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# Improving Preventive Care for International Travelers Through Primary Care Screening

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**A DNP PROJECT**

# Improving Preventive Care for International Travelers Through Primary Care Screening

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A Project Presented to the Faculty of the Department of Nursing

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In partial fulfillment of the requirements

For the Degree of Doctor of Nursing Practice

Family Nurse Practitioner Track

By

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**Abstract**

***Background***: Prior to recent restrictions on travel, international travel was popular with an increasing number of U.S. residents traveling to emerging markets, which may have unfamiliar health risks. In additional to risk of illness, travelers may carry nonendemic disease across country borders, increasing risks to public health. ***Problem***: Though many international travelers report illness during travel or after returning home, only a portion receive a pretravel health consult for preventive care and education. Newer recommendations are to screen for upcoming international travel during routine health contacts; however, a travel medicine provider is best able to perform a comprehensive risk assessment and provide appropriate care. ***Methods***: All adult patients were to be screened for upcoming international travel during each primary care visit at all University of Pittsburgh Medical Center (UPMC) Pinnacle primary care sites – referrals to the Travel Medicine Clinic (TMC) were then given as appropriate. ***Intervention***: A tool to screen for upcoming international travel was embedded into the electronic medical record (EMR) at primary care visits with answers recorded by the rooming medical assistant. For patients with positive screenings, the provider received an immediate EMR prompt for a TMC referral. ***Results***: Analysis of a total quota sample (n=200) found a significant increase in referrals to the TMC [$x^2(1) = 118.7$, $p = .000$] with a large effect size (d = .770) in the post-intervention group. Additionally, asking about upcoming international travel does have a statistically significant effect on referrals to the TMC [pre group: 0%, n = 0; post group: 93.8%, n – 75, $x^2(2) = 29.18$, $p = .000$] with a strong positive association noted ($r = .59$). ***Conclusion***: Screening for upcoming international travel at primary care visits does increase referrals to the TMC, potentially decreasing risks to travelers and public health.

***Keywords***: travel medicine, preventive care, pre-travel consult, travel health, travel-related illness

## Improving Preventive Care for International Travelers through Primary Care Screening

### Background

Prior to recent restrictions on travel, the popularity of international travel was evident as approximately 41.77 million individuals traveled outside the U.S. in 2018 (National Travel and Tourism Office [NTTO], 2020). Additionally, the number of individuals who travel, specifically, from the U.S. to emerging markets and developing countries, which often have unique health risks, is increasing (Angelo, Kozarsky, Ryan, Chen, & Sotir, 2017a; Walker, et al., 2017). Included in this number is the large wave of immigrants to the U.S. – foreign-born persons who return to their countries of birth to visit friends and relatives (VFRs; Hamer et al., 2017; Tan et al., 2017) - who, unfortunately, suffer the highest rate of travel-related morbidity (Freedman, Chen, & Kozarsky, 2016). All international travelers may be exposed to health risks and unfamiliar diseases not endemic to their own country, for which they have no preventive care or education, potentially suffering morbidity and/or mortality as a result (Hagmann et al., 2014; Omodior, Pennington-Gray, Holland, Thapa, & Kiousis, 2017). Additionally, travelers can carry nonendemic diseases across borders, exposing others to secondary disease and increasing risks to public health (Laroque et al., 2010; Walker et al., 2017). Authors, Harvey et al. (2013), published a sentinel study in which they noted, "travelers have contributed to the global spread of infectious diseases, including novel and emerging pathogens" (p. 1). This risk has most recently been realized in coronavirus disease 2019 (COVID-19), first identified in Wuhan, China in 2019 (Centers for Disease Control and Prevention [CDC], 2020), which quickly spread globally through international travel and was declared a pandemic in March 2020 (World Health Organization [WHO], 2020).

## Problem Statement

Although overall rates of international travel-related illness vary, a literature review noted that among travelers visiting developing countries, 43-79% developed a travel-related illness during travel or after returning home (Angelo et al., 2017b). Additionally, 53-56% of all international travelers with a travel-related illness never received a pre-travel health consult (Angelo et al., 2017b; Hagmann et al., 2014; Harvey et al., 2013). Unique to the subset of students (ages 17-24) who traveled for educational purposes to resource-limited countries, 70% had received a pre-travel health consult (Angelo et al., 2018). To increase preventive care and education, a recommendation by Angelo et al. (2017b) and Tan et al. (2017) includes proactive screening for international travel during routine patient contacts. However, due to complex epidemiology and the dynamic nature of travel medicine, unless a primary care provider - whose offices generally do not carry many of the preventive immunizations recommended for certain travel destinations (Freedman & Leder, 2018) - can complete a comprehensive risk assessment and fully understands the traveler-specific, itinerary-specific, and destination-specific risks, the patient should be referred to a travel medicine specialist (Chen et al., 2018; Fischer, 2017; Zappas, Whitely, & Carter, 2019).

Because there was no screening at University of Pittsburgh Medical Center (UPMC) Pinnacle primary care sites for international travel, this quality improvement (QI) project focused on improving preventive care prior to international travel through screening during the rooming process at each adult primary care visit. PICO(T) Question: For adult patients at UPMC Pinnacle primary care clinics (P), how does screening for upcoming international travel at each primary care encounter (I) compare to no screening for international travel at each primary care

encounter (C) influence the number of patients referred from primary care to the Travel Medicine Clinic (TMC) (O) over an 8-month period (T)?

## Needs Assessment

According to the literature, both content and context issues were present. These included an overall lack of public knowledge regarding the need for pre-travel preventive care as well as a lack of coordination in patients receiving this recommended care. A SWOT analysis (Appendix A) reveals internal strengths and weaknesses as well as external opportunities and threats.

Strengths included the large size of the UPMC Pinnacle network with an associated TMC. UPMC Pinnacle TMC employs knowledgeable providers to manage travel-related illnesses as well as to provide comprehensive pre-travel preventive care (UPMC Pinnacle, 2019b). Trained referral team members direct referrals from providers to the TMC efficiently; however, a weakness is present as TMC intake staff only provide estimated costs to the referred individual based on travel destination and are not educated to advise on risks if a patient declines an appointment because of costs. Additionally, staffing vacancies throughout the organization strain resources system wide.

Opportunities for improvement existed due to the large local immigrant community/VFRs – in two main counties the largest group was from Asia with a total population of approximately 17,400 individuals - who often travel to their country of origin and have a uniquely high risk of morbidity related to their travel (Freedman et al., 2016; Migration Policy Initiative [MPI], 2017), as well as the large number of international travelers (Angelo et al., 2017b; Walker et al., 2017). Opportunities also surrounded media coverage of infectious disease outbreaks (i.e. Ebola) which improved public awareness and provided an increased opportunity for disease prevention (World Health Organization [WHO], 2018). Threats to improvement

existed as traditional insurance coverage does not pay for preventive immunizations or medication related to voluntary travel; thus, individuals may decline preventive care and medications due to out-of-pocket costs (Angelo et al., 2017a; Bunn, 2015). A root cause analysis replicated the issues identified through the SWOT analysis (see Appendix B).

One identified core value of UPMC Pinnacle – safety – aligns with this project through preventing primary illness in travelers and, further, preventing secondary illness to staff, other patients, and the community (UPMC Pinnacle, 2019c). This QI project, consistent with the six domains of health care quality, was to be (a) safe, (b) effective, (c) patient-centered, (d) timely, (e) efficient, and (f) equitable (Agency for Healthcare Research and Quality [AHRQ], 2018).

## Aims, Objectives, Purpose Statement

The overarching aim for this project was to increase the number of patients, who have upcoming international travel, referred to the TMC. The SMART objectives included: (a) embedded screening questions regarding upcoming international travel added to the electronic medical record (EMR) rooming template, (b) screening 100% of adult patients for upcoming international travel at all primary care visits from May 2018 through January 2020, (c) offering a TMC referral to all patients who admitted to upcoming international travel, and (d) providing an automated TMC referral for the provider to sign for all amenable patients (see Appendix C). Thus, the overall purpose of this project was to increase the number of patients, planning to participate in international travel, who receive travel-related preventive care and education.

## Review of Literature

A review of applicable literature included a search through Medline Complete and CINAHL with inclusion limits, based on the project specifics, of: (a) English language; (b) USA geographic subset; and (c) 2014-2019 publishing dates. Additional records were identified

through Google Scholar®, UpToDate®, and the Centers for Disease Control and Prevention (CDC) leading to a total combination of 731 records screened, 38 full-text articles assessed for eligibility, and 17 final articles included for relevance and quality (see Appendix D). Final articles, appraised using the Johns Hopkins Evidence-Based Practice Model (Dearhold & Dang, 2012), included research and non-research evidence (levels III through V) with quality ratings of A or B and the resulting data was combined in an evidence matrix summary (see Appendix E).

Common themes included: (a) the lack of pre-travel medical consults for international travelers, (b) the recommendation of screening for upcoming international travel during routine healthcare visits, (c) the need for a pre-travel consult for international travelers to prevent primary disease and secondary illness in the community, and (d) the need for a provider with specialized knowledge of travel medicine to provide comprehensive care. Except students traveling for academic purposes, non-experimental and descriptive research evidence reported only 44-47% of international travelers sought out a medical consult prior to their travel (Angelo et al, 2017b; Hagmann et al., 2014; Harvey et al., 2013). Research authors Angelo et al. (2017a) and Tan et al. (2017) recommended screening for upcoming international travel during routine health care visits to increase preventive care. Additionally, the need for a medical consult before international travel was well supported throughout the evidence from clinical practice guidelines (Freedman & Leder, 2018; Lee et al., 2017), expert opinion (Freedman et al., 2016), and research data (Chen et al., 2018; Harvey et al., 2013; Laroque et al., 2010). Finally, most pre-travel medical consults should be completed by a provider with specialized knowledge of travel medicine to provide comprehensive care based on traveler-specific, itinerary-specific, and destination-specific risks – which is supported by research evidence (Chen et al., 2018; Freedman et al., 2018) as well as published clinical practice guidelines (Fischer, 2017), expert

opinion (Sanford, McConnell, & Osborn, 2016) and community standards (Zappas et al., 2019). An evidence-based need for improvement in preventive care prior to international travel was demonstrated in this literature review. Excepting two sentinel studies by Harvey et al. (2013) and LaRoque et al. (2010), all literature evidence was published within five years of proposal. A notable gap was observed in the literature regarding benchmarks or interventions with which to compare this QI proposal.

## Theoretical Model

Milio's Framework of Prevention was used to guide this QI project through its six identified propositions (Milio, 1976; see Appendix F). Milio's propositions, generally, examine how individuals or populations can be influenced to improve or change their health choices. Applying these propositions specifically to preventive care prior to international travel can help identify reasons for lack of preventive care and recognize ways to improve uptake of that care individually or through population health strategies.

## Translation Model

The Ottawa Model of Research Use (OMRU) framework was utilized for quality improvement and has three fundamental elements which must be addressed as this assessment affects the project's uptake and implementation success (Logan & Graham, 1998; see Appendix G). The innovation element addressed the evidence to support this quality improvement plan - the screening of patients for upcoming travel. The second fundamental element addressed potential adopters which included: (a) primary care medical assistants (Mas) and providers; (b) travel medicine referral team members; and (c) TMC office staff. The practice environment element addressed structure which included an information technology (IT) build, an increased referral burden, and patient economic considerations. Through the linear diagram of the OMRU,

interventions and adoption were assessed in a dynamic manner. Outcomes are addressed in the results portion of this paper while ongoing evaluation and changes may be considered for future initiatives.

## Methodology

### Participants

All adult patients were to be screened for international travel during the rooming process at each UPMC Pinnacle primary care visit. The rooming medical assistant (MA) was to ask the screening question which was built into the EMR. Inclusion criteria was all adult patients (≥18 years of age) presenting for a primary care appointment with a provider, while exclusion criteria eliminated patients less than 18 years of age and patients roomed during EMR "downtime" – any time that the EMR was not functional or available to staff.

Participants under the age of 18 (n=28,063) were deleted from the entire retrieved data set (N=457,865) because they did not meet inclusion criteria. Of the remaining participants (N = 429,802), missing demographic data was <1% for both gender and ethnicity with no missing data for age or appointment type. This sample ranged in age from 18 to 105 years (mean = 56.8 years, SD = 17.2), was primarily female (57.3%, n = 246,420), white (87.9%, n = 372,594) and were seen for a non-acute appointment (98.7%, n = 424,269) In comparing the demographics between the pre-intervention group (n = 266.763) to the post-intervention group (n = 163,014), statistically significant differences were found for both gender [$x^2(1)$, = 97.85, $p$ = .000] and age [pre-intervention, M = 57.5 (SD = 17.13) and post-intervention, M = 55.8 (SD = 17.39)], t(340519) = 31.2, $p$ = .000. Additional analysis of the complete data set revealed large amounts of non-random missing data for the variables of interest (travel plans [yes/no] missing = 54.8% [n=89,311] and referral offered [yes/no] missing = 98.9% [n=161,176]) from the post-

intervention group [n = 163,014] due to lack of documentation of answers to the screening questions. It was decided that the sample would be restricted to participants with complete data and that a data set would be built to control for the two confounders (gender and age) while maintaining all valid data of participants that did have complete information and a positive referral to the TMC.

The quota sample was created by separating groups (pre- or post-), controlling for the demographic variables of age and gender, and choosing individuals to construct equivalent groups. The final data set consisted of two demographically equivalent groups (N = 200). This process did maintain the integrity of the higher number of travel referral orders in the post-intervention group (n=90) versus the pre-intervention group (n=13). Subjects in the pre-intervention group were seen in the primary care offices between August 2018 and mid-May 2019 while subjects in the post-intervention group were seen in the primary care offices between late May 2019 and January 2020. It should be noted that the ethnicity of the total sample was so predominantly White (87.9%) that it was not possible to create equal representation among ethnicities in the quota sample (Appendix H). However, increased representation of minority ethnicities was attempted in the quota sample build with 70% White and 30% Black/Other.

**Setting**

The UPMC Pinnacle network supports over 50 primary care offices which care for a diverse urban, suburban, and rural population spread across ten central Pennsylvania counties (UPMC, 2019a). The TMC is a specialty clinic (as part of Infectious Disease) within the UPMC Pinnacle network. Positive attributes of this project included: (a) low complexity with "yes/no" responses to screening questions, (b) compatibility with simple inclusion as part of current practice as questions were embedded into the EMR for MAs to read and record responses to

during rooming, (c) feasibility with EMR prompts consistent across all offices within the electronic medical system, (d) clear, evidence-based recommendations as previously noted, and (e) UPMC Pinnacle leadership support. Barriers included: (a) staffing workload and associated lack of compliance, (b) minimal opportunities to educate staff due to competing health system priorities, (c) lack of opportunity to trial implementation, and (d) massive implementation with limited opportunity for ongoing evaluation. To overcome barriers, the project manager attempted frequent communication during initial implementation with the Outpatient Chief Quality Officer (OPCQO), Primary Care office managers, and the TMC manager to discuss concerns or roadblocks during implementation, as well as ongoing electronic education to Primary Care office managers during initial implementation. However, data analysis exposed under compliance of rooming staff and associated documentation.

**Tools**

The screening tool, developed by the project manager and the OPCQU, was based on evidence-based recommendations for improvement because no screening tool was previously embedded in the EMR, nor was a tool found in the literature review (see Appendix I).

**Intervention**

Screening was to be obligatory as it was built into the electronic requirements of the rooming process at each adult primary care appointment. During each primary care visit the patients were roomed by the MA, who was to ask the pre-populated EMR screening question - "Do you have upcoming travel planned outside of the United States?" - and record the answer(s) in the EMR. If the screening was positive, an additional statement and question automatically populated in the EMR – "International travel has unique health risks; however, there is preventive care available to help decrease your risk of getting sick. Can we refer you to our

Travel Medicine Clinic for care?" If the patient agreed, a referral to the TMC was automatically triggered for the provider, who signed any appropriate referrals to the TMC (see Process Flow Chart in Appendix J).

For this project, the project manager provided verbal education with an accompanying PowerPoint presentation to the office managers and physician team leaders during a regularly scheduled Team Lead Meeting. The office managers were to educate the MAs in their office on the screening implementation. The providers, who received the electronic prompt to sign any appropriate TMC consults, were sent evidence-based research (written by the project manager) for the change with an authoritative directive through email from the OPCQO (see Appendix K). Additionally, the project manager provided educational materials for the patients on travel risks and prevention (see Appendix L).

**Data Collection**

Quantitative, de-identified, retrospective data of all patients seen at UPMC Pinnacle primary care sites was requested through the IT department for EMR extraction with demographic variables including (a) gender, (b) age, (c) ethnicity, and (d) type of appointment (acute versus non-acute). Data was requested and received for all UPMC Pinnacle primary care appointments from August 2018 through January 2020. Additional data requested and received included all referrals to the TMC and screening question assents (from this QI project intervention) in the EMR. The number of referrals to the UPMC Pinnacle TMC over the 8 months prior to screening implementation were compared to data collected for eight months post-implementation. Additionally, data was statistically analyzed and potential differences with referrals/non-referrals were sought in associated demographic information (gender, age, ethnicity, and reason for appointment – acute versus non-acute).

## Cost Analysis

There were no direct costs to the organization other than utilization of existing resources. Minimal costs were donated by the Project Manager (see Appendix M).

## Timeline

In April 2018, the project manager received proposal approval and completed Institutional Review Board (IRB) submission for both UPMC Pinnacle and Messiah College; both IRB approvals were granted within 2 weeks of submission. An aggressive timeline to initiate the intervention was proposed due to UPMC Pinnacle's enthusiasm for this QI project. Thus, additionally in April 2019, the implementation team was educated, IT completed the intervention build, and the screening tool was embedded into the system EMR. In May 2019, education for patients was distributed to primary care offices, the UPMC Pinnacle Nursing Research Council was updated (per system policy), and the screening tool was enabled in the EMR to begin screening. Retrospective pre-implementation data were obtained through EMR extraction in November 2019 and post-implementation data were extracted in April 2020. These data were analyzed in June/July 2020 with final QI project outcomes written in July 2020 (see Appendix N).

## Ethics and Human Subject Protection

The Messiah College and UPMC Pinnacle IRB approvals were obtained prior to initiating the DNP project. All participants were protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which, among other guarantees, protects the privacy of patients' health information (Robert Wood Johnson Foundation [RWJF], 2013). Additionally, the project manager and practice personnel conducting this project carefully followed regular standards of care for practice in a primary care office. Information collected as part of

evaluating the impact of this project was aggregated data from the project participants and did not include any potential patient identifiers. The risk to patients participating in this project was no different from the risks of patients receiving standard primary care. Participant confidentiality was assured by extracting de-identified aggregate data from the EMR system. This data was kept on a password protected/locked USB (only accessible by the project manager) and in a locked office in the project manager's home.

## Results

### Analysis and Evaluation

The quota sample in its entirety consisted of 200 adult patients seen at primary care visits (100 in pre-intervention group, 100 in post-intervention group) with a mean age of 45.94 years (SD = 13.7). Most of the subjects were female (51%, n = 102), white (70%, n = 140) and at a non-acute primary care appointment (99.5%, n = 199; see Appendix O1). Assumptions for the Chi-square test and the Independent Samples *t*-test were met.

Between the pre-intervention group and the post-intervention group, there were no statistically significant differences for gender [$x^2(1) = .000$, $p = 1$]; ethnicity [$x^2(1) = .000$, $p = 1$]; appointment type [$x^2(1) = 1.005$, $p = .316$]; or age [$t(176) = 0.510$, $p = .611$]. An analysis of the only dependent variable, a travel medicine referral, examined any differences related to the primary question of this project – in adult patients seen in primary care offices, does the implementation of a screening question for upcoming international travel plans increase referrals to the Travel Medicine Clinic - compared to no screening question for upcoming international travel plans? There was a statistically significant greater number of referrals to the TMC in the post-intervention group (n = 90) compared to the pre-intervention group (n = 13) [$x^2(1) = 118.7$, $p = .000$] with a large effect size (d = .770; See Appendix O2). Additional analysis examined the

relationship between the primary intervention question (Do you have plans for upcoming international travel?) and referrals to the Travel Medicine Clinic. The Chi-Square test of association results indicated that asking about upcoming international travel plans does have a statistically significant effect on referrals to the TMC (pre group: 0%, n = 0; post group: 93.8%, n =75, $x^2(2) = 29.18$, $p = .000$; see Appendix O3) with a strong positive association ($r = .59$; See Appendix O4).

**Discussion**

Although the previously identified SMART goals were not fully achieved, the statistically significant difference of TMC referrals in the post-intervention group, specifically associated with the new screening question, demonstrated the value of screening for upcoming international travel at routine medical appointments. This QI project, implemented consistently, could continue to increase referrals to the TMC. A subsequent result may be an increase in preventive care and a decrease in travel-related illness in the primary care population with international travel plans, which was the main purpose of this project. Additionally, public health may be protected through the prevention of secondary, travel-related illness.

Strengths of this project included the large size of the UPMC Pinnacle network which includes a TMC employing providers educated, and specializing, in travel medicine. Limitations included (a) the focus on travelers from one geographic area which limits generalizability of this study's data to other geographic locations, (b) a primarily White population of patients which limits generalizability to more diversely ethnic populations, and (c) low screening rate/gaps in data due to staff non-compliance in utilizing the screening intervention questions.

Recommendations for future research include initiating the intervention on a smaller scale initially to ensure education with frequent audits of staff compliance to decrease gaps in

data. A separate project could examine the participation of patients who receive a TMC consult and their attendance at preventive appointments including compliance with recommended immunizations, protective medications, and self-care practices. Additionally, opportunities exist to increase preventive, travel-related, care to foreign-born persons who return to their country of birth to visit friends and relatives (VFRs) – this population suffers the highest rate of travel-related morbidity but was not well-represented in this project. Nevertheless, the findings of this QI project highlight the importance of screening patients for upcoming international travel to improve referrals, for preventive care and protection of public health, to a TMC.

## Conclusion

The core competency of *independent practice* for the nurse practitioner includes: (a) health promotion; (b) disease prevention; and (c) health protection making this project applicable for the nurse practitioner (Thomas et al., 2017). Thus, through screening for international travel during routine primary care visits (which is not current practice), this QI project could improve preventive care to the primary care population with international travel plans and protect public health through prevention of secondary, travel-related illness.

International travel, which often has preventable health risks, had maintained popularity until the COVID -19 global pandemic occurred. However, prior to the initiation of this project there was a lack of research and QI strategies related to pre-travel medical consults, which assess travelers' risks, and adequate preventive care and education. This QI project screened for prospective international travel and initiated appropriate referrals to the TMC for preventive care. It is anticipated that this improvement in preventive care should minimize travelers' health risks as well as protecting public health through a decrease in secondary illness. The current global pandemic has, currently, severely limited international travel through individual choice,

business modifications, and government restrictions. It is unknown when or how frequently international travel will resume; however, the speed with which COVID-19 was spread through individuals traveling around the world should provide a cautionary tale for the medical community and the public. There remains a need for improved awareness of international health risks as ongoing global travel with already known disease risks resumes, and the evolution of human-animal interface will likely potentiate additional novel infectious diseases (Perl & Price, 2020). Thus, screening for upcoming international travel and encouraging pre-travel medical consults should be prioritized to minimize primary disease and prevent secondary illness.

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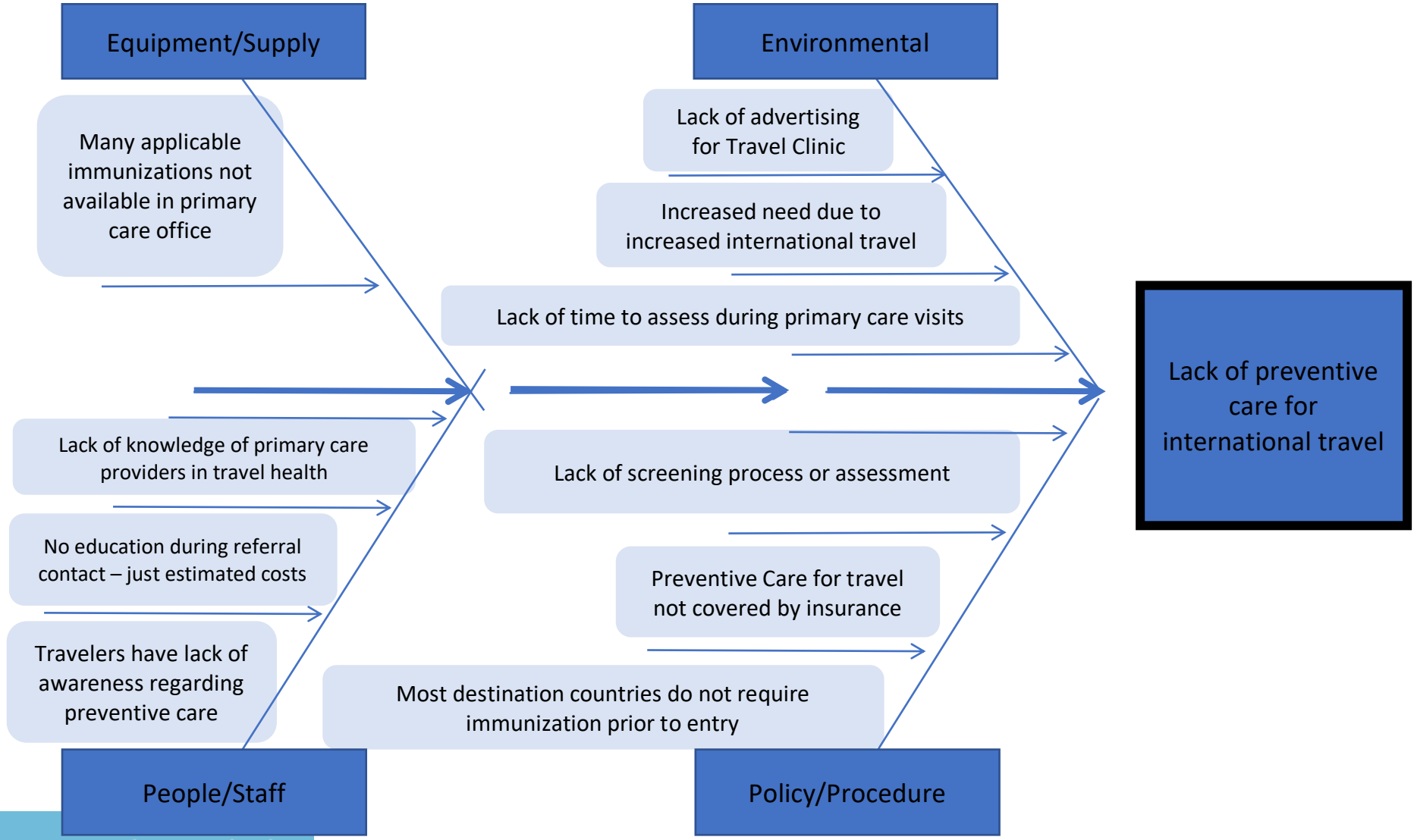
## Appendix A

Table 1. *SWOT Analysis*

| Strengths (internal) | Weaknesses (internal) |
|---|---|
| Healthcare organization has an Infectious Disease Clinic<br><br>Healthcare organization has a Travel Medicine Clinic<br><br>Large healthcare organization with wide reach<br><br>Many primary care offices to screen patients for upcoming travel<br><br>Referral team to efficiently direct referrals to Travel Medicine Clinic | Referral team does not have the knowledge to educate patients on risks if they decline referral<br><br>No ability to add additional resources at this time to educate referral team<br><br>Many staffing holes throughout organization<br><br>PCPs do not have adequate knowledge to advise travelers<br><br>PCP offices do not carry all necessary immunizations for pre-travel preventive care<br><br>Lack of time by PCP during visit to assess upcoming travel |
| **Opportunities (internal)** | **Threats (external)** |
| Increased travel noted internationally<br><br>Large community of individuals visiting family and relatives (VFRs) in the local geographic region<br><br>Media often highlights infectious diseases cases which increases awareness (i.e. current coronavirus and Ebola) | Lack of insurance coverage for preventive care related to travel<br><br>Travel medicine preventive care and visit requires private payment |

**Appendix B**

Root Cause Analysis Tool



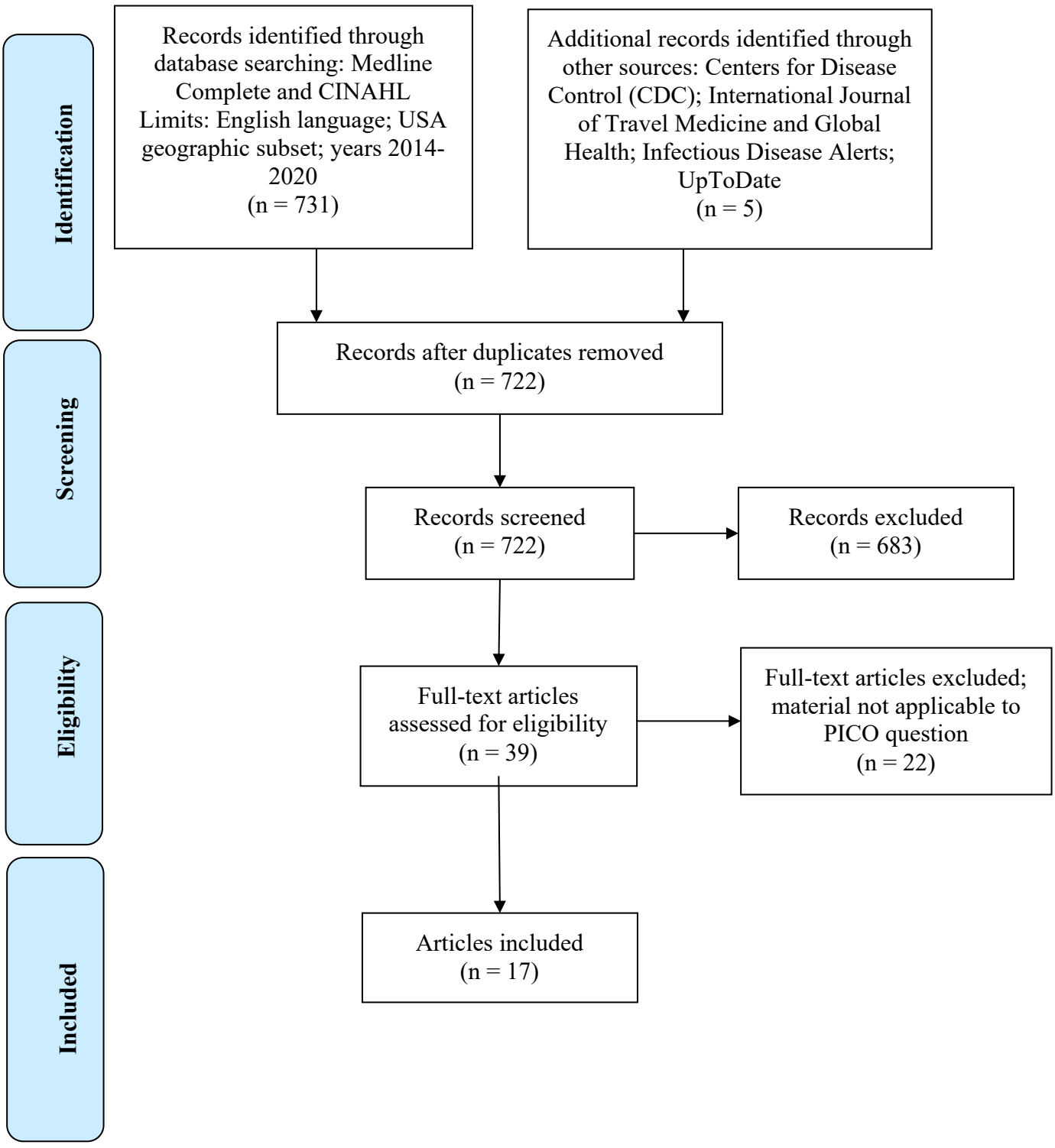
## Appendix C

SMART objectives:

1. EMR screening questions regarding upcoming international travel, asked by the medical assistant, will be built into the rooming process template in the EPIC system and asked at each adult primary care visit. This build will be completed by May 10, 2019.
2. 100% of adult patients presenting for a primary care visit will be screened for upcoming international travel over an eight-month screening period using the EPIC system triggers during the rooming process from May 2019 through January 2020.
3. 100% of adult patients who admit to upcoming international travel will be offered a referral to the TMC by the medical assistant who is completing the rooming process.
4. 100% of patients who agree to the referral will have an automated referral directed to the provider for the provider's signature.
5. By screening every adult primary care patient at each visit for international travel, an increased proportion of patients will be referred from primary care to the TMC for preventive care and education over an 8-month period when compared to the proportion of referrals from primary care to the TMC in the eight months prior to implementation of screening.

**Appendix D**

PRISMA Flow Diagram



## Appendix E

Evidence Summary Matrix

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| 1 | Freedman<br><br>The New England Journal of Medicine<br><br>July 2016 | Non-research: Expert Opinion – to provide specialist advice for providers performing international pre-travel patient health consultations | n/a | Provided a structured and sequenced approach using standardized protocols to provide a pre-travel preventive health consultation for healthy adults traveling to common destinations. Advice from a specialist is recommended for all other travelers | Authors are specialists in Infectious Disease; Due to constantly changing global health threats, providers must frequently consult updated travel medicine information to provide current and accurate prevention advice; thus, article advice may not be current. | V | A |
| 2 | Hamer<br><br>Mayo Clinic Proceedings: Innovations, quality, and outcomes<br><br>July 2017 | Research – Non-experimental; comparative of traveler demographics and trip characteristics with travel plans as well as | Consecutive sample of 15,440 patients from 5 travel clinics in the Boston Area Travel Medicine Network (BATMN) | Compared traveler demographics and trip characteristics with travel plans as well as pretravel preparations; Demographic information – age, sex, race/ethnicity, country of origin, year of arrival in the | Focus on travelers from only one geographic area of the US (threat to external validity of selection bias and setting); missing responses for certain variables; lack of data on reasons vaccines | III | B |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | | pretravel preparations | who were medically evaluated for travel outside the United States from March 2008 – July 2010 | U.S., parents' countries of origin, primary language; Noted importance of assessing unique traveler and trip characteristics to improve understanding of clinic-specific population health risks based on clinic geography as well as individual travel risks; Increased risks noted for VFRs (visiting friends and relatives) | were not administered (threat to instrument content validity); differences in provider practice (threat to intervention fidelity) | | |
| 3 | Omodior<br><br>International Journal of Travel Medicine and Global Health<br><br>February 2017 | Research – Non-experimental; descriptive – to investigate chikungunya disease awareness, personal | Convenience sample of 653 US adult travelers who visited any one of 34 Caribbean destinations | Only 35% of travelers reported seeking out information about health risks at a destination prior to visiting to Caribbean; Although chikungunya disease is a significant risk to | Study findings limited to those using an online platform (threat to external validity of selection bias); No survey question differentiation noted between | III | B |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | | protective behaviors, and health-seeking behaviors of US travelers to destinations in the Caribbean | through an online survey | travelers in the Caribbean, there is a low level of disease awareness among travelers (30%) with associated inadequate prevention practices | unique Caribbean destinations (threats to instrumentation content validity and external validity of setting) | | |
| 4 | Angelo<br><br>Malaria Journal<br><br>July 2017 | Research – Non-experimental; descriptive – to describe demographic information, travel details, clinic visit characteristics, and disease attributes of travelers diagnosed with malaria after travel to malaria-endemic areas | Consecutive sample of 5689 travelers diagnosed with malaria at GeoSentinal Global Surveillance Network sites from March 2003 - July 2016 | 53% of travelers did not have a pre-travel medical visit; 53% were VFRs (visiting friends and relatives); recommended proactive action – increasing malaria awareness, promoting pre-travel medical visits, inquiring about upcoming travel during routine healthcare contacts to increase prevention measures | May not be representative of all travelers with malaria due to specialized sites record review (threats to external validity of selection bias and setting); no information on malaria prophylaxis taken or compliance with medication (threat to external validity of history and treatment) | III | A |
| 5 | Freedman<br><br>UpToDate<br><br>November 2018 | Non-research: Clinical Practice Guidelines (for travel immunizations) | n/a | Immunization recommendations for international travel; travelers should receive preventive care prior to | Guidelines presented through evidence-based research from the International Society of Travel | IV | A |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | | | | international travel; a pre-travel consult should be completed by a specialized travel clinic or a primary care practice with expertise in travel medicine | Medicine, the Centers for Disease Control and Prevention; and the World Health Organization | | |
| 6 | Walker<br><br>CDC<br><br>June 2017 | Non-research: Expert Opinion (on travel epidemiology) | n/a | International tourist numbers are expected to increase which leads to an increased risk for disease for the traveler and for secondary infections; only 40% of returning ill travelers reported pretravel medical visits | Information presented from experts in infectious disease and/or travel medicine. Information sources identified: Centers for Disease Control and Prevention; GeoSentinel Surveillance System; and United Nations World Tourism Organization | V | A |
| 7 | Fischer<br><br>Infectious Disease Alert<br><br>June 20, 2017 | Non-research: Consensus statements from International Society of Travel | n/a/ | Most primary care providers are unable to give accurate and complete information regarding pre-travel preventive vaccines | Conference of international travel medicine consultants – may be biased toward travel medicine | IV | B |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | | Medicine conference proceeding | | and prevention/management of travelers' diarrhea; Professions providing pre-travel care must be knowledgeable about all aspects of travel health, able to effectively educate travelers, and have adequate time for comprehensive care | specialists providing pre-travel care | | |
| 8 | Angelo<br><br>Journal of Travel Medicine<br><br>2017 | Non-research: Literature review (of studies that included international travelers who acquired a travel-related illness | n/a | Much data related to illness from travel is dated and with limited generalizability; 4 studies were found to provide valid estimates on travel-related illness – between 43-79% of travelers reported a travel-related illness | All data from the 4 studies was drawn from patients which had a pre-travel health consultation – thus, may not be generalizable to all travelers as most who received a consult were traveling to higher-risk destinations (Africa & Asia) | V | A |
| 9 | Harvey | Research – Non-experimental – Descriptive – to | Consecutive sample of 141,789 patients who | The number of patients evaluated increased each consecutive year; the | All data were from GeoSentinel sites – thus, may not be generalizable to | III | A |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | CDC – Morbidity and Mortality Weekly Report<br><br>July 19, 2013 (sentinel study) | summarize data from patients with confirmed or probable travel-related illnesses | were evaluated at one of 22 GeoSentinel Global Surveillance Network medical sites and were diagnosed with a travel-related illness from September 1997 through December 2011; limited to patients who had traveled across an international border within the previous ten years and had sought care for a presumed travel-related illness | most common reason for travel sited was tourism; fewer than half of all patients (44%) reported a pre-travel medical consult; the most common diagnosis included was unspecified diarrhea; future efforts should increase the number of international travelers who seek a medical consult pre-travel | entire traveling population (threats to external validity of selection and setting); cannot be used to estimate disease rates or risks because of lack of denominator data; Data coding practices and the GeoSentinel data system have changed over time and may have varied by site (threat to instrument construct validity and test-retest reliability) | | |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| 10 | Hagmann<br><br>Family Practice<br><br>2014 | Research – non-experimental – descriptive demographics included reason for travel, geographic area of disease acquisition, and disease spectrum | Consecutive sample of 9624 US travelers who were evaluated at one US medical clinic in the GeoSentinel Surveillance Network and were diagnosed with a travel-associated illness from January 1, 2000 through December 31, 2012 | Pre-travel advice was sought by 45% of returned ill travelers; information on purpose of travel and destination represents important information to help inform strategies in improving preventive pre-travel care; highest percentage captured (38%) had traveled for tourism; median travel duration was 20 days; GI illness were most common (58%) | GeoSentinal data only captures information from patients seen at the specialty travel clinics – not primary, acute, or emergency care settings (threats to external validity of selection and setting) | III | B |
| 11 | Chen<br><br>Journal of Travel Medicine<br><br>2018 | Research – non-experimental; descriptive of ill business travelers post international travel | Consecutive sample of 12,203 international business travelers who were evaluated at one of the GeoSentinel | Malaria was the most frequent diagnosis as well as the most common cause of mortality; less than half (46%) of the travelers reported a pre-travel medical consultation; pre-travel medical advice | GeoSentinal data only captures information from patients seen at the specialty travel clinics – not primary, acute, or emergency care settings (threats to external validity of | III | A |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | | | Surveillance Network clinics (64 clinics in 29 countries) and were diagnosed with a travel-associated illness from January 1, 1997 through December 31, 2014 | is recommended but, currently, underutilized for international business travelers – needs to be improved | selection and selection) | | |
| 12 | Lee<br><br>Tropical Diseases, Travel Medicine and Vaccines<br><br>2017 | Non-research: Clinical Practice Guidelines for prevention of travel-associated illness in older adults | n/a | Elderly patients should have a medical consult prior to international travel for risk assessment and guidance | Authors used the GRADE system to evaluate strength and quality of recommendations; gaps in research related to subgroup of travelers (elderly) with special needs | IV | B |
| 13 | Tan<br><br>International Journal of Travel Medicine and Global Health<br><br>2017 | Research: Non-experimental; comparative of pre-travel health care utilization | Consecutive sample of 2073 patients (393 VFRs and 1680 non-VFRs) evaluated at | Compared to non-VFRs, VFRs often have last-minute, long-term travel practices and lower rates of vaccine completion; authors | Conducted at a single clinic so limited generalizability (threats to external validity of selection and setting); those | III | B |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | | | Mayo Clinic Travel and Tropical Medicine Clinic from January 1, 2012 through December 31, 2013; compared pre-travel utilization of healthcare between VFRs and non-VFRs | recommend that during routine health care visits, primary care providers remind VFR population to seek pre-travel care if needed | seen at clinic may be more motivated and literate related to pre-travel care (threats to external validity of selection and setting) | | |
| 14 | Sanford<br><br>American Family Physician<br><br>2016 | Non-research: Expert Opinion (on a pretravel medical consult) | n/a | Physicians without travel medicine training or who do not regularly perform pre-travel consults should refer any complex patients to travel medicine specialists | Only one author has documented travel medicine expertise; reliable sources are cited – Travel and Tropical Medicine Manual; Centers for Disease Control and Prevention; and Infectious Diseases Society of America | V | B |
| 15 | LaRocque | Research: non-experimental – comparing | Convenience sample of 1254 travelers | Travelers to still-developing nations have preventable | Sample restricted to single US airport; small | III | B |

| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| | Journal of Travel Medicine<br><br>2010 (sentinel study) | travelers of low/low-middle income companies and upper-middle/high income countries | to outside countries at Boston-Logan International Airport from February – August 2019 | health risks; 54% of survey respondents to LLMI countries pursued any health information prior to travel; less than 33% of those who did pursue health information visited a travel medicine specialist | sample size; few travelers surveyed who were planning to travel to Asia and Africa (higher risk destinations) (threats to external validity of selection and setting); survey response rate not noted (threat to external validity of selection | | |
| 16 | Angelo<br><br>Journal of Travel Medicine<br><br>2018 | Research: Non-experimental – descriptive of students' characteristics | Convenience sample of 432 students (ages 17-24) who traveled inter-nationally for school and were given a confirmed travel-related diagnosis at a GeoSentinel travel clinic for illness after returning home to the U.S. | Increasing number of students traveling to resource-limited countries; only 70% of ill students did receive a health consult prior to travel; all U.S. students traveling internationally should receive a pre-travel consult with education, and vaccines/chemoproph ylaxis when indicated | GeoSentinel data only captures information from patients seen at the specialty travel clinics – not primary, acute, or emergency care settings (threats to external validity of selection and setting); over half of the student records were from only two clinics (threat to external validity of setting) | III | B |

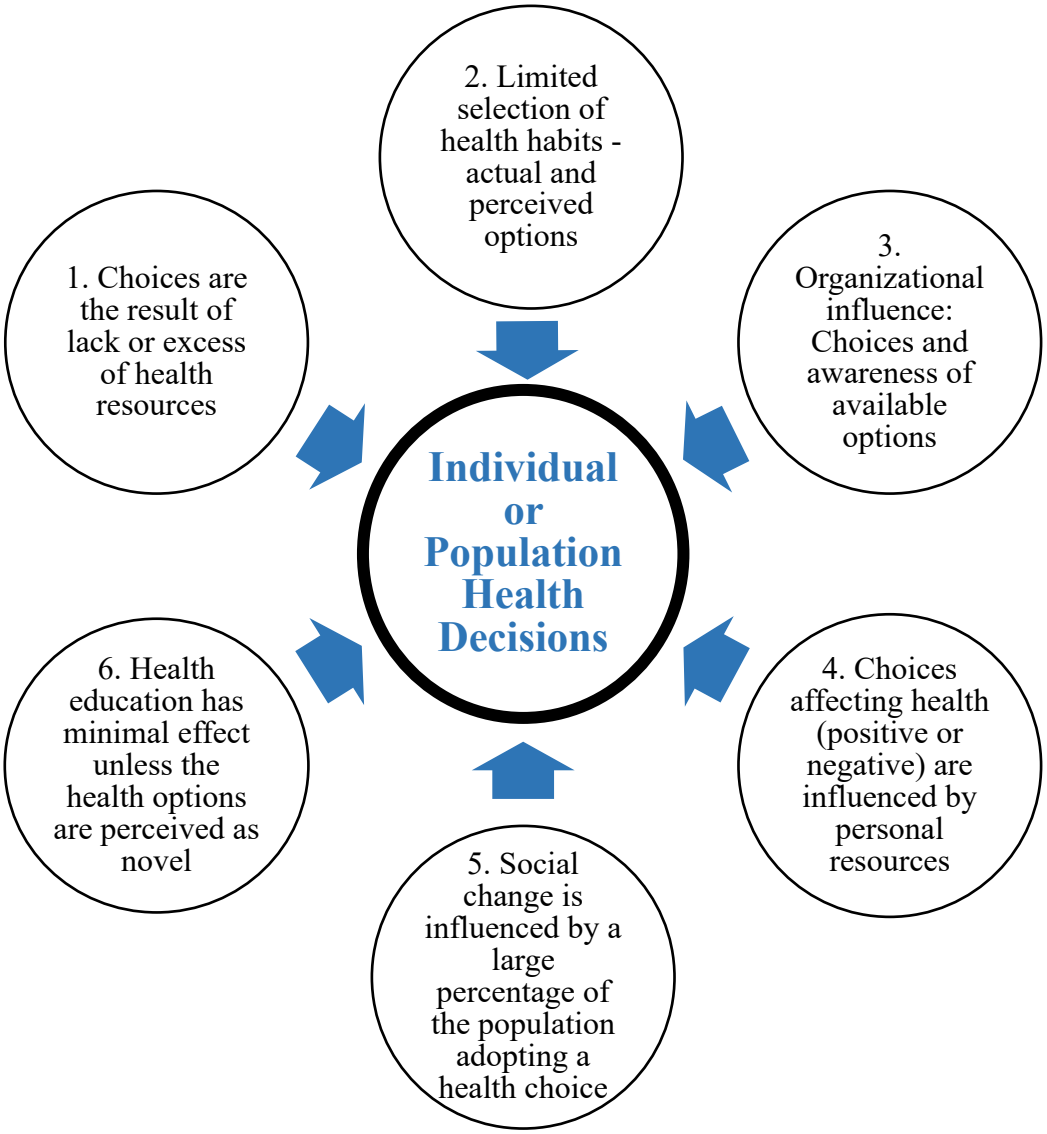
| Article # | Author, Publication Source, & Date of Publication | Evidence Type and Purpose | Sample Type, Size, Setting | Study Findings | Limitations | Evidence Level | Quality Rating |
|---|---|---|---|---|---|---|---|
| 17 | Zappas<br><br>The Journal for Nurse Practitioners<br><br>2019 | Non-research: Community Standard for nurse practitioners advising traveling patients | n/a | It is important to protect the health of travelers as well as the communities to which they return; the pre-travel consult should be with a provider who is well-versed in travel medicine | Reliable source cited – Centers for Disease Control and Prevention; | V | B |

* From: Dang, D., & Dearholt, S. L. (2018). *Johns Hopkins evidence-based practice: Model and guidelines* (3rd ed.). Indianapolis, IN: Sigma Theta Tau.

**Appendix F**

Milio's Framework of Prevention

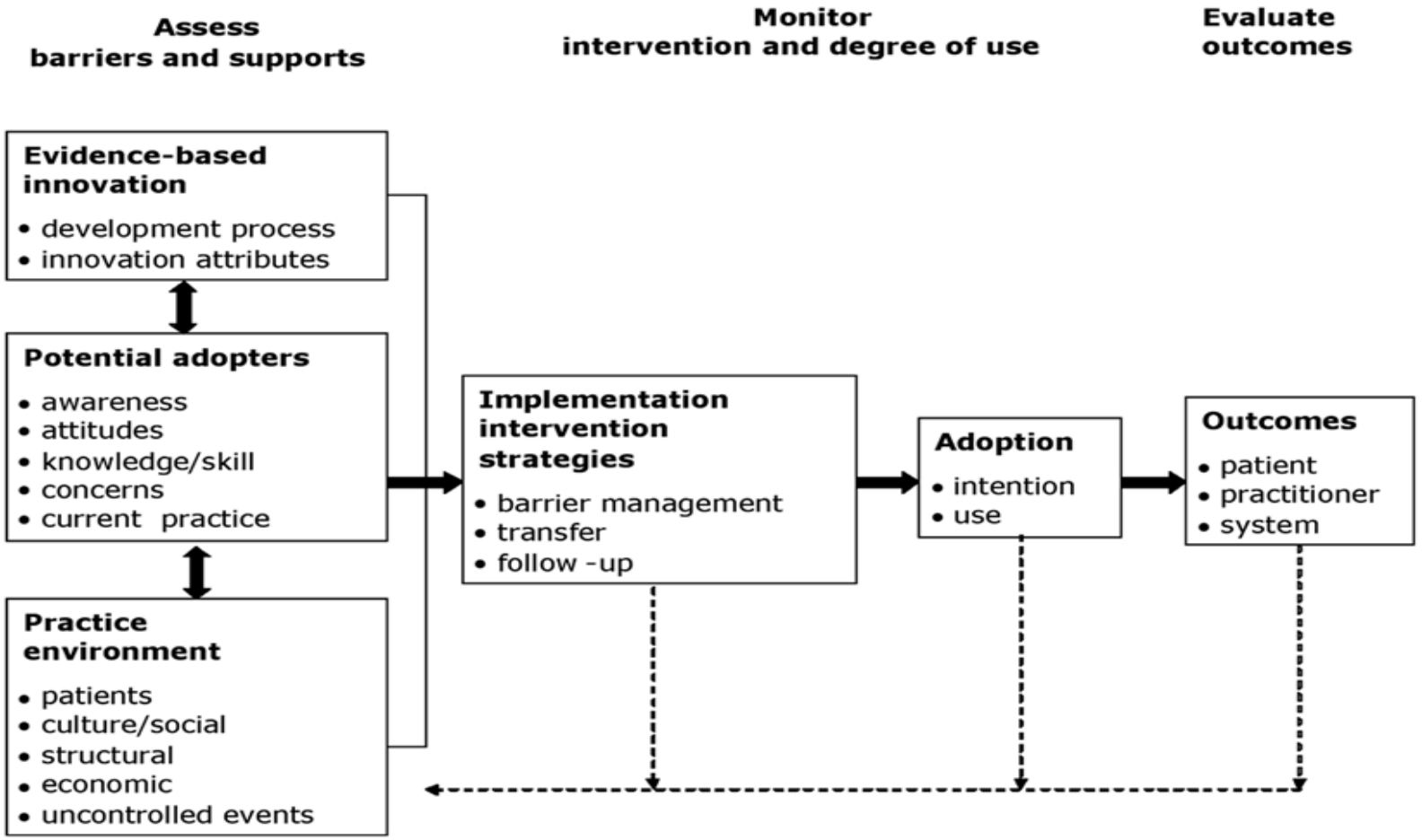
*Figure 1. Six propositions affecting health decisions*




(Milio, 1776)

**Appendix G**

Ottawa Model of Research Use (OMRU)

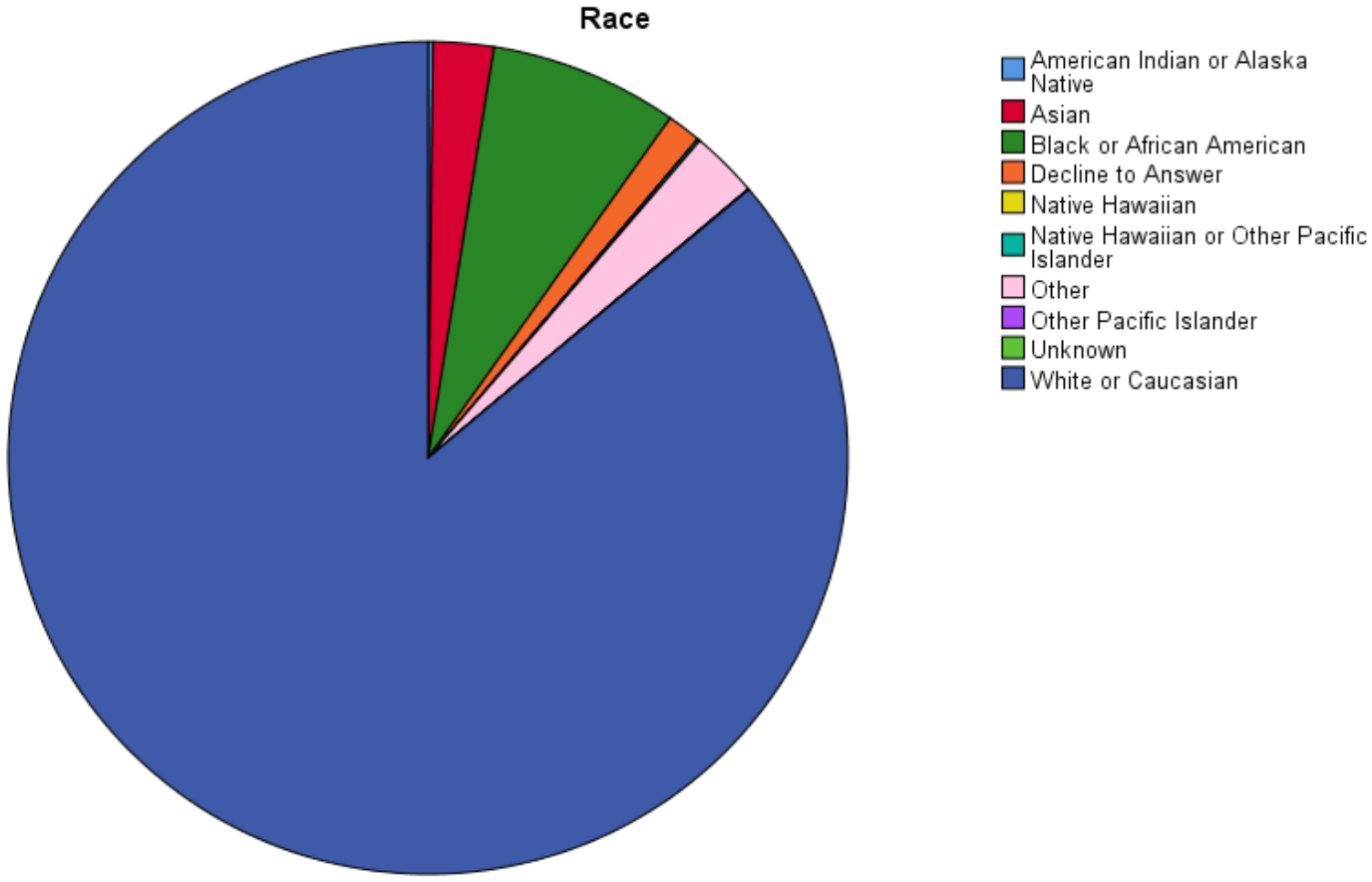



Reprinted from Center on Knowledge Translation for Disability and Rehabilitation Research. Retrieved from http://ktdrr.org/ktlibrary/articles_pubs/ncddrwork/focus/focus18/figure2.html

## Appendix H

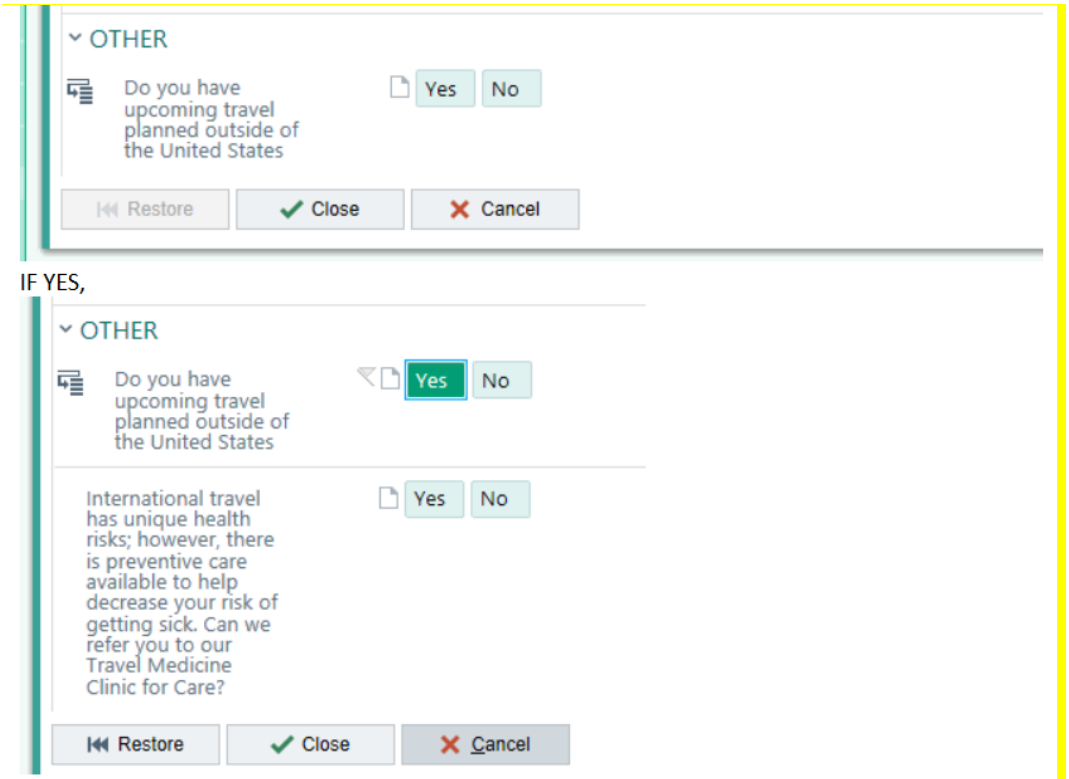
Original Data Set Ethnicities

*Chart 1. Ethnicities*



## Appendix I

Screening Tool (EMR build)




**(Triggers a Best Practice Advisory for Providers in Family Medicine and Internal Medicine)**

! Referral to Travel Medicine Clinic due to planned upcoming international travel

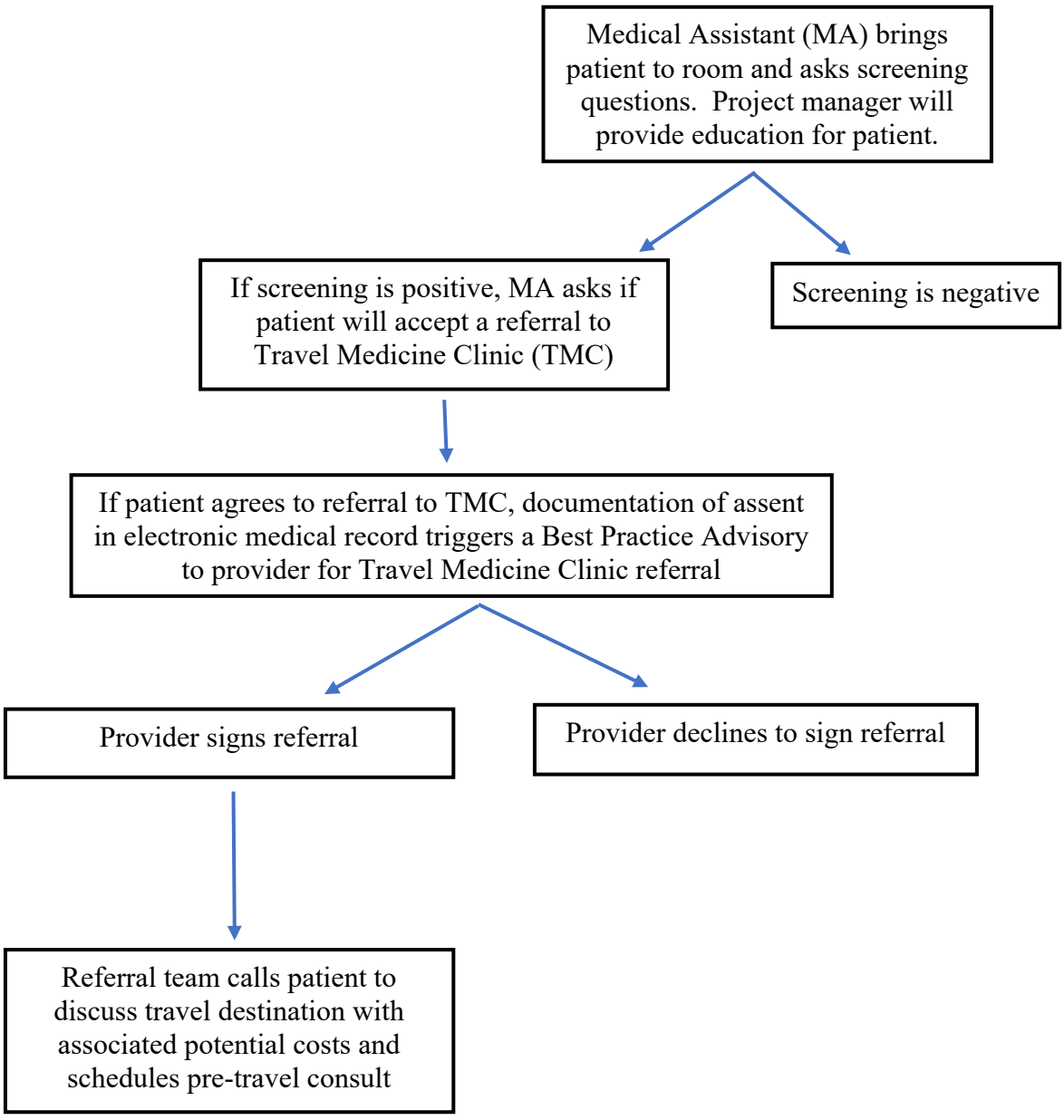
Order | Do Not Order **Ambulatory referral to Travel Clinic**

Acknowledge Reason ----------

Patient declines | Other comment

**Appendix J**

Process Flow Chart



## Appendix K

Provider/Office Manager Education

**Background**: The popularity of international travel is evident as approximately 1.2 billion individuals traveled outside their own country in 2015 with anticipated estimates increasing to 2 billion international travelers by 2030 (Freedman, Chen, & Kozarsky, 2016 and Walker, LaRocque, & Sotir, 2017). Additionally, the number of individuals who travel to emerging markets, often with inherent and unfamiliar health risks, is growing. This number includes the large wave of immigrants to the U.S. – foreign-born persons who return to their countries of birth to visit friends and relatives (VFRs) (Walker, LaRocque, & Sotir, 2017). All travelers can expose themselves to unfamiliar diseases and risks outside of their own country, for which they have received no preventive care or education, suffering morbidity and mortality as a result (Angelo, Kozarsky, Ryan, Chen, & Sotir, 2017; Chen et al., 2018; Hagmann et al., 2014; Laroque et al., 2010 and Omodior, Pennington-Gray, Holland, Thapa, & Kiousis, 2017). Additionally, these travelers can carry nonendemic diseases across borders, exposing others to secondary disease and increasing risks to public health (Walker, LaRocque, & Sotir, 2017).

**Problem**: Though 43-79% of international travelers reported illness during travel or after returning home, up to 54% of international travelers never received a pre-travel health consult to receive preventive care and education (Angelo et al., 2017a; Angelo et al., 2017b; Chen et al., 2018; Hagmann et al., 2014; Laroque et al., 2010; and Omodior et al., 2017). Recommendations by Angelo et al. (2017b) and Tan et al. (2017) are to proactively screen for international travel during routine patient contacts. However, due to complex epidemiology and the dynamic nature of travel medicine, unless a primary care provider (whose offices generally do not carry many of the preventive immunizations recommended for certain travel destinations) can complete a

comprehensive risk assessment and fully understands the traveler-specific, itinerary-specific, and destination-specific risks, the patient should be referred to a travel medicine specialist (Aw et al., 2014 and Fischer, 2017).

**Process**: The screening initiative will utilize an EPIC embedded tool and will be obligatory as it will be built into the electronic requirements of the rooming process at each primary care appointment. The medical assistant will ask the screening questions and record the answers in the electronic record. A "positive" screen will post an additional question about referral to the UPMC Pinnacle Travel Medicine Clinic. If a patient agrees, a Best Practice Advisory will generate for providers who can sign any appropriate referrals to the Travel Medicine Clinic.

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Omodior, O., Pennington-Gray, L., Holland, S., Thapa, B., & Kiousis, S. (2017). Chikungunya disease awareness among U.S. travelers to Caribbean destinations. *International Journal of Travel Medicine and Global Health*, *5*(1), 20-27. https://doi.org/10.15171/ijtmgh.2017.04

Tan, E. M., Njeru, J. W., Jacobson, D. J., Wilson, P. M., Fan, C., Marcelin, J. R., ... Sia, I. G. (2017). Pre-travel health care utilization among travelers who visit friends and relatives. *International Journal of Travel Medicine and Global Health*, *5*(2), 53-59. https://doi.org/10.1517/ijtmgh.2017.11

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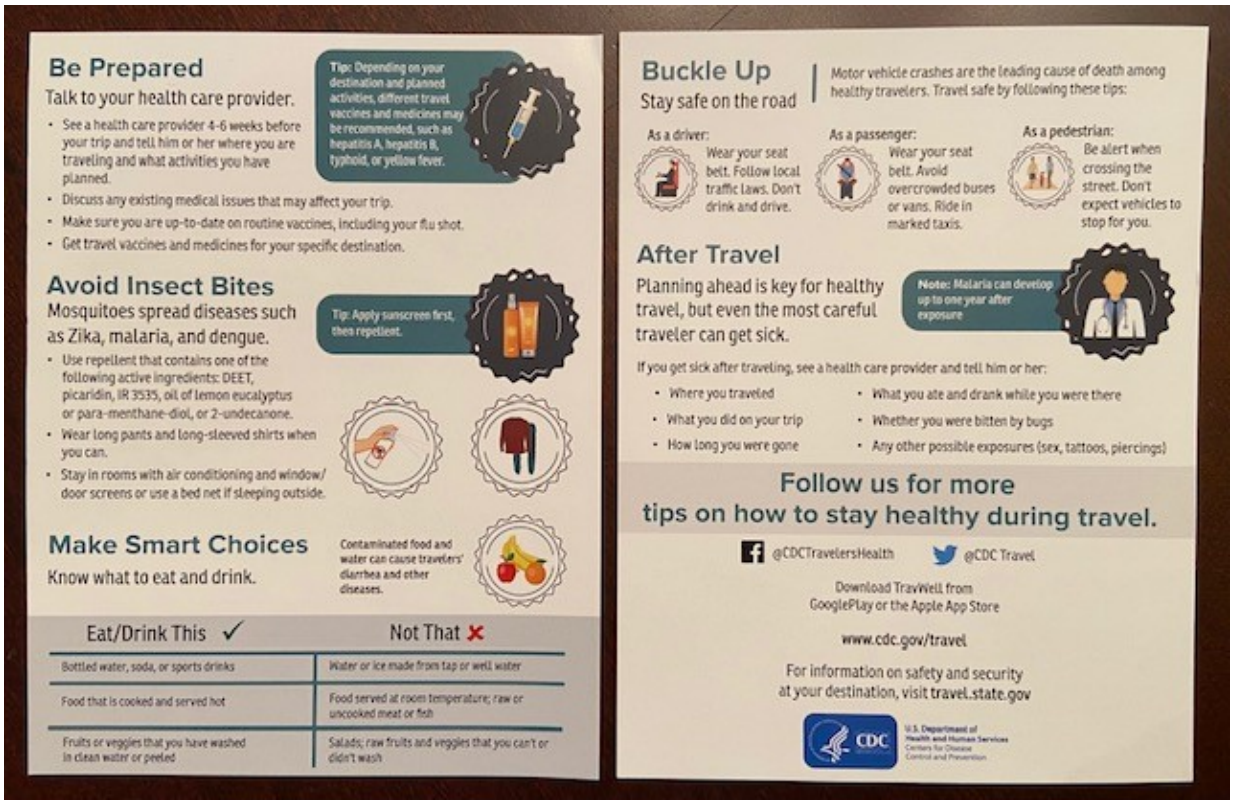
## Appendix L

Patient Education




Patient education taken from Centers for Disease Control and Prevention (CDC) travel information – condensed and printed for patient distribution.
*Note*. From *Centers for Disease Control and Prevention*, 2020, https://www.cdc.gov/travel

## Appendix M

DNP Project Budget

| **Salaries/Wages (human resource costs)** | Monthly ($) | Total ($) |
|---|---|---|
| • Administrative Support | $0 | $0 |
| • IT Systems Analyst | $0 | $0 |
| • Practitioners | $0 | $0 |
| • Medical Assistants | $0 | $0 |
| • Travel Clinic Staff | $0 | $0 |
| • Project Manager | $0 (donated) | $0 |
| Total Salary Costs (already incorporated - UPMC Pinnacle) | $0 | $0 |

| **Startup Costs** | Total ($) |
|---|---|
| • Copies of research proposal | $10 |
| • Copies of educational handouts | $145 |
| • Costs donated by Project Manager | -$145 |
| Total Startup Costs | $0 |

| **Capital Costs** | Total ($) |
|---|---|
| • Hardware | $0 |
| • Equipment | $0 |
| • Office Supplies | $0 |
| Total Capital Costs (already incorporated - UPMC Pinnacle) | $0 |

| **Operational Costs** | Total ($) |
|---|---|
| • Electricity (already incorporated - UPMC Pinnacle) | $0 |
| • Heat/AC (already incorporated - UPMC Pinnacle) | $0 |
| | |
| Total Project Expenses | $0 |

**Appendix N**

Stages/GANNT Chart

| | Tasks | 2019 | | | | | | | | | 2020 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug |
| Pre-intervention | Proposal approval | | | | | | | | | | | | | | | | | |
| | IRB submission and approval | | | | | | | | | | | | | | | | | |
| | Educate implementation team | | | | | | | | | | | | | | | | | |
| | Embed screening tool in EPIC system | | | | | | | | | | | | | | | | | |
| Intervention | Enable screening tool in EPIC | | | | | | | | | | | | | | | | | |
| | Educate patients on purpose of screening | | | | | | | | | | | | | | | | | |
| | Communicate with team leads, TMC manager, providers (stakeholders) | | | | | | | | | | | | | | | | | |
| | Update nursing research council on progress | | | | | | | | | | | | | | | | | |
| Post-intervention | Gather retrospective and intervention data | | | | | | | | | | | | | | | | | |
| | Analyze data | | | | | | | | | | | | | | | | | |
| | Write final DNP project | | | | | | | | | | | | | | | | | |
| | Submit final project and present to stakeholders | | | | | | | | | | | | | | | | | |

## Appendix O

Data Analysis

*Table 1: Comparison of Demographics Pre and Post Intervention Groups*

| Demographics | Group | |
|---|---|---|
| | Pre-intervention | Post-intervention |
| Age in yrs (SD) | 52.3 (15.9) | 50.81 (17.8) |
| Gender: female % (n) | 50% (n = 50) | 50% (n = 50) |
| Race: White % (n) | 70% (n = 70) | 70% (n = 70) |
| Appointment type: non-acute % (n) | 100% (n = 100) | 99% (n = 99) |

*Table 2. Travel Referral Order * Travel Plans Crosstabulation (without missing data)*

| | | | Travel Plans | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Travel Referral Order | No | Count | 3 | 0 | 3 |
| | | % within travel referral order | 100.0% | 0.0% | 100.0% |
| | | % within travel plans | 37.5% | 0.0% | 3.6% |
| | Yes | Count | 5 | 75 | 80 |
| | | % within travel referral order | 6.3% | 93.8% | 100.0% |
| | | % within travel plans | 62.5% | 100.0% | 96.4% |
| Total | | Count | 8 | 75 | 83 |
| | | % within travel plans | 9.6% | 90.4% | 100.0% |
| | | % within travel referral order | 100.0% | 100.0% | 100.0% |

*Table 3. Chi-Square Test*

| | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
|---|---|---|---|---|---|
| Pearson Chi-Square | 29.180 | 1 | .000 | | |
| Continuity Correction | 19.408 | 1 | .000 | | |
| Likelihood Ratio | 15.227 | 1 | .000 | | |
| Fisher's Exact Test | | | | .001 | .001 |
| Linear-by-Linear Association | 28.828 | 1 | .000 | | |
| N of Valid Cases | 83 | | | | |

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .29.
b. Computed only for a 2x2 table

*Table 4. Symmetric Measures*

| | | Value | Asymptotic Standard Error | Approximate T[b] | Approximate Significance |
|---|---|---|---|---|---|
| Interval by Interval | Pearson's R | .593 | .141 | 6.627 | |
| Ordinal by Ordinal | Spearman Correlation | .593 | .141 | 6.627 | |
| N of Valid Cases | | 83 | | | |