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CDC

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To produce a book subtitled "Health Information for International Travel" during an ongoing pandemic takes the right mix of folly, optimism, pluck, and prescience. And who could have predicted that just 2 weeks after delivering our draft to the publisher, the first cases of monkeypox heralding an international outbreak would be diagnosed? Using a travel analogy, putting together CDC Yellow Book 2024 has been a bit like running along the platform and jumping to catch a moving train. After scrapping our plans for CDC Yellow Book 2022 (the release of which had been slated to coincide with the May 2021 Conference of the International Society of Travel Medicine meeting) we rededicated ourselves to publishing this current edition. Written, reviewed, and edited by clinicians and public health professionals over 12 months (roughly April 2021–April 2022), this book reflects not only their generosity but also their steadfast commitment to the philosophy behind this ongoing project.

To all who participated, the editorial team would like to express its sincerest thanks. We would also like to extend our gratitude to Drs. Elise Beltrami and Nicole Cohen for their meticulous reading of the entire volume. They, too, completed their thorough reviews while juggling multiple pandemic-related responsibilities. Their combined breadth and depth of knowledge, keen eye for detail, and artful knack for inserting well-placed, insightful comments significantly improved the manuscript.

The CDC Yellow Book 2024 editorial team would also like to recognize the following authors for their past contributions to the listed chapters in CDC Yellow Book 2020:

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Henry Baggett (Burma [Myanmar])
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Alan Czarkowski (Health Care Workers, Including Public Health Researchers & Medical Laboratorians)
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John Henderson (Burma [Myanmar])
Ronnie Henry (Jet Lag)
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Preface

This edition of the CDC Yellow Book continues a longstanding tradition of providing guidance for the practice of travel medicine. It also serves as a source of US government recommendations for immunizations and prophylaxis for international travel. The goal for this edition, as for previous editions, is to serve as a comprehensive resource for clinicians looking for answers to travel health–related questions. We believe you will find CDC Yellow Book 2024 lives up to the high standards set by its predecessors.

The COVID-19 pandemic interrupted the writing, editing, and publishing of the CDC Yellow Book, delaying the normal biennial production cycle by 2 years. COVID-19 has also created authorship and editorial challenges due to the frequently changing guidance around management, prevention, and treatment of this disease. With the understanding that the science and epidemiology of this disease will continue to evolve, we have endeavored to provide the most "evergreen" COVID-19 information available; for the most up-to-date details on COVID-19, we encourage you to visit the CDC website.

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Dedication

Ronnie Henry (1973–2020)

With this edition of the CDC Yellow Book, we say goodbye to several friends. Martin "Marty" Cetron, who directed the Division of Global Migration and Quarantine (DGMQ) in the National Center for Emerging and Zoonotic Infectious Diseases at CDC since 1996, will retire from the Agency in spring 2023. Over the course of his distinguished career, Marty advanced the practice of global health, mentoring numerous leaders in the field of travel medicine along the way. A list of his accomplishments could easily fill their own volume and his ongoing support of the CDC Yellow Book over the years has helped ensure that this reference remains the respected resource it is. Thank you, Marty, for all you have done. With deep appreciation, we wish you fair winds and Godspeed.

We also are saying goodbye to three physician colleagues and longtime CDC Yellow Book contributors who passed away since we last published: Jay Keystone (September 2019), William Bunn (January 2021), and Karl Neumann (February 2021). We will miss them and their teaching. Their legacy endures, however, and the clinicians and public health professionals who contributed to this edition in their stead, stand on their shoulders.

And last, we remember Ronnie Henry, a dearly loved son, brother, and friend. Ronnie, who began working in medical writing, editing, and publishing in 1996, had experience in a wide range of subjects, including infectious and chronic disease, epidemiology, microbiology, pharmacology, and clinical research. He came to CDC in 2003 as an editor for *Emerging Infectious Diseases*, spent a year in Beijing teaching

medical writing and publishing to Chinese researchers, and then worked as an editor for *Preventing Chronic Disease*. Ronnie joined the Travelers' Health Branch in June 2010, as a health communication specialist. He quickly became an encyclopedia of travel health information and served as technical editor for five editions of CDC Yellow Book.

Ronnie helped shape CDC's messaging around healthy international travel for over 10 years, and supported multiple emergency response efforts including Ebola, Zika, and COVID-19. An extraordinary teacher, he influenced authors throughout the agency. He continued writing "Etymologia" features for *Emerging Infections Diseases* long after he left the journal's staff, expanding readers' knowledge with his explanations of the origins of medical and scientific terms. Ronnie had the rare ability to write equally well for scientific and lay audiences. He was also the driving force behind the development of the "Can I Eat This?" app, which delivered accurate and actionable food and water recommendations for international travelers with a dose of Ronnie's trademark humor. The app appeared as an answer to a question on *Jeopardy*, which he claimed as a crowning achievement in his career.

Ronnie traveled the world with his closest friends, exploring the continents of North and South America, Europe, and Asia. He regaled colleagues with tales of his adventures abroad, including the time he ate the entire head of a large fish thinking it was customary to do so in Japan. The shocked expression of the chef and other diners told him otherwise, just a moment too late. Outwardly, Ronnie was a colorful character with many striking qualities that all who met him knew and loved: his ever-changing hair color; his passion for trivia games; his amazing cooking, fermenting, baking, and ice cream–making skills; improv comedy; his fondness for cats and cat memes; his wry wit, astonishing intellect, and eloquence; and the pleasure he took in sharing a well-made meal with good friends. Ronnie was a mainstay in DGMQ and a light to everyone who knew him. At the time of his death (May 2020), Ronnie left behind many friends across CDC, and it is to his memory that this edition of the CDC Yellow Book is dedicated.

1 Introduction

DISEASE PATTERNS IN TRAVELERS

Allison Walker, Regina LaRocque

Travelers are an important population because of their mobility, their potential for exposure to infectious diseases outside their home country, and the possibility that they could bring those diseases from one country to another. The coronavirus disease 2019 (COVID-19) pandemic is the most recent example of the role travelers can play in the global spread of infectious diseases. Ebola virus, Zika virus, and antimicrobial-resistant pathogens are other examples of health threats whose geographic distribution has been facilitated by international travelers over the past several years. Travelers consequently should be included in general and targeted epidemiologic surveillance—including the use of molecular genomic approaches—to better understand both the exposure risk and impact of current and novel prevention recommendations.

The ability to provide appropriate pretravel guidance—and, when necessary, optimal post-travel evaluation and treatment—is predicated on understanding the epidemiologic features (disease patterns) among different traveling populations. Accounting for behaviors that can influence and potentially increase risk for travel-associated infections and diseases (e.g., attendance at a mass gathering, long-term or adventure travel, visiting friends and family) helps the astute clinician make directed travel health recommendations and focus their attention on the more likely diagnoses from among the lengthy list of travel-associated infections and diseases. An understanding of the epidemiology of the diseases themselves, including modes of transmission, incubation periods, signs and symptoms, duration of infectiousness, and accuracy of diagnostic testing, is also crucial. Including international travelers in epidemiologic surveillance provides additional information about the presence, frequency, seasonality, and geographic distribution of diseases, which might shift over time due to outbreaks, changes in climate and vector habitat, emergence or reemergence in new areas or populations, successful public health interventions, or other factors.

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The risk for travel-related infection can, however, be difficult to ascertain precisely for several reasons. Existing information regarding disease risk for travelers is limited because of the difficulty in obtaining accurate numerators (i.e., number of cases of infection among travelers) and denominators (i.e., number of overall travelers or number of travelers to a specific destination who are susceptible to infection). In cases of mild illness, travelers might never seek health care, or clinicians might not perform diagnostic tests to identify the cause. Travelers often visit multiple destinations, complicating identification of the location of exposure. Data on disease incidence in local populations might be available, but the relevance of such data to travelers—who have different risk behaviors, eating habits, accommodations, knowledge of and access to preventive measures, and activities—might be limited. In addition, epidemiologic investigations involving travelers use various methodologic designs, each with their own strengths and weaknesses, making findings difficult to compare or combine. Many single-clinic or single-destination investigations draw conclusions that might not be generalizable to travelers from different local, national, or cultural backgrounds.

Two existing networks provide epidemiologic data on international travelers from the United States and acquisition of travel-related illness. The GeoSentinel Global Surveillance Network is a worldwide data collection and communication network composed of International Society of Travel Medicine–associated travel and tropical medicine clinics that collect posttravel illness surveillance data. GeoSentinel scientists analyze these data to describe travel-related illness in specific populations of travelers.

Global TravEpiNet (GTEN) is a consortium of health clinics across the United States that deliver pretravel health consultations. Data from GTEN provide a snapshot of travelers seeking pretravel health care, and longitudinal cohort data on risk for and acquisition of travel-associated conditions, including for a subset of travelers who self-collect biological samples for microbiologic and genomic testing.

These travel medicine networks, and travel medicine researchers, increasingly are implementing next-generation sequencing tools to delineate the epidemiology of travel-associated infections and the role of travelers in the global spread of infectious diseases. Advances in the field of genomic sequencing enable high-resolution surveillance that can identify previously unrecognized geographic and epidemiologic associations. These molecular tools are becoming essential to understanding the spread of disease, the emergence of new pathogens or variants of existing ones, and the evolution of antimicrobial resistance. Combining these molecular techniques with traditional surveillance, epidemiologic approaches, and community-based participatory research represents a promising approach to expanding the evidence base underpinning the guidance and recommendations in the field of travel medicine. A broader evidence base will enable better-informed pretravel preparation for the individual traveler, and development of new approaches to mitigating the impact of travel on the global spread of disease.

RESOURCES

HealthMap (https://healthmap.org/en) uses online informal sources and real-time surveillance to provide information on emerging public health threats for diverse audiences.

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1

WHY GUIDELINES DIFFER

David Shlim

Numerous international, national, and professional organizations publish guidelines and recommendations for travelers; CDC's Yellow Book is but one example. Travel health providers should be aware of these recommendations, even though they might not follow them in every instance. Through awareness, travel health providers can explain to their patients how their recommendations, and their patients' choices, might be discrepant with what others recommend. It can be unsettling for patients to receive travel medicine advice, vaccines, or an antimalarial drug prescription from a provider, only to find that the advice and prescriptions are contradicted by what other professionals, friends, or destination-country nationals have to say. The skillful travel health provider will be able to help the traveler reconcile seemingly conflicting advice, and travelers will be reassured when providers explain why these differences exist.

HOW GUIDELINES ARE CREATED

In the United States, the Food and Drug Administration (FDA) approves standards for how to use a vaccine or medication, including dosages, ages for which the product is approved, and booster recommendations. Guidance about when to use a product can come from a separate body (e.g., the Advisory Committee on Immunization Practices [ACIP]). To give ACIP the best possible information on which to base their recommendations, working groups of experts hold meetings to review the literature and new studies.

International bodies (e.g., the World Health Organization [WHO]), national committees of other countries, and medical organizations (e.g., the International Society of Travel Medicine and the Infectious Diseases Society of America), also promote their own guidance. Other professional organizations might create consensus clinical practice guidelines based on published medical literature and expert opinion. Travel medicine–specific paid subscription services employ travel medicine experts to organize and present guidelines for health care providers who see international travelers in their practice but who might lack expertise in the subject. Guidance about vaccinations and malaria prophylaxis developed by these organizations and subscription services can differ from CDC advice. Reasons for this are varied and include differences in product availability, licensure standards, cultural perceptions of risk, and opinions among experts, as well as lack of definitive evidence.

Availability of Products

Travel health providers can only use the products available to them. Availability is determined by the regulatory approval status of the product and, to a lesser extent, the marketing and distribution plan of the manufacturer. Regulatory approval processes vary greatly by country. For example, registering a new vaccine or antimalarial drug in the United States is a costly and rigorous process. If the market in a particular country is insufficient to justify the expense of registration, a commercial company might not seek it.

Licensure Standards

Licensure standards also vary. What might be sufficient for one regulatory authority might not

suffice for another. For example, primaquine, an option for malaria prophylaxis in the United States, is not registered or commercially available in Switzerland. Atovaquone-proguanil also was available for malaria prophylaxis in the United States before many other countries. In another example, 4 Japanese encephalitis vaccines are available in the world, but only 1 is licensed in the United States.

Differences in Data Interpretation

Even when the same products are available, recommendations for use might not be the same in all countries. The injectable Ty21a typhoid vaccine and the oral typhoid vaccine are examples. In the United States, a booster of the injectable Ty21a vaccine is recommended after 2 years, but in most European countries, a booster is recommended after 3 years. In the United States, health providers dispense a packet of 4 oral typhoid vaccine capsules, whereas in Europe, 3 doses are considered adequate. The regulatory agencies might have reviewed the same data and drawn different conclusions, or they might have reviewed different data at separate times. Regulatory submissions to various agencies rarely occur at the same time. Therefore, for legitimate reasons, the data available for review by each agency might not be the same.

Perception of Risk

People from varying backgrounds can view the same risk data and come to very different conclusions regarding the costs and benefits of minimizing risk to what they consider to be an acceptable level. For example, recommendations to prevent malaria during travel to India vary widely. Germany does not recommend using malaria prophylaxis for any travel to an Indian destination; standby emergency treatment or self-treatment are the only recommendations for identified risk destinations. Guidelines from the United Kingdom recommend only awareness and mosquito bite prevention for more than half the Indian subcontinent, including large cities and popular tourist destinations in the north and south, but suggest prophylaxis consideration for some travelers or for those visiting higher-risk areas. By contrast, CDC recommends malaria prophylaxis for all travelers to any Indian destination, except for some mountainous areas of northern states.

THE IMPACT OF ADVICE

The real question is not just which recommendations each country should adopt, but the possible impact of that advice. Because we do not usually have detailed data on the exact risk to travelers for different vaccine-preventable diseases at a given destination, immunization guidance and recommendations often are based on serologic studies or on the original studies, most often performed in local people, that led to licensing. For example, as noted above, most European countries recommend a booster for the injectable Ty21a typhoid vaccine after 3 years, whereas the United States recommends a booster at 2 years. This difference is based on the perception of falling antibody levels over time, and a decision about where the line of protection against disease falls. Both standards have been in effect for many years, but no current available evidence would lead someone to conclude that one regimen has had a different impact than the other.

An extensive literature review, conducted by the Canadian Committee to Advise on Travel Medicine and Travel, led the committee to limit the recommendation of typhoid vaccine for travelers to South Asia only. This recommendation has not been adopted by CDC or many other international advisory

(continued)

WHY GUIDELINES DIFFER (CONTINUED)

boards. Despite this, we have little evidence that Canadian travelers are experiencing more typhoid fever than their counterparts from other countries.

Similar conclusions can be drawn for malaria prophylaxis recommendations. If the guidance provided by one group or organization consistently resulted in more cases of malaria than another, the guidance likely would change. In the absence of that data, however, health professionals continue to use their best judgment, without much knowledge of the true impact of their advice.

CAN WE HARMONIZE GUIDELINES?

The complex nature of how health organizations obtain, evaluate, and verify data, combined with fundamental differences in risk perception, makes it likely that multiple, overlapping, and at times conflicting guidelines will continue to exist. However, conflicting guidelines have decreased in the past decade due to the efforts of several organizations. A recent example has been the collaboration among the WHO, US CDC, and the European Centre for Disease Prevention and Control to develop consistency and clarity in defining travel-associated risk for Zika infection so that providers can more clearly relay that information, particularly to those who are pregnant or planning pregnancy. In addition, more rapid and frequent communication via the internet and regularly held international conferences have narrowed the gaps between conflicting advice.

In summary, the role of the travel health provider is to understand the differences in guidelines, interpret this information, and convey tailored and informed advice in an assured and comforting manner to travelers. There are no absolute right or wrong answers for many existing travel health guidelines. Even with all the data available, recommendations often are based on expert opinion, which can vary.

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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).

MAPS & TRAVEL MEDICINE

Marielle (Ellie) Glynn, Jesse Blanton, R. Ryan Lash

For well over 50 years, the Centers for Disease Control and Prevention (CDC) has used maps to help communicate geographically nuanced information about travel-related disease risks and associated health and safety recommendations. The earliest editions of CDC Yellow Book, a slim pamphlet entitled *Immunization Information for International Travel*, included reprints of maps produced by the World Health Organization showing areas of risk for malaria (Figure 1-01) and yellow fever (Figure 1-02). Although the number and variety of maps in the CDC Yellow Book have grown over the past 11 editions, from 7 in 2000 to 58 in 2020 (Figure 1-03), most still focus on identifying areas of risk for these same 2 diseases. Over time, as malaria prophylaxis and yellow fever vaccine recommendations for many destinations have become increasingly geographically specific, we have included additional country-specific reference maps in CDC Yellow Book (see Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country).

A well-designed map speaks for itself, even when depicting complex features of a disease. Public health maps must accurately reflect the subject matter expert's judgment on best available evidence and clinical practices. CDC Yellow Book maps are subject to multiple constraints, including the spatial and temporal precision of reported disease surveillance data, variation in how data are reported, and the availability of corresponding environmental and demographic data. Decisions also must be made about whether including a map provides additional clarity. For some health risks, a

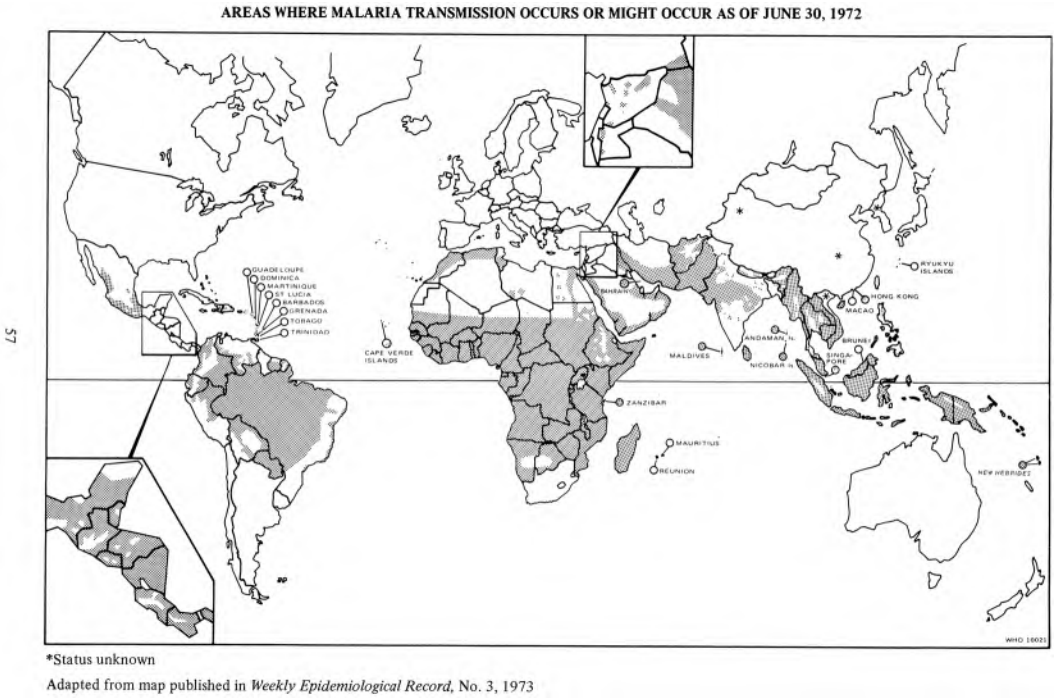

FIGURE 1-01. Reprint of malaria map from Health Information for International Travel 1974 (CDC 1974)

For many years, CDC Yellow Book included World Health Organization global malaria maps, which generally followed the above design style. Small size and lack of labels made these maps difficult to interpret for specific travel itineraries.

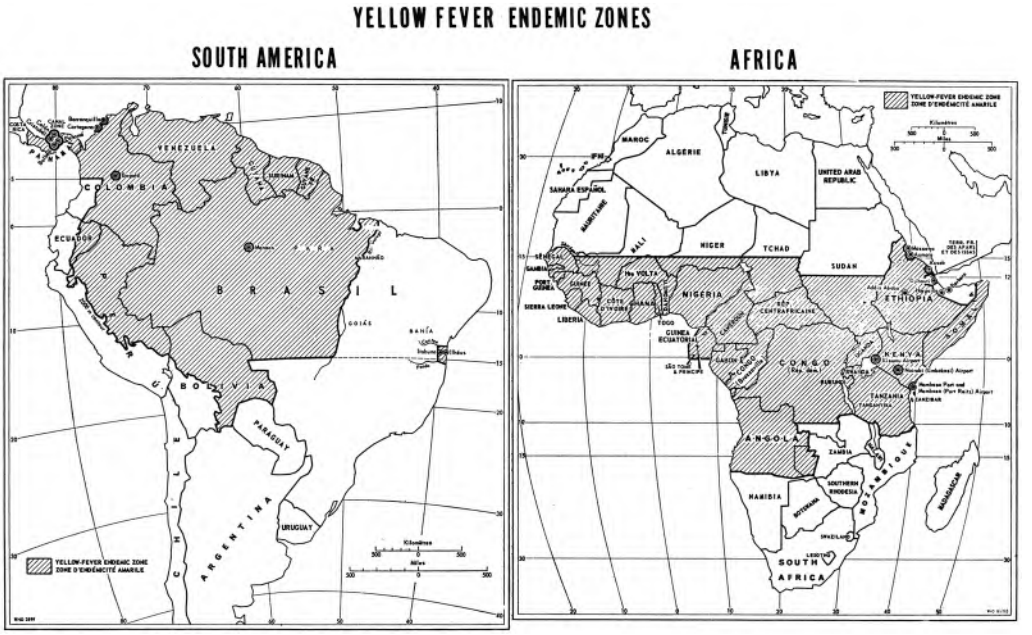

FIGURE 1-02. Reprint of yellow fever endemic zones map from Health Information for International Travel 1977 (CDC 1977)

These World Health Organization maps highlight various ways that boundaries of vectorborne diseases (e.g., yellow fever) can be demarcated. Compare these maps to the most current yellow fever vaccine recommendations in this edition of CDC Yellow Book (see Section 5.2.26, Yellow Fever).

table or textual description is adequate. When vaccination or prophylaxis recommendations apply to an entire country, for example, a map might be unnecessary. Conversely, when risk or recommendations vary based on geographic boundaries that are difficult to describe in words, maps can enhance risk communication, orienting the viewer more quickly and efficiently than a table or text.

In addition to providing vaccination and prophylaxis recommendations, other categories of CDC Yellow Book maps include destination maps, disease distribution maps, and risk maps. The destination maps in Section 10, Popular Itineraries, are included to provide information about the locations of national parks, game preserves, cities, and culturally significant gathering places. These maps serve as visual references to help clinicians understand their patients' travel plans. Disease distribution maps found throughout Section 5, Travel-Associated Infections & Diseases, show the global or regional presence or burden of the diseases described. Disease mapping varies, however. In some cases, a disease prevalence map could be most useful to a clinician; in other instances, risk maps, depicting both disease distribution and other relevant factors (e.g., elevation or access to preventative measures) can help health care providers make specific recommendations. Diseases with complex geographic variation in both prevalence and preventative measures also might have corresponding prophylaxis recommendation maps.

All the static maps from the print edition of CDC Yellow Book are available on the Travelers' Health website (https://wwwnc.cdc.gov/travel/) but advances in online mapping technology have created opportunities to deliver travel health information in novel ways. In March 2017, for example, CDC's Travelers' Health Branch launched a mapping application to aid in the communication of international Zika travel recommendations. This application allows users to search an interactive map; clicking on a destination opens a text box that provides travel health information for the specific location. CDC created a similar map for the coronavirus disease 2019 (COVID-19) pandemic. Efforts are under way to create interactive

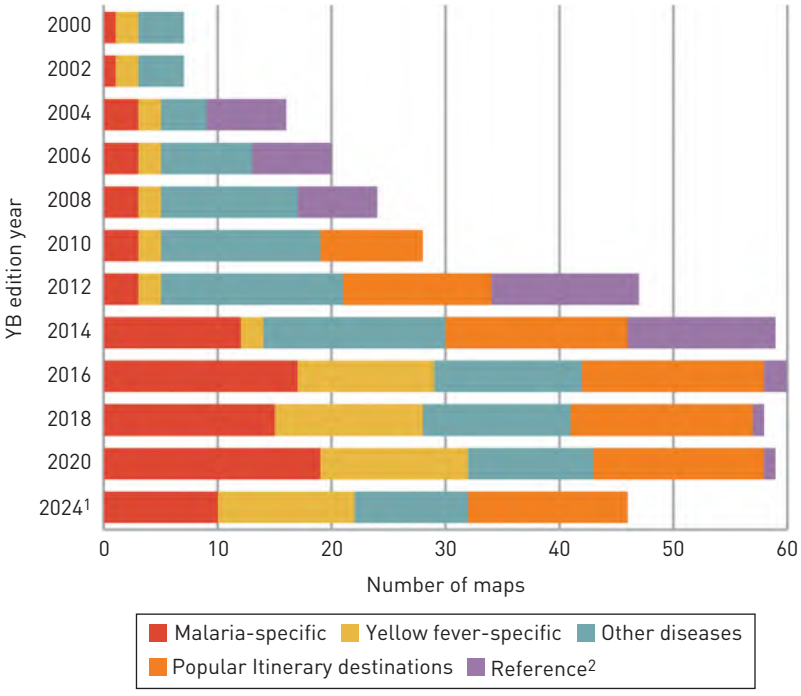

FIGURE 1-03. Number of maps included in CDC Yellow Book (YB) print editions, 2000–2024[1,2]

Over the past 11 editions, the number of CDC YB maps has increased by approximately 10-fold. Many new country-specific malaria and yellow fever risk maps aid in the interpretation of prophylaxis and vaccination recommendations.

[1] YB2022 not published due to the coronavirus disease 2019 pandemic.

[2] Created to supplement written information that appeared in the YB chapter, Yellow Fever Vaccine & Malaria Prevention Information, by Country, reference maps showed cities and provinces of selected countries. It was left to the reader to review these maps along with the written information in the chapter to determine where travelers could be at risk for yellow fever virus and/or malaria transmission. Starting in 2014, YB began replacing reference maps with disease-specific maps depicting risk areas for yellow fever virus and malaria transmission. The last reference map (China) appeared in YB2020.

maps for the online version of CDC Yellow Book that will elucidate the geographic health risks associated with international travel, beyond malaria and yellow fever.

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1 IMPROVING THE QUALITY OF TRAVEL MEDICINE THROUGH EDUCATION & TRAINING

Suraj Arshanapally, Jessica Allen Tchoukalov

Individuals planning international travel benefit from a pretravel visit dedicated to health-related travel recommendations. Such consultations with clinicians can help travelers remain healthy during and after travel.

Recent outbreaks of infectious diseases (e.g., Zika, coronavirus disease 2019 [COVID-19]) demonstrate the role of international travel in the geographic spread of disease. These outbreaks highlight the need to equip more clinicians with travel medicine training to ensure they can properly educate and advise travelers and prevent travel-related disease spread.

TRAVEL MEDICINE EDUCATION & TRAINING

The pretravel consultation is most effective when the clinician has experience and training related to travel medicine and can provide travelers with up-to-date information and guidance. In the United States, many types of health care professionals, ranging from infectious disease specialists to family medicine practitioners, offer travel medicine care and counseling. Travel medicine professional organizations offer training opportunities and certification programs for clinicians. This training is available via in-person courses or e-learning (e.g., webinars, workshops, online courses). Outlined below are several organizations that provide travel medicine–related trainings and education.

TRAVEL MEDICINE–RELATED PROFESSIONAL ORGANIZATIONS

Aerospace Medical Association

The Aerospace Medical Association (AsMA; www.asma.org) represents professionals in the fields of aviation, space, and environmental medicine who take care of air and space travelers. AsMA publishes the journal *Aviation, Space, and Environmental Medicine*; hosts an annual scientific meeting; and offers continuing medical education and certification in aerospace medicine–related topics.

American Society of Tropical Medicine and Hygiene

Formed in 1951 through the merger of predecessor organizations dating back to 1903, the American Society of Tropical Medicine and Hygiene (ASTMH; www.astmh.org) has a subsection, the American Committee on Clinical Tropical Medicine and Travelers' Health, that focuses exclusively on tropical and travel medicine. ASTMH publishes *The American Journal of Tropical Medicine and Hygiene,* a peer-reviewed scientific journal; hosts the ASTMH annual meeting; hosts an electronic distribution list; and maintains a tropical and travel medicine consultant directory.

In addition, ASTMH offers the CTropMed examination, which leads to a Certificate of Knowledge in Clinical Tropical Medicine and Travelers' Health (www.astmh.org/education-resources/certificate-programs). CTropMed is open to clinicians with a current professional health care license who have passed an ASTMH-approved tropical medicine diploma course or who have sufficient tropical medicine experience. ASTMH also hosts an annual intensive update course in clinical tropical medicine and travelers' health, designed to prepare clinicians planning to take the CTropMed examination.

Infectious Diseases Society of America

The Infectious Diseases Society of America (IDSA; www.idsociety.org) is the largest organization

representing infectious disease clinicians in the United States. IDSA has many active members with expertise in tropical and travel medicine. In 2006, IDSA published evidence-based guidelines on the practice of travel medicine in the United States. IDSA publishes travel-related research in 3 journals: *The Journal of Infectious Diseases*, *Clinical Infectious Diseases*, and *Open Forum Infectious Diseases*. IDSA also co-sponsors the annual IDWeek meeting (https://idweek.org) and the online Emerging Infections Network (EIN; https://ein.idsociety.org), a provider-based sentinel network to assist public health authorities with emerging infectious disease surveillance.

International Society for Infectious Diseases

The International Society for Infectious Diseases (ISID; www.isid.org) was organized in 1986 and has approximately 80,000 members in 201 countries. Like IDSA, ISID does not specifically focus on travel medicine. However, its international reach, particularly in low-resource countries, makes travel medicine an important topic in ISID and makes ISID a valuable source of information for infectious diseases clinicians in many overseas travel destinations.

ISID publishes the *International Journal of Infectious Diseases* and hosts the biennial International Congress on Infectious Diseases and the International Meeting on Emerging Diseases and Surveillance. In addition, ISID hosts the Program for Monitoring Emerging Diseases (ProMED; www.promedmail.org)—an open-source electronic system for reporting emerging infectious diseases and toxins, including outbreaks—and the EpiCore (www.epicor.com) global outbreak surveillance system.

International Society of Travel Medicine

The International Society of Travel Medicine (ISTM; www.istm.org) is a multinational organization dedicated to promoting healthy, safe, and responsible travel and movement of all people crossing borders by facilitating advancement of epidemiologic surveillance and research, education, and service in travel and migration medicine. ISTM was founded in 1991 and has over 4,000 members worldwide. ISTM publishes the peer-reviewed *Journal of Travel Medicine* and hosts the TravelMed listserv, where members share information. ISTM also maintains a directory of domestic and international travel medicine clinics affiliated with ISTM members in 90 countries (www.istm.org/AF_CstmClinicDirectory.asp).

ISTM hosts committees that address pressing issues in travel medicine (e.g., digital communications and publications); special interest and professional groups, including groups for travel medicine nurses and travel medicine pharmacists; the biennial Conference of the International Society of Travel Medicine; and annual regional sub-meetings.

In addition, ISTM provides an online learning curriculum and offers the Certificate in Travel Health (CTH) Examination (www.istm.org/certificateofknowledge#istmcertintravhealth); passing the examination is one of several required elements for health care professionals (including physicians, nurses, and pharmacists) who provide travel health advice and who participate regularly in travel medicine professional development to receive ISTM certification. ISTM also provides an annual intensive update course in travelers' health designed to prepare clinicians planning to take the CTH exam.

Wilderness Medical Society

Organized in 1983, the Wilderness Medical Society (WMS; www.wms.org) focuses on adventure travel, including wilderness travel and diving. WMS publishes the journal *Wilderness and Environmental Medicine*, and has developed practice guidelines for emergency care in wilderness settings. WMS hosts annual meetings, a world congress, and subspecialty meetings. In addition, WMS offers courses leading to certification in advanced wilderness life support and courses leading to the Diploma in Mountain Medicine (DiMM). WMS also offers a wilderness medical curriculum that, when successfully completed, qualifies members for fellowship in the Academy of Wilderness Medicine.

In addition to the above-mentioned organizations, the World Health Organization maintains a list of regional and national societies of travel medicine on its website (www.who.int/travel-advice/regional-and-national-societies-of-travel-medicine).

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2 Preparing International Travelers

THE PRETRAVEL CONSULTATION

Lin Hwei Chen, Natasha Hochberg

The pretravel consultation offers a dedicated time to prepare travelers for health concerns that might arise during their trips. During the pretravel consultation, clinicians can conduct a risk assessment for each traveler, communicate risk by sharing information about potential health hazards, and manage risk by various means. Managing risk might include giving immunizations, emphasizing to travelers the importance of taking prescribed malaria prophylaxis and other medications (and highlighting the risks of not taking them correctly), and educating travelers about steps they can take to address and minimize travel-associated risks. The pretravel consultation also serves a public health purpose by helping limit the role international travelers could play in the global spread of infectious diseases.

THE TRAVEL MEDICINE SPECIALIST

Travel medicine specialists have in-depth knowledge of immunizations, risks associated with specific destinations, and the implications of traveling with underlying conditions. Therefore, a comprehensive consultation with a travel medicine expert is indicated for all international travelers and is particularly important for those with a complicated health history, anyone taking special risks (e.g., traveling at high elevation, working in refugee camps), or those with exotic or complicated itineraries. Clinicians aspiring to be travel medicine providers can benefit from the resources provided by the International Society of Travel Medicine (ISTM; www.istm.org) and might consider specialty training and certification (see

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Sec. 1, Ch. 4, Improving the Quality of Travel Medicine Through Education & Training).

COMPONENTS OF A PRETRAVEL CONSULTATION

Effective pretravel consultations require attention to the traveler's health background, and incorporate the itinerary, trip duration, travel purpose, and activities, all of which determine health risks (Table 2-01). The pretravel consultation is the best opportunity to educate the traveler about health risks at the destination and how to mitigate them. The typical pretravel consultation does not include a physical examination, and a separate appointment with the same or a different provider might be necessary to assess fitness for travel. Because travel medicine clinics are not available in some communities, primary care physicians should seek guidance from travel medicine specialists to address areas of uncertainty. The Centers for Disease Control and Prevention (CDC) Travelers' Health website (https://wwwnc.cdc.gov/travel/) also has materials and an interactive web-tool to guide

Table 2-01 The pretravel consultation: medical history & travel risk assessment

MEDICAL HISTORY (HEALTH BACKGROUND)	
PAST MEDICAL HISTORY	Age Allergies (especially any pertaining to vaccines, eggs, or latex) Medications Sex Underlying conditions
SPECIAL CONDITIONS	Breastfeeding Cardiopulmonary event (recent) Cerebrovascular event (recent) Disability or handicap Guillain-Barré syndrome (history of) Immunocompromising conditions or medications Older age Pregnancy (including trimester) Psychiatric condition Seizure disorder Surgery (recent) Thymus abnormality
IMMUNIZATION HISTORY	Routine vaccines Travel vaccines
PRIOR TRAVEL EXPERIENCE	High-elevation travel/mountain climbing Malaria chemoprophylaxis Prior travel-related illnesses
TRAVEL RISK ASSESSMENT (TRIP DETAILS)	
ITINERARY	Countries and specific regions, including order of countries visited if >1 country Outbreaks at destination Rural or urban destinations
TIMING	Season of travel Time to departure Trip duration

Table 2-01 The pretravel consultation: medical history & travel risk assessment (continued)

REASON FOR TRAVEL	Adoption Adventure Business Education or research Medical tourism (seeking health care) Pilgrimage Tourism Visiting friends and relatives Volunteer, missionary, or aid work
TRAVEL STYLE	Accommodations (e.g., camping/tent, dormitory, guest house, hostel/budget hotel, local home or host family, tourist/luxury hotel) "Adventurous" eating Independent travel or package tour Level of hygiene at the destination Modes of transportation Traveler risk tolerance Travel with children
SPECIAL ACTIVITIES	Animal interactions (including visiting farms, touring live animal markets) Cruise ship Cycling/motorbiking Disaster relief Diving Extreme sports High elevations Medical care (providing or receiving) Rafting or other water exposure Sexual encounters (planned) Spelunking

primary care physicians through a pretravel consultation.

Personalize travel health advice by highlighting likely exposures and reminding the traveler of ubiquitous risks (e.g., injury, foodborne and waterborne infections, vectorborne diseases, respiratory tract infections—including coronavirus disease 2019 [COVID-19]—and bloodborne and sexually transmitted infections). Balancing cautions with an appreciation of the positive aspects of the journey can lead to a more meaningful pretravel consultation. In addition, pay attention to the cost of recommended interventions. Because some travelers are unable to afford all the recommended immunizations and medications, prioritize interventions (see Sec. 2, Ch. 15, Prioritizing Care for Resource-Limited Travelers).

Assess Individual Risk

Traveler characteristics and destination-specific risk provide the background to assess travel-associated health risks. Such characteristics include personal health background (e.g., past medical history, special conditions, immunization history, medications); prior travel experience; trip details, including itinerary, timing, reason for travel, travel style, and specific activities; and details about the status of COVID-19 and other infectious diseases at the destination.

Certain travelers also might confront special risks. Recent hospitalization for serious problems might lead to a decision to recommend delaying travel. Air travel is contraindicated for patients with certain conditions. For instance, patients should not travel by air <3 weeks after an

uncomplicated myocardial infarction or <10 days after thoracic or abdominal surgery. Consult relevant health care providers most familiar with the traveler's underlying illnesses.

Other travelers with specific risks include those who have chronic illnesses, are immunocompromised, or are pregnant. Travelers visiting friends and relatives, long-term travelers, and travelers with small children also face unique risks. More comprehensive discussion on advising travelers with additional health considerations is available in Section 3. Determine whether recent outbreaks or other safety notices have been posted for the traveler's destination by checking information available on CDC Travelers' Health and US Department of State websites and other resources.

In addition to recognizing the traveler's characteristics, health background, and destination-specific risks, discuss anticipated exposures related to special activities. For example, river rafting could expose a traveler to schistosomiasis or leptospirosis, and spelunking in Central America could put the traveler at risk for histoplasmosis. Flying from lowlands to high-elevation areas and trekking or climbing in mountainous regions introduces the risk for altitude illness. Inquire about plans for specific leisure, business, and health care–seeking activities.

Communicate Risk

Once destination-specific risks for a particular itinerary have been assessed, communicate them clearly to the traveler. Health-risk communication is an exchange of information in which the clinician and traveler discuss potential health hazards for the trip and any available preventive measures. Communicating risk is one of the most challenging aspects of a pretravel consultation, because travelers' perception of and tolerance for risk can vary widely. For a more detailed discussion, see Sec. 2, Ch. 2, . . . *perspectives*: Travelers' Perception of Risk.

Manage Risk

VACCINATIONS

Vaccinations are a crucial component of pretravel consultations, and the risk assessment forms the basis of recommendations for travel vaccines. Consider whether the patient has sufficient time to complete a vaccine series before travel; the purpose of travel and specific destination within a country will inform the need for vaccines. At the same time, the pretravel consultation presents an opportunity to update routine vaccines (Table 2-02) and to ensure that eligible travelers are up to date with their COVID-19 vaccinations; see www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html.

Pay attention to vaccine-preventable diseases for which immunity might have waned over time or after a recent immunocompromising condition (e.g., after a hematopoietic stem cell transplant). Asking whether travelers plan to travel again in the next 1–2 years can help them justify an immunization for travel over several years (e.g., rabies preexposure, Japanese encephalitis) rather than only the upcoming trip. Provide travelers with a record of administered immunizations and instructions to follow up as needed to complete a vaccine series.

MALARIA PREVENTION

Malaria continues to cause substantial morbidity and mortality in travelers. Since 1973, the annual number of US malaria cases reported to CDC has increased; therefore, clinicians must carefully assess travelers' risk for malaria and recommend preventive measures during the pretravel consultation. For travelers going to malaria-endemic countries, discuss malaria transmission, ways to reduce risk including mosquito avoidance, recommendations for prophylaxis, and symptoms of malaria. Additional information on malaria is available in Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country, and Sec. 5, Part 3, Ch. 16, Malaria.

SELF-TREATABLE CONDITIONS

Despite health care providers' best efforts, some travelers will become ill. Obtaining reliable and timely medical care during travel can be problematic in many destinations. Consequently, consider prescribing certain medications in advance to enable the traveler to treat common health problems. Box 2-01 provides a list of some of the most

Table 2-02 The pretravel consultation: vaccines to update & consider[1]

ROUTINE VACCINES	
VACCINE	**TRAVEL-ASSOCIATED INFECTION OR DISEASE OCCURRENCES & VACCINE RECOMMENDATIONS**
COVID-19	International travelers should be fully vaccinated with a COVID-19 vaccine, including all recommended booster doses.
Haemophilus influenzae type b	No reports of travel-related infection; organism ubiquitous worldwide.
Hepatitis B	Recommended for travelers visiting countries where HBsAg prevalence is ≥2%. Vaccination can be considered for all international travelers, regardless of destination, depending upon individual behavioral risk and potential for exposure.
Human papillomavirus (HPV)	No reports of travel-acquired infection; sexual activity during travel might lead to HPV and other sexually transmitted infections.
Influenza	Year-round transmission can occur in tropical areas. Outbreaks have occurred on cruise ships. Novel influenza viruses (e.g., avian influenza viruses H5N1 and H7N9), can be transmitted to travelers visiting areas where these viruses are circulating.
Measles, mumps, rubella	Infections are common in countries and communities that do not immunize children routinely, including parts of Europe. Outbreaks have occurred in the United States because of infection in returning travelers.
Meningococcal (serogroups A, C, W, and Y)	Outbreaks occur regularly in sub-Saharan Africa in the meningitis belt during the dry season, generally December–June, although transmission can occur at other times for those with close contact with local populations. Outbreaks have occurred with Hajj pilgrimage, and the Kingdom of Saudi Arabia requires the quadrivalent vaccine for pilgrims.
Pneumococcal	*Streptococcus pneumoniae* is ubiquitous worldwide; causal relationship to travel is difficult to establish.
Polio	Unimmunized or under-immunized travelers can become infected with either wild poliovirus or vaccine-derived poliovirus. Because the international spread of wild poliovirus in 2014 was declared a Public Health Emergency of International Concern under the International Health Regulations, temporary recommendations for polio vaccination are in place for countries with wild poliovirus circulation for their residents, long-term visitors, and international travelers.
Rotavirus	Common in developing countries, although not a common cause of travelers' diarrhea in adults. The vaccine is only recommended for young children.
Tetanus, diphtheria, pertussis	Rare cases of diphtheria have been attributed to travel. Pertussis has occurred in travelers whose immunity has waned.

(*continued*)

Table 2-02 The pretravel consultation: vaccines to update & consider (continued)

Varicella	Infections are common in countries that do not immunize children routinely, as in most low- and middle-income countries.
Zoster	Travel is a form of stress that might trigger varicella zoster reactivation, but causal relationship is difficult to establish.
TRAVEL VACCINES	
VACCINE	**TRAVEL-ASSOCIATED INFECTION OR DISEASE OCCURRENCES & VACCINE RECOMMENDATIONS**
Cholera	Infections in travelers have been rare. Vaccination can be considered for those participating in humanitarian relief efforts.
Hepatitis A	Hepatitis A is one of the most common vaccine-preventable diseases acquired during travel. Prevaccination serologic testing for hepatitis A immunity before vaccination is not routinely recommended but may be considered in specific settings to reduce costs by not vaccinating people who are already immune.
Japanese encephalitis	Rare cases have occurred, estimated at <1 case/1 million travelers to endemic countries. However, the severe neurologic sequelae and high fatality rate warrant detailed review of trip plans to assess the level of risk.
Rabies	Rabies preexposure immunization simplifies postexposure immunoprophylaxis; rabies immunoglobulin (RIG) might be difficult to obtain in many destinations.
Tick-borne encephalitis (TBE)	Cases have been identified in travelers with an estimated risk of 1/10,000 person-months in travelers. Endemic areas are expanding in Europe. The US Food and Drug Administration has approved the use of TBE vaccine, and the Advisory Committee on Immunization Practices has voted to recommend its use in selected travelers.
Typhoid	The highest risk is for travelers going to Bangladesh (21 cases/100,000 visits), Pakistan (9 cases/100,000 visits), and India (6 cases/100,000 visits), areas where drug-resistant isolates have been increasing.
Yellow fever	Risk occurs mainly in defined areas of sub-Saharan Africa and the Amazonian regions of South America. Some countries require proof of vaccination for entry. For travelers visiting multiple countries, sequence of country entry can affect yellow fever vaccination requirement.

Abbreviations: HBsAg, hepatitis B surface antigen

[1] Based on Advisory Committee on Immunization Practices guidelines, current as of October 21, 2021

common situations for which travelers find self-treatment useful.

Travel health providers need to recognize conditions for which travelers might be at risk and provide information about appropriate self-diagnosis and treatment. Keys to a successful treatment strategy include sharing a simple disease or condition definition, recommending or prescribing treatment, and educating the traveler about the expected outcome of treatment. As an example,

BOX 2-01 The pretravel consultation: self-treatable conditions

The following list includes common situations for which travelers might find self-treatment useful. The extent of self-treatment recommendations offered to travelers should reflect the remoteness and difficulty of travel and the availability of reliable medical care at the destination. Recommended self-treatment options for each of the listed diseases are provided below or in the designated sections of this text.

ALTITUDE ILLNESS: Sec. 4, Ch. 5, High Elevation Travel & Altitude Illness

HIV EXPOSURE (OCCUPATIONAL): Sec. 9, Ch. 4, Health Care Workers, Including Public Health Researchers & Medical Laboratorians

JET LAG: Sec. 8, Ch. 4, Jet Lag

MALARIA: Sec. 5, Part 3, Ch. 16, Malaria

MOTION SICKNESS: Sec. 8, Ch. 7, Motion Sickness

TRAVELERS' DIARRHEA: Sec. 2, Ch. 6, Travelers' Diarrhea

URINARY TRACT INFECTIONS: common among many women; carrying a prescribed antibiotic for empiric treatment can be helpful.

VAGINAL YEAST INFECTIONS: self-treatment course of patient's preferred antifungal medication can be prescribed for people who are prone to infections, sexually active, or who might be receiving antibiotics for other reasons, including doxycycline for malaria chemoprophylaxis.

for travelers' diarrhea, inform travelers that most symptoms can be managed with fluid replacement plus loperamide or bismuth subsalicylate; prescribe travelers antibiotics they can carry with them for use in selected cases of incapacitating diarrhea (see Sec. 2, Ch. 6, Travelers' Diarrhea, and Sec. 2, Ch. 7 . . . *perspectives*: Antibiotics in Travelers' Diarrhea—Balancing Benefit & Risk); and tell them to seek medical attention if symptoms persist for 24–36 hours or are particularly severe.

With some activities in remote settings (e.g., trekking), the only alternative to self-treatment would be no treatment. Pretravel counseling might result in a more accurate self-diagnosis and treatment than relying on local medical care in some areas. In addition, the increasing awareness of substandard and counterfeit drugs in pharmacies in certain countries makes it important for travelers to bring quality manufactured drugs with them from a reliable supplier (see Sec. 6, Ch. 3, . . . *perspectives*: Avoiding Poorly Regulated Medicines & Medical Products During Travel).

Encourage travelers to carry a travel health kit with prescription and nonprescription medications and review each traveler's medication list for possible drug–drug interactions. More detailed information for providers and travelers is included in Sec. 2., Ch. 10, Travel Health Kits, and Section 3 has supplementary travel health kit information for travelers who have additional health needs and considerations.

ADDRESS SPECIAL HEALTH RISKS

Travelers with underlying health conditions require additional attention to health issues related to the destination and activities. For instance, travelers with a history of cardiac disease should carry medical reports, including a recent electrocardiogram. Asthma can flare in a traveler visiting a polluted city or from physical exertion during a hike; recommend that travelers discuss with their primary care provider a plan for treatment and carry necessary medication in case of asthma exacerbation.

Instruct travelers on how to obtain travel medical insurance and direct them to resources that provide lists of reputable medical facilities at their destination (e.g., the ISTM website [www.istm.org]; the American Society of Tropical Medicine and Hygiene website [www.astmh.org]; the US Department of State's Your Health Abroad website [https://travel.state.gov/content/travel/en/international-travel/before-you-go/your-health-abroad.html]). Advise travelers to identify any allergies or serious medical conditions on a bracelet or a card to expedite medical care in emergency situations (see Sec. 3, Ch. 4, Highly Allergic Travelers). Section 6 provides

more information on preparing for and obtaining health care abroad.

EDUCATE TO CHANGE BEHAVIOR

The pretravel consultation provides another setting to remind travelers of basic health and safety practices during travel, including frequent handwashing, wearing seatbelts, using car seats for infants and children, safe sexual practices, and COVID-19 prevention. Organize topics into a checklist and place priority on the most serious and frequently encountered issues (Table 2-03

Table 2-03 The pretravel consultation: key discussion topics

TRAVEL-ASSOCIATED RISK	DISCUSSION POINTS
ALTITUDE ILLNESS	Determine if the itinerary puts the traveler at risk of altitude illness. Discuss preventive measures (e.g., gradual ascent, adequate hydration, medications to prevent and treat).
BLOODBORNE PATHOGENS	Avoid potential exposures (e.g., injections, piercings, tattoos, shared razors). Inform travelers who will provide health care overseas on what to do in case of needlesticks or bloodborne pathogen exposures; discuss use of HIV postexposure prophylaxis. See Box 2-02 for summary on sexual health recommendations for travelers.
DISEASE-SPECIFIC COUNSELING	Advise travelers to prepare for exacerbations or complications of underlying disease(s). Remind travelers to keep medications and supplies in carry-on luggage, to keep medications in their original prescription bottles, and to carry copies of their written prescriptions.
ENVIRONMENTAL HAZARDS	Advise travelers to avoid walking barefoot to reduce their chances of certain parasitic infections. Advise travelers to avoid wading or swimming in freshwater where risk for schistosomiasis or leptospirosis is possible. Caution travelers to avoid contact with animals to reduce the potential for bites and scratches that can transmit rabies. This is particularly important advice for the parents of young children. Remind travelers to apply sunscreen to sun-exposed skin.
IMMUNIZATIONS	Discuss indications for, effectiveness of, and adverse reactions to immunizations. Discuss benefit of antibody titers when past vaccine records are unavailable or unreliable, particularly for hepatitis A, measles, mumps, rubella, and varicella. Review routine immunizations and travel immunizations indicated for the specific itinerary and based on the traveler's medical history. Screen for chronic hepatitis B for people born in countries with HBsAg prevalence ≥2% (see Map 5-07).
MALARIA, YELLOW FEVER & OTHER VECTORBORNE DISEASES	Define vectorborne disease risks at the destination. Discuss personal protective measures and recommended insect bite precautions. For itineraries where malaria transmission is a risk: discuss risks and benefits of malaria chemoprophylaxis and recommended chemoprophylaxis choices. For itineraries where yellow fever virus transmission is a risk (see Sec. 2, Ch. 5, Yellow Fever Vaccine & Malaria Prevention Information, by Country, and Sec. 5, Part 3, Ch. 16, Yellow Fever): assess individual traveler precautions and contraindications for receiving yellow fever vaccine; discuss risks and benefits of vaccination; discuss alternatives to vaccination for travelers at increased risk for adverse events from yellow fever vaccine.

Table 2-03 The pretravel consultation: key discussion topics (continued)

TRAVEL-ASSOCIATED RISK	DISCUSSION POINTS
PERSONAL SAFETY	Advise travelers to look for security bulletins related to their destination and consider areas to avoid. Discuss precautions travelers can take (including avoiding excess alcohol consumption) to minimize risk for traffic accidents, personal assault, robbery, or drowning. Provide information on travel health and medical evacuation insurance.
RESPIRATORY ILLNESSES	Consider influenza self-treatment for high-risk travelers. Discuss diseases and destinations of particular concern.
TRAVELERS' DIARRHEA & OTHER FOOD/WATERBORNE ILLNESSES	Discuss food and water safety. Discuss antibiotics for self-treatment, adjunct medications (e.g., loperamide), and staying hydrated. Recommend strategies to decrease risk of diarrhea.

Abbreviations: HBsAg, hepatitis B surface antigen

and Box 2-02). In addition, address general issues (e.g., preventing injury, sunburn). Written information is essential to supplement oral advice and enables travelers to review the instructions from their clinic visits. CDC's Travelers' Health website (https://wwwnc.cdc.gov/travel/) provides educational material. By giving advice on health risks and self-treatable conditions, clinicians can minimize the traveler's need to seek medical care while abroad and possibly help them return to good health faster.

BOX 2-02 The pretravel consultation: summary of sexual health recommendations for travelers

BEFORE TRAVEL

Get recommended vaccinations, including those that protect against sexually transmitted infections (STIs).
Get recommended tests for HIV and treatable STIs. Be aware of STI symptoms in case any develop.
Obtain condoms to carry on trip.
Consider preexposure prophylaxis medication for HIV for high-risk travelers.
Review local laws about sexual practices and obtain contact information for medical and law enforcement services.
If pregnant or considering pregnancy, review whether Zika virus infection is a risk at destination.

DURING TRAVEL

Use condoms consistently and correctly to decrease the risk of HIV and STIs.
If indicated, be prepared to start taking medications for HIV postexposure prophylaxis or unintended pregnancy within 72 hours after a high-risk sexual encounter.
Never engage in sex with a minor (<18 years old), child pornography, or trafficking activities in any country.
Report suspicious activity to US and local authorities as soon as it occurs.

AFTER TRAVEL

Avoid exposing sexual partners at home. See a clinician to get recommended tests for HIV and STIs.
Get treatment for all diagnosed, treatable STIs.