Tropical Diseases, Travel Medicine and Vaccines

REVIEW

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Exploring primary care physicians' role in travel medicine: a scoping review of knowledge, practices, and training

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Abstract

Background With the surge in international travel, primary care physicians (PCPs) play a critical role in managing travel medicine (TM) challenges. This scoping review aims to comprehensively synthesize literature on PCPs' involvement in TM, covering their knowledge, practices, and training.

Methods Systematic searches across various electronic databases identified empirical studies in English language peer-reviewed journals up to July 2023. Data synthesis involved charting evidence on PCPs'TM knowledge, practices, and training.

Results Sixteen articles met inclusion criteria, offering insights into PCPs' engagement with TM in primary care. The findings reveal a general deficiency in PCPs'TM knowledge, with factors like prior TM experience, formal training, high traveler exposure, and multilingual abilities predicting higher knowledge scores. TM consultation duration and documentation were frequently reported as insufficient. Barriers to effective TM provision included physician-related factors such as lack of formal training, traveler-related factors like delayed presentation and low-risk perception, and practice-related factors such as low traveler exposure and resource constraints.

Conclusion This review underscores the crucial role of PCPs in TM and the need for targeted interventions to enhance their expertise and practices. Overcoming barriers through tailored training and support is essential for optimizing TM delivery in primary care.

Keywords Travel medicine, Practice, Knowledge, Primary care physicians, Scoping review

Introduction

Travel medicine (TM) stands as a specialized branch of medicine dedicated to preventing, managing, and treating health issues arising during travel [1]. As the world continues to globalize, TM has emerged as a crucial component of primary care [2]. Primary care physicians (PCPs) occupy a pivotal position in TM practice, serving as frontline healthcare providers and serving as the initial point of contact for travelers seeking both pre- and post-travel guidance [3, 4].

PCPs play a diverse role in TM, conducting pre-travel consultations to assess medical histories and provide

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tailored recommendations on travel-related health concerns, vaccinations, malaria prophylaxis, and preventive measures [5]. Additionally, PCPs conduct post-travel assessments, diagnose and manage travel-related illnesses, and ensure appropriate follow-up care [5]. With their knowledge of patients' medical histories, chronic conditions, and medication regimens, PCPs are uniquely positioned to offer personalized guidance and treatment to travelers [3, 5, 6].

Several studies have highlighted the divergent degrees of PCPs' engagement in TM. While some demonstrate limited involvement, such as a US survey revealing that only 37% routinely offer pre-travel advice [7], others exhibit more robust participation. For example, a Canadian study found that merely 28% of PCPs felt comfortable providing such advice, with even fewer (22%) confident in managing travel-related illnesses [8]. In contrast, a nationwide German survey showed a substantial 95% active engagement in TM among PCPs [9]. Similarly, Australian research found that over two-thirds of PCPs conduct pre-travel consultations, indicating significant TM involvement [10]. These findings underscore the varied landscape of PCPs' participation in TM, likely influenced by factors such as geographic location and available resources.

Despite the crucial role of PCPs in TM, a consensus on their optimal involvement in delivering TM services remains elusive [11]. The degree of PCPs' engagement in TM varies significantly across healthcare systems and regions [11]. Therefore, it is imperative to evaluate and delineate the scope of TM practice by PCPs to ensure the provision of effective and safe healthcare for travelers.

This scoping review endeavors to chart the existing literature concerning the role of PCPs in TM, with a particular emphasis on their knowledge, practices, and training. Through the synthesis of available literature, this review offers a comprehensive portrayal of PCPs' involvement in TM, pinpointing prevailing evidence gaps and guiding future research and practice in this domain. Grasping the capacities and constraints of PCPs in delivering TM services holds the potential to foster its seamless integration into primary care settings and facilitate the formulation of tailored educational initiatives and guidelines.

Methods

This scoping review followed the Arksey and O'Malley Framework [12], selected for its structured approach to investigating the Role of PCPs in TM practice. Moreover, adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines was maintained in the writing of this review.

Identifying the Research Questions

The research questions guiding this review were as follows:;.

1. What is the current global practice of PCPs in TM?.
2. What are the knowledge sources utilized by PCPs for TM?.
3. What are the training requirements identified by PCPs for TM practice?.
4. What are the barriers and facilitators influencing TM practice within primary care settings?.

Identifying relevant literature

Search strategy

A librarian conducted a comprehensive search across multiple electronic databases including the Cochrane Library, Embase, Google Scholar, Joanna Briggs Institute, Medline, PubMed, Science Direct, Scopus, and Web of Science. Manual searches of retrieved article references were also performed to ensure completeness. The search findings were documented following PRISMA flow diagram guidelines for transparency.

Subject headings and keywords were combined to conduct a thorough literature search. These terms included primary care physician, primary care doctor, family doctor, general practitioner, travel medicine, practice, consultation, pre-travel, post-travel, travel medicine encounter, knowledge, education, training, attitude, vaccine, vaccination, setting, and destination.

Eligibility for inclusion

All publications that were released up to July 10, 2023 were included in the study if they met the following criteria:

1) Empirical research.
2) Published in English.
3) Full text accessibility.
4) Published in peer-reviewed journals regardless of journal rank or impact factor.

Study selection

Figure 1 depicts the PRISMA flowchart of article selection. Articles meeting inclusion criteria were uploaded to Rayyan for screening (https://www.rayyan.ai/). After removing duplicates, three authors (AAD, SA, VK) independently screened articles by title, abstract, and full text. Discrepancies were resolved through author consensus.

Charting, collating and summarizing the data

The study systematically organized and summarized articles in Table 1, covering author, title, country, study purpose, design, sample size, setting, and key findings.

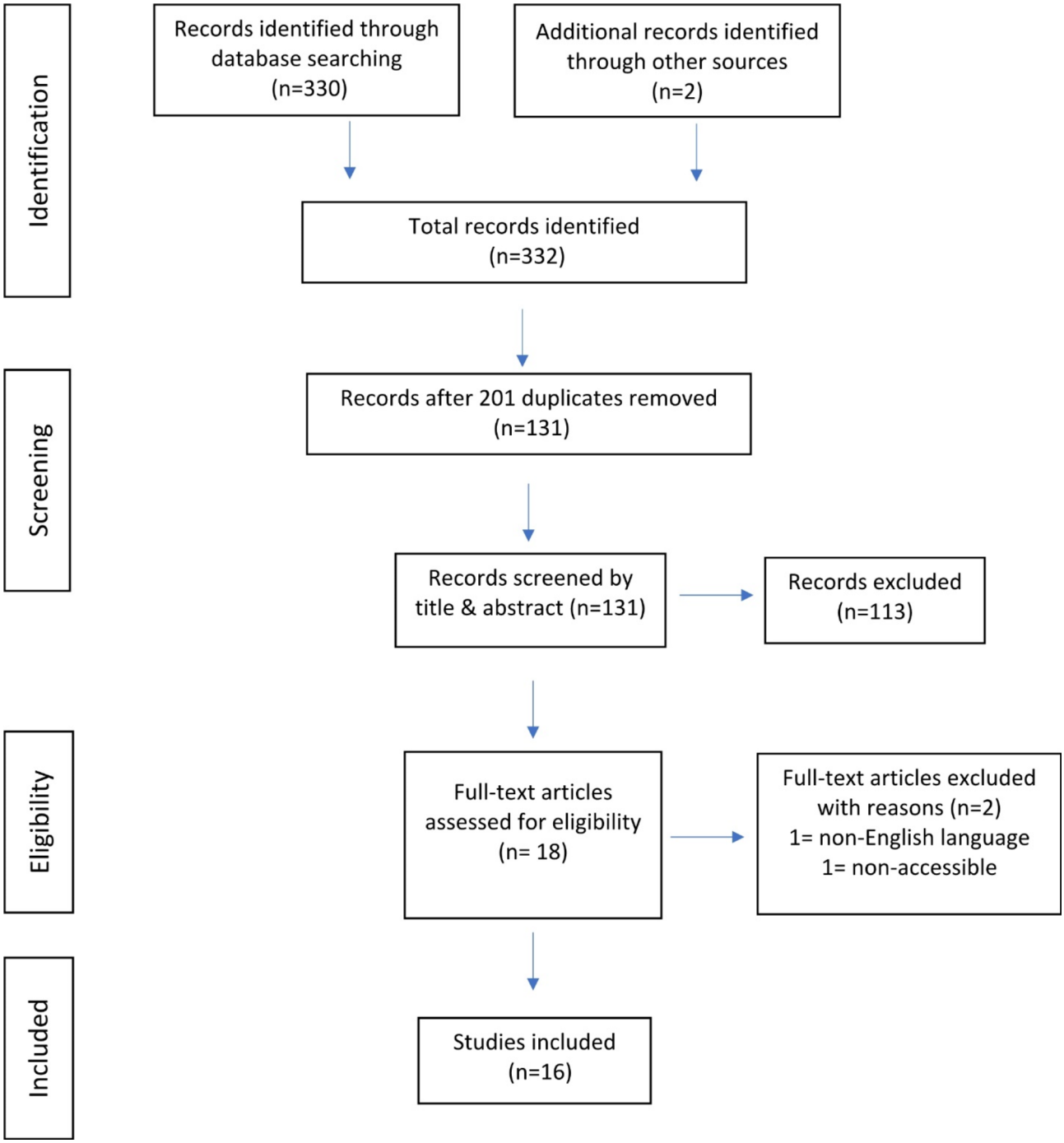

Fig. 1 Study flow chart

Articles were sorted alphabetically by first authors' surnames. After individual data extraction, one author refined the data, while another formatted key findings. Authors collectively reviewed key findings, identifying common themes and sub-themes, as shown in Table 2. This process adhered to scoping review principles [12].

Summarizing and synthesizing the results

Identification of potential studies

Out of 330 articles initially retrieved, two more were found from other sources. After removing 201 duplicates, 131 articles remained. Following title and abstract screening, 113 were excluded. Full-text review of the remaining 18 articles led to the exclusion of two more. Ultimately, 16 articles were included in this scoping review (Fig. 1).

Table 1 Data extraction from the 16 articles included in the scoping review

SN	Author (year), Title. Country, [(Reference number]	Study objectives	Study Design & Data Collection tools	Sample Size, study population and & setting	Key Findings
1	Al-Dahshan et al. (2022). Primary care physicians' knowledge of travel vaccine and malaria chemoprophylaxis and associated predictors in Qatar. Qatar. [17]	To assess travel vaccine and malaria chemoprophylaxis knowledge and associated predictors among primary care physicians (PCPs) in Qatar.	A cross-sectional design using a questionnaire.	364 PCPs; 27 primary health centers (PHC).	Overall, mean knowledge score was 9.54/16 (± 3.24). Significant predictors of higher knowledge included: aged 40–49 years (1.072;95% CI: 0.230, 1.915), had medical degree from non-Arab countries (0.748; 95% CI: 0.065, 1.432), had training in TM (1.405; 95%CI: 0.407, 2.403), and provided ≥ 10 consultations/ month (2.585; 95% CI:1.294, 3.876). Online information was the main reported resource of travel medicine consultation.
2	Al-Dahshan et al. (2023). Scope and Predictors of Travel Medicine Practice among Primary Care Physicians in Qatar. Qatar. [21]	To assess the scope of primary care physicians' (PCPs) practice of travel medicine (TM) in Qatar and its associated predictors.	A cross- sectional study design. Using a self-administered questionnaire.	364 PCPs	Most PCPs (91.1%) provided pretravel consultations of which 72.7% provided less than 10 consultations per month. Overall, pretravel advice content and frequency including vaccine and malaria chemoprophylaxis recommendations were inadequate. Significant predictors of high frequency of pretravel consultations (≥ 10/month) included male PCPs (AOR 1.78, 95% CI: 1.01, 3.18), PCPs who had postgraduate training or experience in TM (AOR 2.74, 95% CI: 1.59, 4.72), and multilingual (speaking ≥ 3 languages) physicians (AOR 1.96, 95% CI: 1.12, 3.45). Frequently encountered post-travel illnesses included travelers' diarrhea, respiratory diseases, and fever. While most PCPs provided pretravel consultations, the frequency and content of consultations were inadequate. Male PCPs, past training or experience in TM, and multilingual physicians were important predictors of providing a high frequency of pretravel consultation.
3	Alduraibi et al. (2020). Knowledge, attitudes, and practices of primary health care physicians regarding the pre-travel counselling of patients with type 2 diabetes in Riyadh, Saudi Arabia. Saudi Arabia. [18]	To assess the knowledge, attitudes and practices of primary health care (PHC) physicians regarding pre-travel counselling for patients with type 2 diabetes.	A cross-sectional design using a self-administered questionnaire.	385 PCPs were general practitioners (54.5%) or family medicine physicians (45.5%); PHC centres under the Ministry of Health in Riyadh, Saudi Arabia.	57.9% of PHC physicians had poor knowledge scores. The following characteristics were significantly associated with poor knowledge: being younger in age, being male, being Saudi, being a general practitioner, and having limited (0–5 years) experience. Attitude scores ranged from 0–6. 52.5% had strong agreement attitudes towards the importance of pre-travel counseling among patients with diabetes. 47.5% had disagreement attitudes. These disagreement attitudes were significantly associated with being older and having more years of experience. 62.6% had poor practice scores. Poor practices were detected among physicians who were younger, male, Saudi, and who had a general specialty and degree.
4	Al-Hajri et al. (2011). Knowledge and practice of travel medicine among primary health care physicians in Qatar. Qatar. [19]	To determine whether travelers obtained correct travel health information from primary health care (PHC) physicians in Qatar.	Prospective descriptive survey of PHC physicians using a structured self-administered questionnaire.	76 PCPs.	44.7% of the PHC physicians provided health advice to travelers. Most spent at least 15 min with each traveler (44.7%) and the mean duration of consultation was 7.3+/- 4.6 min. Physicians provided pretravel advice mostly regarding travel vaccines, Malaria Prophylaxis, safety, first aid knowledge, insect bite avoidance, sexual transmitted infections, motion sickness. and unsafe sex. The most common topics in pretravel consultation were travel vaccines (30.3%), Malaria Prophylaxis (28.9%), and sexually transmitted infections (19.7%). The main sources of knowledge were the internet (78.9%), followed by books (56.6%), and journals (27.6%). A significant increase in knowledge was seen in the post-symposium testing for most questions in all physicians.

Table 1 (continued)

SN	Author (year), Title. Country, [(Reference number]	Study objectives	Study Design & Data Collection tools	Sample Size, study population and & setting	Key Findings
5	Carroll et al. (1998). Primary Health Care Needs for Travel Medicine Training in Britain. United Kingdom. [26]	To assess training requirements and to establish the demand for an academic course in travel medicine among doctors and nurses who work in general practice.	A cross-sectional design using a short postal questionnaire.	1430 completed questionnaires (37% response rate). Including: 716 medical doctors, 709 (99%) were general practitioners (GPs) And 714 nurses working in general practice.	87% of the GPs advised travelers and only 48% administered vaccines. GPs consulted an average of 10 per month, and immunizing on average 1 1 travelers each month. Only 20% saw 15 or more travelers a month, and 5% 30 or more. Prior training: Only 21% of GPs (145) had undergone prior training, although twelve cited courses such as the diploma in Tropical Medicine & Hygiene, which would have provided little, if any, instruction in travel medicine. Most mentioned lectures organized by pharmaceutical companies, with very few attending TM conferences and three reporting specialist courses such as aviation medicine. 88% percent of GPs wanted approved postgraduate training. This was more sought-after than a diploma (28%), certificate (35%) or a Royal College qualification (18%) ($p < 0.001$). Source of TM information: 93% used a computer, 91% had access to a medical library, 85% to a postgraduate medical center, and 54% had a modem attached.
6	Durham et al. (2011). A Comparison of Pharmacist Travel-Health Specialists versus Primary Care Providers' Recommendations for Travel-Related Medications, Vaccinations, and Patient Compliance in a College Health Setting. USA. [13]	To compare the recommendations for travel-related medications and vaccinations of the PCPs (primary care physician) and the pharmacists specializing in pretravel health, and also compare medication and vaccination compliance between the two groups.	A cross-sectional design using a retrospective chart review.	513 travelers were identified; 172 were seen by a PCP and 341 were seen in the PTC (pharmacist-run travel clinic). The setting for this study was a student health center at a major university.	Vaccine/medication recommendations were assessed for consistency with national/international guidelines. Antibiotic prescription: Antibiotics for travelers' diarrhea were given by the PTC group more often when indicated than the PCP group (96% vs. 50%, $p < 0.0001$). Patients seen in the PTC group received their medications more often than those seen by the PCP group (75% vs. 63%, $p = 0.04$). PCPs prescribed more antibiotics for travelers' diarrhea that were inconsistent with guidelines than the PTC group (not ordered when indicated 49% vs. 6%, $p < 0.0001$) and ordered when not indicated 21% vs. 3%, $p < 0.0001$). Antimalarials prescription: PTCs prescribed antimalarials more often when indicated (98% vs. 81%, $p < 0.0001$); PCPs prescribed more antimalarials that were inconsistent with guidelines (not ordered when indicated 15% vs. 1%, $p < 0.0001$ and ordered when not indicated 19% vs. 2%, $p < 0.0001$). Travel prescription: PTCs ordered more vaccines per patient when indicated (mean = 2.77 vs. 2.31, $p = 0.0012$). PTC patients were more likely to receive vaccines when ordered (mean = 2.38 vs. 1.95, $p = 0.0039$). PCPs recommended more vaccines per patient that were inconsistent with guidelines (not ordered when indicated: mean = 0.78 vs. 0.12, $p < 0.0001$, ordered when not indicated: mean 0.18 vs. 0.025, $p < 0.0001$). Visit documentation: The PTC group documented the purpose of travel more frequently than PCPs (99% vs. 55%, $p < 0.0001$), and also documented activities planned by the traveler more frequently (70% vs. 48%, $p < 0.0001$) than PCPs.
7	Hatz et al. (1997). Travel advice: a study among Swiss and German general Practitioners. Germany and Switzerland. [15]	To assess the information materials used, the quality of current standard pretravel advice and the perceived needs of Swiss and German general practitioners (GPs).	A cross-sectional design using pretested telephone interviews and questionnaires.	150 Swiss and 150 German GPs who give travel advice. The study groups included GPs in two neighboring areas of southern Germany and north-western Switzerland.	Pretravel advice: Swiss GPs provided pre-travel advice 4–5 times per month. German GPs provided pre-travel advice 5–7 times per month. The extent of correct pre-travel advice was unsatisfactory in both study groups. There was no significant association between the frequency of advice given and the quality of the answers on malaria medication and required vaccinations. Malaria recommendations: 25% of Swiss GPs provided standard recommendations on malaria medication, and 9% of German GPs for Kenya and Thailand. Vaccine recommendations: 47% Swiss GPs and 25% German GPS had correct advice on vaccination requirements. Source of information: Half of the GPs wanted to consult their documents before giving advice. The main source of information used by Swiss GPs was the monthly updated Bulletin of the Federal Office of Public Health (BFOPH). A variety of different sources was recorded among German practitioners. Regular, concise information on travel advice topped the list of requested information material in both countries.

Table 1 (continued)

SN	Author (year), Title. Country, [(Reference number]	Study objectives	Study Design & Data Collection tools	Sample Size, study population and & setting	Key Findings
8	Heywood et al. (2015). General Practitioners' Perception of Risk for Travelers Visiting Friends and Relatives. Australia. [22]	To examine the knowledge, attitudes, and practices of general practitioners (GPs) in the provision of pre-travel preventative health advice to travelers who visit friends and relatives (VFR) and the challenges of providing this advice.	A cross-sectional design using self-administered structured questionnaires (postal survey).	563 completed questionnaires were returned and included in the analysis (response rate 29%). GPs practicing in Sydney, Australia.	Languages Other Than English (LOTE) were spoken by 76.6% of GPs. 83.8% consulted in one or more languages. GPs who consulted in LOTE were more likely to see more travel patients per week than GPs consulting in English only. Visiting family and relatives was the most stated reason for travel for the most recent patient presenting for travel advice. 47.1% GPs reported they had not undertaken any TM training. 62.9% reported previous referral of travel patients to another physician. 84.5% were referred for the administration of yellow fever vaccine. Other reasons included complex itineraries, special needs populations (for example, children or pregnant women), and for travel vaccines. The most selected barriers to the provision of pre-travel medical care to VFR travelers were: perceived late presentation by VFR travelers (85.6%). Low perception of risk by VFR travelers (80.5%). Cost of vaccines and medications (78.5%). Patients believed previous immunity will be protective (63.2%). Difficulty in assessing prior vaccination or disease exposure (62.2%).
9	Hoveyda et al. (2004). A Description of Travel Medicine in General Practice: A Postal Questionnaire Survey. England. [24]	To determine the current practice about pretravel health advice in general practices within South Cheshire Health Authority and to gather information on quality control.	A cross-sectional design (postal survey) using self-administered structured questionnaires.	91 general practices (GP) in South Cheshire Health Authority, England.	All GPs offered pretravel travel health advice. The median duration of travel health consultation was 11 min. Common sources of travel health advice: wall immunization charts (72%), various drug company telephone help lines (62%), Liverpool School of Hygiene &Tropical Medicine (37%), World Health Organization (15%), Travax, SCIEH (14%). Pretravel advice content: All respondents reported giving advice on insect or animal bites and water, 86% discussed the risks of sun exposure, 82% reported discussing sexual health and the risks of HIV, and food precautions, 72% reported discussing risks of accidents. TM training: 93% had attended a course on TM; 83% had attended a course for 2 days or less; over 75% expressed a wish to train to a set standard with certification. Barriers to practice TM: limited consultation time; lack of training in travel medicine; need for a protocol; low number of travelers to acquire adequate skills or knowledge in TM.
10	Kogelman et al. (2014). Knowledge, attitudes, and practices of US practitioners who provide pre-travel advice. United States. [14]	To assess the extent to which primary care providers (PCPs) deliver travel medicine advice and compare their practice with travel medicine specialists.	A cross-sectional design using a web-based survey.	14,932 e-mails were sent to valid e-mail addresses to PCPs and TM specialists. 902 yielded complete or partially completed surveys (6.0% response rate).	80% personally provided pre-travel advice (95% of TM specialists versus 73% of PCPs). About two thirds of PCPs (68%) providing pre-travel consultations saw < 50 travelers per year. 30% of TM specialists saw < 50 travelers per year. More TM specialists (59%) than PCPs (18%) saw > 500 travelers per year. Familiarity with travel-specific vaccines (Yellow Fever; Japanese encephalitis) and provision of written educational materials increased as volume of travelers increased. Familiarity with antimalarial side effects and malaria resistance patterns, and knowledge scores based on brief pre-travel scenarios were higher in TM specialists, American Society of Tropical Medicine and Hygiene (ASTMH) or International Society of Travel Medicine (ISTM)certificate holders, and respondents who saw more pre-travel patients. Around 94% of PCPs were interested in a short course in TM compared to 77% of TM specialists.
11	Krause et al. (1999) Pretravel advice neglects rabies risk for travelers to tropical countries. Germany & Switzerland. [16]	To assess general practitioners' (GP) awareness of the risk of rabies for travelers, and of the relevant preventive measures.	A cross sectional design using a pretested telephone interview followed by a written questionnaire with a multiple-choice list.	150 German and 150 Swiss GPs.	76% recommended 'nothing' as a preventive measure against rabies. One or two important preventive measures were mentioned by only a few GPs. No major differences were detected between German and Swiss GPs about their recommendations for rabies prevention. 119 German and 121 Swiss GPs said they would recommend the three important preventive measures in the future significantly more often than they had recommended them to their patients in the past.

Table 1 (continued)

SN	Author (year), Title. Country, [(Reference number]	Study objectives	Study Design & Data Collection tools	Sample Size, study population and & setting	Key Findings
12	Kurup et al. (2019). Knowledge, attitude and practice of travel medicine among primary care physicians in Oman: the need for intervention. Oman. [20]	To assess the current knowledge, attitude, and practice of travel medicine among primary care physicians (PCPs) working in the Muscat Governorate.	A cross-sectional design using a self-administered questionnaire.	134 questionnaire was distributed; 108 PCPs (81%) in primary healthcare institutions in the Muscat Governorate responded.	More than 50% ($n=54$) had been in practice for more than 8 years. 43 (40%) had post-graduate training. 19 (18%) attended TM updates. 63 (58%) reported having pre-travel consultations during the previous 1-month. 86 (80%) had post-travel consultations. 64 (65.4%) ($n=98$) had up to 30 consultations per day. 36 (33%) had access to journals. Mean knowledge score was 7.1 (SD 2.7, median 8, IQR 5–9); max score possible was 14. Most were aware of the issues that needed to be addressed in pre-travel consultation. 72/97 (74%) strongly agreed for the need to have training in TM.
13	Piotte et al. (2013). Pre-travel consultation: evaluation of primary care physician practice in the Franche-Comté region. France. [5]	To assess the level of specific knowledge among primary care physicians (PCPs) on health advice, vaccinations, and malaria prophylaxis.	A cross sectional design using postal questionnaire.	400 PCPs practicing in the Franche-Comté regions (eastern France).	Higher knowledge scores were associated with proximity of a vaccination center ($p=0.001$), motivation score ($p=0.004$), and absence of request for expert advice on malaria prophylaxis ($p=0.007$).
14	Price et al. (2011). General Physicians Do Not Take Adequate Travel Histories. England. [25]	To determine how often generalists documented travel histories from patients admitted to emergency and acute medical units (AMU) with travel-related diseases. To assess the adequacy of these histories to guide patient and public health management.	A cross -sectional design using a retrospective record review.	132 relevant patient admissions were identified and included in AMUs of 2 hospitals in Northwest England.	Travel history was documented in only 26 patients (19.7%). 16 (62.5%) of whom had travelled abroad. For the 16 patients who had travelled abroad: the destination was recorded in (87.5%); a reason for travel in (75%). A sexual history was only recorded for four (25.0%); location within destination country (18.8%). Questions about pretravel health advice were only recorded for one patient (6.3%). Duration of travel was recorded in eight patients (50.0%). Of the five patients presenting with fever after travel, none had adequate documentation of a viral hemorrhagic fever risk assessment.
15	Ropers et al. (2004). Nationwide survey of the role of travel medicine in primary care in Germany. Germany. [9]	To investigate the role and scope of travel medicine (TM) provided by general practitioners (GPs) in primary health care, assess the determinants of specific prophylactic recommendations, and identify the needs of GPs regarding training and cooperation in travel medicine.	A cross-sectional design using a standardized postal questionnaire.	1,320 National survey of GPs in Germany.	Of all GPs, 95% provided medical pretravel advice or post-travel counseling (13.2 patients per month). Most common topics in pretravel consultation were immunizations (95%), malaria chemoprophylaxis (94%), advice on exposure prophylaxis (41%), and advice on protection from sexually transmitted infections (STIs; 43%). GPs frequently advised certain patient groups (e.g., cardiovascular patients 68%, pregnant women 20%). Travelers' diarrhea was the most common topic in post-travel consultation (89%), followed by fever (38%). 25% GPs cooperated regularly with institutions with special expertise in TM or tropical diseases. 64% had received some training in TM, and 86% stated a need for additional training. In multivariate analysis, independent determinants for advice on exposure prophylaxis and STI risks included special training in TM, use of country-specific information sources, and location of the practice in the former West Germany and urban areas.

Table 1 (continued)

SN	Author (year), Title. Country, [(Reference number]	Study objectives	Study Design & Data Collection tools	Sample Size, study population and & setting	Key Findings
16	Seelan et al. (2003) Health advice given by general practitioners for travelers from Australia. Australia. [23]	To investigate the prevalence of travel health advice and written documentation reported to be given by general practitioners to travelers from Australia.	A cross-sectional study using postal questionnaire.	433 GPs were randomly selected from the register of the Medical Directory of Australia from the areas of western Sydney and Townville.	GPs saw an average of 3.9 (SD +/- 11.8) travelers per week. 79.2% (160/202) spent between 5–25 min for pre-travel consultations. GPs gave advice on travel vaccines, malaria prophylaxis, personal protective measures against insect bites, geographic diseases, clothing, and sexually transmitted infections. Majority of GPs did not routinely give information on travel insurance, unsafe sex, barotrauma, in-flight exercise, jet lag or first aid knowledge. Most GPs did not routinely give written documentation in the form of written travel health advice, a doctor's letter, or a travelers' vaccination record.

Table 2 The identified study results synthesis themes and sub-themes

Themes	Sub-themes
1. Knowledge	Knowledge level/Scores
	Knowledge predictors/determinants
2. Training	Training received
	Interest in further training
3. Sources of information	Online/internet sources
	Official/institutional sources
4. Travel medicine practice	Pre-travel consultation
	Post-travel counselling
	Referral
	Documentation
	Number of patients (consultations)
	Duration of consultations
	Population served
5. Barriers/challenges to travel medicine practice	No sub-themes were identified

Characteristics of articles

All articles included in the review were cross-sectional studies and were published in peer-reviewed journals. Geographically, two articles originated from the United States of America (USA) [13, 14], three from Germany and Switzerland [9, 15, 16], five from the Gulf Cooperation Council (GCC) countries [17–21], two from Australia [22, 23], three from the United Kingdom [24–26], and one from France [5] (Table 1).

The most commonly used method for data collection from general practitioners (GPs) and primary care physicians (PCPs) was the postal survey [5, 9, 22–24, 26], followed by retrospective patient record review [13, 25]. Other methods included telephone interviews combined with questionnaires [15, 16], self-administered questionnaires [21], and web-based surveys [14]. The sample sizes of individual studies varied, ranging from less than 100 participants in studies from GCC countries [17–20] to approximately 1500 in studies from the United Kingdom [26] and Germany [9], with a mean sample size of around 500 across all included studies.

Description of themes and sub-themes

Themes and sub-themes derived from the key findings of the 16 included studies were initially generated independently by the three authors. In instances of discrepancy, consensus was reached on the final themes and sub-themes for inclusion, as presented in Table 2. Together, these themes addressed the scoping review questions outlined above (Sect. 2.1).

Results

Knowledge

Knowledge scores/levels

Three studies examined PCPs' knowledge of TM in general [14, 18, 20], while two assessed their knowledge of specific vaccines or chemoprophylaxis [16, 17]. Overall, knowledge levels were low, although only two studies established a predetermined cutoff point for knowledge scores [18, 20]. The highest reported knowledge score was from the study in Qatar, with a mean score of approximately 60% [17], followed by 50% in the Oman study [20]. Conversely, the Saudi study revealed that around 60% of PCPs had poor knowledge [18], while the remaining two studies from the USA and Germany, and Switzerland concluded that PCPs exhibited poor knowledge levels without employing a specific scoring system [14, 16].

Knowledge predictors/determinants

Predictors or determinants for PCPs' knowledge levels in TM were reported in five out of the 16 studies [5, 14, 17, 18, 21]. Predictors of higher knowledge levels included specialized training or prior experience in TM, a higher volume of pre-travel consultations, multilingual PCPs (speaking three or more languages), proximity to vaccination centers, motivation scores, and inaccessibility to expert advice on malaria prophylaxis [5, 14, 17, 21]. Additionally, a higher volume of travelers was associated with increased familiarity with travel-specific vaccines (Yellow Fever, Japanese encephalitis) and the provision of written educational materials [14]. Conversely, younger

age, shorter years of clinical experience, and graduates of Arab countries were associated with lower knowledge scores [17, 18]. Gender was variably associated with TM knowledge levels in two studies [17, 18].

Training

Training received in TM

The percentage of PCPs who received training in TM ranged from 21 to 93% in five studies [9, 19, 20, 24, 26]. The length and type of TM training also varied, ranging from a few-day courses to official certification and specialized post-graduate training [17, 20, 24].

Interest in further training

Five studies highlighted that PCPs expressed the need for further training in TM, including specialized certification, by attending special courses, enrolling in postgraduate training programs or obtaining diplomas, or acquiring specific international qualifications tailored to the context of each study setting. The percentage of PCPs indicating the need for further TM training ranged between 74% and 94% [9, 14, 20, 24, 26].

Sources of information

Online/Internet sources

Out of the 16 included studies, two from Qatar revealed that the internet was the primary source of TM information [17, 19]. Al-Hajiri et al. discovered that approximately 80% of PCPs relied on the internet as their main source of TM knowledge [19], while Al-Dahshan et al. demonstrated that the vast majority of PCPs (95%) utilized specialized internet websites (e.g., CDC, WHO) as their primary information resources for practicing TM [17].

Official/Institutional sources

Five out of the 16 studies reported official/institutional sources for information [9, 15, 20, 24, 26]. The main official/institutional sources reported were computers, medical libraries, postgraduate medical centers, documents, the Bulletin of the Federal Office of Public Health (BFOPH), immunization charts, TM updates, journals, various drug company telephone helplines, specific universities, and internet sources of international organizations (e.g., World Health Organization), and institutions with special expertise in TM or tropical diseases.

Travel medicine practice

Pre-travel Consultation

The frequency of providing pre-travel consultation varied in the reviewed studies between 50% [19, 20] to more than 90% [9, 14, 15, 21, 24, 26]. The topics of travel consultation also varied among the studies and included the following: travel vaccines and immunizations, Malaria prophylaxis, sexually transmitted diseases, exposure prophylaxis like personal protective measures against insect bites, geographic diseases, travelers' diarrhea and needed antibiotics, fever, clothing, sun exposure and food precautions, and risks of accidents [9, 13, 15, 19, 21–24]. In contrast, areas which were frequently missed by the majority of GPs in one study included counseling about travel insurance, unsafe sex, barotrauma, in-flight exercise, jet lag, and first aid knowledge [23].

Post-travel consultation

Only 3 studies reported the provision of post-travel counseling [9, 20, 21]. The most frequently encountered topic in post-travel consultations was traveler's diarrhea followed by fever and respiratory symptoms [9, 21].

Referral

Only one study conducted in Australia reported that around two-thirds of the respondent GPs had previously referred travel patients to other physicians which was mostly done for the administration of yellow fever vaccine. Other reasons for referral included complex journeys and populations of special needs [22].

Documentation

Two studies examined PCPs' documentation about TM [13, 25]. Durham et al. compared visit documentation between PCPs and specialized pharmacists in TM. The authors found that the latter group had more comprehensive documentation of the travel purpose and planned activities [13]. The second study was conducted in two acute medical units in England. The travel history was only recorded in one-fifth of the patients admitted with travel-related illnesses. Moreover, in the few patients who had documented travel history, most of the documents were deficient for important aspects of travel history such as sexual history, location within the destination country, duration of travel, and pretravel health advice. In addition, none of the patients who had post-travel fever had adequate documentation of viral hemorrhagic fever risk assessment [25].

Number of consultations

Eight studies reported the frequency of TM consultations or the number of patients seen [9, 14, 15, 17, 20, 21, 23, 26]. The range of provided travel consultations in primary care varied according to the study context from fewer than 50 to more than 500 per year [14], 30 patients per day [20], 4–13 per month [9, 15, 17, 26], and around 4 travelers per week [23]. Predictors for higher frequency of pretravel consultations included male gender, having past training or experience in TM, and multilingualism [21, 22].

Duration of consultations

Three studies reported on the duration of TM consultations with a mean duration of 7–15 min according to the study context [19, 21, 22].

Populations served

Only two studies specified the characteristics of the population served in the travel consultations [9, 21]. They reported that GPs frequently advised certain patient groups (e.g., patients with chronic disease and pregnant women).

Barriers to TM practice

Two studies addressed the barriers to TM practice [22, 24]. The main barriers identified included perceived late presentation of travelers, low perception of risk by the travelers, the cost of vaccines and medications, belief in the protective effects of previous immunity, difficulty in assessing prior vaccination or disease exposure, limited consultation time, lack of training in TM, absence of protocols, and a low number of travelers hindering the acquisition of adequate skills or knowledge in TM [22, 24].

Discussion

This scoping review mapped 16 articles on PCPs' roles in TM practice. Overall, PCPs' TM knowledge levels appear low across most studies, with varying frequencies of specialized TM training. Many rely on specialized websites for TM information. Pre-travel consultations are more common than post-travel ones, often with inadequate documentation. Barriers to TM in primary care include patient-related factors (late presentation, low risk perception), PCP-related factors (lack of training), and healthcare system factors (cost, lack of protocol).

PCPs consistently demonstrated low levels of TM knowledge across the reviewed literature, raising concerns about their competency in providing pretravel counseling and essential services for traveler health and safety. TM knowledge demands continuous updates on global infectious disease trends, antimicrobial resistance, and health regulations [27]. However, the assessment of knowledge lacked standardization, varying from general TM knowledge to specific vaccines or chemoprophylaxis, with no predefined scoring system. Comparing knowledge levels between studies was challenging due to geographical variations and time gaps. While international organizations have outlined standards for TM practice by PCPs, the extent of PCP compliance remains uncertain, as inadequately examined in the literature [28–32]. The Certificate in Travel Health® (CTH®) training, offered by the International Society of Travel Medicine (ISTM) aims to standardize travel health knowledge and ensure competencies of the healthcare providers involved in TM practice. However, further studies are needed to assess the impact of CTH certification on TM practice [33].

We identified factors associated with higher TM knowledge scores, categorized as physician-related (motivation, multilingualism, prior TM training) and practice-related (high exposure to travelers, proximity to vaccination centers). Interestingly, these predictors are largely modifiable. Inconsistent exposure to travel patients could be addressed by healthcare system design to ensure PCPs have regular TM practice opportunities. Though the optimal frequency of travel consultations for maintaining TM competency is not well defined, it is suggested that practitioners should regularly advise travelers with diverse medical backgrounds and destinations [30, 31].

This review demonstrates wide variation in the frequency of travel consultations by PCPs, ranging from occasional consultations per week to over ten consultations daily. This highlights the inconsistent exposure to TM practice in primary healthcare [9, 14, 15, 17, 20, 21, 23, 26]. It is also noteworthy that PCPs with past TM experience or official training were found to practice TM more frequently [5, 14, 17, 21]. , reflecting a positive feedback loop between training, experience, and practice. Moreover, lack of training in TM and inadequate exposure to travelers were frequently cited as major barriers to knowledge in TM [22, 24]. These observations underscore the importance of PCPs' training in TM and regular engagement in TM practice to achieve and maintain adequate levels of knowledge in TM.

Several studies demonstrated that training in TM was associated with higher knowledge scores [14, 17], more frequent TM practice [21], and higher quality of medical advice to travelers [14, 34, 35]. The percentage of PCPs who received formal TM training varied widely in the studies, ranging from around 20–90%. Additionally, the majority of PCPs acknowledged significant knowledge gaps and emphasized the need for additional training. An earlier Irish study assessing compliance with national yellow fever vaccination programs in 246 centers, mostly in primary care, uncovered several deficiencies in vaccine administration protocols and the management of adverse events. Notably, there was a concerningly low rate of formal qualifications in travel medicine among respondents, with many expressing a need for further training [36]. Leder et al. proposed a four-step approach to enhance TM training and practice in primary care: defining minimum knowledge requirements, teaching effective patient education on TM, integrating TM training into medical education programs, and providing accessible, regularly updated clinical practice guidelines on TM [37]. Although many international organizations and scientific

committees have incorporated most of these steps into their recommendations, the art and science of pedagogy in delivering effective health education have not been commonly addressed [37]. Previous literature suggested that injection anxiety among travelers was not uncommon, which could impact health advice recall [38]. We also identified in this review some barriers to TM practice, including low risk perception by travelers and the belief that previous immunity would be protective [22, 24]. Training PCPs on effective patient education in TM is an interesting area of development that might help overcome these barriers.

Most consultations in this review focused on pretravel advice on communicable diseases, with limited examination of post-travel medical issues. Documentation of TM consultations was often lacking, even for hospitalized patients with travel-related illnesses, and many consultations omitted crucial topics on non-infectious aspects of travel. The mean duration of travel consultations reported (7–15 min) was notably shorter than the recommended duration (20 to 60 min) by international TM societies, including the Infectious Diseases Society of America (IDSA), the Committee to Advise on Tropical Medicine and Travel (CATMAT), and the Faculty of Travel Medicine (FTM) of the Royal College of Physicians and Surgeons of Glasgow [30, 31, 39]. TM consultation duration should be customized based on individual risk assessment and geographic exposure. Trained non-physician healthcare workers, like community nurses or pharmacists, can conduct TM consultations following detailed protocols, with a clear pathway to physician consultation if required [31]. Documentation of TM consultations is crucial for patient safety and care continuity. Standardized formats for risk assessment, medical advice, and patient pathways before, during, and after travel could enhance this. Additionally, virtual consultations offer intriguing potential for patient access to medical care across all travel stages, representing a significant area of TM development.

Limitations

This review provided a comprehensive analysis of PCPs' involvement in TM, focusing on knowledge, training, practice, and barriers. However, the limitations primarily involve a focus on Western-centric studies with diverse sample sizes and methodologies. Additionally, the studies span a long timeframe, which may not account for the effects of recent widespread access to reliable internet resources for travel medicine. There is a need for further global research using standardized assessments. Studies predate COVID-19, indicating a need for updated evaluations and exploring telemedicine's role. Biases in observational studies may affect evidence quality. Clinical impacts like vaccine uptake were not assessed, nor were travelers' perspectives on TM care. These areas present opportunities for future research.

Conclusions

The practice of TM in primary care faces challenges due to PCPs' low knowledge levels, inadequate training, and documentation. Various barriers exist, including those related to physicians, healthcare systems, and travelers themselves. Experience and training in TM positively impact consultation volume and knowledge scores. To address these challenges, family medicine training programs should integrate TM into their curriculum, healthcare systems should ensure PCPs have exposure to travelers and updated protocols, and non-physician healthcare providers should be trained to support TM services. Public health campaigns are needed to raise awareness about seeking medical advice before traveling. Policymakers should establish standardized assessment tools for TM knowledge, and future research should explore virtual consultations and patient education's impact on TM outcomes.

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Author contributions

AAD: conceptualization, data curation, methodology, writing - original draft, writing – review & editing, and project administration. SA: data curation, methodology, writing - original draft, and writing – review & editing. AJ: writing - original draft, and writing – review & editing. VK: conceptualization, data curation, methodology, writing – review & editing, and supervision.

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References

1. Aba YT, Gagneux-Brunon A, Andrillat C, Fouilloux P, Daoud F, Defontaine C, et al. Travel medicine consultation: an opportunity to improve coverage for routine vaccinations. Med Mal Infect. 2019;49(4):257–63.
2. Lim PL. Travel and the globalization of emerging infections. Trans R Soc Trop Med Hyg. 2014;108(6):309–10.
3. Gherardin T. The pre-travel consultation - an overview. Aust Fam Physician. 2007;36(5):300–3.

4. Chiodini J. Providing a travel health service in primary care. Nurs Stand. 2005;19(39).
5. Piotte E, Bellanger AP, Piton G, Millon L, Marguet P. Pre-travel consultation: evaluation of primary care physician practice in the Franche-Comté region. J Travel Med. 2013;20(4):221.
6. Posey DL. Manual of Travel Medicine and Health. Emerg Infect Dis. 2004;10(7):1347–1347.
7. Larocque RC, Rao SR, Tsibris A, Lawton T, Anita Barry M, Marano N, et al. Pre-travel health advice-seeking behavior among US international travelers departing from Boston Logan International Airport. J Travel Med. 2010;17(6):387–91.
8. Henderson S, Bakshi R, Lobraico J, et al. Family physicians' knowledge, attitudes, and practices regarding travel health. J Travel Med. 2014;21(2):104–9. https://doi.org/10.1111/jtm.12085.
9. Ropers G, Krause G, Tiemann F, Van Beest Holle MDR, Stark K. Nationwide survey of the role of travel medicine in primary care in Germany. J Travel Med. 2004;11(5):287–94.
10. Seelan ST, Leggat PA. Referral of travellers from Australia by general practitioners for travel health advice. Travel Med Infect Dis. 2003;1(3):185–8.
11. Angell SY, Behrens RH, Diaz JH, Gershman MD, Hagmann SH, Kamminga P, Leder K, Schwartz E. Travel Medicine as a Global Health Discipline: from the Geographical Medicine Perspective. J Travel Med. 2016;23(6):taw083. https://doi.org/10.1093/jtm/taw083.
12. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. https://doi.org/10.1080/1364557032000119616. 2007;8(1):19–32.
13. Durham MJ, Goad JA, Neinstein LS, Lou M. A comparison of pharmacist travel-health specialists' versus primary care providers' recommendations for travel-related medications, vaccinations, and patient compliance in a college health setting. J Travel Med. 2011;18(1):20–5.
14. Kogelman L, Barnett ED, Chen LH, Quinn E, Yanni E, Wilson ME, et al. Knowledge, attitudes, and practices of us practitioners who provide pre-travel advice. J Travel Med. 2014;21(2):104–14.
15. Hatz C, Krause E, Grundmann H. Travel advice: a study among Swiss and German general practitioners. Trop Med Int Heal. 1997;2(1):6–12.
16. Krause E, Grundmann H, Hatz C. Pretravel advice neglects rabies risk for travelers to tropical countries. J Travel Med. 1999;6(3):163–7.
17. Al-Dahshan A, Selim N, Al-Kubaisi N, Mahfoud Z, Kehyayan V. Primary care physicians' knowledge of travel vaccine and malaria chemoprophylaxis and associated predictors in Qatar. PLoS ONE. 2022;17(3 March):1–14.
18. Alduraibi RK, Almigbal TH, Alrasheed AA, Batais MA. Knowledge, attitudes, and practices of primary health care physicians regarding the pre-travel counselling of patients with type 2 diabetes in Riyadh, Saudi Arabia. BMC Fam Pract. 2020;21(1):200.
19. Al-Hajri M, Bener A, Balbaid O, Eljack E. Knowledge and practice of travel medicine among primary health care physicians in Qatar. Southeast Asian J Trop Med Public Health. 2011;42(6):1546–52.
20. Kurup PJ, Al Abri SS, Ajmi F, Al, Khamis HA, Singh J. Knowledge, attitude and practice of travel medicine among primary care physicians in Oman: the need for intervention. East Mediterr Health J. 2019;25(1):40–6.
21. Al-dahshan A, Selim N, Al-kubaisi N, Mahfoud Z, Kehyayan V. Scope and predictors of travel medicine practice among primary care physicians in qatar scope and predictors of travel medicine practice among primary care physicians in qatar. Prev Med Rep. 2023;35:102337.
22. Heywood AE, Forssman BL, Seale H, MacIntyre CR, Zwar N. General practitioners' perception of risk for Travelers visiting friends and relatives. J Travel Med. 2015;22(6):368–74.
23. Seelan ST, Leggat PA. Health advice given by general practitioners for travellers from Australia. Travel Med Infect Dis. 2003;1(1):47–52.
24. Hoveyda N, McDonald P, Behrens RH. A description of travel medicine in general practice: a postal questionnaire survey. J Travel Med. 2004;11(5):295–9.
25. Price VA, Smith RAS, Douthwaite S, Thomas S, Almond DS, Miller ARO, et al. General physicians do not take adequate travel histories. J Travel Med. 2011;18(4):271–4.
26. Carroll B, Behrens RH, Crichton D. Primary health care needs for travel medicine training in Britain. J Travel Med. 1998;5(1):3–6.
27. Aw B, Boraston S, Botten D, et al. Travel medicine: what's involved? When to refer? Can Fam Physician. 2014;60(12):1091–103.
28. International Society of Travel Medicine. ISTM Body of Knowledge. 2017. Accessed January 14, 2024. https://www.istm.org/education-resources/cth-program/istm-body-of-knowledge/
29. Public Health Agency of Canada. The Committee to Advise on Tropical Medicine and Travel. Canada.ca. March 27, 2023. Accessed January 14. 2024. https://www.canada.ca/en/public-health/services/catmat.html
30. Committee to Advise on Tropical Medicine and Travel. Guidelines for the practice of travel medicine. An Advisory Committee Statement (ACS). Can Commun Dis Rep. 2009;35(ACS–8):1–14.
31. Hill DR, Ericsson CD, Pearson RD, Keystone JS, Freedman DO, Kozarsky PE, et al. The practice of travel medicine: guidelines by the Infectious Diseases Society of America. Clin Infect Dis. 2006;43(12):1499–539.
32. Sanford C, McConnell A, Osborn J. The Pretravel Consultation. Am Fam Physician. 2016;94(8):620–7.
33. Kozarsky PE, Steffen R. Travel medicine education—what are the needs? J Travel Med. September 2016;23(5):taw039. https://doi.org/10.1093/jtm/taw039.
34. Boddington NL, Simons H, Launders N, et al. Evaluation of travel medicine practice by yellow fever vaccination centers in England, Wales, and Northern Ireland. J Travel Med. 2012;19(2):84–91. https://doi.org/10.1111/j.1708-8305.2011.00587.x.
35. Ruis JR, van Rijckevorsel GG, van den Hoek A, Koeman SC, Sonder GJ. Does registration of professionals improve the quality of travelers' health advice? J Travel Med. 2009;16(4):263–6. https://doi.org/10.1111/j.1708-8305.2009.00309.x.
36. Noone P, Hamza M, Tang J, Flaherty G. Standards of yellow fever vaccination and travel medicine practice in the Republic of Ireland: a questionnaire-based evaluation. Travel Med Infect Dis. 2015;13(5):409–14. https://doi.org/10.1016/j.tmaid.2015.06.007.
37. Leder K, Bouchaud O, Chen LH. Training in Travel Medicine and General practitioners: a long-haul journey! J Travel Med. 2015;22(6):357–60. https://doi.org/10.1111/jtm.12240.
38. Noble LM, Farquharson L, O'Dwyer NA, Behrens RH. The impact of injection anxiety on education of travelers about common travel risks. J Travel Med. 2014;21(2):86–91. https://doi.org/10.1111/jtm.12081.
39. Chiodini JH, Taylor F, Geary K, Lang S, Moore J, Ross DA, et al. Faculty of Travel Medicine of the Royal College of Physicians and surgeons of Glasgow. Good Practice Guidance for Providing a Travel Health Service; 2020.

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