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ROAD & TRAFFIC SAFETY

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Around the world, thousands of people are killed every day in motor vehicle crashes involving bicycles, buses, cars, motorcycles, trucks, and pedestrians.

MOTOR VEHICLE CRASHES: BY THE NUMBERS

Annually, ≈1.35 million people are killed (≈3,740 people every day) and an additional 20–50 million are injured in motor vehicle crashes. Road traffic injuries have become the leading cause of death for children and young adults aged 5–29 years. Although only 60% of the world's vehicles are in low- and middle-income countries, 93% of the world's crash deaths occur in these countries. More than half of people who die on the world's roads each year are cyclists, motorcyclists, and pedestrians, also called vulnerable road users.

According to US Department of State data, motor vehicle crashes are the leading cause of nonnatural death among US citizens who die in a foreign country (see Sec. 4, Ch. 12, Injury & Trauma). In 2017 and 2018, 431 US citizens living or traveling internationally died following motor vehicle crashes; 62% of crash deaths occurred among drivers and passengers of passenger vehicles (cars, sport utility vehicles, trucks). Other traffic-related fatalities involved motorcycle drivers and passengers (21%) and pedestrians (8.8%).

Table 8-01 shows the top 30 countries visited by US citizens (2016–2017) based on the Survey of International Air Travelers from the US Department of Commerce. For each country, the table lists the estimated motor vehicle crash death rate per 100,000 population as an indicator for the risk of motor vehicle crash death and the number of US citizens who died in each country because of a crash death from 2017 through 2018.

MOTOR VEHICLE CRASHES: RISK FACTORS

Motor vehicle crashes are common among US citizens traveling abroad for many reasons. In many low- and middle-income countries, unsafe vehicles and an inadequate transportation environment contribute to the crash injury problem. According to the World Health Organization (WHO), vehicles sold in 80% of all countries worldwide fail to meet basic safety standards promoted by the United Nations World Forum for Harmonization of Vehicle Regulations. In addition, motor vehicles share the road with vulnerable road users, and the mix of traffic, including animals, buses, cars, rickshaws, taxis, and large trucks, increases the risk for crashes and injuries.

Speed is another risk factor for vehicular crashes, injuries, and deaths. According to the WHO, speed contributes to about a third of road fatalities in high-income countries and to nearly half in low- and middle-income countries, including fatalities among vulnerable road users (see www.who.int/publications/i/item/managing-speed). Other factors that contribute to the risk for motor vehicle crashes among travelers include

Table 8-01 Thirty most visited destinations for US citizens traveling abroad, 2016–2017 (US Department of Commerce), World Health Organization (WHO) estimated motor vehicle crash death rate (per 100,000 population) & number of US citizen crash deaths per country, 2017–2018[1]

COUNTRY	2016–2017 COUNTRY VISITATION RANK[2]	WHO ESTIMATED CRASH DEATH RATE (PER 100,000 POPULATION)[3]	NUMBER OF US CITIZEN CRASH DEATHS[4,5]
Mexico[6,7]	1	13.1	126
Canada[6]	2	5.8	8
United Kingdom[6]	3	3.1	NA
Dominican Republic	4	34.6	12
France	5	5.5	3
Italy[6]	6	5.6	5
Germany	7	4.1	8
Spain	8	4.1	NA
Jamaica	9	13.6	9
China[6]	10	18.2	6
Japan	11	4.1	3
Ireland	11	4.1	7
India	13	22.6	10
Netherlands[6]	13	3.8	NA
Costa Rica[6]	15	16.7	11
Bahamas	16	NA	1
Philippines[6]	17	12.3	14
Colombia	17	18.5	2
Aruba	19	NA	NA
Switzerland	20	2.7	NA
Israel	21	4.2	NA
Austria	22	5.2	NA

Table 8-01 Thirty most visited destinations for US citizens traveling abroad, 2016–2017 (US Department of Commerce), World Health Organization (WHO) estimated motor vehicle crash death rate (per 100,000 population) & number of US citizen crash deaths per country, 2017–2018 (continued)

COUNTRY	2016–2017 COUNTRY VISITATION RANK[2]	WHO ESTIMATED CRASH DEATH RATE (PER 100,000 POPULATION)[3]	NUMBER OF US CITIZEN CRASH DEATHS[4,5]
Peru	23	13.5	2
Hong Kong	23	NA	1
Thailand	23	32.7	29
Greece	26	9.2	5
Korea, South	26	9.8	3
Taiwan	26	NA	5
Australia	26	5.6	3
Iceland	30	6.6	NA

Abbreviation: NA, data not available.

[1]Most recent available complete data.
[2]US Department of Commerce, National Travel & Tourism Office. Top destinations of U.S. residents traveling abroad, 2016–2017. December 2018. Available from: https://travel.trade.gov/outreachpages/outbound.general_information.outbound_overview.asp
[3]World Health Organization. WHO global status report on road safety 2018. Geneva: World Health Organization; 2018.Available from: www.who.int/publications/i/item/9789241565684.
[4]US Department of State. Deaths of US citizens abroad by nonnatural causes, 2018. Available from: https://travel.state.gov/content/travel/en/international-travel/while-abroad/death-abroad1/death-statistics.html.
[5]A total of 158 crash deaths occurred in countries not included in the list of top-visited countries, including Vietnam (17 deaths) and Honduras (8 deaths). All other countries not listed reported ≤5 deaths in 2017–2018.
[6]2016 data not available for reported number of road travel deaths based on WHO global status report on road safety, 2018.
[7]Number of drivers and passengers combined for road user death percentage based on WHO global status report on road safety, 2018.

lack of familiarity with the roads, driving on the opposite side of the road, the influence of alcohol, poorly made or inadequately maintained vehicles, travel fatigue, poor road surfaces without shoulders, unprotected curves and cliffs, and absent lighting creating conditions of poor visibility.

Use of protective equipment significantly decreases the risk for injury and death during a vehicle crash. Seat belts, correctly installed children's booster and car seats, and helmets for bicycle and motorcycle riders reduce crash-related injury and death, but this equipment can be scarce in some countries. In addition, timely and effective emergency and hospital care might be unavailable in some locations. Trauma centers capable of providing optimal care for serious injuries are uncommon outside urban areas in many international destinations.

MOTOR VEHICLE CRASHES: RISK REDUCTION STRATEGIES

Strategies travelers can use to reduce the risks for motor vehicle crash injuries include remaining alert and avoiding distractions when cycling, driving, or walking; choosing transportation carefully (e.g., avoiding overcrowded buses); abstaining from alcohol before driving; and not accepting rides from an impaired driver (see Table 8-02 for more strategies). Travelers should always use seat belts and child safety seats and should rent vehicles with seat belts. Whenever possible, travelers

Table 8-02 Risk factors & recommended strategies to reduce risk for road traffic crashes and injuries while abroad

RISK FACTORS FOR CRASHES	RECOMMENDED RISK REDUCTION STRATEGIES
Alcohol-impaired driving	Alcohol increases the risk for all causes of injury. Do not drive after consuming alcohol or other drugs. Do not accept rides from drivers who have been drinking. Penalties for impaired driving (alcohol, drugs) can be severe overseas, and laws vary widely by country.
Bus travel	Avoid riding in overcrowded, overweight, or top-heavy buses or minivans, and avoid riding in mountainous terrain. Always avoid riding with an impaired (alcohol, drugs) or distracted driver.
Mobile telephones	Do not use a mobile or cellular telephone or text while driving. Distracted driving increases crash risk. Many countries have enacted laws banning cellular telephone use while driving and some countries have made using any kind of telephone, including hands-free, illegal while driving.
Country-specific driving hazards	Check the US Department of State Driving and Road Safety Abroad website (https://travel.state.gov/content/travel/en/international-travel/before-you-go/driving-and-road-safety.html) to learn more about driving in another country, and check the Association for Safe International Road Travel website (www.asirt.org) for driving hazards or risks by country.
General driving hazards	Avoid driving at night in low- and middle-income countries because adequate lighting is limited in many places. Always pay close attention to the correct side of the road when driving in countries that drive on the left. Speed is a major risk factor for crashes, injury, and death. Note speed limits and consider the driving conditions (road quality, infrastructure, weather).
Pedestrian hazards	Be alert when crossing streets, especially in countries where motorists drive on the left side of the road. Walk with a companion or someone from the host country. Use crosswalks and follow pedestrian signals when available. Pay full attention when crossing streets (i.e., don't walk distracted).
Taxis or hired drivers	Ride only in marked taxis, preferably those with working seat belts. If no seat belt is available or the vehicle is in disrepair, refuse the ride and wait for another taxi. Hire drivers familiar with the area and that have official status or credentials as taxis. Ask the US embassy or consulate for taxi company recommendations.

should only ride in taxis with seat belts, and opt for the rear seat. Travelers also should bring car seats or booster seats for their children from home, unless they can be assured of their availability and quality at the destination.

Discourage travelers from driving or riding on motorcycles or motorbikes, including motorcycle and motorbike taxis. For travelers who cannot be dissuaded, strongly recommend that they wear a helmet that meets US safety standards. A good-quality helmet can reduce the risk for death by 40% and for severe injury by 70%.

The Department of State has useful safety information for international travelers, including road safety and security alerts, international driving permits, and travel insurance (https://travel.state.gov/content/travel/en/international-travel/before-you-go/driving-and-road-safety.html), along with the Smart Traveler Enrollment Program (https://step.state.gov/step). In addition, the Association for International Road Travel (www.asirt.org) has useful safety information for international travelers, including road safety checklists and country-specific driving risks.

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CRUISE SHIP TRAVEL

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Cruise ship travel presents a unique combination of health concerns. Travelers from diverse regions brought together in the often crowded, semi-enclosed shipboard environment can facilitate the spread of person-to-person, foodborne, and waterborne diseases. Outbreaks on ships can be sustained over multiple voyages by crewmembers who remain onboard, or by persistent environmental contamination. Port visits can expose travelers to local diseases and, conversely, be a conduit for disease introduction into shoreside communities.

Some people (e.g., those with chronic health conditions or who are immunocompromised, older people, pregnant people) merit additional considerations when preparing for a cruise. Because travelers at sea might need to rely on a ship's medical capabilities for an extended period, potential cruise passengers with preexisting medical needs should prepare accordingly by calling the cruise line's customer service center to learn what type and level of health care services are (and are not) available on specific ships.

CRUISE SHIP MEDICAL CAPABILITIES

Medical facilities on cruise ships can vary widely depending on ship size, itinerary, cruise duration, and passenger demographics. Generally, shipboard medical centers can provide medical care comparable to that of ambulatory care centers; some are capable of providing hospitalization services or renal dialysis. Although no agency officially regulates medical practice aboard cruise ships, the American College of Emergency Physicians (ACEP) published consensus-based guidelines for cruise ship medical facilities in 1995, and updated the guidelines in 2013. ACEP guidelines, which most major cruise lines follow, state that cruise ship medical facilities should be able to provide quality medical care for passengers and crew; initiate appropriate stabilization, diagnostic, and therapeutic maneuvers for critically ill or medically unstable patients; and assist in the medical evacuation of patients in a timely fashion, when appropriate (see www.acep.org/patient-care/policy-statements/health-care-guidelines-for-cruise-ship-medical-facilities).

ILLNESS & INJURY

Cruise ship medical centers deal with a wide variety of illnesses and injuries; ≈10% of conditions reported to cruise ship medical centers are an emergency or require urgent care. Approximately 95% of illnesses are treated or managed onboard, with the remainder requiring evacuation and

shoreside consultation for dental, medical, or surgical issues. Roughly half of all passengers seeking medical care are >65 years old.

Medical center visits are primarily the result of acute illness or injury. The most frequently reported diagnoses include respiratory illnesses (30%–40%); injuries from slips, trips, or falls (12%–18%); seasickness (10%); and gastrointestinal (GI) illness (10%); 80% of onboard deaths are due to cardiovascular events.

Infectious Disease Outbreaks

The most frequently reported cruise ship outbreaks involve GI infections (e.g., norovirus), respiratory infections (e.g., coronavirus disease 2019 [COVID-19], influenza), and other vaccine-preventable diseases (VPDs), such as varicella. Although cruise ships do not have public health authority, to reduce the risk of introducing communicable diseases, some ships conduct medical screening during embarkation to identify ill passengers, prevent them from boarding, or require isolation if permission to board is given.

Before travel, to help limit the introduction and spread of communicable diseases on cruise ships, prospective cruise ship travelers and their clinicians should consult the Centers for Disease Control and Prevention (CDC) Travelers' Health website (https://wwwnc.cdc.gov/travel) for updates on outbreaks and destination-specific travel health notices. People who become ill with a communicable disease before a voyage should consult their health care provider and delay their travel until they are no longer contagious. When booking a cruise, travelers should check the trip cancellation policies and consider purchasing trip cancellation insurance (see Sec. 6, Ch. 1, Travel Insurance, Travel Health Insurance & Medical Evacuation Insurance).

Travelers who become ill during a voyage should seek care in the ship's medical center; the onboard staff will provide clinical management, facilitate infection-control measures, and take responsibility for reporting potential public health events. For information on how to report travelers who become ill with suspected communicable diseases after they return home from a cruise, see Sec. 8, Ch. 8, Airplanes & Cruise Ships: Illness & Death Reporting & Public Health Interventions.

INFECTIOUS DISEASE HEALTH RISKS

Gastrointestinal Illnesses

During 2006–2019, rates of GI illness among passengers on voyages lasting 3–21 days fell from 32.5 to 16.9 cases per 100,000 travel days. Despite the decrease, outbreaks continue to occur. CDC assists the cruise ship industry to prevent and control the introduction, transmission, and spread of GI illnesses on cruise ships. Information on cruise ship GI illnesses is available at www.cdc.gov/nceh/vsp; updates on GI illness outbreaks involving ships with US ports of call, specifically, are available from www.cdc.gov/nceh/vsp/surv/gilist.htm.

NOROVIRUS

On cruise ships, >90% of GI illness outbreaks with a confirmed cause are due to norovirus. Characteristics of norovirus that facilitate outbreaks include a low infective dose, easy person-to-person transmissibility, prolonged viral shedding, absence of long-term immunity, and the ability of the virus to survive routine cleaning procedures (see Sec. 5, Part 2, Ch. 16, Norovirus). For international cruise ships porting in the United States during 2006–2019, an average of 12 norovirus outbreaks occurred each year.

OTHER SOURCES OF GASTROINTESTINAL ILLNESS

GI outbreaks on cruise ships also have been caused by contaminated food or water; most outbreaks were associated with *Campylobacter*, *Clostridium perfringens*, or enterotoxigenic *Escherichia coli*.

PROTECTIVE MEASURES

Travelers can reduce the risk of acquiring a GI illness on cruise ships by frequently washing hands with soap and water, especially before eating and after using the restroom. Travelers should call the ship's medical center promptly, even for mild symptoms of a GI illness, and strictly follow cruise ship guidance regarding isolation and other infection-control measures.

Respiratory Illnesses

Respiratory illnesses are the most common medical complaint on cruise ships. During the pretravel

visit, evaluate whether vaccines or boosters (e.g., COVID-19, influenza) are needed and emphasize the importance of practicing good respiratory hygiene and cough etiquette while onboard. As with GI illnesses, cruise ship passengers should report respiratory illness to the medical center promptly and follow isolation recommendations as instructed.

CORONAVIRUS DISEASE 2019

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19, spreads more easily between people in close quarters, and multiple studies have concluded that transmission rates of SARS-CoV-2 among travelers on ships are much greater than in other settings. Cruise ship COVID-19 outbreaks can tax onboard medical and public health resources. Ship-to-shore medical evacuations to facilities capable of providing higher levels of medical care can present logistical challenges and pose additional risks to ill patients.

Cruise passengers and crewmembers who are not up to date with their COVID-19 vaccines are at increased risk for severe illness, hospitalization, medical evacuation, and death. Since cruising will always pose some risk of SARS-CoV-2 transmission, ensure that people planning cruise ship travel are up to date with their vaccinations, and assess their likelihood for developing severe COVID-19. For people at increased risk of severe COVID-19 regardless of their vaccination status (e.g., pregnant people, people who are immunocompromised), discuss the potential health hazards associated with cruise ship travel. CDC has developed recommendations and guidance designed to help cruise ship operators provide a safer and healthier environment for crewmembers, passengers, port personnel, and communities (www.cdc.gov/quarantine/cruise/covid-19-cruise-ship-guidance.html).

INFLUENZA

Historically, influenza has been among the most often reported VPDs occurring on cruise ships. Because passengers and crew originate from all regions of the globe, shipboard outbreaks of influenza A and B can occur year-round, with exposure to strains circulating in different parts of the world (see Sec. 5, Part 2, Ch. 12, Influenza). Thus, anyone planning a cruise should receive the current seasonal influenza vaccine ≥2 weeks before travel if vaccine is available and no contraindications exist. For people at high risk for influenza complications, health care providers should discuss chemoprophylaxis and how and when to initiate antiviral treatment.

Additional guidance on the prevention and control of influenza on cruise ships is available from www.cdc.gov/quarantine/cruise/management/guidance-cruise-ships-influenza-updated.html.

LEGIONNAIRES' DISEASE

Less common on cruise ships, Legionnaires' disease is nevertheless a treatable infection that can result in severe pneumonia leading to death (see Sec. 5, Part 1, Ch. 9, Legionnaires' Disease & Pontiac Fever). Approximately 10%–15% of all Legionnaires' disease cases reported to CDC occur in people who have traveled during the 10 days before symptom onset. Clusters of Legionnaires' disease associated with hotel or cruise ship travel can be difficult to detect, because travelers often disperse from the source of infection before symptoms begin. Data reported to CDC during 2014–2015 included 25 confirmed cases of Legionnaires' disease associated with cruise ship exposures.

In general, Legionnaires' disease is contracted by inhaling warm, aerosolized water containing the bacteria, *Legionella*. Transmission also can sometimes occur through aspiration of *Legionella*-containing water. Typically, people do not spread *Legionella* to others; a single episode of possible person-to-person transmission of Legionnaires' disease has been reported. Contaminated hot tubs are commonly implicated as a source of shipboard *Legionella* outbreaks, although potable water supply systems also have been culpable. Improvements in ship design and standardization of water disinfection have reduced the risk for *Legionella* growth and colonization.

DIAGNOSIS & REPORTING

People with suspected Legionnaires' disease require prompt antibiotic treatment. When evaluating cruise travelers for Legionnaires' disease, obtain a thorough travel history of all destinations

during the 10 days before symptom onset to assist in identifying potential sources of exposure, and collect urine for *Legionella* antigen testing. Most cruise ships have the capacity to perform this test, which detects *L. pneumophila* serogroup 1, the most common serogroup.

Perform culture of lower respiratory secretions on selective media to detect non–*L. pneumophila* serogroup 1 species and serogroups. Culture also is used for comparing clinical isolates to environmental isolates during an outbreak investigation. Notify CDC of any travel-associated Legionnaires' disease cases by sending an email to travellegionella@cdc.gov. Quickly report all cases of Legionnaires' disease to public health officials, who can determine whether a case links to previously reported cases and work to stop potential clusters and new outbreaks.

Other Vaccine-Preventable Diseases

Although most cruise ship passengers come from countries with routine vaccination programs (e.g., Canada, the United States), many of the crew are from low- or middle-income countries where immunization rates can be low. Outbreaks of hepatitis A, measles, meningococcal disease, mumps, pertussis, rubella, and varicella have all been reported on cruise ships. The majority (82%) of these outbreaks occur among crewmembers; prior to the COVID-19 pandemic, varicella was the most frequently reported VPD. Other VPDs (e.g., pertussis) occur more often among passengers.

Each cruise line sets its own policies regarding vaccinations for its crew; some have limited or no requirements. Thus, all passengers should be up to date with routine vaccinations before travel, as well as any required or recommended vaccinations specific for their destinations. People of childbearing age should have documented immunity to measles, rubella, and varicella (either by vaccination or titer) before cruise ship travel.

Vectorborne Diseases

Some cruise ship ports of call include destinations where vectorborne diseases (e.g., dengue, Japanese encephalitis, malaria, yellow fever, Zika) are known to be endemic. In addition, new diseases can surface in unexpected locations; chikungunya was reported for the first time in the Caribbean in late 2013, with subsequent spread throughout the region and numerous other North, Central, and South American countries and territories. Zika was first reported in Brazil in 2015, and subsequently spread across the Caribbean and Latin America, sparking concern because of its association with microcephaly and other congenital abnormalities in the fetus. For disease-specific information, see the relevant chapters of Section 5.

For guidance on how to avoid bites from mosquitoes and other disease-transmitting arthropod vectors, both onboard and while on shore at ports of call, see Sec. 4, Ch. 6, Mosquitoes, Ticks & Other Arthropods. For specific details on yellow fever vaccination and malaria prevention, see Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country.

NONINFECTIOUS HEALTH RISKS

Stresses of cruise ship travel include varying weather and environmental conditions, and unaccustomed changes to diet and levels of physical activity. Despite modern stabilizer systems, seasickness is a common complaint, affecting up to 25% of travelers (see Sec. 8, Ch. 7, Motion Sickness). Note that travel is an independent risk factor for behaviors such as alcohol and illicit drug use and misuse (see Sec. 3, Ch. 5, Substance Use & Substance Use Disorders), and unsafe sex (see Sec. 9, Ch. 12, Sex & Travel).

TRAVEL PREPARATION

Cruise ship travelers have complex itineraries due to multiple short port visits. Although most port visits do not include overnight stays off ship, some trips offer travelers the opportunity to venture off the ship for ≥1 night. These excursions can complicate decisions about exposures and the need for specific antimicrobial prophylaxis, immunizations, and other prevention measures. Boxes 8-04 and 8-05 summarize recommended cruise travel preparations and healthy behaviors during travel for health care providers and cruise ship travelers.

Travelers with Additional Considerations

Travelers with chronic illnesses and travelers with disabilities who have additional needs

BOX 8-04 Healthy cruise travel preparation: a checklist for health care providers

RISK ASSESSMENT & RISK COMMUNICATION

- ☐ Discuss itinerary, including season, duration of travel, and activities at ports of call.
- ☐ Review the traveler's medical and immunization history, allergies, and any additional health needs.
- ☐ Discuss relevant travel-specific health hazards and risk reduction.
- ☐ Provide travelers with documentation of their medical history, immunizations, and medications.

VACCINATION & RISK MANAGEMENT

- ☐ Provide routinely recommended (age-specific), required (yellow fever), and recommended vaccines.
- ☐ Discuss safe food and water precautions.
- ☐ Discuss insect bite prevention.
- ☐ Provide older travelers with a baseline electrocardiogram, especially those with coronary artery disease.

MEDICATIONS BASED ON RISK & NEED

- ☐ Consider prescribing malaria chemoprophylaxis if itinerary includes stops in malaria-endemic areas.
- ☐ Consider prescribing motion sickness medications for self-treatment.

(e.g., dialysis, supplemental oxygen, wheelchairs) should inform their cruise line before traveling. Highly allergic travelers and travelers with underlying medical conditions should carry a file that contains essential, pertinent health information (e.g., allergies, blood type, chest radiograph [if abnormal], chronic conditions, electrocardiogram, medication list, primary and/or specialty care provider contact information). Travelers also should bring any medications recommended by their health care provider (e.g., an epinephrine auto-injector) to help facilitate care during a

BOX 8-05 Healthy cruise travel preparation: a checklist for travelers

PRETRAVEL

- ☐ Carry prescription drugs in original containers with a copy of the prescription and a physician's letter.
- ☐ Check the Centers for Disease Control and Prevention (CDC) Outbreak Updates for International Cruise Ships website (www.cdc.gov/nceh/vsp/surv/gilist.htm) for gastrointestinal outbreaks.
- ☐ Consider purchasing additional insurance coverage for overseas health care and medical evacuation.
- ☐ Consult medical and dental providers before cruise travel.
- ☐ Consult CDC Travelers' Health website (https://wwwnc.cdc.gov/travel/notices) for travel health notices.
- ☐ Defer travel while acutely ill.
- ☐ Evaluate the type and length of the planned cruise in the context of personal health requirements.
- ☐ Notify the cruise line of additional health needs (e.g., dialysis, supplemental oxygen, wheelchair).
- ☐ Pack Environmental Protection Agency (EPA)–registered insect repellent; consider treating clothes and gear with permethrin.
- ☐ Pack sunscreen.

DURING TRAVEL

- ☐ Avoid contact with people who are ill.
- ☐ Follow safe food and water precautions when eating off ship at ports of call.
- ☐ Maintain good fluid intake and avoid excessive alcohol consumption.
- ☐ Practice safe sex.
- ☐ Report all illnesses to ship's medical center and follow their recommendations.
- ☐ Use insect bite precautions during port visits, especially in vectorborne disease–endemic areas or areas experiencing outbreaks of vectorborne diseases (e.g., Zika, yellow fever)
- ☐ Use sun protection.
- ☐ Wash hands frequently with soap and water; if soap and water are not available, use ≥60% alcohol–based hand sanitizer.

POST TRAVEL

- ☐ See CDC's latest post-cruise health guidance regarding coronavirus disease 2019 at www.cdc.gov/coronavirus/2019-ncov/travelers/cruise-travel-during-covid19.html.

medical emergency. For detailed information on preparing travelers who have additional considerations for international travel, including severe allergies, chronic illness, disabilities, or immune compromise, see Section 3.

Pregnant Travelers

Most cruise lines have policies that do not permit people to board after their 24th week of pregnancy. Contact cruise lines directly for specific guidance before booking. For additional information on preparing pregnant people for international travel, see Sec. 7, Ch. 1, Pregnant Travelers.

Insurance Coverage

All prospective cruise travelers should verify coverage with their health insurance carriers and, if not included, consider purchasing additional insurance to cover medical evacuation and health services received onboard cruise ships and in foreign countries (see Sec. 6, Ch. 1, Travel Insurance, Travel Health Insurance & Medical Evacuation Insurance).

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MOTION SICKNESS

Ashley Brown

Motion sickness describes the physiologic responses to travel by air, car, sea, train, and virtual reality immersion. Given sufficient stimulus, all people with functional vestibular systems can develop motion sickness. People vary in their susceptibility, however.

RISK FOR TRAVELERS

Risk factors for motion sickness include age, sex, preexisting medical conditions, and concurrent medications. Children aged 2–12 years are especially susceptible, but infants and toddlers are generally immune. Adults >50 years are less susceptible to motion sickness. Pregnancy, menstruation, and taking hormone replacement therapy or oral contraceptives have also been identified as potential risk factors. People with a history of migraines, vertigo, and vestibular disorders are more prone to motion sickness.

Some prescriptions can worsen motion sickness–associated nausea.

CLINICAL PRESENTATION

Motion sickness typically occurs after a triggering motion or event. People with motion sickness commonly experience dizziness; headache; nausea, vomiting, or retching; sweating. For a complete list of motion sickness–associated signs and symptoms, see Box 8-06.

NEUROPHYSIOLOGY

When sensory input does not align with expected patterns (neural mismatch), patients suffer dizziness and nausea. Sensory conflict theory (the most widely accepted explanation for motion sickness) proposes that the condition is caused by conflict between the visual, vestibular, and somatosensory systems, and involves complex neurophysiologic signaling between multiple nuclear regions, neurotransmitters, and receptors. Medications used to prevent and treat motion sickness are thought to work by suppressing the signals that contribute to neural mismatch.

NONPHARMACOLOGIC PREVENTION & INTERVENTIONS

Travelers can use nonpharmacologic interventions to prevent or treat motion sickness (see Box 8-07). Awareness and avoidance of situations that tend to trigger symptoms are the primary defenses against motion sickness.

TREATMENT

Medications used to treat motion sickness can vary in effectiveness and side effects; suggest travelers take a trial dose of medication at home before departure to find what works best for them. The most frequently used antihistamines to treat motion sickness include cyclizine, dimenhydrinate, meclizine, and promethazine (oral and suppository); nonsedating antihistamines appear to be less effective. Other commonly used motion sickness medications include anticholinergics (e.g., scopolamine [hyoscine, oral and transdermal]); benzodiazepines; dopamine receptor antagonists (e.g., metoclopramide, prochlorperazine); and sympathomimetics (often used in combination with antihistamines).

Complementary approaches with anecdotal evidence of effectiveness for preventing or treating motion sickness (e.g., acupressure and magnets, ginger, homeopathic remedies, pyridoxine [vitamin B6]) might be effective for individual travelers but cannot generally be recommended (see Sec. 2, Ch. 14, Complementary & Integrative Health Approaches to Travel Wellness). Clinical trials have shown that ondansetron, a commonly used antiemetic, is ineffective in preventing nausea associated with motion sickness.

Children & Motion Sickness

For children aged 2–12 years, dimenhydrinate (Dramamine), 1–1.5 mg/kg per dose, or diphenhydramine (Benadryl), 0.5–1 mg/kg per dose up to 25 mg, can be given 1 hour before travel and every 6 hours during the trip. Because some children have paradoxical agitation with these medications, encourage parents to try a test dose before departure. Oversedating young children with antihistamines can be life-threatening. Scopolamine can cause dangerous adverse effects in children and should not be used.

BOX 8-06 Motion sickness symptoms

Anorexia	Increased sensitivity to odors
Apathy	Loss of appetite
Cold sweats	Nausea
Drowsiness	Salivation, excessive
Generalized discomfort	Sweating
Headache	Vomiting or retching
Hyperventilation	Warm sensation

BOX 8-07 Non-pharmacologic prevention & interventions for motion sickness: a checklist for travelers

- ☐ Be aware. Try to avoid situations that tend to trigger your symptoms.
- ☐ Optimize your position to reduce motion or motion perception (e.g., drive a vehicle instead of riding in it; sit in the front seat of a car or bus; sit over the wing of an aircraft; hold your head firmly against the back of the seat; choose a window seat on flights and trains).
- ☐ Reduce sensory input. Lie face down, shut your eyes, try sleeping, look at the horizon.
- ☐ Maintain hydration by drinking water, eating small meals frequently, and limiting alcoholic and caffeinated beverages.
- ☐ Get plenty of sleep or rest. Being sleep-deprived can worsen motion sickness symptoms.
- ☐ Avoid smoking. Quitting (even short-term) reduces susceptibility to motion sickness.
- ☐ Try using distractions. Controlled breathing, listening to music, or using aromatherapy scents like mint, lavender, or ginger. Flavored lozenges also might help.
- ☐ Some people recommend using acupressure or magnets to prevent or treat nausea, although scientific data are lacking on how effective these interventions are for preventing motion sickness.
- ☐ Gradually expose yourself to continuous or repeated motion sickness triggers. Most people, in time, notice a reduction in motion sickness symptoms.

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8

AIRPLANES & CRUISE SHIPS: ILLNESS & DEATH REPORTING & PUBLIC HEALTH INTERVENTIONS

Alida Gertz, Francisco Alvarado-Ramy

The Centers for Disease Control and Prevention (CDC) has a regulatory mission to protect the public health of the United States by preventing the introduction, transmission, and spread of communicable diseases from foreign countries into and within US states and territories. For diseases of concern that have received special designation by the President of the United States, CDC may issue federal public health orders for quarantine, isolation, and conditional release. Diseases falling under this specific federal public health authority (Table 8-03) include cholera, diphtheria, infectious tuberculosis, measles, plague, smallpox, yellow fever, viral hemorrhagic fevers, severe acute respiratory syndromes (e.g., Middle East respiratory syndrome [MERS], coronavirus disease 2019 [COVID-19]), and influenza due to novel or reemergent viruses that are causing (or have the potential to cause) a pandemic. The list of federally quarantinable diseases can be revised by executive order when a communicable disease becomes a significant public

Table 8-03 Executive Orders specifying diseases for which federal quarantine is authorized

EXECUTIVE ORDER	DATE	TITLE	REVISIONS, MODIFICATIONS, ADDITIONS	AVAILABLE FROM
13295	April 4, 2003	Revised List of Quarantinable Communicable Diseases	Specified the following diseases for the list of quarantinable communicable diseases: cholera; diphtheria; infectious tuberculosis; plague; smallpox; yellow fever; and viral hemorrhagic fevers (Lassa, Marburg, Ebola, Crimean-Congo, South American, and others not yet isolated or named); and severe acute respiratory syndrome (SARS)	www.federalregister.gov/d/03-8832
13375	April 1, 2005	Amendment to Executive Order 13295 Relating to Certain Influenza Viruses and Quarantinable Communicable Diseases	Added to the list, influenza caused by novel or reemergent influenza viruses that are causing, or have the potential to cause, a pandemic	www.federalregister.gov/d/05-6907
13674	July 31, 2014	Revised List of Quarantinable Communicable Diseases	Expanded the definition of severe acute respiratory syndromes	www.federalregister.gov/d/2014-18682
14047	September 17, 2021	Adding Measles to the List of Quarantinable Communicable Diseases	Added measles to the existing list, after infectious tuberculosis	www.federalregister.gov/documents/2021/09/22/2021-20629/adding-measles-to-the-list-of-quarantinable-communicable-diseases

health threat. For more information, see Specific Laws and Regulations Governing the Control of Communicable Diseases (www.cdc.gov/quarantine/specificlawsregulations.html).

PROTECTING THE PUBLIC'S HEALTH BEFORE, DURING & AFTER TRAVEL

In the United States, CDC conducts public health actions before, during, and after commercial flights and cruise travel to prevent or mitigate the introduction and spread of diseases of public health concern. Many of these actions are carried out by CDC quarantine station personnel working in collaboration with state, tribal, local, and territorial (STLT) public health officers. CDC quarantine stations are located at the 20 ports of entry, including land border crossings, where most travelers arrive to or transit through the United States. More information on CDC quarantine stations is available from www.cdc.gov/quarantine/quarantinestations.html.

Before Travel

In 2007, CDC and the US Department of Homeland Security (DHS) developed a public health Do Not Board (DNB) list to prevent people from boarding commercial aircraft if they are known to have, are suspected of having, or were exposed to a communicable disease of public health concern. A person placed on the DNB list will not be issued a boarding pass for any commercial airline flight originating from or arriving to a US airport.

STLT public health authorities notify CDC when people with communicable diseases of public health concern are at risk of traveling on a commercial flight; they also can recommend to CDC that people who meet certain criteria be added to the DNB list. For more information about the DNB list, see FAQs for Public Health Do Not Board and Lookout Lists (www.cdc.gov/quarantine/do-not-board-faq.html).

During Travel

Federal regulations mandate that before arrival, the person in charge of a conveyance destined for a US port of entry must report to the CDC quarantine station of jurisdiction (www.cdc.gov/quarantine/quarantine-stations-us.html) any death or "ill person" among passengers or crew. For the definition of an ill person, see CFR Title 42 §71.21: Report of death or illness (https://ecfr.io/Title-42/Section-71.21) and Box 8-08.

Airlines, DHS's US Customs and Border Protection, and emergency medical personnel at arriving airports can each provide CDC quarantine station staff with reports of illness and/or death that occurs during commercial air travel. Most reports of illness or death on commercial, seagoing vessels are received directly from the ship's medical staff or from a shipping agent. Airline and cruise ship illness and death reports also can originate from other federal partners or STLT health departments.

AIR TRAVEL RESPONSE

CDC's goals in responding to reports of illness during air travel are to determine whether the illness poses (or has the potential to pose) a public health threat and to take appropriate public health actions. When responding to reports of illness during air travel, public health officials can either allow ill air passengers to resume travel if their illness does not pose a meaningful public health risk; recommend ill air passengers

BOX 8-08 Regulatory definition of an "ill traveler" for the purposes of reporting illness on commercial airplanes and ships[1]

Fever,[2] plus ≥1 of the following
- Appears obviously unwell (applies to air travelers only)
- Breathing difficulty (or, for maritime travelers, suspected or confirmed pneumonia)
- Bruising or bleeding, new and unexplained, without a history of previous injury
- Consciousness decreased or confusion of recent onset
- Cough, persistent (or, for maritime travelers, cough with bloody sputum)
- Diarrhea, persistent (applies to air travelers only)
- Headache with stiff neck
- Vomiting, persistent (other than air or sea sickness)
- Rash

OR

Fever for >48 hours

OR

Acute gastroenteritis[3] (applies to maritime travelers only)

OR

Symptoms or other indications of a communicable disease, as the CDC may announce through posting of a notice in the Federal Register.

[1]Definition applies to all travelers, including passengers and crew, US citizens and non–US citizens.

[2]Measured temperature ≥100.4°F (≥38°C); feels warm to the touch; or provides a history of feeling feverish.

[3]Defined as diarrhea (≥3 episodes of loose stools in a 24-hour period or what is above normal for the person) OR vomiting accompanied by ≥1 of the following: ≥1 episode of loose stools in a 24-hour period, abdominal cramps, headache, muscle aches, or fever (temperature ≥100.4°F [≥38°C]).

with a suspected communicable disease seek medical care and delay further commercial travel until noninfectious; or require ill air passengers to be medically evaluated if they are suspected of having a quarantinable communicable disease.

Together with airport and public health response partners (e.g., emergency medical services, public health authorities), CDC staff board arriving airplanes to conduct public health assessments of ill travelers and to make recommendations regarding potentially exposed passengers. Potentially exposed travelers might be asked to provide their contact information before disembarking so that health authorities can follow up and provide additional health information if the ill traveler is diagnosed with a disease of public health concern.

CDC provides guidance to airlines on reporting and managing ill travelers on airplanes at Airline Guidance: Reporting Death/Illness (www.cdc.gov/quarantine/air/reporting-deaths-illness/index.html), and Airline Guidance: Managing Ill Passengers/Crew (www.cdc.gov/quarantine/air/managing-sick-travelers/index.html).

CRUISE SHIP RESPONSE

For public health responses to ill cruise ship passengers and crew, control measures typically are initiated while the ship is still at sea. CDC quarantine station personnel obtain clinical and epidemiologic information about the ill or deceased person(s), determine public health risk, and provide guidance to the ship's clinicians about case findings, infection control measures, and contact investigations.

CDC quarantine station personnel might respond by meeting a ship at the port of entry to further investigate or to assist the responding health department with surveillance and control measures. CDC personnel also might provide onsite response for outbreaks or clusters of disease, quarantinable communicable diseases, and some vaccine-preventable diseases (e.g., measles, rubella). CDC's Vessel Sanitation Program (www.cdc.gov/nceh/vsp/default.htm) is responsible for responding to reports of acute gastroenteritis on cruise ships.

CDC provides guidance to cruise lines on reporting and managing ill travelers at Cruise Ship Guidance: Reporting Death or Illness on Ships (www.cdc.gov/quarantine/cruise/reporting-deaths-illness/index.html), and Cruise Ship Guidance: Disease-specific Management of Ill Passengers/Crew (www.cdc.gov/quarantine/cruise/management/index.html).

After Travel

When a US or foreign public health authority notifies CDC of an illness of public health concern in airplane or cruise ship travelers who have reached their final destination, CDC conducts, or assists STLT health departments in conducting, a public health contact investigation. The primary purpose of the contact investigation is to identify and notify potentially exposed passengers and crew, so they can be offered clinical evaluation, postexposure prophylaxis (when necessary), and health education, including recommended quarantine periods.

REPORTING POSTTRAVEL ILLNESS

Travelers who become ill at their destination or after returning home should inform their health care providers of where, when, and on what type of conveyances they traveled. Report cases of communicable diseases of public health concern in returning travelers to appropriate public health authorities according to the state's specific reportable disease requirements.

When a risk for communicable disease transmission during travel is possible, health departments can notify CDC by contacting either the quarantine station with jurisdiction for their region (www.cdc.gov/quarantine/quarantinestations.html) or the CDC Emergency Operations Center (770-488-7100; eocreport@cdc.gov).

Report cases of travel-associated legionellosis to CDC to travellegionella@cdc.gov, and cases of acute gastroenteritis associated with cruise travel to vsp@cdc.gov.

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9 Travel for Work & Other Reasons

THE INTERNATIONAL BUSINESS TRAVELER

Davidson Hamer

In 2017, ≈4.8 million US residents traveled overseas for business. With an increasingly global economy, this number is expected to increase, although a major slowdown in business travel occurred due to the onset of the coronavirus disease 2019 (COVID-19) pandemic. Business travelers (also known as occupational travelers) include people traveling for conventions, research, work-related training, and volunteer work. Business travelers fall into several different categories according to duration and purpose of travel (see Table 9-01).

For international business travelers, the likelihood of an adverse health event increases with the number of trips made to at-risk areas and the length of time spent at the destination. Because most international business travelers take multiple trips each year, travel health providers should consider the cumulative risk to the traveler and not just the risks of the current trip.

HOW INTERNATIONAL BUSINESS TRAVELERS DIFFER FROM OTHER TRAVELERS

Unlike leisure travelers, international business travelers are usually employees, although some might be working as independent consultants. Business travelers' employers have a responsibility to protect their employees from health threats. Employers should cover the cost for all required and recommended vaccinations, prophylactic medications (e.g., antimalarials), and other health

CDC Yellow Book 2024. Jeffrey Nemhauser, Oxford University Press. © Oxford University Press 2023.
DOI: 10.1093/oso/9780197570944.003.0009

Table 9-01 International business traveler categories

CATEGORY	TRAVEL DURATION	TRAVEL DESCRIPTION	ADDITIONAL TRAVEL DETAILS	REPRESENTATIVE PROFESSIONS
Short-term traveler	≤2 weeks	Single destination for a specific meeting or event	Make presentations, attend conventions or association meetings	Academicians, business executives, health care professionals
Frequent traveler	2 weeks on average	Multiple trips per year to different locations	Most often over several years to same site but might repeat assignment	Auditors, business executives, engineers, managers (including financial managers), researchers, technical trainers, volunteer workers
Commuter or recurrent traveler	Varies	Regular international travel, multiple times per year	Special projects	Managers (e.g., financial, engineering), researchers
Assignee	3–12 months	Travels for specific, time-limited objectives	Does not relocate; might return home on a regular basis	Engineers, managers, specialists (e.g., legal, financial), volunteer workers
Expatriate	Long-term assignments (often 2–5 years or more)	Moves to host country	Usually relocates with family	Business executives, managers, researchers, technical experts

protection measures, either through in-house or contracted occupational health services or a sponsored health plan.

In the United States, employers are liable for tort suits for negligence and workers' compensation claims. Employers should have systems in place to evacuate employees traveling under their auspices; this typically requires a preexisting contractual relationship with an air medical evacuation provider or some form of comprehensive travel health insurance that includes medical evacuation coverage.

To better prepare their employees for healthy travel, businesses have developed international travel health programs (ITHPs). Primarily an innovation of larger corporations, ITHPs focus on disease prevention and health promotion activities before, during, and after international travel. Potential advantages of corporate travel health programs include fewer instances of urgent repatriations (including emergency medical evacuations) and hospital admissions for international business travelers; enhanced employee confidence; improved productivity overseas; and better public relations. Midsized and smaller businesses with large numbers of international business travelers might also benefit from the cost savings realized by an ITHP.

SPECIAL CONSIDERATIONS FOR INTERNATIONAL BUSINESS TRAVELERS

Risks for travel-related adverse health outcomes in international business travelers generally have been considered low. They have increased, however, as the number of people traveling for work (and the overall distance they travel) increases and as the time allotted for adjustment after arrival at destinations and after return home decreases. International business travelers are as likely as other travelers to develop some travel-related illnesses; a GeoSentinel analysis of 12,203

business travelers seen during 1997–2014 found that frequent diagnoses included malaria (9%), acute unspecified diarrhea (8%), viral syndrome (6%), and acute bacterial diarrhea (5%). Notably, only 45% of travelers in the analysis had had a pretravel encounter and, among the subset traveling to malaria-endemic regions for whom malaria prophylaxis data were available, 92% did not take prophylaxis or took an incomplete course of prescribed medication.

Extensive business travel also correlates with a higher body mass index and increased cholesterol, hypertension, and mental stress. A World Bank study showed overall health plan expenditures were 70% higher for international business travelers than for their nontraveling counterparts, and that the likelihood of developing a noncommunicable disease increased with travel frequency. The study also showed increased incidence for 20 noncommunicable disease categories among this employee group.

Although international business travelers should receive all indicated vaccines and prophylaxis prior to travel, gaps in care exist. For instance, not all practitioners adhere to the most current guidance, some clinicians provide insufficient pretravel counseling, and some travelers fail to follow recommendations when provided.

PRETRAVEL CONSIDERATIONS

Fitness for Travel

The pretravel consultation should determine and document fitness for travel. Fitness for travel, particularly the risk for adverse health events overseas, depends on several factors, including how well underlying medical conditions are controlled; how easily preexisting medical conditions can be managed during travel; duration of time spent away from home; destination-specific health risks; access to health care while away; and job tasks and activities. As much as possible, international business travelers, especially assignees, expatriates, and recurrent travelers—and their health care providers—should attempt to improve those factors within their control and to minimize the risks presented by factors outside their control.

Employers can authorize international travel for their employees after consideration of several factors including an assessment of health and safety risks. Although almost all medical risks can be managed, the health care provider must ascertain whether a health condition will, based on the medical resources expected to be available, prevent a traveler from performing their essential job functions. For example, diabetes monitoring and care could be challenging during international travel, particularly to more austere environments.

If a provider identifies underlying medical conditions during the pretravel consultation, it is their responsibility to have a full discussion with both the international business traveler and the employer regarding the added health risks imposed by international travel, and then carefully document these conversations. Disability laws apply to most employees. Tort suits and workers' compensation liability are considerations for situations in which a US standard of medical care is not readily available, or when an increased risk for accident, illness, or injury is expected.

Health Risks

Structure the pretravel consultation to identify and address risks to both physical and mental health. Administering vaccines, prescribing prophylactic medication, and educating travelers about how to mitigate health threats while traveling are key elements of the consultation. To best prepare an international business traveler for healthy travel, providers must have access to the traveler's full itinerary, including all work sites, stopovers, likely side trips, and potential itinerary changes. Do not assume that international business travelers will only visit major cities, stay in first-class hotels, and eat at 5-star restaurants.

Attempt to elicit information about conditions at worksites listed in the itinerary, going into as much detail as possible. International business travel can include visits to industrial sites where travelers can be exposed to chemical or physical hazards or poor air quality. Some work locations could pose slip, trip, and fall hazards or the possibility of other injuries. International business travelers visiting hospitals or medical environments might require protection from biological hazards. Providing requisite personal protective equipment (PPE) and education regarding its proper use is unique to the pretravel consultation for people preparing to work internationally.

Mental Health Assessment

A mental health assessment is another component of the pretravel consultation for international business travelers. Travel- and work-associated stressors can be additive and manifest as circadian rhythm disruption, sleep disorders, and increased alcohol or substance use. The ability to work effectively with people from other cultures is known as cultural adaptability; employers should consider providing cultural adaptability training for frequent travelers, particularly if the employee is being sent to work abroad for extended periods (assignees and expatriates). Predeployment testing can help measure whether an international business traveler has the requisite cultural adaptability skills, and a variety of assessment tools are available. Address mental health and adaptability issues before the international business traveler embarks on international travel or assignment.

Vaccines

Once mental health issues and risks associated with a particular travel itinerary have been identified and addressed, evaluate the traveler for needed vaccines. Update routine vaccines (e.g., influenza, measles, tetanus-diphtheria-pertussis), if indicated. Unlike the leisure traveler, the international business traveler typically needs to be fully productive when traveling overseas. The inability to perform one's job because of illness has serious implications for both employee and employer; recommend immunizations for international business travelers based on an individualized risk assessment of potential vaccine-preventable health risks.

Administer vaccinations with a view toward the international business traveler's total travel over the course of a year or next several years, not just a single trip. A single business trip of only 1 or 2 weeks' duration to a low-risk destination might not warrant immediate vaccination against a particular disease, but future work trips could present a risk for exposure. Consider offering a vaccine series even if the travel requiring it has not yet been planned. Because business travel often is scheduled last-minute, vaccinating the international business traveler for later trips when immunity against specific diseases is required is reasonable. This is true even if the traveler does not complete the full vaccine series in advance of the most current trip.

Malaria Chemoprophylaxis

Simply providing prescriptions for necessary prophylaxis against travel-related diseases, particularly malaria, is not sufficient. As a large GeoSentinel study recently noted, >90% of international business travelers who contracted malaria while traveling did not take their prescribed medication appropriately, or at all. Although international business travelers are aware of the need for prophylaxis, they demonstrate poor adherence that only worsens with the length of the trip. Reported reasons for nonadherence include the challenges posed by daily dosing, presumed immunity, busy schedules or forgetfulness, conflicting advice, and fear of side effects. The use of electronic reminders (e.g., software applications on handheld devices) can help.

Additional Considerations

CHANGES IN PLANS

Travel plans often change. Before departing, international business travelers should know where to access health and safety information for destinations not included on the original itinerary. Destination-specific health recommendations are available from the Centers for Disease Control and Prevention (CDC) Travelers' Health website (https://wwwnc.cdc.gov/travel/).

TRAVEL COMPANIONS

All family members accompanying the international business traveler also should visit a primary care provider for a pretravel physical and mental health screening; the inability of a child, companion, or spouse to adjust to an international environment is often a cause for early repatriation. Each family member should have their own consultation with a health care provider familiar with assessing the impact of travel on health and safety.

TRAVEL HEALTH ISSUES DURING TRAVEL & AT THE DESTINATION

Planning for and adhering to guidance provided by medical and human resources personnel can mitigate health and wellness risks

posed by lengthy flights. These risks include deep vein thrombosis, dehydration, jet lag, and motion sickness (for more details on these conditions, see the relevant chapters in Section 8). Multiple-leg, complex itineraries can aggravate and increase the likelihood of these conditions occurring. To decrease a traveler's chances of experiencing adverse effects—which is particularly important when work duties are scheduled on or close to arrival—counsel travelers to limit or refrain from in-flight alcohol consumption, and caution against the use of hypnotic drugs to facilitate sleep while flying.

Coronavirus Disease 2019

Because of the COVID-19 pandemic, international travel guidance—ranging from alerts about the risk for COVID-19 in different countries to travel interdictions between certain countries—changes frequently. Countries might require proof of vaccination, quarantine on arrival, or documentation of negative test results before permitting entry. Quarantine can range from stays in a government-mandated facility, at one's home, or in a hotel; quarantine also could mean travelers need to be available by phone for a daily interview by government health authorities. Employers should check with their human resources office or publicly available references (e.g., CDC, US State Department, government websites in the destination country) for COVID-19 travel information, and work with their employees to help ensure they adhere to the latest requirements and recommendations.

Medication

Changing time zones can interfere with taking prescribed medicine on time, another potential threat to the health and wellness of international travelers. Adjusting the timing of regular medication during international travel might be a challenge for the international business traveler; help create schedules for travelers taking medication(s), both on the way overseas and when returning. Anticipating the possibility that checked luggage could be delayed, broken into, or lost during international travel, international business travelers should carry with them a travel health kit containing sufficient quantities of all necessary medications to last the duration of travel, and extra doses in case of delays.

Occupational & Environmental Hazards

On arrival, international business travelers should review with their hosts all safety, security, occupational, and environmental hazards specific to the destination. In low- and middle-income countries in particular, international business travelers could encounter occupational and environmental health risks much different from what they experience at home; chemicals used in some locations might no longer be used (or might never have been approved for use) in the United States because of their hazardous properties. Foreign governments might lack or not enforce exposure limits, requirements for PPE use, or worker safety laws.

Health Emergencies

Advise business travelers to use the Smart Traveler Enrollment Program (STEP), a free program offered through the US Department of State, in which international travelers and expatriates enroll their trip with the US embassy in the country of travel or residence. STEP benefits include receiving information alerts from the local embassy about health and safety issues, facilitating contact with the embassy if a problem arises, and helping family and friends reach international travelers through the embassy, in case of an emergency.

International business travelers should be well briefed on what to do in case of an overseas health emergency and which hospitals and health clinics in the vicinity provide the highest levels of medical care. This information might be available through the local US embassy and is another reason for travelers to consider enrolling in STEP. Details about how to access quality outpatient and inpatient care must be available to the international business traveler throughout the trip, and updated as needed.

POSTTRAVEL CARE

ITHPs provide international business travelers with both pretravel and posttravel care. Studies show that, upon returning home, 22%–64% of people traveling internationally for work will have

an unresolved health issue meriting careful case management with referral to specialists. Because an international business traveler could be a sentinel for a health risk at an overseas facility or workplace, a correct diagnosis is important not only to the health and well-being of the traveler but also to that of the other workers at that jobsite.

Employers have a general duty to prevent occupational injuries. Returning workers can assist by notifying employers of any work-related incidents or on-the-job exposures. Such workplace hazards might require medical monitoring and referral to occupational health specialists for the person, and exposure mitigation by a hierarchy of controls at the location. International business travelers also should provide information about any changes in the quality of available medical care, accommodations, security, and any other medical or legal issues that could adversely affect the health of future travelers.

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ADVICE FOR AIRCREW

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9

As airlines expand their routes to include more destinations, particularly to low- and middle-income countries, aircrew (pilots and flight attendants) need to be prepared for travel-related exposures. Help aircrew protect themselves when traveling for their jobs and when off duty.

Aircrew are distinct from leisure travelers, and the nature of their work requires modifications to travel health recommendations. When consulting with aircrew, consider that they travel frequently; can have short layovers, often 24–48 hours; often travel to new destinations on short notice; might be more adventurous and exposed to more risks than typical tourists, despite short travel times; and that aircrew might perceive themselves to be low-risk since they mostly are healthy, and their in-country exposure time is short.

In general, air carriers that fly to low- and middle-income countries try to inform their crew about the health issues they face. Airlines do not necessarily employ occupational health providers or experts in travel medicine, however, and they can be unaware of special risks at the destinations they serve. Therefore, airlines should avail themselves of travel medicine professionals who can provide well-informed recommendations to their traveling employees.

GENERAL HEALTH MEASURES

When conducting a pretravel consultation for flight crew, ask each crewmember about their airline company's requirements. If in doubt regarding airline requirements, contact the medical director or occupational health department of the

airline for guidance. For example, some airlines might require all aircrew without contraindications to be vaccinated against yellow fever, even those who fly primarily to regions without risk for the disease. Such a policy provides the employer with added flexibility to reassign employees to cover routes that include yellow fever–endemic regions and destinations. In addition, although pilots are required to have periodic medical examinations to ensure they are fit to fly, those visits do not typically address issues related to international travel, particularly to destinations in low-income countries.

Immunizations

ROUTINE VACCINES

Because of their travel frequency, aircrew could be exposed to various diseases that are uncommon in the United States. Measles can be life-threatening in adults and is more common in countries, including some in Europe, that lack mandatory childhood immunization requirements. Measles cases have increased in the United States, with exposures reported to have occurred in airports, and potentially on airplanes. The Centers for Disease Control and Prevention (CDC) has developed recommendations for airlines to help reduce the risk for measles transmission through air travel (see www.cdc.gov/quarantine/air/managing-sick-travelers/airline-recommendations.html).

Although US carriers generally do not require pilots and flight attendants to demonstrate adherence to the adult immunization schedule recommended by the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/schedules/hcp/imz/adult.html#vaccines-schedule), use the pretravel visit as an opportunity to ensure that aircrew are up to date with their vaccines. Check vaccination status for coronavirus disease 2019 (COVID-19), diphtheria-tetanus-pertussis, influenza, measles-mumps-rubella (MMR), polio, as well as age-appropriate vaccines (e.g., pneumococcal vaccine). International aircrew should use the pretravel health visit to ensure as complete protection as possible.

Aircrew also can be at risk for varicella infection. In tropical regions, chickenpox occurs in an older age group than in the United States. Contact with local populations in the tropics can increase the risk for varicella exposure among flight crew who do not have natural or vaccine-induced immunity.

TRAVEL VACCINES

No established guidelines are in effect for recommending travel vaccines to aircrew, but because of their frequent and at times unpredictable assignments to areas of risk, offering Japanese encephalitis, meningococcal, and typhoid vaccines is reasonable (see the relevant disease-specific chapters in Section 5 for details). In addition, consider yellow fever vaccine for aircrew whose unexpected reassignments might include countries that require proof of vaccination against yellow fever under the International Health Regulations (for details, see Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country, and Sec. 5, Part 2, Ch. 26, Yellow Fever). Ask about the possibility of itinerary changes so that vaccinations for upcoming trips can be given, or a series started early.

Hepatitis A vaccine is advisable for all travelers and should be stressed for aircrew, since most adults in the United States have not been immunized. Advise aircrew, particularly frequent travelers, to receive hepatitis B vaccine because of the unpredictability of exposure.

Aircrew are generally a group who travel frequently beyond work; during a consultation, always ask whether they are planning other travel, and address those risks at the same time. For example, some aircrew do relief work or fly to areas of natural disasters; consider vaccination against cholera.

Coronavirus Disease 2019

Many international carriers have offered their employees COVID-19 vaccination. The CDC, FAA, and US airlines strongly recommend vaccination against COVID-19 with a product approved or authorized by the US Food and Drug Administration. Pilots are prohibited from flying or serving as a required crewmember within 48 hours after immunization because of possible transient adverse effects (see FAA's FAQs on Use of COVID-19 Vaccines by Pilots and Air Traffic Controllers, at www.faa.gov/coronavirus/guidance_resources/vaccine_faq).

Advise aircrew not to report to work and to notify their airline's occupational health program if they are symptomatic or test positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19. Crewmembers should follow current guidance and company policies regarding testing, duration of isolation, mask wearing, and return to work. Aircrew also should contact their airline's occupational health program after exposure to a person with COVID-19; management guidance (e.g., testing, symptom monitoring, mask wearing, quarantine) should be based on their vaccination status and prior history of SARS-CoV-2 infection.

FAA's COVID-19 guidance and resources can be found at www.faa.gov/coronavirus/guidance_resources.

Malaria Prevention

Airlines typically inform crewmembers about which destinations report malaria transmission. Although malaria transmission might occur in some areas of destination countries, sometimes no transmission is reported in the capitals or the larger urban areas (e.g., Manila) where major American carriers fly. In sub-Saharan Africa, however, aircrew can have substantial exposure risk even during a short, 24-hour layover.

Unfortunately, aircrew awareness about malaria and prevention strategies might not be widespread; US and European aircrew traveling to malaria-endemic destinations continue to acquire malaria, including severe and complicated disease. Infections might result from lack of awareness of airline recommendations, failure to take precautions against mosquito bites, or lack of compliance with antimalarial prophylaxis. A small recent survey by Farag and colleagues from the Qatar Ministry of Health revealed that while most aircrew had heard of malaria, many were unaware of the route of transmission, and some were not even sure whether they had traveled to a destination where malaria risk was high.

Help aircrew learn as much as possible about malaria. Provide easy access to educational materials and chemoprophylaxis and, if desired, an individual risk assessment for preventive measures (see Sec. 5, Part 3, Ch. 16, Malaria). Aircrew should understand the importance of personal protective measures and how to use them properly (see Sec. 4, Ch. 6, Mosquitoes, Ticks & Other Arthropods). They should know how take chemoprophylaxis as prescribed; recognize that fever or chills after an exposure is a medical emergency; and know how to get medical assistance at their destinations or at home in the event of symptoms or signs of malaria.

At destinations where the prevalence of malaria is high, prescribe antimalarial medication for aircrew to take even during brief layovers. For some stops (e.g., in West Africa on the way to South Africa), aircrew are at some risk any time aircraft doors are open. Transmission can be focal and intermittent; prescribe chemoprophylaxis for every trip to regions highly endemic for malaria, and stress the importance of taking the full prescription as directed.

Several options are available for malaria prophylaxis depending on the destination, although duration of prophylaxis and adverse effect profiles of drugs make some options less optimal or prohibited for aircrew. Mefloquine, for example, is contraindicated for pilots due to its effects on the central nervous system. International airlines generally recommend that aircrew take the combination drug atovaquone-proguanil because of its minimal adverse effects and its dosing schedule. Country-specific recommendations for malaria chemoprophylaxis can be found in Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country, or on the CDC Travelers' Health website (https://wwwnc.cdc.gov/travel).

For destinations where crew are thought to be at low risk based on local intensity of transmission, accommodations, and personal behaviors, advise taking precautions to prevent mosquito bites without chemoprophylaxis. Few published data are available on the risk for malaria among aircrew with brief layovers, but some suggest that because of the typically shorter duration, risk for aircrew could be less than for tourists. Although risk for malaria transmission in hotels at a destination could be low, it might be greater at international airports due to layovers and unpredictable transit delays.

Other Vectorborne Diseases

During the past decade, several mosquito-borne viruses have emerged or reemerged, including chikungunya, dengue, and Zika (see the individual disease chapters in Section 5). Strict adherence to mosquito bite prevention in tropical and subtropical destinations is critical to preventing disease. Because Zika virus infection during pregnancy can cause severe birth defects, airlines should develop flight destination policies for pregnant aircrew based on CDC recommendations (https://wwwnc.cdc.gov/travel/page/zika-travel-information).

Food & Water Precautions: Travelers' Diarrhea

Aircrew should follow the same safe food and water precautions for prevention and management of travelers' diarrhea as other travelers (see Sec. 2, Ch. 8, Food & Water Precautions, and Sec. 2, Ch. 6, Travelers' Diarrhea). Aircrew should also be well versed in the recognition and self-treatment of moderate to severe travelers' diarrhea to shorten the duration of illness. Gastrointestinal illness can impair job performance and preclude safe operation of an airplane. In addition, pilots should be certain that any antidiarrheal medications they take are approved for use when flying. Loperamide, for example, is not permitted because it can cause drowsiness and dizziness.

Bloodborne & Sexually Transmitted Infections

Although bloodborne pathogen and sexually transmitted infection (STI) risks and preventions are addressed in more detail in other chapters of this book, note that frequent travelers have an increased likelihood of engaging in casual and unprotected sex, and that rates of HIV and other STIs are greater among travelers (see Sec. 9, Ch. 12, Sex & Travel). The risk of acquiring infections might be increased not only for STIs (e.g., chlamydia, gonorrhea), but also for viral illnesses (e.g., hepatitis B, hepatitis C). Because of the risk for bloodborne pathogen infections, discourage aircrew from having dental procedures or participating in activities during travel like acupuncture, piercing, or tattooing.

Tuberculosis Screening

Screen for tuberculosis (TB) exposure and symptoms and administer a periodic test for TB infection to aircrew who travel frequently to destinations where the prevalence of the disease is greater than in the United States, the incidence of drug resistance to usual TB treatment medication is high, or the crewmember will be in close contact with populations at risk for TB. For more details, see Sec. 5, Part 1, Ch. 23, . . . *perspectives*: Testing Travelers for *Mycobacterium tuberculosis* Infection.

Medications for Chronic Conditions

Instruct aircrew to carry extra quantities of all medications for chronic conditions; medications might not be available at some locations, and, even if available and less costly, might be counterfeit or of substandard quality. Counterfeit medications are readily available for purchase in many low- and middle-income countries, and travelers might not be able tell based on the packaging or pills whether drugs are genuine. Some counterfeit drugs contain little or no active ingredient, and others contain toxic contaminants (see Sec. 6, Ch. 3, . . . *perspectives*: Avoiding Poorly Regulated Medicines & Medical Products During Travel).

FITNESS TO FLY

Federal Aviation Administration (FAA)–certified aeromedical examiners (AMEs) examine pilots regularly and are responsible for certifying that they are fit to fly. Without prior clearance from the FAA, AMEs might not certify pilots taking prescription or over-the-counter medications known to cause drowsiness; the FAA provides a list at www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/pharm/dni_dnf. Sometimes medication approvals are made on a case-by-case basis. If questions arise, consult an AME (see www.faa.gov/pilots/amelocator to locate an AME).

Antihistamines

Do not prescribe medications for pilots that can affect their central nervous system while on duty. Pilots often are aware of some of the medications and classes of medications (e.g., antihistamines) that might interfere with their flight capacity.

Pilots who take sedating antihistamines, including chlorpheniramine and diphenhydramine, are not permitted to fly until >5 half-lives have elapsed after the last dose; this equates to a 9-day no-fly rule for chlorpheniramine and a 60-hour no-fly rule for diphenhydramine.

Pilots should not take new medications or drugs before or during travel, whether prescribed or over-the-counter, that have reported side effects known to interfere with judgment or the ability to safely operate a plane. Before providing pilots with nonsedating antihistamines (e.g., desloratadine, fexofenadine, loratadine), ensure the medications can be taken without adverse effect during a trial period.

Sleep Medication

The FAA prohibits the use of all prescription sleep medication other than zolpidem, which is permitted for use on an infrequent basis (only once or twice per month), and only to reset circadian rhythm. Taking zolpidem results in a 24 hour no-fly period and thus is more appropriate for use at the end of a trip than during a multiday international flight assignment.

Alcohol

Aircrew might have to follow individual airline requirements regarding the allowable time from most recent alcohol consumption to flight duty. The international regulatory expectation is zero alcohol level upon reporting for duty. Warn cabin crew that the alcohol content of beer and other alcohol-containing beverages could be considerably greater at international destinations than what they typically consume at home, which for pilot testing might result in a non–zero alcohol level after a layover overseas. US airline pilots are subject to random alcohol testing, and urine specimens could be collected before or after flights. Although cannabis and cannabinoids are legal in some US states for medical and recreational use, these are prohibited for pilots.

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PEOPLE WHO FLY FOR A LIVING—HEALTH MYTHS & REALITIES

Raquel Velazquez-Kronen

Airline pilots and flight attendants might have concerns about long-term health risks related to their exposures in the workplace. Aircrew have the highest annual individual radiation dose of any occupation, work irregular hours, and can be at risk of exposure to infectious diseases when traveling. Here we answer some of the common health-related questions about people who fly for a living.

DO AIRCREW HAVE HIGHER RATES OF CANCER THAN THE GENERAL POPULATION?

Aircrew do not appear to be at higher risk for cancer than the general population. In the United States, 1 in 2 men and 1 in 3 women will develop some form of cancer in their lifetime. Many exposures can contribute to cancer risk, some of which could be related to a person's occupation. Airline pilots and flight attendants are exposed occupationally to certain known cancer risk factors (e.g., cosmic radiation, ultraviolet radiation, and circadian rhythm disruption).

Several studies of aircrew have shown that overall and cause-specific cancer mortality is low compared with the general population despite these additional occupational exposures. As compared to people who do not fly for a living, pilots and flight attendants might be more likely to develop skin and female breast cancers, but reasons for this are unclear. CDC provides more information on cancer in aircrew, including steps that might reduce skin and breast cancer risk, at www.cdc.gov/niosh/topics/aircrew/cancer.html.

ARE AIRCREW MORE LIKELY TO DEVELOP HEART DISEASE THAN THE GENERAL POPULATION?

Aircrew might be at greater risk for developing some forms of heart disease compared with the general population. Heart disease is the leading cause of death in the United States. Although occurrence is rare, aviation medical examiners need to consider the likelihood of an in-flight incapacitation event due to common medical conditions (e.g., some forms of heart disease). Among pilots, heart disease and related conditions are the leading cause of grounding due to medical disqualification.

The prevalence of peripheral artery disease also has been shown to increase with the number of years flight attendants have worked. Combined with lifestyle and genetic factors, numerous occupational exposures in aviation might contribute to heart disease risk (e.g., circadian rhythm disruption, fatigue, shift work, chronic stress). CDC has information on heart disease prevention at www.cdc.gov/heartdisease/prevention.htm.

ARE COMMERCIAL AIRCREW AT INCREASED RISK FOR CONTRACTING INFECTIOUS DISEASES?

Aircrew, especially flight attendants, interact with many people daily and can be exposed to infectious diseases when in contact with sick crewmembers, passengers, or their bodily fluids; by inhaling airborne pathogens; or by touching contaminated surfaces. Information on standard safety protections for aircrew, identifying potentially infectious travelers, and

(continued)

infection-control guidance are available at www.cdc.gov/niosh/topics/aircrew/communicablediseases.html and www.cdc.gov/quarantine/air/managing-sick-travelers/commercial-aircraft/infection-control-cabin-crew.html.

Aircrew can reduce their risk for becoming ill with infectious diseases by keeping up to date with routine vaccinations (e.g., diphtheria-tetanus-pertussis, influenza, measles-mumps-rubella) and by frequently washing hands with soap and water or using an alcohol-based hand sanitizer containing ≥60% alcohol when soap and water are not readily available. Aircrew should be trained to use appropriate personal protective equipment (e.g., disposable gloves, face masks) when assisting potentially infectious travelers (e.g., those with a fever or respiratory symptoms). For additional occupational health and safety information that might pertain to emerging infectious diseases or public health emergencies, aircrew also can review the Federal Aviation Administration (FAA)'s Safety Alerts for Operators (www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo).

ARE WORKPLACE EXPOSURES LINKED TO REPRODUCTIVE HEALTH EFFECTS IN AIRCREW?

Some evidence suggests that cosmic radiation exposure, high physical job demands, and working during typical sleep hours might be associated with an increased risk for miscarriage among pregnant flight attendants. Flight attendants do not, however, appear to be at elevated risk for preterm birth, low infant birthweight, or female reproductive (e.g., ovarian, uterine) cancers. For breastfeeding aircrew members, exposure to external radiation while working will not expose a baby to radiation through the breastmilk.

The National Council on Radiation Protection and Measurements recommends a radiation dose limit of 0.5 mSv (millisievert) per month during pregnancy, and the National Oceanic and Atmospheric Administration (www.swpc.noaa.gov) provides information on current weather conditions and whether aircrew flying at higher altitudes could be exposed to higher radiation levels due to solar radiation activity.

Pregnant aircrew can take steps to reduce their exposure to other potential occupational hazards by limiting physically demanding job tasks (e.g., prolonged standing) and by following guidance on weight limits for lifting during pregnancy (see www.cdc.gov/niosh/topics/repro/images/Lifting_guidelines_during_pregnancy_-_NIOSH.jpg). More information on aircrew reproductive health issues is available at www.cdc.gov/niosh/topics/aircrew/reproductivehealth.html and www.cdc.gov/niosh/topics/repro/pregnancy.html.

WORK-RELATED FATIGUE OR SLEEP DISORDERS

As compared to the general population, aircrew report fatigue and sleep disorders more frequently, which could be due to high job stress, irregular sleep schedules, jet lag, and long work hours. Chronic fatigue and sleep disorders (e.g., insomnia) can have negative long-term effects on overall physical and mental health and represent a potential risk for workplace injury.

In addition to recommending regular sleep, FAA provides guidance for aircrew to help reduce fatigue and improve sleep. Because even short naps can help increase alertness and improve performance throughout the day, aircrew should consider taking a nap either before starting work or when an opportunity arises to take a break during work. Other strategies include engaging in a few minutes of light physical activity (e.g., stretching, walking) during work to break up continuous tasks, and minimizing exposure to sunlight (which can make it more difficult to get enough sleep) after working a night shift. The FAA has a free online fatigue prevention training available at www.faasafety.gov/gslac/ALC/CourseLanding.aspx?cID=174. CDC also offers a free fatigue prevention training for commercial pilots in Alaska at www.cdc.gov/niosh/docs/2016-162/default.html.

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. . . *perspectives* chapters supplement the clinical guidance in this book with additional content, context, and expert opinion. The views expressed do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

HEALTH CARE WORKERS, INCLUDING PUBLIC HEALTH RESEARCHERS & MEDICAL LABORATORIANS

Henry Wu, Eric Nilles

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Health care workers practicing outside the United States face unique health hazards, including exposure to infectious diseases associated with patient contact or handling clinical specimens. Any type of health care worker (e.g., ancillary clinical staff, nurses, physicians, public health personnel, researchers, students and trainees on international rotations) working in clinical areas or handling specimens can be at risk (see Box 9-01).

Infectious agents can be spread through contact with blood, bodily fluids, respiratory secretions, or contaminated materials or surfaces. Health care workers might be exposed through dermal, ingestion, inhalation, or percutaneous routes of absorption. Risks vary depending on assigned duties, geographic location, and practice setting. Of note, health care workers working abroad can be at increased risk for exposure to patients with emerging, highly pathogenic, or uncommon, infectious diseases (e.g., Ebola virus disease, Middle East respiratory syndrome [MERS], or extensively drug-resistant tuberculosis [XDR-TB]).

PRETRAVEL VACCINATION & SCREENING

Before traveling or working abroad, all health care workers should be up to date with their routine age-appropriate vaccines, vaccines recommended for employment in health care settings (see Box 9-03), and coronavirus disease 2019 (COVID-19) vaccines (www.cdc.gov/coronavi

BOX 9-01 Risks for health care workers practicing outside the United States

Challenging practice conditions (e.g., extremely resource-limited settings, natural disasters, or conflict zones) can prevent health care providers from adhering to standard precautions.

Greater prevalence of transmissible infections (e.g., hepatitis B virus, hepatitis C virus, HIV, tuberculosis) with potentially increased transmission risk from untreated source patients.

Less stringent safety regulations or infection control standards.

Limited availability of personal protective equipment (PPE), safety-engineered devices, or postexposure management resources.

Unfamiliar practice conditions, equipment, or procedures.

rus/2019-ncov/vaccines/stay-up-to-date.html). In addition, ensure health care workers receive vaccinations specifically indicated for the country visited. Cholera vaccine, meningococcal vaccine, and inactivated polio vaccine (given as an adult booster dose) could be indicated for health care workers traveling to locations experiencing high incidence or outbreaks of these diseases.

Ebola Virus Disease

Consider vaccinating health care workers responding to Ebola virus outbreaks with the Ebola

BOX 9-02 Health care workers in extreme circumstances

Health care workers regularly provide care in a range of extreme circumstances, which can be characterized by limited or absent medical and public health infrastructure; lack of fundamental hygiene supplies (e.g., soap and water for handwashing); increased infectious disease transmission; extreme environmental conditions; and high levels of violence. In 2020, 484 attacks against aid workers were reported; 117 were killed.[1]

Because of the increased risks and consequences of severe disease or injury, adequate prevention and preparation are essential. Health problems for the health care worker can have serious implications, both for the person and for those who depend on the health care worker for provision of health care. Detailed instructions on how to prepare for travel or work in developing countries or humanitarian environments is covered in other sections, but additional key considerations for health care workers include the following:

RELIABLE COMMUNICATION EQUIPMENT, usually a satellite phone, ensuring service provider contract for duration of the mission. Consider portable solar recharging capabilities unless guaranteed a power supply, which is rare in most extreme circumstances.

EVACUATION INSURANCE AND A PLAN FOR ILL OR INJURED WORKERS. Not all deploying organizations provide evacuation insurance (see Sec. 6, Ch. 1, Travel Insurance, Travel Health Insurance & Medical Evacuation Insurance) or a detailed evacuation contingency plan. Both are critical, and the health care worker should be familiar with all details.

WORKERS' UNDERLYING HEALTH CONDITIONS. Monitor the provider's health closely, and initiate treatment early, if necessary. Any indication that a potentially serious condition is not responding to treatment should warrant rapid planning for potential medical evacuation.

WORKER PSYCHOLOGICAL STABILITY. Providers in conflict and disaster zones typically work long hours under dangerous conditions and are exposed to profound suffering. These experiences can be intensely stressful, leading to increased rates of depression, posttraumatic stress disorder, and anxiety (see Sec. 2, Ch. 12, Mental Health). Before deployment, providers should think about coping strategies and, as much as possible, stay in contact with a support network of family and friends.

CHEMICAL WARFARE AGENT ANTIDOTES. Although rare, health care workers could be exposed to chemical warfare agents while caring for patients. If exposure to these agents is a possibility, antidotes (e.g., atropine) should be immediately available.

[1]Source: Impunity must end: Attacks on health in 23 countries in conflict in 2016. Safeguarding Health in Conflict Coalition; 2017. Available from: www.safeguardinghealth.org/sites/shcc/files/SHCC2017final.pdf.

BOX 9-03 Recommended vaccinations or documented immunity for employment in health care settings abroad

Coronavirus disease 2019 (COVID-19)
Diphtheria
Hepatitis B
Influenza
Measles
Mumps
Pertussis
Rubella
Tetanus
Varicella

vaccine approved for use by the US Food and Drug Administration (FDA). For more details, see www.fda.gov/vaccines-blood-biologics/ervebo and www.cdc.gov/vhf/ebola/clinicians/vaccine.

Hepatitis B

Because hepatitis B immune globulin (HBIG) and urgent hepatitis B virus (HBV) infection testing might not be available in resource-poor or field practice settings, be certain traveling health care workers have documentation of post-vaccination antibodies to HBV. Health care workers without documented response to vaccination should receive ≥1 additional dose of hepatitis B vaccine and further serologic testing to assess response.

Hepatitis C & HIV

Pretravel baseline testing for hepatitis C virus (HCV) and HIV infection is not routinely recommended; consider performing baseline testing for people who will be working in areas with high incidence of disease where reliable testing will not be available locally in the event of an exposure.

Tuberculosis

The Centers for Disease Control and Prevention (CDC) recommends screening for latent tuberculosis infection (LTBI) with tuberculin skin test or interferon-γ release assay for US health care workers; baseline screening is particularly important for health care workers traveling to countries with greater TB transmission risk, or working in high-risk settings (e.g., health care facilities, prisons, refugee camps). For more details, see Sec. 5, Part 1, Ch. 22, Tuberculosis, and Sec. 5, Part 1, Ch. 23., . . . *perspectives*: Testing Travelers for *Mycobacterium tuberculosis* Infection.

For people without a documented history of LTBI, perform repeat testing 8–10 weeks after travel if they had known exposure to an infectious patient or worked for a prolonged period in an area with high incidence of disease or increased prevalence of multidrug resistant TB (MDR-TB). Routine vaccination of US health care workers with bacillus Calmette-Guérin (BCG) is not recommended; by contrast, some experts do advise vaccinating health care workers who will work in settings with high TB transmission risk and a high prevalence of isoniazid-resistant and rifampin-resistant strains. Currently, however, no FDA–approved BCG formulations are available in the United States.

PERSONAL PROTECTIVE EQUIPMENT

Health care workers should consistently follow standard precautions and apply other transmission-based precautions (e.g., airborne, contact, droplet) as needed; anyone untrained in infection-control practices should not participate in patient care or in activities with risk for exposure to infectious materials. For details, guidelines, and training materials on standard precautions and personal protective equipment (PPE), see www.cdc.gov/infectioncontrol/basics/index.html. PPE approved for single use only should not be reused. Health care workers should maintain strict safety standards, even if local practices are less stringent.

Aprons, gloves, gowns, surgical masks, protective eyewear, and air-purifying respirators (e.g., a National Institute for Occupational Safety and Health [NIOSH]–approved N95 filtering facepiece respirator fit-tested to the worker) might all be necessary to achieve

an adequate level of personal protection. Specialized (enhanced) PPE and infection-control techniques might be indicated for infections (e.g., avian influenza, COVID-19, Ebola virus disease, MERS) that pose a high risk to health care workers. Current disease-specific epidemiology can be found on the CDC Travelers' Health website (https://wwwnc.cdc.gov/travel).

Because equipment and facilities for airborne isolation are limited or unavailable in many countries (whenever possible, local resources should be determined in advance), health care workers should consider bringing a personal supply of PPE. This includes NIOSH-approved respirators with a ≥N95 level of protection (e.g., a reusable elastomeric half-mask respirator, a supply of disposable filtering facepiece respirators). Considering the available equipment, health care workers should be properly trained for all anticipated procedures (e.g., PPE donning and doffing, respirator fit testing, reusable respirator decontamination).

Health care workers should anticipate environmental conditions (e.g., high heat, humidity) that can make PPE, particularly high-level PPE (e.g., gowns, respirators), challenging to wear and use for extended periods. In addition, identifying situations where enhanced PPE is needed can be difficult, especially when working in locations where TB is highly prevalent and patient isolation is suboptimal.

9

INFECTION TRANSMISSION ROUTES

Airborne & Respiratory Droplet–Transmitted Infections

Although some airborne or respiratory droplet–transmitted infections (e.g., COVID-19, seasonal influenza, measles, varicella) are vaccine-preventable, others (e.g., MERS, pneumonic plague, TB) do not have routine or even available vaccines. TB infection is a particular concern for health care workers going to areas with high incidence of disease or an increased prevalence of MDR-TB (see Sec. 5, Part 1, Ch. 22, Tuberculosis).

Infections Transmitted by Blood & Body Fluids

Health care workers are at risk for infections transmitted through blood or body fluids via mucous membrane, percutaneous, or nonintact skin exposures. Bloodborne pathogens (e.g., HBV, HCV, HIV) can be transmitted through these routes. Other bodily fluid sources of infection for hepatitis viruses and HIV include amniotic fluid, cerebrospinal fluid, pericardial fluid, peritoneal fluid, pleural fluid, semen, synovial fluid, and vaginal secretions.

Other pathogens transmitted to health care workers via blood or bodily fluids include several not endemic to the United States (e.g., *Brucella* species, the bacteria that cause brucellosis; viruses like dengue and Ebola; and parasitic infections, such as malaria).

PERCUTANEOUS & DERMAL EXPOSURE

Typically, exposure to bloodborne pathogens occurs as a result of percutaneous exposure to contaminated sharps, including lancets, needles, scalpels, and broken glass from capillary or test tubes. Infection risk is increased after percutaneous exposures to larger blood volumes (e.g., deeper injuries, hollow-bore needles, procedures involving direct cannulation of an artery or vein, or visible blood on the injuring device).

Needlestick injuries are a common mode of percutaneous exposure to bloodborne pathogens; health care workers should avoid practices known to increase risk for needlestick injuries (e.g., recapping or using needles to transfer a bodily fluid between containers). Health care workers should be aware that safety-engineered medical devices and biosafety equipment (e.g., sharps containers) might not be available.

Skin exposures to potentially infectious bodily fluids are only considered a risk for bloodborne pathogen infection if skin integrity is compromised (e.g., through dermatitis, abrasion, open wounds). Higher circulating viral load in the source patient is also thought to increase transmission risk, which can be of particular concern in resource-poor settings where treatments for viral hepatitis and HIV are limited.

INFECTION RISK

Health care workers who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. Reported risk for HCV transmission after a percutaneous

exposure to HCV-infected blood or body fluid varies; recent studies report rates around 0.2%. The risk for HIV transmission is ≈0.3% after a percutaneous exposure to HIV-infected blood, and ≈0.09% after a mucous membrane exposure. Unless visibly bloody, feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus, are not considered infectious for HCV or HIV.

POSTEXPOSURE INTERVENTION

IMMEDIATE ACTIONS

Health care workers with occupational exposures to blood or body fluids should thoroughly wash the exposed area with soap and water. If mucous membrane exposure has occurred, the area should be flushed with copious amounts of water or saline.

If possible, assess both HCV and HIV infection status of the source patient; rapid HIV testing of the source patient is preferred. Exposures originating from source patients who test HIV negative are considered not to pose HIV transmission risk unless they have clinical evidence of primary HIV infection or HIV-related disease (see Sec. 5, Part 2, Ch. 11, Human Immunodeficiency Virus / HIV). HBV testing of the source patient might be indicated if the health care worker is not a documented responder to hepatitis B vaccination.

Perform baseline testing of the exposed health care worker for HCV and HIV infection immediately after exposure. In addition, if the exposed health care worker has no documented serologic response to hepatitis B vaccination, perform baseline testing for HBV infection. Seek qualified medical evaluation as soon as possible to guide decisions for postexposure prophylaxis (PEP).

POSTEXPOSURE PROPHYLAXIS

A decision to initiate PEP is based on the timing, nature, and source of the exposure. Regimen choice is affected by available drugs, the exposed person's medical history and pregnancy status, potential drug interactions, and the possibility of exposure to a drug-resistant strain. Expert consultation is important when considering PEP. When expert advice is not immediately available, contact the National Clinician Consultation Center (888-448-4911; http://nccc.ucsf.edu/clinician-consultation/pep-post-exposure-prophylaxis) for assistance in managing occupational exposures to HBV, HCV, and HIV.

HEPATITIS B

If the source patient is not confirmed to be HBV surface antigen (HBsAg) negative, begin PEP with hepatitis B immune globulin and vaccination for health care workers who do not have documented serologic response to hepatitis B vaccination or who are incompletely vaccinated against hepatitis B.

HIV

To reduce the chance of HIV transmission after percutaneous or mucous membrane exposures to potentially infectious bodily fluids from patients with known or potential HIV infection, PEP is recommended. A number of medication combinations are available for PEP (see HIV and Occupational Exposure at www.cdc.gov/hiv/workplace/healthcareworkers.html). Before travel, employers and health care workers should determine whether HIV PEP regimens are available at their practice locations; if not, they should consider bringing their own reliable supply for emergency use.

HIV PEP should be initiated as soon as possible after exposure. PEP efficacy is thought to decrease with increasing time after exposure, particularly if initiated >72 hours after exposure, and PEP can be stopped if new information changes the decision to treat. Counsel PEP recipients about drug interactions, drug toxicities, and the importance of adherence.

TESTING & COUNSELING

Postexposure testing and counseling are important follow-up measures for exposed health care workers, whether hepatitis B immune globulin or HIV PEP have been administered or not (see Box 9-04 for details).

BOX 9-04 Postexposure testing & counseling

POSTEXPOSURE TESTING

Hepatitis B virus (HBV): If the health care worker is not a documented serologic responder to hepatitis B vaccination or is incompletely vaccinated, conduct baseline and follow-up testing for HBV infection for those with known or potential HBV exposure.

- Perform a baseline test for total antibodies to HBV core antigen (HBcAg) as soon as possible after exposure.
- Perform follow-up testing for HBV surface antigen (HBsAg) and HBcAg at 6 months after exposure.

Hepatitis C virus (HCV): Conduct baseline and follow-up testing for HCV infection for those with known or potential exposure to HCV.

- Perform a baseline test for HCV antibody; if the baseline test is positive, perform an HCV RNA test.
- Perform follow-up testing for HCV RNA at 3–6 weeks after exposure.
- Test for HCV antibody at 4–6 months after exposure; if positive, perform a confirmatory RNA test.

HIV: Conduct baseline and follow-up testing for HIV infection for those with known or potential HIV exposure.

- Follow-up testing at 6 weeks, 3 months, and 6 months.
- Follow-up testing at 6 weeks and 4 months is acceptable if a 4th-generation, combination HIV p24 antigen-HIV antibody test is used.
- Extended HIV follow-up testing for ≤12 months, for people infected with HCV (after exposure to a co-infected source).

POSTEXPOSURE COUNSELING

Advise exposed health care workers to take precautions to avoid secondary transmission (e.g., abstain from sexual contact, use condoms or other barrier methods to prevent sexual transmission, avoid blood or tissue donations, and refrain from breastfeeding, if possible) especially during the first 12 weeks after exposure

Psychological counseling is essential because the emotional impact of occupational exposures can be substantial and can be exacerbated by stressors inherent to the overseas work environment.

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HUMANITARIAN AID WORKERS

Sean Kivlehan, Stephanie Kayden

Humanitarian aid workers assist people forced from their homes because of conflict or natural disasters. Assistance begins within hours after a disaster and often continues for years. Humanitarian relief deployments can last for weeks to years; the work can be rewarding and adventurous but requires preparation. During deployments, humanitarian aid workers must plan to be self-sufficient and to face unique challenges, including insecure environments and emotional stress.

Each year hundreds of thousands of professional aid workers are deployed worldwide to support people affected by disaster and conflict. Many of these efforts are coordinated by the United Nations Office for the Coordination of Humanitarian Affairs, whose appeals in 2021 identified 235 million people in 34 countries or regions in need, a number that continues to grow (Figure 9-01).

Professional aid workers often deploy with large specialist organizations (e.g., Doctors Without Borders) that have infrastructure and resources to properly support their personnel. Many more people (e.g., doctors, civic and religious groups) participate as amateur responders to international disasters. In contrast with professional aid workers, amateur responders might deploy with smaller, less prepared groups and little experience in providing humanitarian aid (Box 9-05).

UNIQUE CHALLENGES

Aid workers experience situations and specific risks (e.g., safety, security, mental health) related to providing humanitarian relief. Safety and security challenges include exposure to the conflict or disaster environment that precipitated or sustained the crisis; damaged or absent infrastructure (e.g., living accommodations, sanitation facilities); and high levels of insecurity. Mental health risks

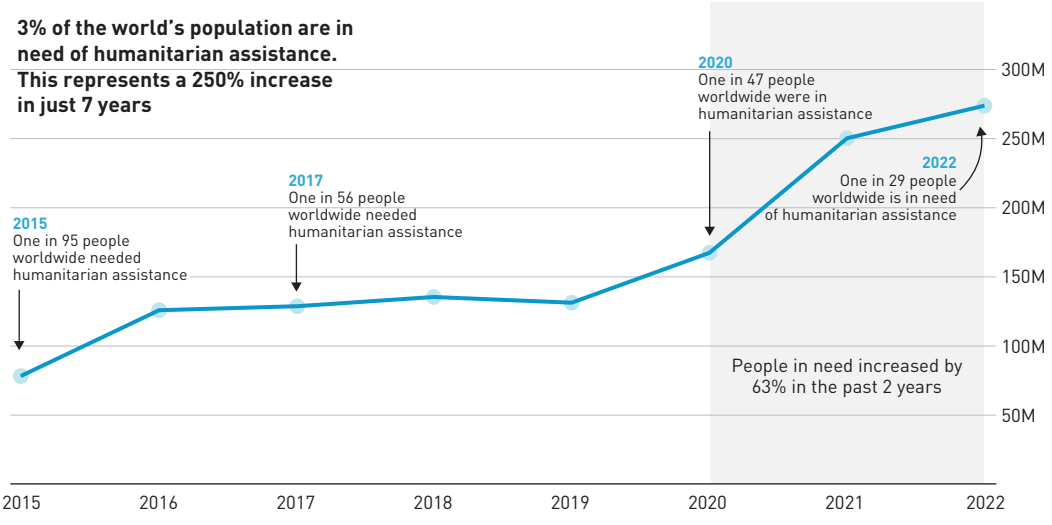

FIGURE 9-01 **Trends in the global number of people in need of humanitarian assistance (2015–2022)**

Source: Global Humanitarian Overview 2022. United Nations Office for the Coordination of Humanitarian Affairs. Inter-Agency Coordinated Appeals: Overview for 2022. Available from: https://gho.unocha.org/appeals/inter-agency-coordinated-appeals-overview-2022.

BOX 9-05 Voluntourism

Volunteer tourism (also called "voluntourism") describes tourists volunteering for a charity or development organization, usually for short periods, in low- and middle-income countries. Although largely well intentioned, the impact of short-term visits—often by volunteers lacking specific understanding of the local context and lacking requisite training or skills—is variable and might be harmful in certain settings.

Voluntourism in humanitarian emergencies can be particularly problematic given dynamic and often dangerous humanitarian environments that require professional knowledge, organizational infrastructure, and understanding of the humanitarian response coordination system. Without the necessary individual competencies and organizational support, voluntourists in these settings expose themselves to unnecessary personal risks and can create a burden on the broader humanitarian response operations.

include living in stressful environments; working long hours under adverse or extreme conditions; and challenges to reentering home life and post-deployment activities.

Humanitarian service can have an adverse effect on personal health. Studies of long-term humanitarian aid workers indicate that >35% report a deterioration in their personal health during the mission. Injuries from accidents and violence are risks for humanitarian aid workers and cause more deaths than disease or natural causes. Recent estimates place the risk for medical evacuations, hospitalizations, and violence-related deaths at ≈6 per 10,000 person-years among aid workers. Conditions and outcomes vary by location, nature of the humanitarian event, and time spent in the field. A study of American Red Cross workers reported that 10% experienced accident or injury and 16% were exposed to violence. The same study demonstrated that >40% found the experience more stressful than expected.

Safety & Security

Security risks and targeting of aid workers with kidnapping and violence continues to be a concern for the humanitarian community. Risks to staff are not uniformly distributed across the humanitarian landscape, however. Ongoing surveillance of violence directed against humanitarian aid and disaster relief workers continues to demonstrate that most of these events occur in a few insecure locations, including Afghanistan, Cameroon, Central African Republic, Democratic Republic of the Congo, Ethiopia, Mali, Nigeria, Somalia, South Sudan, and Syria.

Injuries and motor vehicle accidents are common risks for travelers, including humanitarian aid workers, throughout the world. Aid workers should be sensitive to their surroundings and carefully select the type of transportation and hour of travel, if possible (see Sec. 8, Ch. 5, Road & Traffic Safety).

In disaster and emergency situations, aid workers should be aware of physical hazards (e.g., debris, downed power lines, unstable structures, and other environmental hazards). Workers in certain conflict and post-conflict settings should be educated on improvised explosive devices, landmines, and other unexploded ordnance. Although less common, some environments might involve unusual exposures, such as radiation (e.g., after the 2011 earthquake and tsunami in Japan) or chemical agents (e.g., mustard gas and sarin used on civilians in the Syrian conflict). Humanitarian aid and disaster relief workers who will be deployed to insecure areas, including active conflict zones, should undergo specialized security briefings by the deploying agency or private sources. Reputable and free resources exist for basic security training (e.g., the United Nations BSAFE course [https://training.dss.un.org/thematicarea/category?id=6]).

In situations associated with damage or destruction to local services and facilities, humanitarian aid workers should anticipate and plan for limited accommodations and logistical and personal support. Humanitarian aid and disaster relief workers destined for low-resource areas or situations can benefit from pretravel training and counseling regarding the moral complexities of providing service in these environments.

Encourage humanitarian aid workers from the United States to enroll in the Department of State's Smart Traveler Enrollment Program (STEP, https://step.state.gov/step) to register with the US embassy in their destination country. Enrollment before departure will ensure that the local consulate is aware of their presence and can provide them with notifications, account for them, and include them in evacuation plans.

Travelers providing humanitarian assistance should review and understand medical, evacuation, and life insurance provided by their employing agency. They also should consider supplemental travel, travel health, and medical evacuation insurance to cover medical care and evacuation should they become ill or injured (see Sec. 6, Ch. 1, Travel Insurance, Travel Health Insurance & Medical Evacuation Insurance). Travelers should carefully review evacuation policies for any exclusions, such as from higher risk countries or potential exposure to certain infectious diseases (e.g., Ebola, coronavirus disease 2019 [COVID-19]).

Mental Health

Studies suggest that aid workers returning from humanitarian missions, particularly missions characterized by high or chronic stress, have increased symptoms of anxiety, depression, and posttraumatic stress disorder. People with preexisting mental health issues, including anxiety and depression, could be predisposed to worse outcomes.

Generally, humanitarian aid and disaster relief workers demonstrate considerable resilience and adapt to the stressful environments, but elevated and chronic stress can lead to deterioration in mental health and decompensation in some people. Predeployment briefings can increase an aid worker's ability to cope with highly stressful environments; data are lacking, however, on the effectiveness of postdeployment debriefings to decrease adverse mental health impacts of deployment.

A detailed evaluation of risk factors (e.g., preexisting mental illness, family history of mental illness, history of alcohol or substance use disorder) might identify previously unrecognized chronic mental health conditions. Identifying alcohol or substance dependence or underlying mental health issues (e.g., depression) is particularly important because stressful humanitarian environments frequently exacerbate these conditions, which are often the reason for emergency repatriation (see Sec. 2, Ch. 12, Mental Health, and Sec 3, Ch. 5, Substance Use & Substance Use Disorders).

PREPARATION

Careful attention to pretravel evaluation, both physical and mental health, can reduce the likelihood of illness and the need for emergency repatriation of humanitarian aid workers. Comprehensive medical and—for those planning long-term assignments—dental evaluations can prepare aid workers by identifying previously unrecognized conditions, enabling treatment before travel. Medical illness or injury among deployed staff, particularly serious conditions that require repatriation, are not only burdensome and potentially dangerous for the affected staff member, but these events redirect limited organizational resources from the intended beneficiaries.

Most of the core elements of the pretravel evaluation and counseling are discussed in detail in Sec. 2, Ch. 1, The Pretravel Consultation, and in Sec. 9, Ch. 4, Health Care Workers, Including Public Health Researchers & Medical Laboratorians. Administer routine vaccinations and prescribe malaria prophylaxis or medications to prevent altitude sickness, as appropriate. COVID-19 risk and related guidance can vary based on the individual and the destination, but the Centers for Disease Control and Prevention recommends vaccination for all travelers. Additional COVID-19 guidance is discussed in Sec. 5, Part 2, Ch. 3, COVID-19. Give guidance on food and water precautions; self-treatment for travelers' diarrhea; protection from insect bites; environmental protection from the elements including sun exposure; behavioral risk avoidance; and injury prevention. Several of these topics listed here are covered in detail in Section 2 and Section 4.

For health care workers providing medical care as part of their humanitarian activities, evaluate occupational risk and the need for preventive preexposure or postexposure interventions. Medical humanitarian aid workers responding to outbreaks of communicable diseases are

often at increased risk for exposure and infection by specific infectious pathogens, which requires meticulous attention to infection control and personal protective measure protocols. Medical workers (see Sec. 9, Ch. 4, Health Care Workers, Including Public Health Researchers & Medical Laboratorians) should ensure their organization provides adequate safety protocols and personal protective equipment (e.g., gloves, gowns, masks, eye protection).

In humanitarian emergencies, direct infrastructure damage; lack of equipment, supplies, and human resources; or a surge in medical need can all contribute to a medical facility becoming compromised or overwhelmed. Counsel volunteers with significant underlying medical conditions, who are likely to require care themselves, against travel; encourage them to support the response in other ways. Similarly, a person who is pregnant should discuss their plans with their obstetrician and should typically be advised to defer deployment.

For travelers planning to participate in animal rescue activities, share information available in Sec. 4, Ch. 9, Bringing Animals & Animal Products into the United States, and discuss rabies preexposure prophylaxis (see Sec. 5, Part 2, Ch. 18, Rabies).

Travel Health Kits

In general, because aid workers will need a more comprehensive travel health kit than the typical traveler (Sec. 2, Ch. 10, Travel Health Kits), they should consult with their deploying organization to determine how extensively to tailor their packed supplies. For example, health care workers deployed by a medical organization will usually be able to access basic pharmacologic and other medical supplies for acute care treatment from the organization and should be familiar with basic first aid to self-treat any injury until they can obtain medical attention.

Conversely, people with chronic medical conditions requiring treatment should ensure they travel with prescriptions and medications sufficient for the duration of their service. They also should consider bringing along treatment for exacerbations of diseases or conditions they might not usually experience (e.g., asthma, back pain). Because not all pharmaceuticals are globally available, travelers on extended deployments should review safe alternatives to their regular medication (see Sec. 6, Ch. 3, . . . *perspectives*: Avoiding Poorly Regulated Medicines & Medical Products During Travel). Aid workers should store medications in 2 separate allotments in case of loss or theft. Sec. 2, Ch. 10, Travel Health Kits, provides additional information on preparing, storing, and traveling with medications.

People with dental crowns or bridgework should consider taking temporary dental adhesive for short-term management of a dislodged dental appliance. In addition to a basic travel health kit, humanitarian aid workers should consider bringing the items listed in Box 9-06.

BOX 9-06 International humanitarian aid travel health kit checklist: additional items

- ☐ Cash (new or crisp bills can often be exchanged at better rates)
- ☐ Contact lenses, prescription glasses (extra pairs, if applicable)
- ☐ Gloves (leather gloves if physical labor will be performed)
- ☐ Headlamp and spare batteries
- ☐ Insect repellent
- ☐ Insecticide-impregnated mosquito net (if traveling to areas endemic for insect-borne diseases)
- ☐ Long pants, shirts that cover the shoulders
- ☐ Menstrual supplies
- ☐ Mobile telephone, equipped to work internationally (or preferably unlocked)
- ☐ Money belt
- ☐ Safety goggles
- ☐ Sewing kit
- ☐ Sturdy work boots (particularly in disaster or rudimentary settings)
- ☐ Sunglasses
- ☐ Sunscreen

Personal Items

Loss of life, serious injuries, missing and separated families, and destruction of communities are often associated with humanitarian emergencies; aid workers should recognize they are likely to encounter stressful situations as part of their work. Keeping a personal item nearby (e.g., a family photo, favorite music, religious or spiritual material) can offer comfort. Communicating with family members and close friends from time to time can be an important means of support.

Access to mobile phones and internet services are frequent challenges in humanitarian emergencies. Global mobile coverage continues to improve, however, and free applications (e.g., WhatsApp) have expanded accessibility. For more remote regions, satellite telephones are an option, although some government authorities might prohibit or limit their importation and use, particularly in conflict zones. Before travel, aid workers should clarify any restrictions to telephone, internet, or satellite technology in the destination country.

Documents

Aid workers should carry extra passport-style photos, which might be required for certain types of security passes, visas, and work permits. Travelers should bring photocopies of documents (e.g., credit cards, passports) and copies of their medical, nursing, or other professional licenses, if applicable.

Aid workers also should have medical information (e.g., blood type, immunization records), available. Travelers should carry physical copies of all these documents, leave copies with their main contact at home, scan and email copies to their smartphones (if appropriate), and ensure the documents are securely stored and available in a cloud storage service. In addition, aid workers should carry information for their emergency contacts written on paper, and not rely exclusively on an electronic device.

POSTTRAVEL

Returning humanitarian aid and disaster relief workers should seek medical care if they sustained injuries during their travel or become ill after returning home. To ensure a thorough assessment, returning aid workers should advise their providers of the nature and location of their recent travel. Depending on the duration and nature of the deployment, including if they were providing direct medical care, returning aid workers might benefit from a comprehensive medical review. Educate workers involved in responding to infectious disease outbreaks on posttravel illness monitoring recommendations or requirements, if applicable.

Homecoming can be psychologically challenging, and aid workers should seek treatment or counseling if they have concerns about transitioning to postdeployment life. Consider referring workers who witnessed or were involved in mass casualties, deaths, or serious injuries or who have been victims of violence (e.g., assault, kidnapping, serious road traffic crash) for critical incident counseling. Educate returning aid workers that the onset of adverse psychological effects after exposure to traumatic experiences can be delayed, sometimes by several months or longer.

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UNITED STATES MILITARY DEPLOYMENTS

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In 2021, ≈1.4 million Americans served on active duty in the military, and approximately 800,000 were in the reserve forces. The United States Armed Forces follow most of the recommendations in the Centers for Disease Control and Prevention (CDC) Yellow Book as a matter of policy. Certain situations apply only to military personnel, however, and some policies or recommendations differ from what is recommended for civilian travel in this text.

Military physicians generally manage military-unique aspects of medical care for service members, but civilian physicians might interact with people on reserve status, on leave from duty, recently discharged from active duty, or veterans. Less commonly, active-duty service members not stationed near military hospitals or clinics must use civilian physicians for their care. Deployments can vary depending on the service branch, so understanding the type of deployment or work travel the service member participated in is essential because not all deployments or work travel are alike.

FORCE HEALTH PROTECTION

Force health protection (FHP) is an important concept in military medicine. FHP is defined as all measures taken by commanders, supervisors, individual service members, and the Military Health System to conserve, improve, promote, protect, and restore the mental and physical well-being of service members across the range of military activities and operations. Delivery of vaccines, use of malaria chemoprophylaxis agents, and mental health screening are examples of the many measures employed under the umbrella of FHP and are likely the most common scenarios that civilian providers will encounter. Medical and mental health screenings, both pre- and postdeployment, also support FHP to identify, track, and treat concerns.

Medical interventions for FHP are the responsibility of the unit commander, with advice from the unit medical officer. When predeployment vaccines or malaria chemoprophylaxis are indicated, the commander includes such requirements in the mission plan. Service members are then required to receive these interventions under proper medical supervision. If a particular vaccine or drug is medically contraindicated, alternative agents might be used if available. The unit medical officer documents which military personnel have not received standard preventive measures so these people can receive additional monitoring or treatment if they become ill.

FHP policy positions in the Department of Defense (DoD) are issued as directives and instructions. All directives and instructions can be found online at www.esd.whs.mil/dd. The Policy and Program for the Department of Defense Immunization Program is found in directive 6205.02 (July 23, 2019) at www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/620502p.pdf?ver=2019-07-23-085404-617.

Although policy is made at higher levels in Washington, DC, the final decision to use vaccines or malaria chemoprophylaxis under FHP is made by commanders in the field, guided by their medical staff. In certain circumstances, individual service members might be exempt from vaccination. The 2 types of exemptions from immunization are administrative and medical. Granting administrative exemptions is a nonmedical function, usually controlled by the unit commander with input from other sources (e.g., religious counsel). Granting medical exemptions is a medical function that can be validated only by a health care professional.

IMMUNIZATIONS

DoD policy states that the recommendations for immunization from CDC and the Advisory Committee on Immunization Practices generally

shall be followed, consistent with requirements and guidance developed by the US Food and Drug Administration (FDA) and with consideration for the unique needs of military settings and exposure risks. Specific assignment-dependent vaccines given prior to deployment are summarized at the Military Health System website (https://health.mil/Military-Health-Topics/Health-Readiness/Immunization-Healthcare/Vaccine-Recommendations/Vaccine-Recommendations-by-AOR).

The Defense Health Agency (DHA) Immunization Healthcare Branch (IHB) enhances military medical readiness by coordinating DoD vaccination programs worldwide. A valuable source of service-specific information on immunizations for all branches of the United States Armed Forces is available on the DHA IHB website (www.health.mil/vaccines).

MALARIA PROPHYLAXIS

Preventing malaria in military units deployed to endemic areas is essential. Medical commanders must designate trained staff to provide comprehensive malaria prevention counseling to military and civilian personnel considered at risk of contracting malaria.

Several features of malaria prophylaxis are specific to the US military because of the unique activities and stressors of military deployments. When antimalarial drugs are used, the military can only use FDA-approved agents in accordance with the specific FDA-approved indications for population-based approaches. If off-label use is felt to be in the best interest of the person or unit, trained and knowledgeable clinicians must provide one-on-one medical evaluations, document in the medical record the rationale for such use, and provide a prescription for the drug or vaccine to each service member.

Primary Prophylaxis

Atovaquone-proguanil (Malarone) is the recommended malaria prophylaxis option for all personnel for both short- and long-term deployments in high-transmission areas of Africa. For practical purposes, this includes most of sub-Saharan Africa. For people unable to receive atovaquone-proguanil because of intolerance or contraindication, doxycycline is the preferred second-line therapy.

Use of mefloquine prophylaxis is a third-line recommendation for those unable to receive either atovaquone-proguanil or doxycycline. Before prescribing mefloquine for prophylaxis, consider the absolute and relative contraindications as described in the approved product label.

Atovaquone-proguanil and doxycycline are both first-line choices in areas other than sub-Saharan Africa. Reserve the use of mefloquine for people with intolerance or contraindications to first-line medications.

Although primaquine is included as an acceptable alternative by CDC for primary prophylaxis in some countries where the risk for malaria is exclusively or mostly due to *Plasmodium vivax*, primaquine is not FDA-approved for primary prophylaxis. Because use of primaquine for primary prophylaxis constitutes off-label use, it cannot be prescribed for a deploying group. It can, however, be prescribed by a licensed medical provider on an individual basis as part of medical practice.

Terminal Prophylaxis (Presumptive Antirelapse Therapy)

PRIMAQUINE

To prevent the late relapse of *P. vivax* or *P. ovale* malaria in returning military populations, the United States Armed Forces routinely use primaquine for terminal prophylaxis (also referred to as presumptive antirelapse therapy [PART]). As a matter of policy, primaquine is given to otherwise healthy people on their departure from an endemic area. Primaquine is used for this indication much more frequently in the military than in most civilian travelers. For more information on terminal prophylaxis, see Sec. 5, Part 3, Ch. 16, Malaria.

DOSING

The FDA-approved regimen for terminal prophylaxis is 15 mg (base) given daily for 14 days. In 2003, CDC recommended 30 mg (base) of primaquine daily for 14 days for terminal prophylaxis based on available evidence, but the FDA-approved regimen remains the lower dose. Adherence to the daily 14-day regimen is poor unless primaquine is given under

directly observed therapy, which is rarely done. As a result of noncompliance and subtherapeutic dosing with the 15-mg/day regimen, periodic outbreaks of relapsed *P. vivax* malaria continue to occur in returning military personnel. Use of the higher-dose primaquine regimen for terminal prophylaxis is now recommended for military personnel.

TIMING

A recurrent issue for military medicine is the correct timing of primaquine when given as terminal prophylaxis in conjunction with the standard prescribed primary prophylaxis. Primaquine can be given at any time after personnel leave an endemic area. For convenience and for enhancing adherence to the 14-day regimen, it is often best for military units to prescribe primaquine in the immediate 2 weeks after return. During this time, units are often still at their home base completing in-processing before "block leave." Once personnel depart on leave, adherence and monitoring for side effects becomes more challenging, and civilian physicians might encounter service members who were prescribed terminal prophylaxis.

HEMOLYTIC ANEMIA

The most crucial risk of primaquine use is the potential for hemolytic anemia in people who are glucose-6-phosphate-dehydrogenase (G6PD)–deficient. Current policy is for all US military personnel to be screened for G6PD deficiency on entry into military service. Some (e.g., reservists) might have deployed without testing, however, or clinicians might not be able to confirm results for all people in a unit requiring terminal prophylaxis. Hemolytic reactions to primaquine can occur in people with an unrecognized G6PD deficiency.

TAFENOQUINE

In 2018, the FDA approved tafenoquine for malaria prophylaxis and treatment, including terminal prophylaxis for *P. vivax* and *P. ovale* malaria. As with primaquine, the most important risk of tafenoquine is hemolytic anemia in people who are G6PD-deficient. As of 2019, tafenoquine is considered a second-line drug for both chemoprophylaxis of chloroquine-resistant malaria and terminal prophylaxis in military populations. This guidance for tafenoquine use in members of the US military differs from recommendations for use in civilian populations; see Sec. 5, Part 3, Ch. 16, Malaria, for CDC guidance regarding civilian use of tafenoquine.

UNIQUE MILITARY NEEDS

US military personnel can encounter threats (e.g., biological warfare agents) that are not usually considered for civilian travelers. Drug prophylaxis, drug treatment, immunoglobulins, and vaccines can be given only in accordance with FDA-licensed products and regimens and for FDA-approved indications. Products not approved by the FDA are given to service members only with voluntary informed consent under an institutional review board–approved protocol and in accordance with a current and FDA-approved investigational new drug application.

Only under exceptional circumstances would products not approved by the FDA be given to military personnel without their informed consent. The FDA Commissioner can authorize the use of an unapproved medical product or an unapproved use of an approved medical product during a declared emergency involving a heightened risk of attack on the public or US military forces or when national security could be affected.

RETURNING SERVICE MEMBERS WITH HEALTH CONCERNS

Although symptoms and health concerns after a deployment can be similar to health issues reported from nonmilitary returning travelers, deployments present a different set of circumstances for service members than does civilian travel. These circumstances include differential vaccination recommendations, physical and psychological impact from deployment experiences, environmental exposures, and infections that create distinct health concerns. Civilian providers can help members of the United States Armed Forces access medical services, but providers should reference service-specific standards to help ensure that the treatments and medications they offer are appropriate.

The authors of this chapter are all uniformed service members of the United States Government (USG). The views expressed in this section are those of the authors and do not necessarily reflect the official policy or position of any USG Department.

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LONG-TERM TRAVELERS & EXPATRIATES

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The risk for illness or injury increases with duration of travel, so travelers planning long-term (commonly considered ≥6 months) visits to low- or middle-income countries require special consideration regardless of whether they are expatriates with definite plans or adventurers with open itineraries. Points to discuss in the pretravel consultation include accessing routine and emergency care at the destination, vaccines, infectious diseases not prevented by vaccines, injury prevention, and cultural and mental health issues that long-term travelers might encounter.

ACCESSING CARE ABROAD

Before departure, all long-term travelers should undergo complete medical and dental examinations. For expatriates, a mental health evaluation prior to travel could identify and help address underlying issues that often cause early repatriation. Travelers should anticipate that they will need care at some point during their stay and plan where they will obtain it and how they will pay for it.

People traveling for work or with an organization (e.g., a nongovernmental organization, Peace Corps, a university) might have a predetermined source for care; some might access advice from the international expatriate community. By contrast, other travelers should identify a health care source in advance (see Sec. 6, Ch. 2, Obtaining Health Care Abroad). Long-term travelers also should determine whether they will need supplemental travel health insurance and evacuation insurance (see Sec. 6, Ch. 1, Travel Insurance, Travel Health Insurance & Medical Evacuation Insurance).

In some countries, travelers are likely to encounter medications of poor quality that are substandard, falsified, counterfeit, or expired. Because the pills and packaging could be nearly indistinguishable from their legitimate counterparts, travelers should bring a sufficient supply of their routine medications (e.g., antihypertensive or antihyperlipidemic drugs) from the United States (see Sec. 6, Ch. 3, . . . *perspectives*: Avoiding Poorly Regulated Medicines & Medical Products During Travel).

Controlled substances and certain over-the-counter and commonly prescribed medications are illegal to bring into some countries. The International Society of Travel Medicine Pharmacist Professional Group offers the Database on International Regulations on Importation of Medicines for Personal Use (Table 9-02). The International Narcotic Control Board website includes guidelines provided by

Table 9-02 Importing medications for personal use

INFORMATION SOURCE	RESOURCE	AVAILABLE FROM
International Society of Travel Medicine (ISTM) Pharmacist Professional Group	ISTM Pharmacist Professional Group Database on International Regulations on Importation of Medicines for Personal Use	www.istm.org/pharmacistgroup
International Narcotics Control Board (INCB)	Country Regulations for Travelers Carrying Medicines Containing Controlled Substances	www.incb.org/incb/en/travellers/country-regulations.html
	General Information for Travelers Carrying Medicines Containing Controlled Substances	www.incb.org/incb/en/travellers/general-information.html
	Travelling Internationally with Medicines Containing Controlled Substances	www.incb.org/incb/en/travellers/index.html

each country and is a good reference for travelers looking for information about whether they can legally import their medications to their destinations (Table 9-02).

Options for obtaining sufficient medications include requesting an override from the insurance company to dispense the entire quantity of medication; paying out-of-pocket for the full amount of medication needed and then submitting to the insurance company for reimbursement; refilling prescriptions during trips home; or relying on visiting friends or family members to bring refilled medication supplies.

VACCINES

Long-term travelers should be aware of any vaccine requirements for entry, employment, or schooling at their destination. Update routine vaccines, including influenza vaccine, before travelers depart, and consider disease risk in surrounding areas because long-term travelers are likely to travel locally. A short-term traveler to Seoul, for example, would not be considered at risk for Japanese encephalitis (JE), but expatriates living in Seoul might have opportunities to visit the Korean countryside or other areas in Asia where they could be exposed to the JE virus. Similarly, consider yellow fever vaccination even if the posting location is not in an endemic area, because the traveler might journey to endemic areas while living abroad.

Hepatitis A & Typhoid Fever

Given the cumulative risk for hepatitis A and typhoid fever infection among long-term travelers, vaccination against these two diseases is appropriate (see Sec. 5, Part 2, Ch. 7, Hepatitis A, and Sec. 5, Part 1, Ch. 24, Typhoid & Paratyphoid Fever). Neither of the US Food and Drug Administration (FDA)–approved typhoid vaccines, however, effectively prevents infection in all recipients; the injectable (ViCPS) and the oral (Ty21a) vaccine are each estimated to protect ≈50%–80% of recipients from infection. Thus, travelers who receive these vaccines should still adhere to safe food and water precautions (see Sec. 2, Ch. 8, Food & Water Precautions). Moreover, duration of protection afforded by each vaccine is limited; a repeat dose of ViCPS is recommended every 2 years for travelers at continued risk of infection. For Ty21a recipients, a booster is recommended every 5 years.

Hepatitis B

Travel-associated hepatitis B infections are rare, but the risk for travelers might be greater than for nontravelers, especially for long-term travelers and expatriates, so consider hepatitis B vaccine for this population (see Sec. 5, Part 2, Ch. 8, Hepatitis B).

Japanese Encephalitis

Infection with JE virus is associated with longer stays in endemic areas. JE vaccine is recommended for travelers who plan longer stays or residence in endemic areas, travelers anticipating outdoor activities in endemic areas after dusk, and travelers who are uncertain of specific destinations or activities (see Sec. 5, Part 2, Ch. 13, Japanese Encephalitis).

Meningococcal

Meningococcal disease is more likely in travelers with prolonged exposure to local populations in endemic or epidemic areas; consider quadrivalent conjugate vaccine for at-risk travelers (see Sec. 5, Part 1, Ch. 13, Meningococcal Disease)

Rabies

Rabies preexposure prophylaxis is an important consideration for people spending prolonged time in endemic countries, especially in places where rabies immune globulin is not available, which is true of many low- and middle-income countries (see www.cdc.gov/rabies/resources/countries-risk.html). Prioritize vaccination for children who will be living in high-risk areas (see Sec. 5, Part 2, Ch. 18, Rabies, and Sec. 5, Part 2, Ch. 19, . . . *perspectives*: Rabies Immunization).

Yellow Fever

Yellow fever vaccination might be required by some countries or recommended for endemic areas (see Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country, and Sec. 5, Part 2, Ch. 26, Yellow Fever). For instance, numerous unvaccinated Chinese expatriates became ill with yellow fever while working in Angola during the outbreak there in 2016, illustrating the importance of yellow fever vaccination for people who will be living or working in endemic areas.

INFECTIOUS DISEASES NOT PREVENTED BY VACCINES

Dengue & Other Arboviral Diseases

Dengue seroconversion among long-term travelers from the Netherlands with median travel duration of 20 weeks found an attack rate of 6.5% or incidence rate of 13.9 per 1,000 person-months travel in endemic areas. Other mosquito-borne viral illnesses (e.g., chikungunya, Zika), also pose potential risk. Advise long-term travelers and expatriates to protect themselves from mosquito vectors (see Sec. 4, Ch. 6, Mosquitoes, Ticks & Other Arthropods); most travelers are not candidates to receive dengue vaccine (for details, see Sec. 5, Part 2, Ch. 4, Dengue). Section 5 also provides disease-specific information on chikungunya and Zika virus infections.

Hepatitis C & Hepatitis E

Transfusion is a potential source of hepatitis C virus infection in expatriates. Hepatitis E virus is spread by the fecal–oral route; the risk for infection is greatest in Asia, although it has been transmitted in many different tropical locations. Pregnant people are at greatest risk for fulminant disease from hepatitis E. For more information on these infections, see the relevant chapters in Section 5.

HIV & Sexually Transmitted Infections

Travelers and expatriates are at increased risk for HIV and sexually transmitted infections (STIs), and the consistency of condom use among expatriates is low (see Sec. 9, Ch. 12, Sex & Travel). Educate long-term travelers about the risk for HIV and STIs at their destination, as well as preventive measures. Consider the potential for occupational exposure to HIV among health care workers, and during the pretravel consultation include discussions of postexposure prophylaxis with antiretroviral therapy and risk avoidance (see Sec. 5, Part 2, Ch. 11, Human Immunodeficiency Virus / HIV, and Sec. 9, Ch. 4, Health Care Workers, Including Public Health Researchers & Medical Laboratorians).

Malaria

For long-term travelers, emphasize the importance of adjuncts to prophylaxis (see Sec. 4, Ch. 6, Mosquitoes, Ticks & Other Arthropods). Even when urged to adhere to personal protective measures and reassured that long-term prophylaxis is safe and effective, traveler adherence likely will decline over time. Consequently, the pretravel