

## How do you get there with Diabetes? Results of a Survey of Diabetic Travelers

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### Abstract

**Objective:** Knowledge regarding risk of poor glucose control during travel among patients being treated for diabetes mellitus and the actions of their providers remains unclear. This study examined both patient knowledge gaps and provider practices.

**Design and Methods:** We surveyed 228 military beneficiaries who had been diagnosed with diabetes mellitus. These surveys were administered prior to a routine diabetes clinic visit and addressed patient knowledge and behavior along with health care provider practice regarding disease management during travel.

**Results:** The majority of our study population (85%) was > 50 years of age and had been living with diabetes for > 5 years. Only 18.5% had ever inquired about glucose monitoring during travel and among the study subset that required insulin, only 27.8% asked about insulin dosing during travel. Additionally, 76.5% had never been asked about upcoming travel by their provider during a routine clinic visit. Of the 51% of patients who sought travel advice, their sources included: nurse educators (35%) and American Diabetes Association materials (16.5%). Regarding travel outside the United States, 27.9% stated they would make pre-arrangements with a medical facility. The remainder would ask the United States Embassy or hotel staff for recommendations for medical care (72.1%) or prescription medication replacement (63%). Finally, <25% of patients surveyed would consider adjustments of medications while traveling between time zones.

**Conclusions:** This study reveals a significant gap in health literacy among patients and a lack of attention by their providers regarding diabetes management during domestic and international travel.

**Keywords:** Blood glucose monitoring; Diabetes; Travel advice; Military; Travel survey

**Abbreviations:** ADA: American Diabetes Association; CDA: Canadian Diabetes Association; WHMC: Wilford Hall Medical Center; DCoE: Diabetes Center of Excellence

### Introduction

Every year, millions of Americans travel for business and pleasure. Although it remains unknown exactly how many of these travelers are being treated for diabetes, current prevalence rates in the United States suggest that as many as 17 million leisure travelers and 5.6 million business travelers have diabetes [1,2]. These individuals with diabetes face many potential obstacles while traveling, and though these obstacles should not preclude them from traveling it is important they plan and maintain a heightened awareness or them.

Potential obstacles a traveler with diabetes may encounter while in transit include glycemic variability due to increase or decrease physical exertion (i.e. running through and airport to catch a plane or sitting at a gate for hours on end), timing of insulin after crossing multiple time zones, delays in meal or snacks, lost or depleted medications and supplies, or unsuccessful transport of medications and supplies through security checkpoints [3-9]. Additionally, certain risks may be associated with the chosen destination and can include altered meal times, changes in volume of food intake, changes in activity level, infectious disease, injuries and infections of the foot and physiological effects of altitude and temperature on insulin absorption. Finally a traveler with diabetes should be prepared to deal with an emergency abroad such as a hypoglycemic episode, serious infection, DKA, or non-diabetes related injuries [10-15].

Currently the American Diabetes Association (ADA), Canadian Diabetes Association (CDA), and other organizations provide travel

guidance for travelers with diabetes [16]. The ADA and CDA advise these individuals to follow up with their medical providers prior to travel in order to discuss blood sugar control and address risks associated with travel. Providers are expected to then advise the traveler on how to prepare for emergencies abroad and how to deal with diabetes related issues during air, car, and sea travel.

Research into this area conducted over the last several decades has addressed the aforementioned risks of travel. These studies primarily describe how patients should prepare for risks, deal with emergencies, and handle routine diabetes issues while away from home. Dewey and Riley in 1999 published a list of recommendations that closely match those of the ADA and CDA. In 2003 [17] the Aerospace Medical Association Medical Guidelines Task Force developed guidelines that addressed issues with insulin dosing during airline travel, but did not discuss other potential problems with diabetes and travel [18].

Among published health literacy studies, few have examined patient knowledge and provider practice regarding traveling with diabetes [9,19]. Thus, we sought to expand upon this knowledge base by examining the practice of providers and risk perception of patients

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regarding travel recommendations during routine diabetic visits at our institution.

## Methods

Our study site was Wilford Hall Medical Center (WHMC) in San Antonio Texas which is home to the Air Force’s Diabetes Center of Excellence (DCoE). Our study population was recruited from active-duty, retired, and dependent military beneficiaries who had been diagnosed with diabetes mellitus and obtained their diabetes care from clinicians in the DCoE.

A travel-specific needs assessment (in the form of a patient questionnaire) was developed by DCoE clinicians and distributed to

consenting DCoE patients between 2007 and 2011 [20]. The questions asked were based on concerns that an increasing number of patients with diabetes were citing challenges in self-management during domestic and international travel. Patients received the questionnaire prior to their diabetes clinic appointments and were asked to complete them before leaving clinic that day. During this time, 228 patients provided responses. The questionnaires were designed to assess level of preparedness regarding domestic and international travel, knowledge regarding common problems experienced by diabetic patients during travel, and extent of guidance provided by their health care provider (Table 1). Also included in the information obtained from study subjects were current age, disease duration, and history of diabetes treatment.

1. Has your provider ever asked you if you are planning to travel?  Yes  No
2. Have you ever asked your provider for advice regarding any of the following items when planning to travel? (check all that apply)  Yes  No
  - Blood sugar monitoring
  - Insulin dose adjustment
  - Oral (pill) diabetes medicine dose adjustment
  - Letter to document the need to carry monitoring supplies and/or insulin
  - Vaccinations
  - Medications for travel (motion sickness medication, antibiotics, etc.)
  - Specific information on the country or area to be visited
3. Have you ever used any of the following resources for information regarding your diabetes care during travel? (check all that apply)
  - Nurse
  - Books of other written material
  - Internet
  - American Diabetes Association or other organization
4. For the following destinations, would you make an appointment with your provider to seek advice regarding diabetes care while traveling:
 

<u>Destination</u>	<u>Definitely Not</u>	<u>Probably Not</u>	<u>Probably</u>	<u>Definitely</u>
Los Angeles	_____	_____	_____	_____
New York	_____	_____	_____	_____
Honolulu	_____	_____	_____	_____
London	_____	_____	_____	_____
Japan	_____	_____	_____	_____
Peru	_____	_____	_____	_____
Egypt	_____	_____	_____	_____
India	_____	_____	_____	_____
5. If you take insulin, if you travel the following routes, what changes would you anticipate for your insulin dose on the day of travel?
 

<u>Route</u>	<u>No change</u>	<u>Increase the dose</u>	<u>Decrease the dose</u>
San Antonio to London	_____	_____	_____
San Antonio to Honolulu	_____	_____	_____
San Antonio to Mexico City	_____	_____	_____
6. If you travel outside the United States and develop an illness, how would you most likely find medical care?
  - Ask hotel staff for recommendations
  - Contact the US Embassy for recommendations
  - Go to the medical center you arranged prior to travel
7. If you travel outside the United States and lose your medication/insulin, how would you most likely obtain replacement medications?
  - Ask hotel staff for recommendations
  - Contact the US Embassy for recommendations
  - Go directly to a pharmacy and ask for replacement
  - Go to a local medical center and seek a new prescription
  - Attempt to fill a written prescription you carried from the United States

Table 1: Diabetes and Travel Survey – Key Questions.

Data analysis included descriptive characterization of questionnaire responses. Sub-group analyses using logistic regression and chi-2 was used to detect differences in response patterns across subgroups stratified by current age, method of glucose control, and duration of disease.

## Results

The majorities of respondents to our survey were > 50 years of age (87.3%), reported being treated for diabetes > 5 years (85.6%), and reported current use of insulin or oral medication for glucose control (79.5%) (Table 2).

Most subjects had never been asked about travel by their provider (76%) (Figure 1a and 1b). When patient factors (e.g., age, duration of disease, method of glucose control) were examined for their effect, we did not observe a change in the proportion of responses.

The study found that 69% of patients did not seek any advice prior to travel (Figure 2a). Similar to our findings in the previous paragraph, seeking travel advice from their provider was not affected by length of disease, current age, or method of glucose control (Figure 2b).

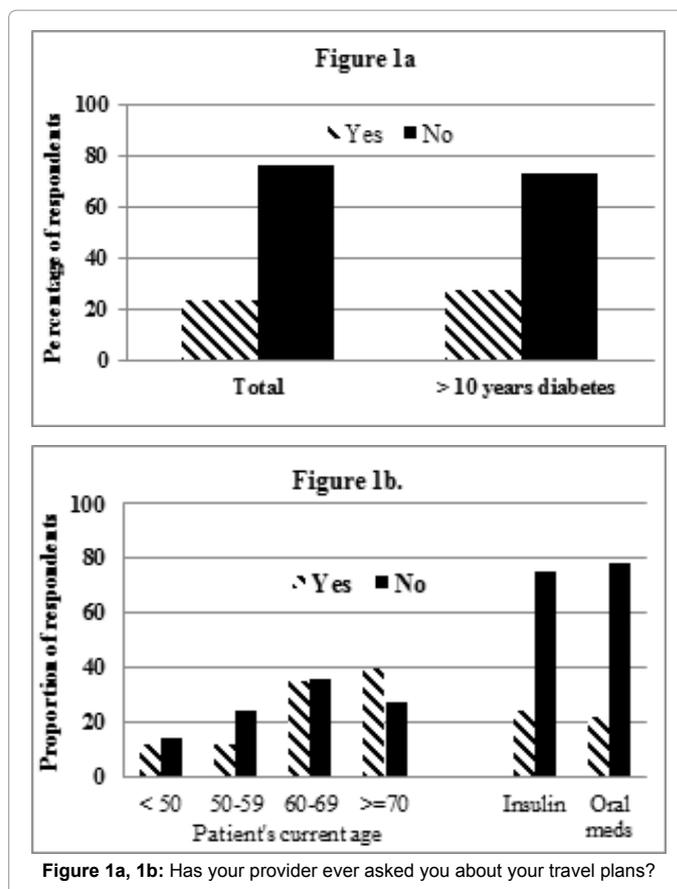
Of the 31% that did seek advice about disease management during travel, concerns regarding insulin dosing and blood sugar monitoring were the most frequent responses (Figure 2c). Among patients who were insulin-dependent, the proportion who asked about travel advice dropped to 28% (data not shown).

The majority of patients sought advice from the following sources: nurse educators (35.5%), written materials (32.5%), and internet (19.5%), and ADA resources (16.5%) (Figure 3) [21].

When planning for trips within the United States, patients were much less likely to see a provider prior to travel than when planning for international flights ( $p < 0.001$ ). When given a hypothetical travel scenario, 18.6% of patient flying to Los Angeles, 20.5% of patients flying to New York, and 38.2% of patient flying to Honolulu indicated they would see a provider prior to travel. In contrast, 55.7% of patients

Age (years) (n = 228)	N (%)
< 50	29 (12.7)
50-59	51 (22.4)
60-69	78 (34.2)
≥ 70	70 (30.7)
Duration of diabetes (years) (n = 208)	
< 5	30 (14.4)
5-9	30 (14.4)
10-14	30 (14.4)
15-19	50 (24.0)
20-24	30 (14.4)
≥ 25	38 (18.3)
Diabetes Type (n = 222)	
Type 1	36 (16.2)
Type 2	181 (81.5)
Other	5 (2.3)
Oral medications (n = 220)	
Yes	133 (60.5)
No	87 (39.5)
Insulin (n = 215)	
Yes	171 (79.5)
No	44 (20.5)

Table 2: Demographic and clinical characteristics of our study population.



flying to London, 66% of patients flying to Peru, and 66.3% of patients flying to Japan indicated they would see a provider.

When asked about adjusting insulin between time zones, less than 25% of patients indicated that they would consider changes in insulin dosing when traveling over multiple time zones. When given a scenario of travel from San Antonio to London, 91.3% of patients did not know they should decrease their dose of insulin during eastward travel over several time zones and chose either to not change or increase their dose of insulin which could lead to hypoglycemia. When traveling from San Antonio to Honolulu, 86.1% of patients did not know they should increase their dose of insulin for westward travel over several time zones and chose either to decrease or not change their dose of insulin which could lead to hyperglycemia. In the last scenario from San Antonio to Mexico City, 89% of patients correctly indicated they should not change their dose of insulin during travel; however, 11% indicated they should increase or decrease their dose which could lead to hypoglycemia and hyperglycemia when traveling within the same time zone.

The last set of questions sought to assess how subjects would respond to medical emergencies and medication refills outside the United States. The majority of subjects responded that they would deal with the issue when it arose. When presented with a hypothetical international travel medical emergency, 27.9% of subjects indicated they would seek assistance at the medical facility they had identified prior to travel, 36.5% would ask hotel staff, and 27.9% would make an inquiry to the United States Embassy (Figure 4a).

When asked about how they would seek to refill a prescription

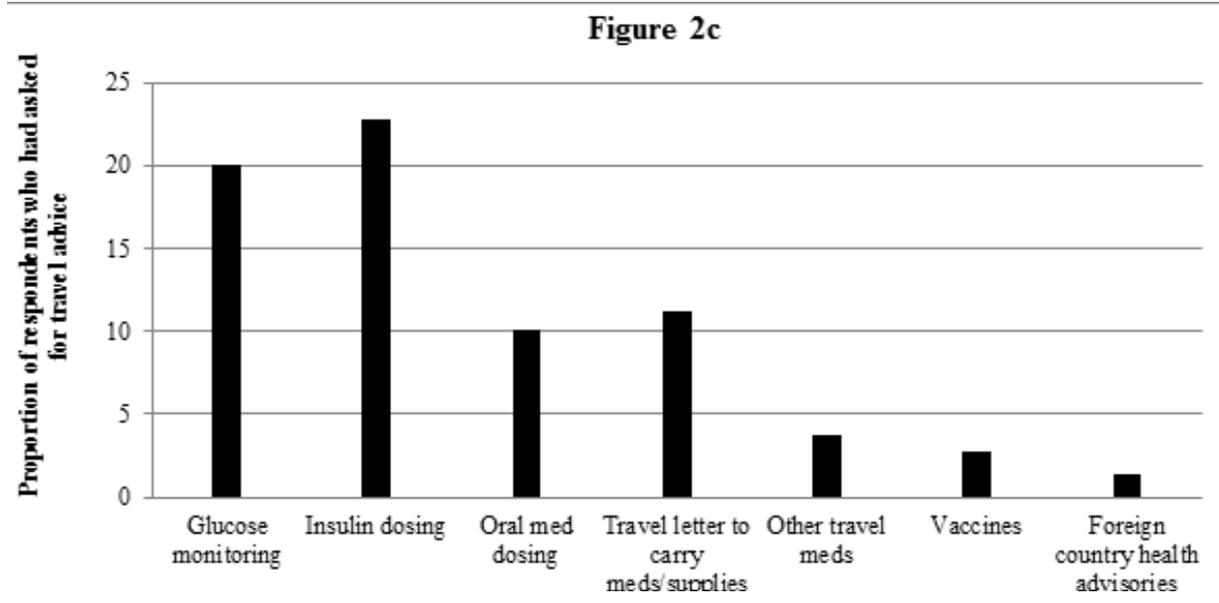
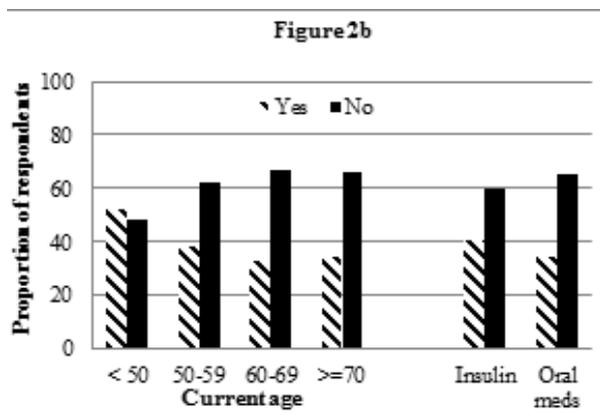
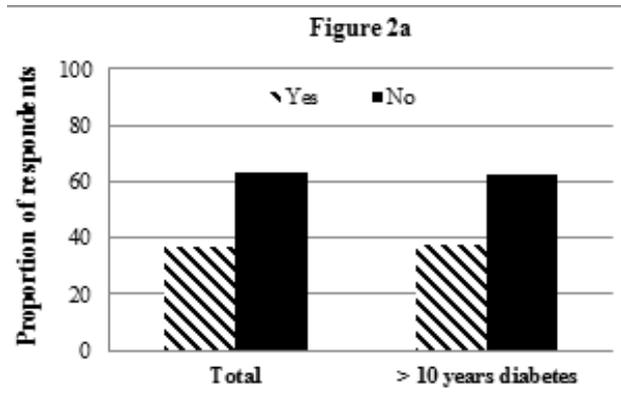


Figure 2a, 2b, 2c: Have you ever asked your provider about diabetes management during travel?

while traveling outside the United States, the responses were as follows: 43% stated they would seek assistance from the United States Embassy [22], 19% indicated they seek assistance at the medical facility they had identified prior to travel, 18% would attempt to fill a prior written prescription, 12% would ask hotel staff for assistance, and 8% stated they would inquire at a local pharmacy (Figure 4b). These health

emergency-seeking behaviors were not influenced by the method of glucose control (e.g., insulin vs. oral medication).

## Discussion

Travelers with diabetes experience many obstacles during transit or at their destination which can negatively affect their glucose control

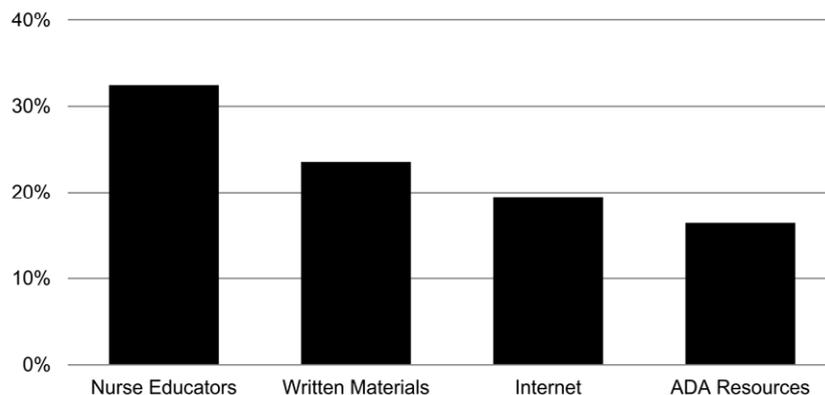


Figure 3: Sources of travel advice sought by DCoE patients.

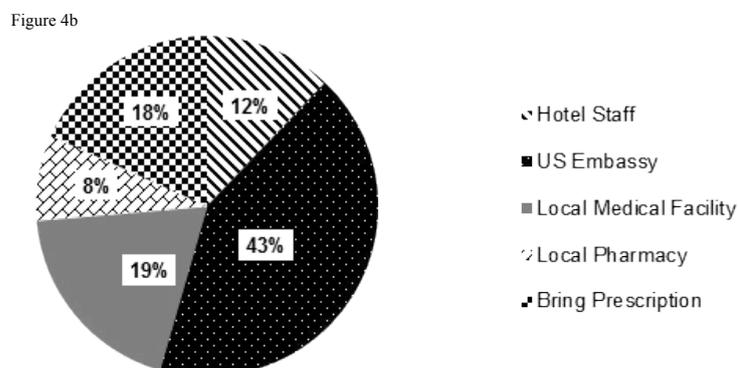
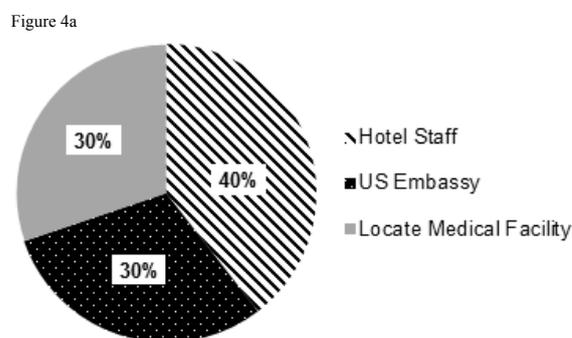


Figure 4: a) Sources for medical assistance selected by DCoE patients during their planned travel outside the United States. b) Sources for prescription refill selected by DCoE patients during travel outside the United States.

or overall health. A study by Driessen et al. examined the rate of complications during travel and found that 55% of travelers with type 1 diabetes and 13% of travelers with type 2 diabetes experienced increased difficulties in glycemic variability during their travel as compared to the month prior. Additionally 55% of type 1 diabetic travelers and 63% of type 2 diabetic travelers experienced non-diabetic related medical problems while traveling. The obstacles to glucose control encountered by travelers with diabetes include timing and absorption of insulin along with changes in the body's demand and use of glucose.

Insulin timing and absorption can be changed when traveling over multiple time zones (compressed day when traveling eastward and prolonged day when traveling westward can cause confusion about

when to give scheduled doses of insulin), or the effects of climate at travel destination (e.g., insulin absorption may increase in warmer climates). Glucose needs change with changes in physical activity, delays in meals, changes in diet (e.g., unknown carbohydrate values in unfamiliar foods), and physiologic stress which may ultimately lead to needing changes in insulin dose [23-26]. Additional travel-related issues that need to be considered are co-morbidity control, travel-related infections, problems carrying injection material through travel security checkpoints, and unanticipated problems with their glucose meters, insulin pumps, or continuous glucose monitors. Furthermore, the risk for complications varies with the patient's physical fitness level, method of glucose control (insulin vs. oral medications), and the patient's long-term disease control [27].

Although it is impossible to prevent all problems during travel, health care providers and patients should recognize the need to ask travel-specific questions during clinic appointments [28]. A review of the literature revealed only two published studies that assessed whether health care providers were providing travel advice to their patients and how this advice was given. In a study by Gill and Redmond in 1993, investigators sent questionnaires to 160 physicians and asked how they were advising patients on insulin adjustments while traveling. They received questionnaires back from 60 (37%) physicians. The study showed that advice was being given by the majority of these clinics with only 3% not giving any specific advice. Unfortunately, 21% of the advice provided was judged to be either unhelpful or potentially harmful. In contrast, our study asked patients about their interactions with providers and found that a substantially lower percentage of providers had discussed travel with their patients. In a 2004 study by Burnett, patients who were being treated with insulin and were on a long- or short-distance flight were provided questionnaires to determine if they were experiencing problems while traveling. The study found that 10% of the respondents experienced problems, the most common being hypoglycemia. Furthermore, the patients in this study wanted more travel advice to be available at their clinic.

In our study, we sought to identify gaps of knowledge among patients being treated for diabetes and the practice of providers. We were particularly interested in whether discussions regarding travel took place during the routine diabetes clinic visit. Our study suggests that only a minority of providers initiated a discussion on travel. Additionally, patients are unlikely to ask their providers for travel advice and only a small proportion make pre-travel plans for medical emergencies or loss of medications. Along with the lack of emergency preparations, the study suggests that most patients do not consider insulin requirements associated with traveling across multiple time zones, an oversight that could lead to hypoglycemia or hyperglycemia depending on the direction of travel.

Limitations of our study include the study population was only a fraction of military beneficiaries being treated for diabetes at WHMC. The DCoE is designed to provide diabetes management care to patients diagnosed with Type 1 and Type 2 diabetes patients who are characterized as "difficult-to-control" [29]. The remaining Type 2 diabetes patients are managed by their respective primary care providers. Thus, our study population may be considered more complex than the general population of diabetic patients. As this study was done in a subspecialty clinic these findings may be different if repeated in a primary care clinic. Another potential limitation of the study is the use of a survey tool that has not undergone prior reliability and validity testing. However, given the simple, straight-forward nature of the questions presented to the subjects, it seems unlikely that the structure of the questionnaire would be a source of significant bias in this study.

## Conclusions

The presence of Type 2 Diabetes should not preclude an individual from leisure or business travel. However, every patient should meet with their provider for a pre-travel risk assessment especially if their travel will require medication adjustment for time zone changes, sources for emergency care (if needed), and dietary modification. Our study revealed that providers are not discussing travel recommendations with diabetic patients, even though the information is available. Furthermore, patients do not routinely ask providers about travel considerations, but are willing to obtain advice from other

sources. In addition to recommending that patients seek pre-travel medical advice specific to their destination [30], both the American Diabetes Association and Canadian Diabetes Association also provide recommendations regarding typical travel scenarios, possible emergencies, necessary supplies, and insulin administration issues. We feel that the findings of this study are timely as options for domestic and international travel as well as tools for effective self-management of Type 2 Diabetes have never been greater. Tools are available from multiple sources to include:

1. ADA website – provides general advice on traveling with diabetes <http://www.diabetes.org/living-with-diabetes/treatment-and-care/medication/when-you-travel.html>
2. CDA website – provides general advice on traveling with diabetes <http://www.diabetes.ca/diabetes-and-you/living/guidelines/travel/>
3. National Diabetes Education Program – provides general advice on traveling with diabetes [http://ndep.nih.gov/media/have\\_diabetes\\_will\\_travel-508.doc](http://ndep.nih.gov/media/have_diabetes_will_travel-508.doc)
4. www.IAMAT.org – helps identify English speaking providers abroad, along with giving information on what vaccines are needed for entry into a given country. This site also provides information on what health risks are present in a given country
5. CDC website for the Yellow Book which provides general information for travelers with chronic medical conditions along with information on infectious disease risk associated with travel. <http://wwwnc.cdc.gov/travel/page/yellowbook-home-2012>
6. www.VoyageMD.com - This site allows you to put in the date and time of departure and arrival along with the type of insulin therapy the patient is using and provides hour by hour recommendations on how to adjust insulin while traveling over multiple time zones. It also provides general advice on traveling with diabetes.

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