BMJ Open

Evaluation of a programme for 'Rapid Assessment of Febrile Travelers' (RAFT): a clinic-based quality improvement initiative

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ABSTRACT

Background: Fever in the returned traveller is a potential medical emergency warranting prompt attention to exclude life-threatening illnesses. However, prolonged evaluation in the emergency department (ED) may not be required for all patients. As a quality improvement initiative, we implemented an algorithm for rapid assessment of febrile travelers (RAFT) in an ambulatory setting.

Methods: Criteria for RAFT referral include: presentation to the ED, reported fever and travel to the tropics or subtropics within the past year. Exclusion criteria include *Plasmodium falciparum* malaria, and fulfilment of admission criteria such as unstable vital signs or significant laboratory derangements. We performed a time series analysis preimplementation and postimplementation, with primary outcome of wait time to tropical medicine consultation. Secondary outcomes included number of ED visits averted for repeat malaria testing, and algorithm adherence.

Results: From February 2014 to December 2015, 154 patients were seen in the RAFT clinic: 68 men and 86 women. Median age was 36 years (range 16–78 years). Mean time to RAFT clinic assessment was 1.2 ±0.07 days (range 0–4 days) postimplementation, compared to 5.4±1.8 days (range 0–26 days) prior to implementation (p<0.0001). The RAFT clinic averted 132 repeat malaria screens in the ED over the study period (average 6 per month). Common diagnoses were: traveller's diarrhoea (n=27, 17.5%), dengue (n=12, 8%), viral upper respiratory tract infection (n=11, 7%), chikungunya (n=10, 6.5%), laboratory-confirmed influenza (n=8, 5%) and lobar pneumonia (n=8, 5%).

Conclusions: In addition to provision of more timely care to ambulatory febrile returned travellers, we reduced ED bed-usage by providing an alternate setting for follow-up malaria screening, and treatment of infectious diseases manageable in an outpatient setting, but requiring specific therapy.

Strengths and limitations of this study

- Fever in the returned traveller is a medical emergency, potentially heralding life-threatening infections such as malaria, or more benign aetiologies, some of which may self-resolve.
- As a clinic-based quality improvement initiative, we designed and implemented an algorithm for 'Rapid Assessment of Febrile Travelers' based on Canadian national fever assessment guidelines, and demonstrated a significant reduction in wait-time to Tropical Medicine assessment and emergency department (ED) bed-usage.
- We also demonstrated a reduction in repeat ED visits for follow-up malaria screening after an initial negative.
- We did not have access to the full range of hospital administrative ED data that would permit quantification of economic savings; thus, we did not perform an economic analysis.
- We identified an aetiological diagnostic gap in 14% of patients, a rate that is similar to other studies of fever in the returned traveller.

Canadian travellers and new immigrants presenting for care after travel.[1] Although often due to self-limited infections, such as travellers' diarrhoea, fever after travel may indicate serious and potentially life-threatening causes, such as malaria, dengue or typhoid fever, as was the case in 28% of febrile returned Canadian travellers or new immigrants studied recently.[1] Fever in the returned traveller is necessarily encountered by front-line Canadian practitioners such as family physicians, walk-in physicians and emergency department (ED) physicians who do not specialise in infectious diseases. Thus, standardised management protocols, algorithms and guidelines are needed to assist in the management of this commonly imported syndrome.

A major gap in the care of febrile returned travellers exists in Canada. Fever in this

INTRODUCTION

Fever in the returned traveller is a common syndrome, occurring in 17% of ill returned

population constitutes a potential medical emergency warranting immediate exclusion of life-threatening travel-acquired infections. One to two Canadians are reported to die each year due to delayed diagnosis or treatment of malaria,[2] and many more become critically unwell and require admission to intensive care.[3] However, most febrile returned travellers will have more benign aetiologies, such as traveller's diarrhoea (TD) or respiratory tract infections;[1 4] yet there is no standardised 'system' for close follow-up and monitoring of such patients in the critical first few days of their illness, when deterioration may occur or a serious diagnosis may declare itself. Thus, many patients are either admitted to hospital for observation, or are discharged from the ED with ambulatory infectious diseases follow-up, days to weeks later. This gap in care translates into over-utilisation of acute care, such as the ED and general medicine inpatient service, and also leads to under-provision of care for those who present early in their potentially serious illness with more benign appearing clinical parameters.[5]

National Canadian guidelines on the assessment of febrile returned travellers have been published,[6] and we have adapted these guidelines into an ED decision-algorithm to standardise the evaluation and disposition of such patients, through creation of the 'Rapid Assessment of Febrile Travelers' (RAFT) Programme. The RAFT algorithm triages patients to either hospital admission, in the case of unstable vital signs, significant laboratory derangements, volume depletion or *Plasmodium falciparum* malaria, or to same-day referral to the RAFT Clinic in the Tropical Disease Unit (TDU) of Toronto General Hospital, if patients fail to fulfil admission criteria (figure 1). In addition, the RAFT algorithm provides management advice and diagnostic stewardship to the participating EDs. The RAFT Programme aims to fill the identified care gap and, in the process, improves patient flow, utilisation and delivery of service and clinical outcomes. We herein report our primary and secondary outcome measures of quality and performance at 10 months postimplementation of the RAFT programme.

METHODS
Preimplementation
We collected data on the turnaround time of referrals for fever in the returned traveller to the TDU at Toronto General Hospital from three EDs of Mount Sinai Hospital (MSH) and the University Health Network (UHN) between October and December 2013. This enabled establishment of a baseline 'referral wait time' to definitive consultation for febrile returned travellers at our institution.

Algorithm development
In consultation with the three EDs of MSH and UHN, we adapted the national fever assessment guidelines[6] into a simple decision-algorithm for use in the ER

(figure 1), as well as supporting materials for clinicians and patients (see online supplementary files 1 and 2). Patients are eligible for RAFT Clinic referral if they: report subjective fever or are objectively febrile in the ED; have travelled outside North America to a tropical or subtropical destination in the past year; are being assessed in the ED between 08:00 on Sunday to 08:00 on Friday. Exclusion criteria for RAFT Clinic referral include: unstable vital signs; significant laboratory derangements; volume depletion; fulfilment of other standard hospital admission criteria; and initial malaria screening that is positive for *P. falciparum* malaria. For patients referred to the TDU via the RAFT algorithm, we offer a same-day or next-day assessment clinic (RAFT Clinic), which runs concurrently with regularly scheduled ambulatory tropical medicine clinics. The RAFT Clinic is operational on weekdays, and is staffed by 1–2 administrative assistants, 1 of 2 staff physicians on each day and up to three rotating resident trainees. A roster of eight staff physicians in tropical medicine offer coverage of TDU staff physician absences. No additional hospital resources were committed to development or implementation of the programme. Since the RAFT clinic operates concurrently with regularly scheduled tropical medicine clinics, there is no net increase in resources allocated.

Implementation
The RAFT programme (ED algorithm and RAFT Clinic in the TDU) were implemented simultaneously at the three EDs of MSH/UHN at the end of February 2014. In-services were provided to the staff of participating EDs, and wall posters were mounted in each ED. Binders containing the national fever assessment guidelines, and copies of the RAFT algorithm (figure 1), patient handout (see online supplementary file 1) and RAFT referral form (see online supplementary file 2) were strategically placed in each ED, and online. Pocket cards of the algorithm were provided to ED staff as well as Infectious Diseases staff, residents and fellows who typically field calls regarding febrile returned travellers. All Infectious Diseases staff were reminded of the RAFT programme at monthly business meetings during the initial implementation period.

Postimplementation evaluation
Following institutional review board approval at MSH and UHN, we extracted demographic, clinical and health systems data on all RAFT patients evaluated between 28 February 2014 and 31 December 2015, and entered them into a password protected MS Access database. The primary outcomes of interest were turnaround time of referrals for febrile returned travellers postimplementation. Secondary outcomes of interest included: number of repeat ED visits prior to the RAFT clinic visit (ideally 0–1 day later), bed-usage averted for repeat 24 hour malaria screening and adherence to the algorithm regarding laboratory investigations.
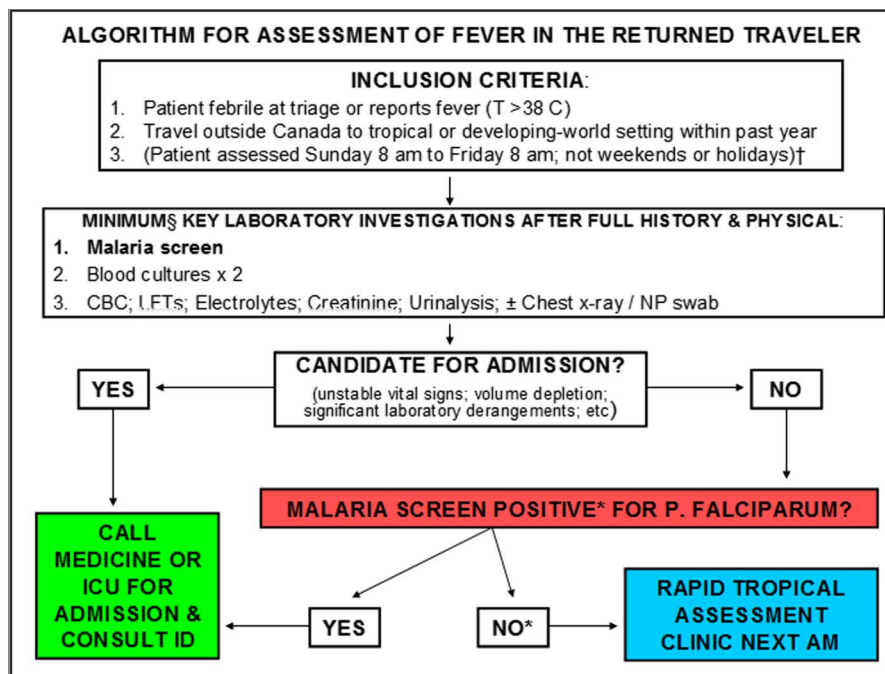
Figure 1 Algorithm for assessment of fever in the returned traveller. †The Rapid Tropical Assessment Clinic is designed to ensure definitive disposition of a febrile returned traveller within 24 hours of their initial emergency room presentation. Between Friday after 8:00 and Sunday before 8:00, as well as statutory holidays and the obligatory ambulatory closure for 2 weeks over the Christmas/New Year's block, the Rapid Tropical Assessment Clinic is unavailable. During these times, if the patient does not have *Plasmodium falciparum* or otherwise fulfil admission criteria, the patient should still be referred to General Internal Medicine or Infectious Diseases for disposition (as per standard historical procedure). §Additional investigations should be based on clinical judgement. For example, a febrile returned traveller with diarrhoea should also have stool investigations; a febrile returned traveller with dysuria should have urine Culture&Sensitivity±STI screening, etc.*If the malaria screen is positive for *Plasmodium vivax, P. ovale* or *P. malariae* (ie, non-*P. falciparum*), please initiate chloroquine therapy: 4 tablet loading dose (600 mg base), followed by 2 tablets 6 hours later. Completion of therapy will be organised by the Rapid Tropical Assessment Clinic. If the malaria screen is positive for *P. vivax* and the patient travelled to Papua New Guinea or Indonesia, please initiate Malarone therapy: 4 tablets orally×1 with food. Completion of therapy will be organised by the Rapid Tropical Assessment Clinic. Chloroquine tablet: 150 mg base (in a 250 mg tablet). Treatment course: Loading dose of 600 mg base, followed by 300 mg base 6 hours later. This is followed by 300 mg base at 24 and 48 hours for a total of 1.5 g base. Malarone tablet: fixed combination of 400-mg atovaquone+100-mg proguanil. Treatment course: 4 tablets orally once daily with food ×3 days. CBC, complete blood count; ICU, intensive care unit; ID, infectious diseases; LFT, liver function test; NP, nasopharyngeal; *P. falciparum, Plasmodium falciparum*; STI, sexually transmitted infections.

Analysis

Descriptive statistics (mean, SD, median, range) were calculated for continuous variables, and differences were compared using Student's t-test or, in the case of non-normal distribution, the Mann-Whitney Rank Sum test. Categorical variables were quantified by proportions, and differences were compared using Yates' corrected χ^2 analysis. All computations were performed using the GraphPad Prism software (GraphPad, USA). Level of significance was set at $p < 0.05$.

RESULTS

Over the first 22 months of implementation, 198 patients were referred to the RAFT clinic and 154 (78%) were assessed, while 44 patients referred to the RAFT clinic failed to present to the clinic as instructed. Of those who did not come to the clinic on referral, 19 (43%) were contacted and rescheduled, 9 (20%) felt completely well

and did not want an appointment and 13 (30%) were lost to follow-up, though not seen again in the ED for their presenting illness. Of the 154 patients referred and assessed in the RAFT clinic, 68 (44%) were men and 86 (56%) were women. Median age was 36 years (range 16–78 years). English was the first language of 81% (n=124). Median time between presentation to the ED and evaluation by an ED physician was 76 min (range 9–359 min; 90th centile 168 min), compared to a provincial median of 60 min and 90th centile of 180 min (Ovens, unpublished data). Median time between initial presentation to the ED and to the first malaria screen was 105 min (range 0–911 min). Median time between initial presentation to the ED and to final disposition was 290.5 min (range 32–936 min; 90th centile 537.8 min), compared to a provincial median of 180 min and 90th centile of 420 min (Ovens, unpublished data).

Mean time to RAFT Clinic assessment following ED discharge was 1.2±0.07 days (range 0–4 days)

postimplementation, compared to 5.4±1.8 days (range 0–26 days) prior to implementation (p<0.001). Time to RAFT Clinic assessment did not differ by age, sex, first language or family physician status; however, we noted an increased time to assessment for referrals made on Friday and Saturday (p<0.0001; table 1). No patient was admitted to hospital during or following care of their travel-acquired illness in the RAFT clinic. Twenty-two patients (14%) had a repeat visit to the ED prior to assessment in the RAFT clinic, and for those patients, their second malaria screen was performed.

The RAFT clinic averted an average of six repeat malaria screens in the ED per month, as these were now being performed in the RAFT clinic, rather than using ED resources. This translates to a 24 hour per month reduction in ED bed-usage, assuming a 4 hour stay in the ED for triage, blood work and the malaria result to be returned.

Top regions of exposure were: the Caribbean (n=43, 28%), sub-Saharan Africa (n=31, 20%), South Asia (n=24, 16%), Southeast Asia (n=17, 11%), Central America/Mexico (n=17, 11%) and South America (n=14, 9%). Among 79 different countries visited by RAFT patients, the most common countries of exposure were: India (n=18, 12%), the Dominican Republic (n=15, 10%), Cuba (n=9, 6%), Tanzania (n=9, 6%), Brazil (n=8, 5%), Thailand (n=8, 5%), Mexico (n=7, 4.5%), Jamaica (n=6, 4%) and South Africa (n=5, 3%). The median trip duration was 14 days (range 3–1095 days).

The median temperature of RAFT Clinic patients at presentation in the ED was 37.1°C (range 35.2–40.7°C). Adherence to the recommended initial blood work algorithm was variable. Ninety-nine per cent of patients (n=152) had a complete blood count (CBC) drawn, while 98% (n=151) had electrolytes and creatinine drawn. Ninety-four per cent of patients (n=144) received malaria screening. Among those who did not receive malaria screening, 6 of 10 travelled to areas without appreciable malaria risk such as the USA (n=2), Cuba (n=1), Trinidad (n=2) and Mexico (n=1), while 4 (40%) travelled to areas where malaria screening would have been indicated such as Nicaragua (n=2), the Dominican Republic (n=1) and the Philippines (n=1). Adherence to the remainder of the suggested blood work, in decreasing order, was as follows: liver function tests (hepatic transaminases, bilirubin, alkaline phosphatase) 90% (n=138), blood cultures 88% (n=135) and urinalysis 65% (n=100).

Diagnoses were classified into major common presenting febrile syndromes, such as gastrointestinal (n=44, 29%), respiratory (n=39, 25%), vector-borne (n=32, 21%), sexually transmitted infection (STI)/genitourinary (n=13, 8%), lymphadenopathy (n=2, 1%), skin and soft-tissue infections (n=2, 1%), musculoskeletal (n=1, 0.6%), non-specific viral syndrome (n=19, 12%) and no final aetiological diagnosis (n=3, 2%). Non-infectious causes were found in three travellers (2%). Common aetiological diagnoses were: TD (n=27, 17.5%), dengue fever (n=12, 8%), viral upper respiratory tract infection (URTI) (n=11, 7%), chikungunya fever (n=10, 6.5%), laboratory-confirmed influenza (n=8, 5%), lobar pneumonia (n=8, 5%), acute urinary tract infection (n=7, 4.5%) and rickettsioses (n=6, 4%) (table 2).

Acute HIV was diagnosed in two febrile returned travellers, and *Plasmodium vivax* malaria in another two (table 2). Two cases of *P. falciparum* malaria were diagnosed among RAFT Clinic patients; however, both of these patients had been appropriately referred to and assessed by the inpatient Infectious Diseases consultation service, as per the algorithm, and then referred to RAFT by the Infectious Diseases team, rather than coming to RAFT off-protocol directly from the ED. All cases of chikungunya fever were acquired in the Caribbean or Central America: three in Jamaica, three in the Dominican Republic and one each in the British Virgin Islands, Costa Rica, the Dominican Republic, St. Lucia and St. Vincent.

Table 1 Comparison of RAFT clinic referral time by patient demographics

Referral to TDU wait time (days)	Mean	SD	Median	Range
Sex*				
Male	1.2	0.8	1	0–3
Female	1.2	0.8	1	0–4
Age (years)†				
<19	1	0	1	1
19–50	1.2	0.8	1	0–4
>50	1.3	1.0	1	0–3
First language‡				
English	1.2	0.8	1	0–4
Non-English	1.3	0.8	1	0–3
Family Doctor§				
Yes	1.2	0.8	1	0–4
Unknown	1.3	0.8	1	0–3
Day of the week¶				
Monday	1.4	1.0	1	0–3
Tuesday	0.8	0.5	1	0–2
Wednesday	1	0.4	1	0–2
Thursday	0.8	0.4	1	0–1
Friday	1.9	1.4	3	0–3
Saturday	2.0	0.6	2	1–3
Sunday	1.2	0.7	1	0–4

*No difference by the Mann-Whitney Rank Sum test, p=0.558.
†No difference by One-Way ANOVA on Ranks with Dunn's post hoc test, p=0.543.
‡No difference by the Mann-Whitney Rank Sum test, p=0.493; non-English first languages included Spanish (n=5), Mandarin (n=4), French (n=4), Tagalog (n=3), Hindi (n=2), Portuguese (n=2), Greek (n=2) and 1 each of Bosnian, Bulgarian, Guyanese, Korean, Russian, Tamil, Thai and Ukrainian.
§No difference by the Mann-Whitney Rank Sum test, p=0.19.
¶p<0.0001 by One-Way ANOVA on Ranks with Dunn's post hoc test.
ANOVA, analysis of variance; RAFT, Rapid Assessment of Febrile Travelers; TDU, Tropical Diseases Unit.

Table 2 Final diagnoses issued to 154 febrile returned travellers evaluated in the RAFT Clinic between 28 February 2014 and 31 December 2015

Syndrome/aetiology	Number	Per cent
Gastrointestinal syndromes	44	29
Traveller's diarrhoea, no confirmed aetiology	27	17.5
Campylobacter	3	2
Salmonella, non-typhoidal	3	2
Salmonella typhi/enteric fever	3	2
Strongyloidiasis	2	1
Giardiasis	1	0.6
Dientamoeba fragilis	1	0.6
Viral enteritis	1	0.6
Gastritis	1	0.6
Clostridium difficile colitis	1	0.6
Postinfectious irritable bowel syndrome	1	0.6
Respiratory syndromes	39	25
Viral upper respiratory tract infection	11	7
Lobar pneumonia	8	5
Influenza-like illness	4	3
Influenza A	4	3
Influenza B	4	3
Mononucleosis and mono-like syndrome due to EBV or CMV	3	2
Lower respiratory tract infection, non-lobar pneumonia	1	0.6
Haemophilus influenzae	1	0.6
Group A streptococcus pharyngitis	1	0.6
Acute sinusitis	1	0.6
Coxsackie virus	1	0.6
Vector-borne, non-localising	32	21
Dengue fever	12	8
Chikungunya fever	10	6.5
Rickettsioses	6	4
Malaria, Plasmodium vivax	2	1
Malaria, Plasmodium falciparum	2	1
STI/genitourinary	13	8
Acute urinary tract infection, including urosepsis	7	4.5
Acute HSV-1	2	1
Acute HIV	2	1
Syphilis, secondary	1	0.6
Chlamydia trachomatis	1	0.6
Fever with lymphadenopathy	2	1
Lymphadenitis, bacterial	1	0.6
Toxoplasmosis	1	0.6
Skin and soft-tissue infections	2	1
Cellulitis	1	0.6
Shingles	1	0.6
Musculoskeletal	1	0.6
Septic arthritis	1	0.6
Non-specific viral syndrome	19	12
Non-infectious	3	2
Temporal arteritis	1	0.6
Toxidrome, cocaine	1	0.6
Syncope	1	0.6
No diagnosis	3	2

CMV, cytomegalovirus; EBV, Epstein-Barr virus; HSV-1, herpes simplex virus type 1; RAFT, Rapid Assessment of Febrile Travelers; STI, sexually transmitted infection.

DISCUSSION

Implementation of the RAFT clinic led to a 78% reduction in the time to assessment by ambulatory tropical medicine, and this enabled febrile returned travellers to be followed closely during the critical first few days of illness during which clinical deterioration can occur. That we did not have any patients requiring admission following assessment in the RAFT clinic supports that such an ED algorithm and programme can be implemented safely. For the two patients with *P. falciparum* malaria, the RAFT algorithm was followed and those patients were appropriately referred to the Infectious Diseases consultation service for evaluation, prior to being sent to RAFT by the Infectious Diseases team. Conversely, the benign, self-limited nature of many travel-acquired illnesses was reiterated by the number of patients seen in the EDs and referred to RAFT, but who felt better by the following day and declined the appointment. Since no additional resources are committed to running the RAFT programme as patients are accommodated into the regular schedule, the impact of 'no shows' on clinic operations is negligible. Averaged over a year, our results suggest that implementation of a RAFT programme can avert ~72 repeat ED visits and 288 hours of ED bed-usage for a second malaria screening, thereby enhancing patient care and reducing workload in the ED.

Our RAFT algorithm was derived from national guidelines on the approach to febrile returned travellers.[6] Yet adherence to the recommended minimum blood work was variable, with excellent adherence to malaria screening, CBC, electrolytes and creatinine, and lesser adherence to tests such as hepatic transaminases and urinalysis. Liver function tests are often perturbed in febrile returned travellers with diagnoses such as dengue, enteric fever, Epstein-Barr virus (EBV), cytomegalovirus (CMV), leptospirosis and the viral hepatitides, even in the absence of overt jaundice. Furthermore, hyperbilirubinaemia is one of the diagnostic criteria for severe malaria.[7] The pattern of abnormality of liver tests can be useful in refining the differential diagnosis. For instance, predominant elevation of hepatic transaminases occurs in arboviral infection, enteric fever, EBV, CMV and viral hepatitis. Conversely, a more cholestatic picture is suggestive of leptospirosis, biliary obstruction and even viral alcalulous cholecystitis. Thus, hepatic transaminases and bilirubin should be collected on all febrile returned travellers in order to inform the differential diagnosis, even in the absence of right upper quadrant pain and overt jaundice. Urinalysis, independent of urine culture, is also helpful in refining the differential diagnosis and may be abnormal in those without frank urinary symptoms, but with common travel-related diagnoses such as pyelonephritis (often occurring in the setting of traveller's diarrhoea), STIs including chlamydia and gonorrhoea, and leptospirosis, which leads to significant proteinuria. Conversely, the temptation to perform urine culture on

febrile returned travellers without signs or symptoms of bacterial cystitis or pyelonephritis should be resisted in order to avoid inappropriate antimicrobial treatment of asymptomatic bacteriuria. Even in the absence of a dedicated RAFT programme, we advise adherence to the national guidelines for assessment of febrile travellers, though, as demonstrated in this analysis, adherence overall was quite good.

Respiratory tract infections are the third most common cause of fever in the returned traveller in single-centre and multicentre analyses.[6] [8–13] We noted that respiratory syndromes were the second most common presentation among this group of febrile returned travellers, including eight cases of laboratory-confirmed influenza. We noted at least 1 'off season' transmission of travel-acquired influenza A imported back to Canada in the month of July, which reinforces the point that influenza circulates with reciprocal seasonality in the temperate southern hemisphere (ie, during their winter months, which are our summer months).[14] Influenza can circulate year-round in the tropics, so clinicians must have it on their differential diagnosis and perform nasopharyngeal (NP) swabs on returned travellers with influenza-like illness, regardless of the month or season here. Testing laboratories should be alerted to the potential for off-season transmission of influenza in travellers, so that they may adjust their NP screening algorithms accordingly.

In single-centre and multicentre analyses, TD is the most common cause of non-malarial fever in the returned traveller.[6] [8–13] Invasive bacterial gastroenteritides (eg, *Campylobacter*, *Salmonella*) are common specific causes of fever in the returned traveller, but a specific aetiological confirmation is unlikely due to the insensitivity of stool culture. Of 33 febrile returned travellers with presumed bacterial TD in this study, only six had stool culture positivity for a typical bacterial enteropathogen, despite >80% of TD being bacterial.[15] This lack of aetiological confirmation among individuals with TD has led to widespread implementation of empiric treatment strategies (eg, 3 days of ciprofloxacin[15]); however, this approach may foster increased fluoroquinolone resistance among endogenous flora, and is counter to the tenets of antimicrobial stewardship. High-sensitivity, multiplex stool pathogen detection assays, now even commercially available,[16] [17] have the potential to better direct antimicrobial treatment decisions in returned travellers with TD.

While fatal malaria has been continually imported by febrile returned travellers, it was the 2013–2015 Ebola virus disease (EVD) crisis, during which time fatal and non-fatal cases of EVD were exported from West Africa, that really brought the need for a travel history to the forefront. While we did not have any patients with EVD during our enrolment period, ~17% of diagnoses (n=26) in this population of febrile returned travellers were notifiable at both the provincial and federal level, including influenza, HIV, salmonellosis, campylobacteriosis, typhoid fever, giardiasis and malaria, indicating public health import and/or potential communicability.[18] Our diagnosis of four febrile returned travellers with acute HIV, syphilis and genital chlamydia infection reinforces the need for a thorough sexual and behavioural history, especially in the context of known disinhibition on the part of travellers.[19] In their cross-sectional study of >112 000 ill returned international travellers, Matteelli et al[20] documented STIs in 0.9%, many of which were acute HIV. Common STIs including secondary syphilis, acute HIV, acute HSV1 or HSV2, and gonococcemia can all lead to fever in the returned traveller. As such, these diagnoses should remain on the differential diagnosis and be excluded in the sexually active febrile returned traveller with a compatible history and clinical picture.

The several limitations of this analysis should be acknowledged. First, owing to limitations in the scope and funding of the study, we do not have the full range of hospital administrative ED data that would permit quantification of economic savings; thus, an economic analysis was neither planned nor performed. Although we cannot apply a dollar value to the economic savings of an ED visit averted for fever after travel, owing to the variability of this metric, we believe that our programme offers a systems-level improvement in care as most patients appreciate timely definitive management and avoidance of ED visits if possible. Second, illnesses with very short incubation periods, such as influenza and URTIs, may be over-represented and erroneously attributed to travel. We cannot definitively exclude the possibility that some cosmopolitan causes of fever in this group of returned travellers were locally acquired. Third, our ability to comment on the full spectrum of aetiological illness in this population is limited by the application of specific diagnostic tests deemed to be clinically relevant to the patient. Our goal was not to more precisely define the spectrum of illness encountered, but to reduce time to diagnosis, as we assume this leads to better outcomes and to a more efficient use of hospital resources. In 19 patients, 'non-specific viral illness' was the final diagnosis, and in three patients the diagnosis remained unknown, although symptoms resolved uneventfully and without specific therapy. Understanding the full spectrum of aetiological illness in such a population would require additional sophisticated and investigational diagnostics. Finally, we did not have a system by which to capture febrile returned travellers who may have fulfilled algorithm criteria but not sent to RAFT. We mitigated the risk of failure to capture all febrile returned travellers by frequent in-services and reminders to ED staff, as well as posted RAFT signage and binders in the ED. All fellows on-call overnight for the Infectious Diseases service had RAFT pocket cards and signage in their reviewing room. Similarly, we do not have a system that forces a general travel history, though with triage protocols mandating the collection of travel history to specific geographic regions such as

the Middle East (due to Middle East Respiratory syndrome coronavirus) and West Africa (due to Ebola virus), we believe that travel history is most likely requested from all febrile patients entering the ED. At present, nurses are automatically prompted at triage to document a travel history within 21 days should a patient present with fever, cough, dyspnoea or diarrhoea; thus, we feel that the likelihood of missing travel-acquired illness in our EDs is low.

CONCLUSIONS

Through implementation of a RAFT programme, we have been able to provide more timely care to ambulatory febrile returned travellers and, in doing so, fill a gap in care faced by such travellers prior to implementation of the programme. We have also reduced ED bed-usage by providing an alternate setting for follow-up malaria screening. In addition, we have offloaded the responsibility for treatment of infectious diseases that can be managed in an outpatient setting, but require specific therapy, such as acute urinary tract infections, from the ED. Our programme underscores the range of febrile illnesses that are imported to Canada by travellers on a daily basis, and reinforces the need to combine history, physical examination and a minimum set of laboratory investigations to exclude potentially life-threatening imported illnesses such as malaria and bacteraemia.

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Data sharing statement No additional data are available.

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