentor*, *Amlyomma* spp)	North and South America	Fever, nausea, vomiting. Blanching erythematous macular rash evolving to petechiae. May have no rash (10%). Progresses to encephalitis, pulmonary edema, multiorgan failure	Doxycycline
Rickettsialpox	*R akari*	Mites (*Liponyssoides sanguineous*)	United States and Eastern Europe	Eschar at bite site, abrupt fever, chills, aches leading to papulovesicular rash	Doxycycline
Murine typhus	*R typhi*	Rat flea (*Xenopsylla cheopis*), cat flea (*Ctenocephalides felis*), and mouse flea (*Leptopsyllia segnis*)	Worldwide	Abrupt fever, aches, maculopapular rash at 7 d sparing palms and soles. May progress to neurologic, hepatic, cardiovascular, renal, and pulmonary failure	Doxycycline
Epidemic typhus	*R prowazekii*	Body louse (*Pediculosis humanus*)	Worldwide	Fever, headache, tachypnea, myalgias, rash, and arthralgias. Rash is maculopapular. Most patients with neurologic symptoms of coma, seizures, and cranial nerve deficits, Liver failure is rare	Doxycycline
Scrub typhus	*Orientia tsutsugamushi*	Trombiculid mites/chiggers (*Leptobrombidium* spp)	Asia Pacific Rim	Fever, headache, myalgias, maculopapular rash. May progress to myocarditis, pneumonitis, delirium, multiorgan failure	Doxycycline
African tick bite fever	*R africae*	Tick (*Amlyomma hebrasum*)	Rural Africa	Mild fever, headache, maculopapular rash (fine) over body, rate encephalitis, and myocarditis	Doxycycline

(*continued on next page*)

Table 4
(*continued*)

Disease	Agent	Vector	Geography	Symptoms	Treatment
Mediterranean spotted fever/ boutonneusse fever	*R conorii*	Dog tick (*R sanguineus*)	Sub-Saharan Africa, North Africa, Greece, India, Black Sea region	Eschar and black necrotic lesion at bite, papulovesicular rash similar to varicella. Rare neurologic complications	Doxycycline
Japanese spotted fever	*R japonica*	Tick (*Dermacentor*, *Haemaphysalis*, *Ixodes*)	Japan and Thailand	Eschar, abrupt fever, fine macular rash, thrombocytopenia	Doxycycline

achieved in 4 basic ways: serology, PCR detection of DNA in blood or tissue samples, immunologic detection in tissue samples, and isolation of the organism.[50–54] Often this is difficult in the field, and immediate treatment without a diagnosis is often recommended. The preferred treatment of choice is doxycycline, even for pregnant women and children, given the high rate of success. Alternatively, chloramphenicol can be used in adults. The route of administration will depend on the severity of disease, but most patients can be treated as outpatients with oral therapy.

Viral Hemorrhagic Fevers

Ebola/Marburg

The hemorrhagic fever viruses include wide number of geographically distributed viruses found worldwide, including Ebola and Marburg viruses, Rift Valley fever, Crimean Congo hemorrhagic fever, Lassa fever, yellow fever, and dengue fever.[55–57] Ebola and Marburg viruses are in the family Filoviridae. Although any of the many viral hemorrhagic fevers (VHFs) can cause severe disease in a traveler, Marburg and Ebola viruses serve as a classic template for VHFs and are largely discussed here.

Marburg virus has a single species, whereas Ebola has 4 different species that vary in virulence in humans.[56,58] Transmission appears to occur through contact with nonhuman primates and infected individuals.[59] Settings for transmission have occurred in vaccine workers handling primate products, nonhuman primate food consumption, nosocomial transmission, and laboratory worker exposure.[58] The use of VHF in bioterrorism has also been postulated, largely based on its high contagiousness in aerosolized primate models. The exact reservoir for the virus was initially thought to be with wild primates, but recently bats have been labeled as the reservoir, passing the infection onto nonhuman primates in the wild.[58]

The clinical manifestations of both Marburg and Ebola viruses are similar in presentation and pathophysiology, with mortality being the only major difference between them.[56] The initial incubation period after exposure to the virus is 5 to 7 days, with clinical disease beginning with the onset of fever, chills, malaise, severe headache, nausea, vomiting, diarrhea, and abdominal pain.[59] Disease onset is abrupt, and over the next few days, symptoms worsen to include prostration, stupor, and hypotension. Shortly thereafter, impaired coagulation occurs with increased conjunctival and soft tissue bleeding. In some cases, more massive hemorrhage can occur in the gastrointestinal and urinary tract, and in rare instances, alveolar hemorrhage can occur.[59] The onset of maculopapular rash on the arms and trunk also appears classic and may be a very distinctive sign.[56] Along with the bleeding and hypotension, multiorgan failure occurs, eventually leading to death. Reports of outbreaks and cases have largely occurred in developing countries where critical care resources are more limited.[58] Case fatality rates have reached 80% to 90% in the recent Marburg outbreak in Angola, but Ebola case fatality rates appear lower at 50%.[59]

The diagnosis of VHF becomes extremely important in order to initiate supportive care before the onset of shock, to alert and involve the public health department, and to institute infection control measures.[56,57,60] However, diagnosis is difficult outside of the endemic area. VHF should be suspected in cases of an exposed laboratory worker, of an acutely ill traveler from an endemic area (ie, central Africa), or in the presence of some classic clinical findings with increasing cases within the community suggesting a bioterrorist attack.[56] Outside of travel or laboratory exposure, the presence of a high fever, malaise and joint pain, conjunctival bleeding and bruising, confusion, and progression to shock and multiorgan failure should raise suspicion of a VHF, particularly if multiple cases are presenting in the community.[57] Laboratory diagnosis includes antigen testing by enzyme-linked immunosorbent assay or viral isolation by culture, but these tests are only currently performed by the CDC. Because no specific therapy is available, patient management includes supportive care, including a lung protective strategy with low-tidal volume ventilation if ARDS appears as part of the disease course. In a few cases in a Zaire outbreak in 1995, whole blood with IgG antibodies against Ebola may have improved outcome, although analysis showed these patients were likely to survive anyhow.

Although transmission appears to spread by droplet route, airborne precautions are recommended with respiratory protection with an N95 or PAPR and placement of the patient in a respiratory isolation room.[61] Equipment should be dedicated to that individual, and all higher-risk procedures should be done with adequate, full PPE. Any suspected case of VHF should immediately involve the public health officials and infection control department, because public health interventions and outbreak investigation will be paramount to reducing the spread of disease.[60] If exposure to an HCW occurs, there is no specific postexposure prophylaxis; infection control and occupational healthcare providers should be involved with potential quarantine measures for exposed individuals.[60]

Other Emerging Viral Pathogens

Coronaviruses

Coronaviruses are important human and animal pathogens and the source of approximately 30% of all respiratory tract infections worldwide. However, coronaviruses are a major source of emerging pathogens given their RNA genome, ability to adapt to multiple hosts, and the frequent contact between wildlife, domesticated animals, and humans. In 2003, a rapid progressive respiratory illness originating in China spread to multiple countries with more than 8000 cases and a case fatality ratio of almost 10%.[62] This disease was termed severe acute respiratory syndrome (SARS), and a novel coronavirus was determined to be the etiologic agent (severe acute respiratory syndrome-coronavirus-1 [SARS-CoV-1]). In September 2012, a case of novel coronavirus infection was reported involving a man in Saudi Arabia who was admitted to a hospital with pneumonia and acute kidney injury.[63] This case was followed by multiple clusters of infections in the Arabian Peninsula, and this outbreak was indeed related to a coronavirus (betacoronavirus), which is different but closely related to the other human betacoronaviruses (eg, SARS). In fact, this virus's lineage was closely related to bat coronaviruses. Within 12 months, more than 2400 confirmed cases of Middle East respiratory syndrome coronavirus (MERS-CoV) had spread to North Africa, Europe, Asia, and North America.[62,63] At the end of 2019, another acute respiratory syndrome was described in Wuhan, a city in the Hubei Province of China.[64,65] Likewise, this coronavirus is a betacoronavirus in the same subgenus but different class as the SARS virus. Based on the viral taxonomy, this virus was named severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2). This virus spread rapidly throughout China and with increasing cases worldwide, leading to an active pandemic. By May 2020, more than 1 million cases have been identified on 6 continents with more than 100,000 deaths.[64,65] Although cases of SARS-CoV-1 and MERS-CoV have all but disappeared, SARS-CoV-2 and subsequent disease from this virus (coronavirus disease 2019 [COVID-19]) are actively overwhelming hospitals and health care systems in North America, Asia, Europe, and the Middle East, thus altering the mobility and response of global HCWs.

Person-to-person spread of SARS-CoV-2 is thought to occur mainly via respiratory droplets, resembling the spread of influenza.[17,62,63] With droplet transmission, virus released in the respiratory secretions when a person with infection coughs, sneezes, or talks can infect via direct contact with the mucous membranes. The infection also occurs through the touch of an infected surface with subsequent touch to the eyes, nose, or mouth (fomite spread).[66] SARS-CoV-2 has been detected in nonrespiratory specimens, including stool, blood, and ocular secretions, but the role of these sites in transmission is unknown. Most importantly, spread through droplet mechanisms can be aerosolized when undergoing aerosol-generating procedures, such as intubation, bronchoscopy, tracheostomy, manipulation of the sinus and airway with surgery, and invasive and noninvasive mechanical ventilation.[61,65,67–69] This finding is important for any global HCW undergoing these procedures so that they have the appropriate PPE required for the given procedure to reduce transmission.

The incubation period for COVID-19 is thought to be within 14 days following exposure, with a median of 5.2 days.[17,64,65,69] COVID-19 ranges from mild to severe. Mild disease without pulmonary involvement occurs in approximately 80% of cases. Pneumonia appears to be the most frequent serious manifestation of infection, characterized primarily by fever, cough, dyspnea, and bilateral infiltrates on chest imaging.[64,69] Other findings, such as upper respiratory tract symptoms, myalgias, diarrhea, and smell or taste disorders, are also common. Severe disease (eg, with dyspnea, hypoxia, or >50% lung involvement on imaging within 24–48 hours) occurs in 14%.[64,69] More critical disease (eg, with respiratory failure, shock, or multiorgan dysfunction) was reported in 5%. The overall case fatality rate appears to be 1% to 2%, but a large number of minimal to asymptomatic carriers suggest that this case fatality rate may be lower. Comorbidities of cardiovascular disease, hypertension, diabetes, and immunosuppression appear to increase the likelihood of severe disease.[64,69] Male gender appears to be associated with a worse outcome along with various abnormal laboratory values: lymphopenia, elevated liver enzymes, lactate dehydrogenase, inflammatory markers (eg, C-reactive protein, ferritin, D-dimer [>1 μg/mL] and prothrombin time, troponin, and creatine phosphokinase). However, older age is perhaps most associated with increased mortality. In China, fatality rates were 8% among those aged 70 to 79 years and 15% among those 80 years or older.[64,69] There is a 2.3% case fatality rate among all other ages in contrast. It is also becoming apparent that some infected individuals become hypercoagulable, increasing the risk of embolic stroke or pulmonary embolism.[64,69]

Diagnosis is made by RT-PCR for viral RNA by nasal swab or respiratory sample. In areas of high prevalence, testing can help confirm the diagnosis in individuals with fever, cough, and other symptoms of COVID-19.[17,64,65,69] However, in areas of low prevalence, testing should be focused on individuals whom have had close contact with a known case of COVID-19 or have traveled from an area of high prevalence. Given the worldwide spread, targeted testing for individuals may not be indicated, and anyone with suggestive signs and symptoms should be tested.[17,64,65,69]

Infection control interventions to reduce transmission of COVID-19 include universal source control (eg, covering the nose and mouth to contain respiratory secretions and universal masking), early identification and isolation of patients with suspected disease (droplet or airborne precautions), the use of appropriate PPE when caring for patients with COVID-19, and environmental disinfection. Limiting transmission of SARS-CoV-2 is an essential component of care in patients with suspected or documented COVID-19. For traveling HCWs, an infrastructure of testing, isolation, and appropriate PPE is essential to decrease transmission to workers. In cases whereby inappropriate PPE is available, avoidance of work or travel is recommended.

Given the ongoing changes and evolving data around SARS-CoV-2 and COVID-19, global HCWs will need to follow some common guidelines to ensure safety for their equipment, patients, and team.[17,65,67,68,70] These guidelines include the following:

Pretrip preparations

- All members of a health care team travel should have a symptom screen before departure. If a fever is present along with cough, conjunctivitis, shortness of breath, or severe fatigue, a nasal swab for SARS-CoV-2 RNA by RT-PCR should be performed.
- Workers leaving from a high prevalence area (>10% infection) should have testing performed regardless of symptoms.
- Any worker with a positive test result should not travel. Return to travel or work should only be performed when symptom free for 72 hours or 2 successive negative tests 24 hours apart.
- PPE should include face shield, goggles, N95 or equivalent mask, surgical mask, gloves, and gowns. Confirm if your destination will have these, and if not, ensure that they are being secured with the team before travel.
- All PPE should be stored away from sunlight and in a low humidity area. Check all expiration dates on PPE before departure.

Arrival care

- All workers coming from a high area of prevalence who test negative before departure should self-quarantine for 14 days before working. This will ensure that disease is not spread to another area of lower prevalence, including patients.
- If symptoms consistent with COVID-19 develop on arrival or during work, begin isolation from workers and patients.
- If available, obtain a nasal swab for SARS-CoV-2 RNA by RT-PCR. Many developing countries will not have the resources to test. In this case, isolation until symptom free for greater than 72 hours and at least 1 week from the onset of symptoms will allow for a return to work. A mask should be worn for the next 7 days when working.
- For workers performing high-risk procedures (eg, intubation, surgical manipulation of the upper airway, bronchoscopy), screening of all patients before surgery should be performed. This should include symptoms screening, and any individual with symptoms consistent with COVID-19 should have surgery delayed.
- If possible, have local hospital perform screening by testing with RT-PCR. Because this is limited in developing countries, for patients who cannot receive testing but have no symptoms, appropriate PPE should be worn. This includes airborne precautions for any intubation or surgical procedure involving the airway and sinuses (PPE to include N95 mask, face shield, gown, and gloves).
- Patients with unknown test results should have a procedure performed in the operating room with a delay of more than 1 hour between cases to allow for more than 12 air cycles.
- If a local health care system has patients with active COVID-19, these patients should be cohorted and placed in droplet precautions (face shield, surgical mask, gown, gloves). If aerosol procedures are going to be performed, airborne precautions should be used during the procedure and for 1 hour after (roughly 12 air-cycle changes in room).
- HCW teams should monitor symptoms and wear a mask when unable to keep a greater than 3-m distance from each other.
- Intubations should be done in a rapid sequence manner. All patients should be orally intubated preferably with a skilled operator and video assisted if possible. Nasal intubations should be avoided. Bag valve mask use should be avoided, and the patient, once intubated, should be placed on the ventilator immediately without bag insufflation.

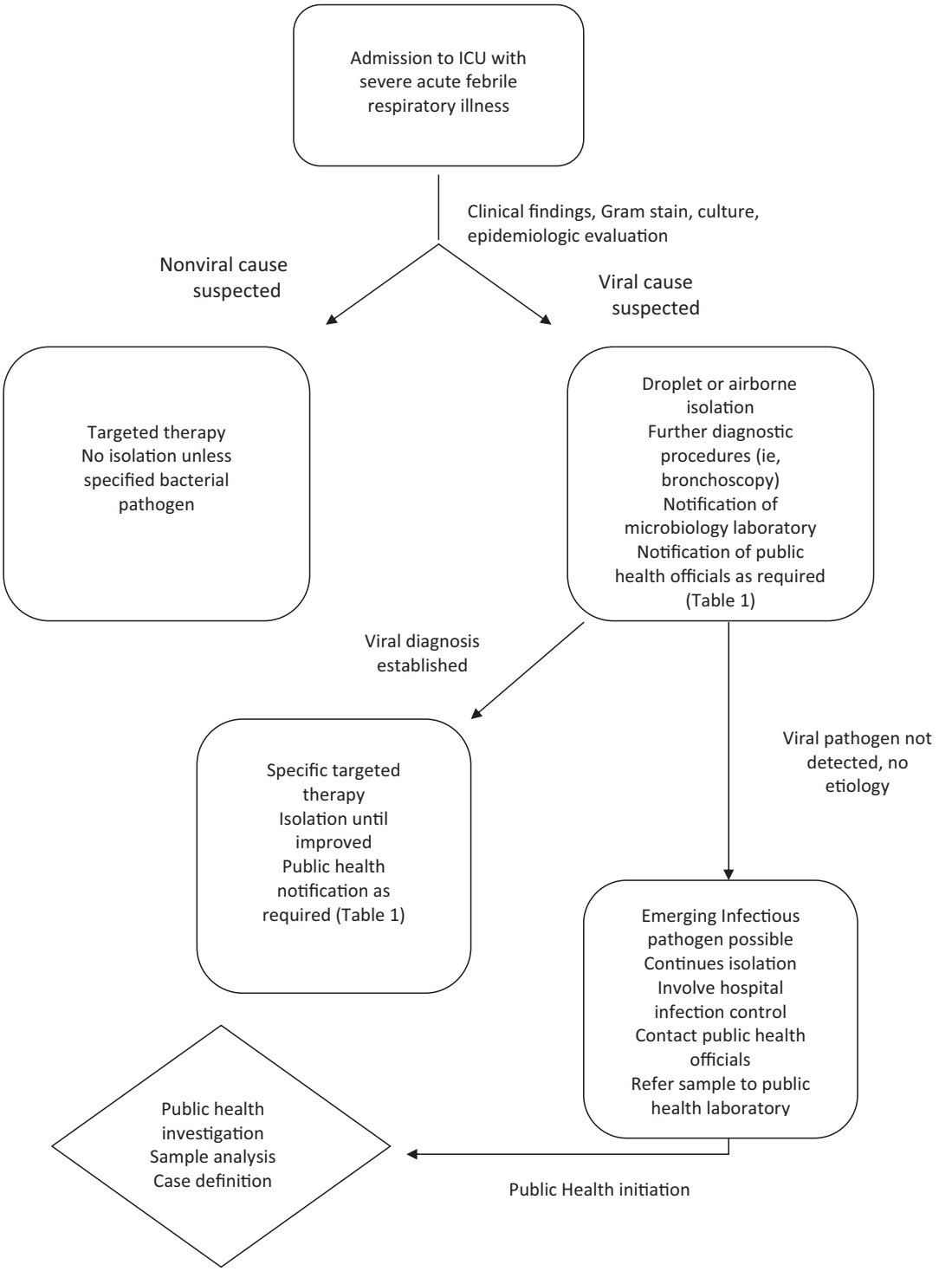

Fig. 1. Approach to early isolation, testing, and involvement of institutional infection control and public health in cases of acute febrile illness in a returning HCW. ICU, intensive care unit.

Posttrip preparations

- Upon return, all workers will have to quarantine for 14 days unless coming from a region with no cases.[6]
- Returning to work should be held off for 14 days.
- Avoiding family is recommended for 14 days as well, given travel from a high-prevalence region.

EMERGING PUBLIC HEALTH: WHEN YOU RETURN

If the returning traveler becomes febrile, if the cause of this fever is largely unknown, and if coming from areas of emerging pathogens, the evaluation and treatment can be difficult.[6,71] Although bacterial pathogens constitute most cases, the breadth of agents that can cause disease is enormous, with many having direct impacts on public health systems and the community.[61] Many of these cases require further epidemiologic and diagnostic testing, which can take time and resources in order to determine the larger impact of 1 ill traveler.[6] Often these patients will not be isolated and tested for these pathogens upon admission, and they will additionally undergo higher-risk aerosolizing procedures that will increase the likelihood for disease transmission.[61,70,71] Therefore, both HCWs and other patients are at risk for acquiring disease as experienced during the SARS-CoV-2 pandemic, the H1N1 pandemic, and other outbreaks of highly contagious disease.[60,61] Therefore, a standardized approach, with early isolation and testing of these cases, can reduce the likelihood of disease transmission of an emerging pathogen within the intensive care unit. **Fig. 1** outlines an approach to early isolation, testing, and involvement of institutional infection control and public health in cases of acute febrile illness in a returning HCW. Upon admission, the patient should undergo initial diagnostic testing as discussed earlier. If an etiologic agent is identified on initial screening and clinical findings (ie, gram-positive diplococci with a lobar pneumonia on x ray), targeted treatment is performed with appropriate isolation based on pathogen. However, if the agent is not easily identified in a patient with acute febrile illness and possibly pneumonia, patients should be placed in isolation, and further diagnostic testing should be performed based on epidemiologic risk. Isolation should most likely be droplet, but based on specific epidemiologic clues or high-risk procedures, airborne isolation may be instituted.[60,68]

Involvement of institutional infection control, microbiology, and public health should be started as early as possible.[68,70,71] Usually this is performed after the common agents have been eliminated and a suspicious high-risk pathogen is suspected.[60] Hospital-based infection control will assist in isolation and HCW protection, and the hospital-based microbiology laboratory should be notified of suspected pathogens, allowing for worker protection and targeted testing of samples.[68,70,71] Finally, public health involvement will allow a broader viral testing, including additional agents, subtyping, and resistance testing as well as rapid laboratory testing, epidemiologic investigation, case definition, and community prevention. Finally, higher-risk procedures should be limited in these cases. Appropriate PPE should be worn by HCWs at all time, and if worn properly, disease transmission is low risk.[68,70,71] Most cases during the SARS and the avian influenza epidemic appeared to have occurred when HCWs did not wear the appropriate PPE.

SUMMARY

The global surgeon may be exposed to a large number of pathogens through travel, including community exposure and health care contact. All global medical travel should begin with a pretravel visit whereby risk is assessed and all appropriate vaccinations and education are performed. Routine universal practices with clean water, food access, and insect avoidance will prevent most travel-related infections and complications. An understanding of the basic illness of malaria, traveler's diarrhea, arthropod-borne viral infections, tick-borne illnesses, and hemorrhagic fever will provide protection. Last, emerging pathogens that can cause a pandemic, such as SARS-CoV-2, should be understood to avoid HCW infection and spread in the workplace and when returning home.

DISCLOSURE

The authors have nothing to disclose.

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