
A “Syndromic” Approach for Diagnosing and Managing Travel-Related Infectious Diseases in Children

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Primary care physicians practicing in the United States are often less familiar with many of the common as well as more exotic diseases that children can acquire when traveling abroad. This review will focus mainly on infectious diseases specifically associated with travel-related exposures. While having access to reference material to help guide diagnostic resources and therapy is useful, it is most useful to have a consistent well-organized approach to help identify specific risk factors associated with both the most common and the most severe illnesses potentially occurring in a child who has recently traveled internationally. According to the National Travel and Tourism Office the number of Americans traveling abroad increased to more than 61.9 million in 2013.¹ The main areas of travel included Europe at 34.6%, the Caribbean at 24.8%, Asia at 18.8%, South America at 7.3%, Central America at 6.9%, Africa at 3.1%, the Middle East at 5.9%, and Oceania at 1.9%. Nearly 27% of travel was to visit friends and families. This category accounts for a significant portion of the travel in the pediatric age groups.^{2,3} Although travel to Asia and Africa accounted for only 21.9% of US traveler the majority of travel-related illnesses were acquired from Asia (32.6%) and sub-Saharan Africa (26.7%) according to a recent geosentinel-illness surveillance of returned international travelers presenting to the GeoSentinel Network.^{4,5} As

stressed in other articles in this supplement, travelers visiting friends and relatives (VFR) have been consistently noted to have both low rates of seeking medical advice before travel, with a resulting large number of serious febrile illnesses appearing on return.^{5,6} A substantial burden of this falls on pediatric travelers (children 17 years or younger), who make up an estimated 40% of US travelers who were visiting friends and relatives internationally.³ A subset of the GeoSentinel surveillance data obtained from 1997–2007 was analyzed specifically to look at factors associated with travel-related illness in children 0–17 years of age.⁴ During this time frame 1591 pediatric patients were compared to 42,173 adults who presented to clinics with travel-associated illness. Although the types and percentages of illnesses for adults and children were relatively the same, children displayed several unique trends in their travel-associated illnesses. Children present earlier after travel, require higher rates of hospitalization, and were less likely to have received pre-travel advice.⁴ The most common types of diagnosis included diarrhea (28%), dermatologic conditions (25%), systemic febrile illnesses (23%) and respiratory disorders (11%). It is important to note that these statistics do not take into account the numerous travelers who experience traveler’s diarrhea or respiratory illnesses and never report to any clinic. Rates of most categories of illness were similar in both adults and children, with the notable exception that dermatological conditions were more prevalent among children, with complications due to animal bites being the most common presenting complaint in this category.^{4,5}

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The views expressed herein are those of the authors and are not necessarily representative of those of the Uniformed Services University or the Department of Defense.

Curr Probl Pediatr Adolesc Health Care 2015;45:231-243

1538-5442/\$ - see front matter

Published by Mosby, Inc.

<http://dx.doi.org/10.1016/j.cppeds.2015.06.005>

The Critical Roles of a Detailed History and Assessment of Risk Factors

The initial assessment of an ill pediatric traveler begins with a rapid screen for acutely life-threatening

symptoms requiring empiric management, as well as features that mandate an escalation of infection prevention and control procedures. Next, a detailed travel history is performed. Table 1 summarizes the most important historical factors to obtain to help identify risks and focus the assessment for serious disease after recent travel. The age of the patient should be taken into account as it may affect the types of exposures and risk behaviors. For example, while smaller children are more prone to animal bites as compared to adults,⁴ adolescents may be more likely to participate in high risk activities such as body piercing, tattoos, and sexual activity. As with pre-travel preparation, the exact geographic location(s) of recent travel is among the most important history to review, as the most serious diseases have very specific regional risks. Overall, malaria is known to be more prevalent in travelers returning from sub-Saharan Africa, dengue is more common after travel in Asia and the Caribbean, and diarrheal diseases more common after travel in northern Africa.^{5,13,14} The predominant disease categories identified in specific regions of the world are summarized in Table 2.

Travelers whose purpose is visiting friends and relatives (VFR) are less likely to have had visits to a travel medicine provider or other pre-trip preparation,² are more likely to be staying in remote areas for longer time periods, and to have been in closer contact with local people, food, water, and animals. They also commonly and mistakenly believe that they are still as immune to malaria as when they lived in a region in which they were constantly exposed.² GeoSentinel surveillance data noted that travelers visiting friends and relatives returning from sub-Saharan Africa, south-central Asia, and Latin America were

TABLE 1. Obtaining a detailed travel history⁷⁻¹²

Detailed travel history
All destinations traveled
Purpose of travel
Dates of travel and timing of illness
Pre-travel visit, immunizations, prophylaxis compliance
Season of travel (rainy vs. dry)
Accommodations: air condition, screens, sleeping quarters, bed nets
Water source: fresh water, tap, bottled, ice
Dietary history: street vendors, home cooking, restaurants, resorts, raw foods, local dairy products, bush meat (exotic animals), etc.
Animal, fresh water, insect exposures, use of repellent
Activities during travel: rafting, spelunking, African game parks
Known infectious local contacts: friends/relatives with fevers, weight loss, chronic cough, diarrhea, medical or other humanitarian work
Any infection or similar symptoms in co-travelers
Sexual encounters, tattoos, body piercing (teens)
History of hospitalizations, trauma, blood exposures, medicines

TABLE 2. The top 2 illnesses in returning travelers based on geographic region traveled 2007–2011⁵

Geographic region (from greatest number of ill travelers to least)	Top two identified causes in ill returned travelers
Sub-Saharan Africa	<i>P. falciparum</i> , Giardia
Latin America and Caribbean	Dengue, Cutaneous larva migrans
Southeast Asia	Dengue, Rabies, Campylobacter
South-central Asia	Giardia and enteric fever
Middle East and North Africa	Giardia and Campylobacter
Europe	Campylobacter, Rabies, PEP
Northeast Asia	Rabies, PEP, Influenza
Australia, New Zealand, and Oceania	<i>Plasmodium vivax</i> , Influenza

overall more likely to experience “fever” than any other group.¹⁵ In all travelers (and particularly the VFR families), the clinician must ascertain not only whether pre-travel advice was sought, but an appraisal of the degree to which a family complied with any pre-travel immunizations, recommended prophylactic medications, and other precautions. This information is important for all travelers but especially in the VFR families.

Incubation periods for the more common travel-acquired diseases are presented in Table 3, and can help focus the differential diagnosis. For instance, dengue has a short incubation period and generally presents during or upon initial return from travel, while *Plasmodium falciparum* infection typically presents within the first 30 days after departing an endemic region, and hypnozoites of *Plasmodium vivax* or *Plasmodium ovale* may result in infections up to a year later.^{8,16} It is important to try to determine the most accurate estimate of symptom onset from the time of exposure. Seasonality is also an important consideration, as risk for many diseases may vary significantly due to climate factors. While most of the risk factors for young children can be extrapolated from the actions and experiences reported by their adult caregivers, one must also ask if the children followed any different practices than the adults, such as swimming in freshwater, sleeping in different circumstances, or consuming different foods?

Patterns (Syndromes) of Disease

Categorizing the illness according to a pattern of symptoms and findings, i.e., “syndrome” that the patient most closely fits; followed by a deliberate and systematic diagnostic approach to identify a specific infectious agent. This simultaneously leads to a more

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