

Types and outcomes of pharmacist-managed travel health services: A systematic review

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ABSTRACT

Background and aim: Pharmacists have an important role in providing travel health services and medications to travelers. However, given the limited literature on this topic, the aim of this study is to systematically review the types and outcomes of pharmacist-managed travel health services.

Methods: A comprehensive literature search was performed in four electronic databases, namely Scopus, Web of Science, PubMed and ProQuest to identify studies published in English from 1999 to July 2022. The inclusion criteria included the studies that reported an experience of providing dedicated travel health services by pharmacists and reported the outcomes and/or evaluation of these travel health services.

Results: Nine studies were identified from the literature and included in the review. The pharmacists have provided a wide range of general and specialized travel health services including pre-travel risk assessment, routine and travel-related vaccination service, prescribing or recommending medications for travel-related illnesses, counseling and travel health advice. Overall, 94–100% of the patients were satisfied or very satisfied with pharmacist-managed travel health services. In addition, a good acceptance rate of pharmacist recommendations for vaccines and travel-related medications was reported with most studies reporting an overall acceptance rate of $\geq 75\%$ (acceptance rate range: 48%–94.2%). In addition, high rates of acceptance of other nonpharmacological advices were noted.

Conclusion: Pharmacists with training in travel medicine have successfully provided a wide range of general and specialized travel health services. Most travelers were highly satisfied with the pharmacy-based travel health services and accepted the pharmacist recommendations.

1. Introduction

International travel is an essential aspect of life and times. Millions of people travel to different places for work, business, leisure, and holiday, and to attend religious, social, cultural events, and for medical purposes [1]. Due to the COVID-19 pandemic, international travel dropped sharply by approximately 60% in 2020 to 462 million international

travelers. However, international travel is already picking up as reports project a gradual rebound of travel in the third and fourth quarter of 2022, following a widespread vaccination rollout and the lifting of travel bans in most regions globally [2]. The number of international tourists is expected to rise by 3.3% per year through 2030 to reach a total of 1.8 billion tourist arrivals [3]. The COVID-19 pandemic has reiterated the importance of the health of international travelers and the need to

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provide proper travel health services and preventive medicines for travel-related illnesses [4,5]. Consequently, given the increased risks associated with international travel, travel health services are very important for the health and safety of travelers [6]. Travel health comprises a) providing pre-travel preventive healthcare and medical services for travelers before travel as per the health risk of their itinerary; b) providing treatment and care to travelers if they get sick during travel; and c) post-travel illness treatment and follow-up [7]. It provides healthcare services, including travel health information, health check-up, preventive medications, and vaccination. It covers conditions such as travelers' diarrhea, altitude sickness, motion sickness, malaria, influenza, hepatitis, heat stroke, jet lag, prevention against injuries, and other health conditions [8,9].

Travel involves experiencing changes in weather, food patterns, accommodation, culture, and social interaction, affecting a person's health and well-being. Travel could be associated with many health risks related to infectious and noninfectious diseases, epidemics, transportation means, climatic conditions (e.g., temperature, high humidity), nutritional and living conditions, and natural disasters [8]. Furthermore, elderly travelers, travelers with chronic diseases, children, pregnant women and disabled travelers are at a higher risk during travel and have unique needs regarding travel advice [9]. In addition, a study by Vilkman et al. reported that certain factors such as traveling to certain geographic regions, the age of the traveler and the duration of the travel predisposes travelers to health problems [10]. Likewise, a comprehensive review of travel-related illness studies by Angelo et al. reported between 6 and 87% of travelers became sick across all the nine studies included in their review while four studies estimated that between 43% and 79% of travelers visiting developing countries get sick [11]. Therefore, travel health services are needed for the health and well-being of international travelers.

Medical doctors and nurses provide travel medicine and health services via travel clinics or general practice clinics. In addition, pharmacists can provide comprehensive travel health services [12–14]. Community pharmacies are a good avenue to provide travel health services because of their accessible location and positioning in the community, regular client/customer base and collaborative network with GP clinics [15]. Community pharmacists have provided travel health services, health advice, including vaccination for travel purpose, COVID-19 vaccinations and medications to travelers in countries such as Canada, the USA, the UK and some EU countries [16–20]. However, in the USA and Canada, for example, there are variations between states and provinces in the legal scope of practice regarding travel health services provided by pharmacists. It varies from a limited scope of practice to providing full pharmacy-managed travel health services including autonomously prescribing travel-related medications and vaccines [21,22].

To date, there has not been a comprehensive review that systematically evaluates the literature regarding the types, outcomes, and evaluation of the functioning of pharmacy-based travel health services. Consequently, analyzing and summarizing the current literature would provide up-to-date evidence and insights about the pharmacist-managed travel health services. In addition, it could provide further guidance to health policymakers regarding improving the access to and expanding travel health services through pharmacies. This is particularly important as the ongoing COVID-19 pandemic has shown pharmacists' important roles in COVID-19 vaccination and travel-related care, thereby contributing to managing the COVID-19 pandemic and global travel [23–27]. Therefore, this systematic review aims to evaluate types and outcomes of pharmacist-managed travel health services.

2. Methods

2.1. Study design

This study is a systematic review, and the study protocol has been

registered at PROSPERO 2020, CRD42020205444. The study was developed based on the *Cochrane Handbook for Systematic Reviews of Interventions* [28] and the study results are reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [29].

2.2. Eligibility criteria

In this review, the studies that met the following eligibility criteria were included:

- Studies that reported an experience of providing dedicated travel health services by pharmacists. This includes pharmacist-run travel medicine clinics, or a structured travel medicine program or a full travel health service provided by pharmacists at community pharmacies or other primary care settings. The services included, for example, pre-travel consultation and advice, travel-related vaccination service (i.e., prescribing or recommendations, and administration of vaccines), supply of medications for travelers (prescribing and/or dispensing), and travelers' preparedness to manage their health issues during travel.
- Those studies that reported outcomes and/or an evaluation of the travel health services. The outcomes and evaluations included travelers' satisfaction with the travel health service, acceptance of pharmacist's recommendations, quality of travel health service, utilization of pharmacy-based travel health services, and barriers/challenges and facilitators, and accessibility to the services.
- The articles that were published in English language and reporting experiences from 1999 through July 2022.

Consequently, the studies that did not meet these inclusion criteria were excluded, including studies published in a language other than English and before the year 1999 and articles that explored nonpharmacist-managed travel health services, and studies not related to the study objectives/questions (Table S1).

2.3. Search strategy

The electronic search was performed in four electronic databases, namely Scopus, Web of Science, PubMed and ProQuest. In addition, a manual search in the references of the retrieved articles and an additional search using Google Scholar were made to include all relevant articles whenever possible. The search strategy is provided in Appendix 1.

2.4. Study selection

Two authors (BKC and BS) screened the titles and abstracts of studies retrieved using the search strategy. Full-text articles were also screened in the same manner. Any disagreements were resolved by consensus through other authors (AAA, SS and MIMI). Data were extracted using standardized forms by one author (AAA) and reviewed by another author (BKC). The data extraction form contains (1) publication details (i.e., authors' name and country of the study), (2) settings, (3) study design/method, (4) qualifications/additional training of pharmacist providing the service, (5) pharmacist scope of practice, (6) travel health services, and (7) outcomes and evaluations of the service.

2.5. Risk of bias

Two authors (CM and SS) independently assessed the risk of bias in the included studies with Joanna Briggs Institute's (JBI's) critical appraisal checklist [30]. Any disagreements between the review authors over the risk of bias in the included studies were resolved by discussion with a third reviewer (AAA).

2.6. Data analysis

A qualitative synthesis of the included studies was conducted. Each study was analyzed, and structured around the settings, study characteristics, the type of travel health services provided by the pharmacists, and the outcomes of the services. Consequently, the findings of the included studies on pharmacist-managed travel health services were qualitatively described. Meta-analysis was not conducted due to a large heterogeneity in study designs, methods, and outcome measurements.

3. Results

3.1. Identification and selection of studies

A total of 461 article records were identified from the databases. No additional studies were found from other sources, i.e., Google Scholar. After removing duplicates, 319 studies underwent title and abstract screening; 50 were included for full-text review. Nine articles were ultimately included and extracted. Reasons for the exclusion of full texts and the flow of studies are described in Fig. 1.

3.2. Description and characteristics of the included studies

As shown in Table 1, the specific setting of the nine studies of

pharmacist-managed travel health services included community pharmacy (n = 4) [21,31–33], pharmacist-run travel medicine clinic at a health center in a university (n = 2) [20,34], supermarket chain pharmacy (n = 2) [17,35], and pharmacist-run travel medicine clinic (independent) (n = 1) [36].

In terms of study design and methodology, eight of the studies were descriptive quantitative studies, while one was a qualitative study. The studies utilized different tools to capture the data and assess the outcomes with some studies utilizing more than one method. Some studies utilized a patient chart/record review [20] or a questionnaire/survey [21,34] while the majority utilized both [31–33,35,36].

The included studies were from three countries: USA (n = 6) [17,20,31,33–35], Canada (n = 2) [21,36], and the UK (n = 1) [32]. The characteristics and details of the studies are presented in Table 1.

3.3. Risk of bias

Two authors (CM and SS) independently assessed the risk of bias in included studies using the JBI tool [30]. Overall, the studies were of moderate and good quality. Table S2 shows the critical appraisal of the included studies.

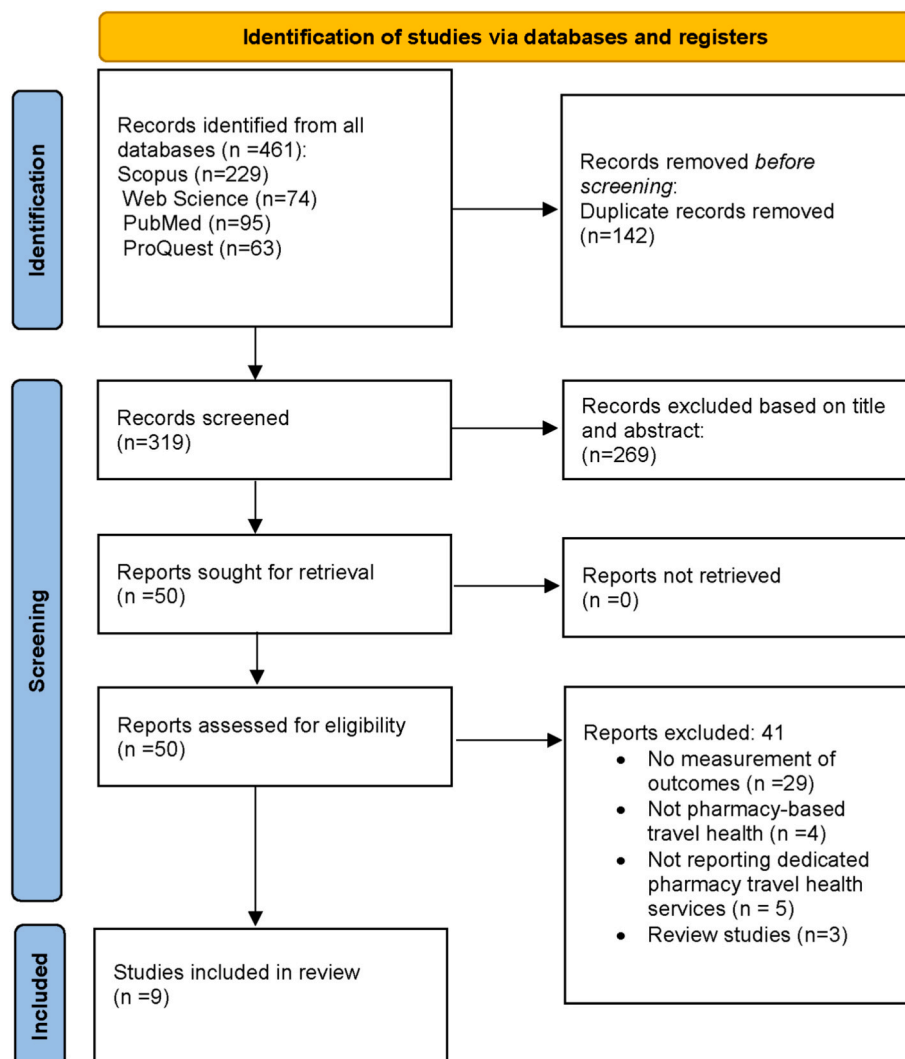


Fig. 1. PRISMA flow chart.

Table 1
Characteristics and main findings of included studies.

Authors, Country	Settings	study design/method	Qualifications/ additional training of pharmacist providing the service	Pharmacist scope of practice	Travel health services	Outcomes and evaluation of the service
Durham et al. [20] United States	Pharmacist-run travel health clinic (PTC) in a student health center at a university.	A retrospective chart review	Clinical pharmacists with postdoctoral residency that included travel medicine. All pharmacists hold Certificate of Knowledge in Travel Health (CTH) from the International Society of Travel Medicine (ISTM).	The pharmacists had prescriptive authority for vaccines and medications under physician protocol.	<ul style="list-style-type: none"> • Verbal counseling • Printed educational materials. • Prescribing of pre-travel medications. • Prescribing vaccines. • The prescribed vaccines were administered by the nurse at the immunization clinic and medicines were dispensed by the university campus pharmacy. 	96% of the patients seen by the travel medicine pharmacists were prescribed antibiotics for travelers' diarrhea when indicated compared to only 50% of patients seen by primary care providers (PCPs). Moreover, 98% of patients were prescribed antimalarials when indicated compared to only 81% seen by a PCP ($P < 0.0001$). 75% of patients seen by the travel medicine pharmacist picked up their prescribed antibiotics for self-treatment of travelers' diarrhea from the pharmacy compared to 63% of patients who were prescribed antibiotics by their primary care provider ($P = 0.04$). The rate of traveler's acceptance of pharmacists' recommendations for vaccine administration was 69%. Most of the travelers (73%) stated that the educational materials and personalized traveler's report provided by the pharmacist were useful during their illness in travel. Most travelers (68%) reported that they have used pharmacist advice when they became ill during their travel. The reasons for nonacceptance of the vaccine recommendation among some travelers included cost, lack of perceived necessity, and inability to take the vaccine series before the travel.
El-Kurdi et al. [34]. United States	Travel health clinic at campus Health services at a university.	Questionnaire (telephonic survey)	A clinical pharmacy practitioner with ISTM training	The pharmacist works with a supervising physician to provide healthcare and initiate or modify the pharmacotherapy for the patients. Consequently, the travel care is provided as per the protocol established in the clinical pharmacist practitioner agreement.	<ul style="list-style-type: none"> • Travel recommendations and advice. • Travelers' educational materials and personalized report • Recommendation for vaccines. • Recommendation for medications. 	Most travelers (68%) reported that they have used pharmacist advice when they became ill during their travel. The reasons for nonacceptance of the vaccine recommendation among some travelers included cost, lack of perceived necessity, and inability to take the vaccine series before the travel.
Hess et al. [31] United States	Pharmacist-run travel health clinic at an independent community pharmacy.	Retrospective patient record review and a prospective survey.	Clinical pharmacist with a postdoctoral residency focusing largely on travel health. In addition, the pharmacist holds Certificate in Travel Health (CTH) from ISTM.	The clinic operates under a pharmacist-physician collaborative practice protocol. Consequently, pharmacist is allowed to administer all necessary routine and travel-related vaccines and to furnish travel-related medications to the patients.	<ul style="list-style-type: none"> • Prescribing and administration of vaccines in the clinic. • Prescribing of travel-related medications. • The prescribed medicines are dispensed from the community pharmacy in which the clinic is located. • Patient education, counseling, and health advices during travel. 	The overall rate of patients' acceptance of pharmacists' recommendations for travel-related vaccines and medications was 84.7%. The acceptance of the antimalarial medications was 94.2%. In this study, 96% of the patients were satisfied regarding the overall visit to pharmacist-run travel health clinic. In this study, the pharmacist consultation significantly increased

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Table 1 (continued)

Authors, Country	Settings	study design/method	Qualifications/ additional training of pharmacist providing the service	Pharmacist scope of practice	Travel health services	Outcomes and evaluation of the service
Gatewood et al. [17] USA	Pre-travel health program at a supermarket chain pharmacy	Descriptive study	Pharmacists with additional training in travel health	<ul style="list-style-type: none"> - Pharmacists scope of practice is based on the authorization of the routine adult immunization protocol and other patient care services provided in the pharmacy. - For travel-related medications and vaccines not covered by the standing protocol, the pharmacists seek authorization from the physician. - Allowed to administer vaccines. 	<ul style="list-style-type: none"> • Prescribing and administration of adult routine vaccines • Recommendation of travel-related medications and vaccines out of the practice scope. Patient education, counseling and travel health-related advice.	the travelers' understanding of the travel-related issues (4 items) by a mean difference of 0.5–1.3 on a 4-point Likert scale. The reasons for non-acceptance of the vaccine recommendation among some travelers included cost, perceived low risk of the disease or infection, and concerns about potential adverse effects. The program was successful and well received by all the stakeholders including patients, physicians and the health department. Over a period of 9 years (2000–2008), the average annual number of patients served was approximately 1000 patients with an approximate number of 1900 vaccines administered yearly. The general evaluation of the program showed 100% of the surveyed patients were very satisfied or satisfied with the availability and knowledge of the pharmacist. The physician rate of authorization for the requests was almost 100%.
Tran et al. [35] United States	Pharmacist-run pre-travel clinic at a supermarket chain pharmacy.	A retrospective chart review and survey (telephonic structured survey).	Pharmacist with Certificate in Travel Health from the ISTM.	Under the pharmacy immunization's protocol, the pharmacist is allowed to administer all CDC-approved vaccines except yellow fever vaccine. Yellow fever and travel-related medications require a prescription from the physician.	<ul style="list-style-type: none"> • Prescribing and administration of vaccines • Recommendation of travel-related medications. • Patient education, counseling and travel health-related advice. 	Overall acceptance of pharmacist recommendations for vaccinations was 48% (239/497). High rates of acceptance were reported for several vaccines e.g., against yellow fever (100%), typhoid (82%), polio (79%), hepatitis A (67%). The lower rates of acceptance were for some vaccines such as Japanese encephalitis (10%), and hepatitis B (19%). 79% of the patients accepted the pharmacists' recommendation and obtained the antimalarial prevention medication, and 92% of them indicated that they took the medication as prescribed. Moreover, 100% of patients accepted pharmacists' recommendations on the prevention of sunburn (i. e., applying sunscreens) and a good acceptance

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Table 1 (continued)

Authors, Country	Settings	study design/method	Qualifications/ additional training of pharmacist providing the service	Pharmacist scope of practice	Travel health services	Outcomes and evaluation of the service
Wilkinson et al. [33] United States	Community pharmacy.	A pre- and post-consultation questionnaire, travel history form, and collection of rate of acceptance of recommendations.	A pharmacist with additional training in travel health (certificate programs in travel health).	The pharmacist is allowed to recommend and administer the vaccines as per the protocol. Travel-related oral medication that requires prescription, the recommendations were faxed to the traveler's physician post-consultation as the pharmacy did not have a collaborative practice agreement with a physician to allow for dispensing these medicines.	<ul style="list-style-type: none"> • Prescribing and administration of vaccines. • Recommendation of travel related medications. • Patient education, counseling and travel health-related advice. 	<p>level of other pharmacological and non-pharmacological advice related to travel health.</p> <p>Overall, patients were either very satisfied or satisfied with various aspects of the pre-travel health clinic (overall satisfaction was 4.76 ± 0.55 out of 5).</p> <p>65% acceptance rate from participants for vaccines recommended by the pharmacist during the visit.</p> <p>Participant understanding significantly increased for all five survey items relating to travel health information.</p> <p>A very high satisfaction with the pharmacists' travel health service (median score (IQR) = 5 (5-5) out of the maximum score of 5.</p>
Houle et al. [36] Canada	Pharmacist-managed travel health clinic	Chart review and post-travel survey	Pharmacist with qualifications and training in travel medicine. In addition, the pharmacists hold Certificate in Travel Health from the ISTM.	- The pharmacist authorized to independently prescribe the medications and vaccines and to administer injections.	<ul style="list-style-type: none"> • Pre-travel consultations. • Recommendations on travel health-related issues (e.g., behavior to reduce risk of illnesses). • Prescribing and administration of vaccines. • Prescribing of oral drug therapies for travelers. • The prescribed medications by the clinic are dispensed from the patient's usual community pharmacy. 	<p>94% of the travelers were satisfied or very satisfied with consultation and the travel healthcare provided by the pharmacist.</p> <p>Of those patients who experienced any health issues during their trip, 93% felt adequately prepared to manage the condition.</p> <p>79% of the vaccine recommendations were accepted and administered to the travelers.</p> <p>The reasons for nonacceptance of the vaccine recommendation among some travelers included cost, perceived low risk of the disease or infection, and lack of time before the trip.</p>
Thidrickson and Goodyer [21] Canada	Community pharmacy 21 community pharmacists.	A qualitative survey (free text questionnaire/survey)	Community pharmacists involved in providing full travel medicine services.	As a national survey, there are variations among regions regarding pharmacists' scope of practice. Pharmacists are allowed to administer vaccines in all Canadian provinces except Quebec. The prescribing authority for vaccines and medications varies from limited to broad especially those with additional training or Advanced Prescribing Authority (APA).	<ul style="list-style-type: none"> • Travel risk assessments. • Vaccination service • education and travel health related advice and recommendations 	<p>The study reported that convenience of accessing travel health services via the pharmacy including the advantage of flexibility of appointments render it as a one-stop shop for traveler health needs.</p> <p>Consequently, this, among other factors, resulted in patient satisfaction.</p> <p>The main challenges that the pharmacists faced included lack of time when running a busy pharmacy (62%), a lack of prescribing authority</p>

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Table 1 (continued)

Authors, Country	Settings	study design/method	Qualifications/ additional training of pharmacist providing the service	Pharmacist scope of practice	Travel health services	Outcomes and evaluation of the service
Hind et al. United Kingdom [32]	Community pharmacy.	Self-administered questionnaire and pharmacy patient records.	Pharmacists with additional training in travel health.	<ul style="list-style-type: none"> - Allowed to prescribe and administer vaccines. - Allowed to dispense prescription-only antimalarial medications. 	<ul style="list-style-type: none"> • Prescribing and administration of vaccines. • Prescribing and dispensing medications for malaria chemoprophylaxis • patient education. 	<p>in some provinces (52%), and lack of access to public health vaccines (52%).</p> <p>Median score for the overall service satisfaction was 10 (interquartile range 9–10) with the maximum attainable score of 10. In addition, 98% of respondents stated that they would use the pharmacy service again, and 81.4% stated that the pharmacy service provided value for money. Only a small number of clients (18.6%) needed to be referred to other travel health providers (e.g., for yellow fever vaccine as it is required to be administered in a registered center).</p>

3.4. Pharmacists’ scope of practice

The pharmacists involved in providing the travel medicine services were qualified with additional training in the field of travel medicine [17,20,21,31–36] and in most studies (n = 5) the pharmacists hold a Certificate in Travel Health (CTH) from the International Society of Travel Medicine (ISTM) [20,31,34–36].

In terms of the scope of practice, pharmacists provided the full travel medicines services either autonomously (the pharmacist authorized to independently prescribe the medications and vaccines and to administer injections) [21,32,36] or under a pharmacist–physician collaborative practice protocol or agreement [17,20,31,34,35]. In one study, the pharmacy did not have a collaborative practice agreement with a physician [33]. The extent of authority in the practice protocol varies. In some studies, the pharmacists have prescriptive authority for vaccines and medications under physician protocol (i.e., pharmacist is allowed to prescribe and administer all necessary routine and travel-related vaccines and to furnish travel-related medications to the patients) [20,31]. In some studies, the pharmacists could prescribe and administer all the routine adult immunization, but for travel-related medications and vaccines not covered by the standing protocol, the pharmacists sought authorization from the physician [17,35]. In all studies, the pharmacists had the authority to administer injections in the pharmacy. The details are included in Table 1.

3.5. Main findings

The studies included in the current review showed that pharmacy-managed travel health services provided a variety of services. In addition, the studies reported several outcomes of the travel health services. The major findings of the review of the studies on pharmacy-managed travel health services are reported as main themes including type of travel health services, outcomes and/or evaluation of the services i.e., traveler’s satisfaction, traveler’s acceptance of pharmacist recommendations, accessibility to the pharmacy-based travel services, facilitators and barriers to providing travel medicine services at pharmacies.

3.6. Type of travel health services

Pharmacist-managed travel health services included pre-travel risk assessment, routine and travel-related vaccination service, prescribing or recommending medicines for travel purposes, and counseling and travel health advices (oral counseling, written education materials, etc) [17,20,21,31–36] (Table 2).

In this review, all studies reported vaccination service—including prescribing or recommending vaccines, and administering vaccines—as an essential part of travel medicine services [17,20,21,31–36].

Pre-travel risk assessment and providing travel health-related advice and counseling was an essential part of travel health services [17,20,21, 31–36]. The pharmacists conducted pre-travel health risk assessments to detect any health risks based on the traveler’s itinerary and provided health advice accordingly.

Pharmacists prescribed or recommended travel-related medications for the travelers. This included, for example, medications to prevent altitude sickness for those traveling to high-altitude destinations [17,33, 35,36] and self-medication for travelers’ diarrhea [17,20,21,31–36]. Pharmacists provided chemoprophylaxis and antimalarial medications for those travelers traveling to malaria-endemic regions [17,20,21,

Table 2
Main travel healthcare services and common services mentioned in the studies based on travelers’ specific itinerary and destinations/countries visited.

No.	Services	References
1	Vaccination service	[17,20,21,31–36]
2	Pre-travel risk assessment	[17,20,21,31–36]
3	Counseling, education and advice	[17,20,21,31–36]
4	Prescription/recommendation for travel-related medications	[17,20,21,31–36]
5	Prevention of malaria and other vector-borne diseases/ insects prevention	[17,20,21,31–33, 35,36]
6	Prevention and precautions of traveler’s diarrhea and other food/water-borne diseases	[17,20,21,31–36]
7	Altitude sickness prevention	[17,33,35,36]
8	Sunburn protection	[17,33,35]
9	Education on access to medical advice abroad	[17,33,34]
10	STDs prevention	[31,36]

31–33,35,36].

Other travel-related conditions and nonvaccine-preventable diseases, such as prevention against insect bites and other vector-borne diseases, prevention of food/water-borne diseases, and sunburn protection were also covered, depending on the traveler itinerary-specific risks, as a part of the travel health services provided by the pharmacists (Table 2).

3.7. Patients' and travelers' satisfaction with the travel health services

Several studies examined the travelers' satisfaction with the pharmacy travel health services [21,31,33,35–37]. In a study from Canada, Houle et al. reported, using a post-travel questionnaire, that 94% of the travelers were satisfied or very satisfied with the consultation and the travel healthcare provided by the pharmacist [36]. Similarly, a high satisfaction rate of 96% was reported in a study from the USA by Hess et al. regarding the overall visit to a travel health clinic located in a community pharmacy (mean score of overall satisfaction was 3.68 ± 0.45 out of 4) [31]. Another study from the USA by Wilkinson et al. reported a very high satisfaction with the pharmacists' travel health service (median score (IQR) = 5 (5–5) [33]. Moreover, in a study by Tran et al., patients were either very satisfied or satisfied with various aspects of the pre-travel health clinic (mean score of overall satisfaction was 4.76 ± 0.55 out of 5), including comprehensive information provided, understanding of recommended immunizations, understanding of health safety and illness prevention information provided, and knowledge of the pharmacists [35]. Similarly, a study by Gatewood et al. from the USA reported that the pre-travel health program was well accepted by the patients, with approximately 1000 patients participating in the program annually. In addition, among the patients' survey about the program, 100% were satisfied or very satisfied with the pharmacist knowledge and expertise in providing travel health services [17]. A study by Hind et al. from the UK indicated that patients were satisfied by the travel healthcare service provided to them and rated the service as an excellent service [median score = 10 (IQR = 9–10) on a scale of 1–10] [32].

3.8. Acceptance of pharmacists' recommendations and advice

Several studies evaluated the outcomes of the services in terms of travelers' acceptance of pharmacists' recommendations and advice [20, 31,33–36]. El-Kurdi et al. reported that the rate of traveler's acceptance of pharmacists' recommendations for vaccine administration was 69%. In addition, most of the travelers (73%) stated that the educational materials and personalized traveler's report provided by the pharmacist were useful during their illness in travel and most travelers (68%) reported that they have used pharmacist advice when they became ill during their travel [34]. Another study by Houle et al. reported that 79% of the vaccine recommendations were accepted and administered to the travelers [36]. In a study by Tran et al., the overall acceptance of pharmacist recommendations for vaccinations was 48% (239/497), but with a high rate of acceptance for several vaccines—e.g., against yellow fever (100%), typhoid (82%), polio (79%), hepatitis A (67%)—and a lower rate of acceptance for some vaccines, such as Japanese encephalitis (10%), and hepatitis B (19%) [35]. In the study by Tran et al., 79% of the travelers accepted the pharmacists' recommendation and obtained the antimalarial prevention medication, and 92% of them indicated that they took the medication as prescribed. Moreover, 100% of patients accepted pharmacists' recommendations on the prevention of sunburn (i.e., applying sunscreens) and a good acceptance level of other pharmacological and nonpharmacological advice related to travel health [35]. Moreover, a study by Hind et al. reported that almost all patients (98%) who received travel health-related care at a community pharmacy would use the service again and the vast majority (81.4%) believed the service provided value for money [32]. In a study by Hess et al. from the USA reported that the overall rate of patients' acceptance

of pharmacists' recommendations for travel-related vaccines and medications was 84.7% with an acceptance of the antimalarial medication by 94.2% [31]. Another study from the USA by Wilkinson et al. reported, overall, a 65% acceptance rate from patients for vaccines recommended by the pharmacist during the visit [33]. Moreover, a study by Durham et al. reported that 75% of patients seen by the travel medicine pharmacist picked up their prescribed antibiotics for self-treatment of travelers' diarrhea from the pharmacy compared to 63% of patients who were prescribed antibiotics by their primary care provider (P = 0.04) [20].

3.9. Accessibility of community pharmacy-based travel health services

Several studies reported on the travelers' perspective regarding the accessibility and convenience of travel health services provided by community pharmacies [21,32,35]. In the UK, it was reported that 74.8% of the patients indicated that the community pharmacy is a convenient location to visit for travel medicine services and 70.2% reported that it could be a one-stop shop for travel health and vaccination services [32]. Similarly, a qualitative study from Canada by Thidrickson and Goodyer reported the convenience of accessing travel health services via the pharmacy as a one-stop shop and the advantage of flexibility and convenience of appointments of the pharmacies providing accessible travel health services [21]. Another study by Tran et al. from the US reported that most of their study participants agreed that community pharmacies were a convenient location for travel health services (Mean score 4.5 out of 5) [35].

3.10. Facilitators and factors impacting the ability to provide travel health services

Some studies have reported several facilitators required for pharmacists who provide travel health services [17,21,31,33,36]. Gatewood et al. reported that marketing of the travel health clinic was important to promote this new service. This is to increase patients' awareness of the service and for physicians to make referrals for the patients who would benefit from the service. Several marketing and promotion strategies were used and targeted the patients (e.g., via daily contact with the patients, educational materials, posters, flyers, signs), physicians and local and state health departments (e.g., providing details about the service and how to work together, and sending out letters), and travel agencies [17]. Similarly, Hess et al. reported that extensive marketing and promotion of the service via several means (posters, flyers, physician detailing etc.) was made to ensure the clinic is visible to the patients and travelers [31].

The authority to furnish travel-related medicines [21,36] and strong collaboration among the travel clinic pharmacist and the supervising physician is considered an important factor for the success of the travel clinic [17,31]. Wilkinson et al. indicated that the lack of a collaborative practice agreement with a physician to allow for dispensing travel health-related prescriptions at the time of the consultation could have prevented some patients from receiving the service [33].

Gatewood et al. reported that travel medicine service/clinic as a specialized service—unlike influenza vaccine and other adult routine immunization—requires an appointment with the pharmacist and needs more time than the walk-in influenza and routine vaccines. Consequently, without adequate staff and appropriate scheduling of appointments, it would be difficult to maintain the workflow and dispensing within the pharmacy [17]. Similarly, Wilkinson et al. reported that the consultations were conducted by a trained pharmacist outside the dispensing time in a private consultation room in the pharmacy via appointments to ensure quality care [33]. In fact, one of some of the major challenges faced by community pharmacists in providing travel health services is lack of time when running a busy pharmacy [21].

4. Discussion

The current study reported the types of travel health services provided by travel medicine trained pharmacists and outcomes of these services, including travelers' acceptance of pharmacist recommendations, and their satisfaction with the pharmacist-run travel health services. All the studies were from high-income countries particularly the US, Canada, and the UK. This systematic review showed that pharmacists with additional training and qualifications in travel medicine have provided a wide range of general and specialized travel health services to travelers [17,20,21,31–36]. These travel health services included, for example, pre-travel vaccination (routine adult vaccines and travel-related vaccines), pre-travel risk assessment and a traveler, country, and itinerary-specific advices and counseling, preventive medications for several travel-related illnesses, supply of regular medications, and travel-related health kit supplies. Travelers receiving these travel health services were highly satisfied with the services with a good level of acceptance of the pharmacist recommendations. Nevertheless, this review also showed that there are still some challenges and there is scope for further improvements to ensure pharmacy-based travel health services are providing the optimal care.

The main travel health services provided by pharmacists in this review were vaccination, travel-related medication recommendation, and pre-travel assessment and the relevant medical advice and recommendations [18,20,21,31–36]. Pharmacists have been at the forefront of vaccination, arranging vaccine logistics and administering vaccines [38–41]. Community pharmacists have successfully administered influenza and tetanus vaccines, and have recently played an important role in the mass COVID-19 vaccine roll out [40,42]. Pharmacists, because of their expertise, experience, and positioning in the community, can provide an ideal site to deliver vaccines for travelers. Pharmacist-administered vaccines are well accepted by both patients and travelers [31,40,43,44]. Consequently, pharmacists' role in travel health and vaccination services, including routine and travel-related vaccines, need to be further expanded and promoted to help and enhance wide access to these vital pre-travel preventive health services.

The studies that examined travelers' satisfaction with the pharmacy travel health services showed a high level of satisfaction, with 94–100% of patients saying they were satisfied or very satisfied with the services [21,31,33,35–37]. The studies evaluated and rated the satisfaction using different scales including four-point Likert-scale, five-point Likert-scale and a scale of one to ten. However, the satisfaction level was interpreted in the same way using the mean and or median score of the overall satisfaction scale. Therefore, the overall levels of satisfaction between studies could be compared with each other. However, future studies could develop a more standardized scale that measures travelers' satisfaction with pharmacy-managed travel services and comprehensively addresses all dimensions and aspects of the service. Several studies have also reported high patient satisfaction with pharmacist-delivered pharmaceutical care services [45–49]. In addition, a study by Ekenge et al. from the US revealed that 91.8% of the public perceived community pharmacists as healthcare providers [50]. Furthermore, a recent study by Stämpfli et al. from Switzerland showed that 57.3% had chosen to receive their COVID-19 vaccine in the pharmacies despite having other options of access to the vaccine and 96% reported trust in the pharmacy services [40]. Consequently, our findings, along with other studies in the literature, show that pharmacists can provide quality travel health services that are accepted by the public as with other regular patient care services provided by the pharmacists to the community.

Overall, this systematic review showed a good acceptance rate of pharmacist recommendations for vaccines and travel-related medications, with all studies except two reporting an overall acceptance rate $\geq 75\%$ (range: 48–94.2%). In addition, high rates of acceptance of other nonpharmacological advices were noted. The reasons for nonacceptance among some travelers are mostly not related to the quality of the service

or the confidence in the pharmacist recommendation. They are related to the issue of the cost of the vaccine/medication, a perceived low risk of contracting the infection or the disease (i.e., perceived lack of necessity), the inability to take the vaccine series before the travel, and some concerns about potential adverse effects or vaccine hesitancy [31,34,36]. Consequently, these findings reflect a good acceptance rate of recommendations and show that a wider utilization of the pharmacy travel services could lead to improved access to travel health services and have the potential to contribute to international travelers' health and well-being.

This review shows that community pharmacy-based travel health services could enhance the accessibility to these important services by travelers. The features of community pharmacies in terms of accessibility, long operating hours, and authorized vaccinator pharmacists might have contributed to travelers' utilization of the vaccination service [17,21,31,32,35]. Community access to medicines and health services have been the core aspect of various community pharmacy-based services. Be it a community pharmacy-based minor ailment service in the UK or the Australian minor ailment scheme, the public accessibility has been the feature of community pharmacy-based services [51,52]. Furthermore, vaccination administration and recommendations were one of the common core services provided by community pharmacies. Similar to other findings, it reflects the expanding role of pharmacists as pharmaceutical care service providers, including vaccination in the primary healthcare settings [38,41]. Moreover, patients' accessibility to a travel health service at their own locality without the need to go to a GP clinic or hospital that requires both time and resources might be a strength of community pharmacy-based travel health services. Consequently, improving accessibility to travel health services via community pharmacies could increase the number of travelers utilizing travel health services. It could also improve travelers' knowledge and awareness of travel related health risks and the importance of preventive measures. Therefore, it could lead to better adherence to preventive measures including medications and travel-related vaccinations. Future studies need to explore the association between improved accessibility and actual utilization of travel health services and their impact on travelers' adherence and health outcomes.

The study findings and analysis showed that there are common factors leading to the success of providing quality pharmacy-based travel services and optimal care. These include the fact that all pharmacists providing the services in the reviewed studies have received further training and qualifications in travel health, such as a Certificate in Travel Health (CTH) from the International Society of Travel Medicine (ISTM). In addition, the pharmacists were providing these services in a designated patient care area (i.e., in a clinic or a private consultation room within or adjacent to the pharmacy). Moreover, the pharmacists provided these services as a dedicated pharmacist for the service or dedicated time outside the dispensing time for scheduled appointments. Moreover, it is important to have the necessary resources and arrangements (e.g., adequate support staff) and the relevant marketing of the service. Gregorian et al. reported that travel health is a specialized practice that requires knowledge, skills, and resources to provide the service and multiple factors should be considered to implement the service, including pharmacist training, partnership with a physician, logistical considerations and other factors to limit the interferences in the daily operations of the pharmacy (e.g., appropriate staffing, resources, workflow, pharmacist time dedicated to the service, space, scheduling system, arrangement with a laboratory for testing) [53]. This is because without suitable infrastructure and adequate human resources, it would be challenging to implement quality travel services in community pharmacies due to a lack of time when running a busy pharmacy, or inadequate time to incorporate the service into their workload [18,21]. Thidrickson indicated that travel health is a complex speciality that requires additional training and ongoing collaboration and communication with other healthcare teams to ensure optimal care, and that pharmacists with appropriate training can provide accessible,

convenient, and quality travel healthcare [12].

Similarly to other findings in the literature [13,41], the expanded scope of pharmacists to administer injections was an important factor in the delivery of travel health services. In addition, the prescriptive authority of pharmacists for a wide range of vaccines and travel-related medicines autonomously or under physician protocol or collaborative practice agreements (CPAs) was a facilitator to providing comprehensive and convenient services. This is important for the wide utilization of pharmacy-based travel health service as the patients will receive the travel care (i.e., counseling, medicines, and vaccine administration) in one consultation/visit rather than several visits to multiple providers to receive the full service [12,21]. On the other hand, the pharmacist's lack of authority to autonomously supply the medications or administer the vaccines during the visit could be a barrier to wide utilization of the service [33]. Consequently, expanding the scope of practice of pharmacists further, with training/credentials in travel medicine to include prescribing of a wide range of vaccines and travel-related medications would further improve the patients' accessibility to travel healthcare services and optimal care at pharmacies [13]. Encouragingly, in some countries, the pharmacists' ability to autonomously prescribe travel-related medications is growing (i.e., without the need for a CPA or protocols) [21,22]. For example, four states in the US (California, Idaho, New Mexico, Florida) allowed pharmacists to prescribe medications for certain travel conditions [22]. In Alberta, Canada, for example, pharmacists with the Advanced Prescribing Authority (APA) could prescribe almost any medication within their area of expertise, including vaccines and travel-related medications [21]. Future studies could investigate why some legislators or authorities allow full prescribing and supply of medications and vaccines and others limit it, and what are the drivers behind it. In addition, future studies could determine the standards, practice requirements, best practices and models to run a travel health service via community pharmacies. Moreover, expanding the legal scope of practice for pharmacists building on the current beneficial impact of pharmacist-managed travel services should be discussed with other stakeholders including legislators and other healthcare professionals.

4.1. Strengths and limitations

The current systematic review has some points of strength. The review focused on studies that reported on dedicated travel health services provided by pharmacists and reported evaluations of these services. Consequently, the review summarized the evidence about the actual services rather than the perceptions or attitude or willingness to provide travel health services. Moreover, we searched all the studies globally using several databases and supplemented by a manual search and search in Google Scholar to include all potential studies in the last two decades. However, the search was restricted to articles published in English. Thus, this could be a limitation as articles in other languages were not retrieved. Moreover, the studies assessed travelers' satisfaction using several scales (i.e. not using a single standardized scale). However, the level of satisfaction was interpreted in the same way using the mean with SD or median with IQR. This could be a limitation. In addition, all the studies retrieved were from high-income countries, namely the USA, Canada, and the UK. Hence, the findings might not be extrapolated to other countries. However, this reflected the current status of practice of advanced travel health services provided in these healthcare systems.

5. Conclusion and recommendations

Pharmacists with additional training in travel medicine have successfully provided a wide range of general and specialized travel health services. The travelers were highly satisfied with the pharmacy-based travel health services. The studies reported a good level of patients' acceptance of the pharmacist recommendations for vaccines, medications, and non-pharmacological advices. Consequently, given the rapid increase in international travel and the increased health risks associated

with travel, pharmacists could contribute to the health of international travelers' through pharmacy-based travel health services. This would provide more access to pre-travel preventive healthcare services at pharmacies. However, to implement these services, the pharmacies need to address any challenges in terms of pharmacists' training requirements in travel health, logistical considerations, and the additional resources to run the service. In addition, further efforts are needed to expand the legal scope of pharmacists' practice, including prescribing rights and authority to provide full pharmacy-managed travel health services. This needs to be addressed by additional legislative changes to enable pharmacists to provide the vaccines, medications, and to order laboratory tests more autonomously.

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Bhuvan KC, Christina Malini, Sunil Shrestha: Validation, Formal analysis and Writing-Original Draft, Methodology, Investigation, Writing-Review and editing. **Alian A Alrasheedy, Binaya Sapkota:** Conceptualization, Methodology, Investigation and Writing-Original Draft. **Peter A. Leggat, Mohamed Izham:** Conceptualization, Methodology, Writing - Review & Editing, Visualization and Supervision.

Declaration of competing interest

Peter Adrian Leggat is the President of International Society of Travel Medicine, immediate Past Chair, Faculty of Travel Medicine of The Australasian College of Tropical Medicine and course coordinator of GradCertTravel Med in James Cook University. All other authors report no conflicts of interest with respect to this review.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tmaid.2022.102494>.

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