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Examining Disparities in Care in an Uninsured, Diabetic Population

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Abstract

Type 2 diabetes is a common health problem that requires continuing medical care, self-management, and education. However, different populations experience diabetes and diabetes-related care differently. This study examined diabetes care and health outcomes at a Midwest community health clinic serving the uninsured. Two waves of data were obtained from medical records. Wave 1 consisted of 88 medical records of people who were diagnosed with type 2 diabetes and also had previous medical record reviews regarding routine diabetes care and outcomes. Wave 2 consisted of in-depth review of 20 medical records of male patients, diagnosed with type 2 diabetes, whose primary language was either Spanish or English. Wave 2 data collection utilized the list of medical records from Wave 1. Statistical analyses utilized non-parametric tests, due to the small sample size. Research questions compared the quality of diabetes care and related health outcomes for Spanish-speaking and English-speaking patients, as recorded in the medical record. Spanish-speaking patients were found to be patients at the clinic for a longer period, have poorer glycemic control, and be less adherent to medication recommendations. A few results from Wave 1 varied from those of Wave 2, including emergency department visits and hospitalizations related to diabetic complications. These conflicting results reflect conflicting outcomes in research, showing the need for further research. Additional research should address reasoning behind these disparities so as to better address them in the future.

Background

Type 2 diabetes is a common health problem in the world today, and rates of diagnosis are increasing (Centers for Disease Control and Prevention [CDC], 2011). The number of Americans diagnosed with diabetes has more than tripled since the year 1980, from 5.6 million to 20.9 million (CDC, 2013). Disparities exist within this disease population, which have not been widely explored, especially among the uninsured. Different populations experience diabetes differently. For example, place of residence can be associated with diabetes care and outcomes (Chan, Gaskin, Dinwiddie, & McCleary, 2012). The Sullivan Commission (2004) indicated that ethnic differences between providers and patients were major reasons for health disparities. This may be due partially to the fact that diabetes requires continuing medical care, self-management, and education. Health disparities in diabetes are related to many factors including provider characteristics, patient characteristics, and system-level factors (Peek, Cargill, & Huang, 2007; Trivedi, Zaslavsky, Schneider, & Ayanian, 2005).

Provider Characteristics

According to a national survey of physicians conducted by the Kaiser Family Foundation (2002), a majority of doctors did not believe the health care system treated patients unfairly based on various characteristics, such as insurance status, sex, fluency in English, educational status, and racial or ethnic background. However, African American physicians were more likely than Caucasian or Asian physicians to believe that disparities existed, particularly with regard to race and ethnicity. In a separate study, most physicians did not see themselves as being directly involved in the cause of disparities (Sequist, Ayanian, Marshall, Fitzmaurice, & Safran, 2008). They saw patient factors such as socioeconomic status, age, and health behaviors as the main contributors to health disparities.

Research consistently indicates that providers make different decisions for patients depending upon sex and race (Chin, Zhang, & Merrell, 1998; Massing et al., 2004; Schulman et al., 1999). For instance, Schulman et al. (1999) found disparities in clinical recommendations for cardiac catheterizations based on race and sex. Male and Caucasian patients were more likely to be referred for a catheterization than were female and African American patients. Massing et al. (2004) found disparities in the use of effective medications for lipid management. African Americans had relatively poorer lipid management than their Caucasian counterparts, partially due to differential prescribing of medications. Chin et al., (1998) found that African American diabetics were less likely than Caucasian diabetics to have hemoglobin A_{1c} percents or eye examinations ordered. These disparities were created by physician choices, which were based in part on the patient's race or ethnicity.

Patient Characteristics

Although providers play a role in health disparities, patient characteristics also contribute. For instance, racial and ethnic minorities have a higher prevalence of type 2 diabetes (CDC, 2011). Other demographic factors, such as age and educational level, are also contributors to health disparities (Spencer et al., 2006). Elderly diabetic patients are less likely to receive eye examinations (Chin et al., 1998). People with diabetes holding less than a high school education have a higher mortality rate from diabetes related complications than do those who hold a high school education or higher (Saydah & Lochner, 2010). Low health literacy and numeracy can be a result of lack of education. These characteristics have been associated with poorer glycemic control in type 2 diabetic patients, which can lead to poorer outcomes (Schillinger et al., 2002; Cavanaugh et al., 2008).

Health literacy is also related to language barriers (Equal Employment Opportunity Program, 2004). The Institute of Medicine (2004) defined health literacy as "the degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions" (para. 5). Health numeracy, a related concept, refers to the ability to understand and use numbers in the context of health (Rothman et al., 2006). Access to care can be restricted by language barriers (Ku & Flores, 2005). Low health literacy or numeracy and concurrent limited English proficiency would restrict access to care and widen the health disparities gap (Seong, Brush, & Padilla, 2010).

A review of the literature has revealed that the extent of health disparities in the non-English-speaking, diabetic population has not been explored extensively and offers inconsistent results. A study from Tocher and Larson (1998) indicated that quality of diabetes care for patients who did not speak English was as good as, if not better than, that provided for those who did speak English. Significantly more non-English speaking patients met the guidelines for care as indicated by the American Diabetes Association. Conversely, a study from Brown et al., (2003) indicated that Spanish-speaking Latinos had poorer blood glucose control than Caucasians and also had lower rates of self-monitoring of blood glucose. Such conflicting findings indicate the need for further research to determine the effects of a patient's primary language on health disparities in diabetes.

System-Level Factors

System-level factors also have a role in health disparities. Socioeconomic status and other social determinants, such as food environment and access to care, can have a significant impact on disparities in diabetes (Chaufan, Davis, & Constantino, 2011). Dinca-Panaitescu et al. (2011) found a trend of increased prevalence of type 2 diabetes among people of lower income status, and Shaw, Dorling, and Smith (2006) indicated that people of lower socioeconomic status, regardless of health behavior, are more likely to die prematurely than those of higher socioeconomic status are.

Additionally, limited access to nutritious foods has become a strong predictor of diabetes (Chaufan, 2008, as cited in Chaufan et al., 2011). If access to nutritious foods is lacking, the possibility for diabetic patients to improve their diets is greatly decreased. Lack of access can be due to income, transportation, or location stores that sell nutritious foods (Chaufan et al., 2011). Poor diet can be a both a disparity and a risk factor. Obesity is a significant risk factor for developing type 2 diabetes, and research has indicated that decreasing obesity, even to a small extent, can have multiple positive effects on diabetes outcomes (O'Sullivan, 2002). Insulin sensitivity can improve and the first phase of insulin secretion can be enhanced through weight loss.

In addition to access to foods, lack of access to sufficient medical care has created disparities for diabetic patients (Jack, Jack, & Hayes, 2012). Clinical outcomes such as hemoglobin A_{1c} percents improve with adequate access to medical care. Hemoglobin A_{1c} is a form of glycosylated hemoglobin, carried by red blood cells, that binds strongly with glucose (Pagana & Pagana, 2010). There are four types of glycosylated hemoglobin; hemoglobin A_{1c} is the most common and thus used for testing the long-term index of a patient's average blood glucose level. Lack of access to sufficient medical care (which leads to poor hemoglobin A_{1c} percents) leads to health disparities. For instance, diabetes is one of the most common causes of kidney failure, and poor glycemic control accelerates the process of kidney failure (Agency for Healthcare Research and Quality, 2011).

Methods

A secondary data analysis of existing medical records was completed at a community health clinic in a small Midwestern city to examine if health disparities existed between English- and Spanish-speaking patients in a diabetic, uninsured population (as recorded in the medical record). Institutional Review Board approval was received through Illinois Wesleyan University and the clinic. The medical records contained information about clinic visits as well as printed reports from local hospitals and specialty practices that provided care to these patients. Data collected included demographic information and quality of care indicators, such as hemoglobin A_{1c} percents for type 2 diabetic patients.

Definitions

- Medical record-used when referring to documents regarding patient care
- Patient-used when referring to characteristics of the person that are included in the medical record
- Clinic--source of medical records. The clinic offers free services for individuals without health insurance. These individuals receive professional health examinations, medications, and referrals to specialty services as needed.
- Glycemic control
    - Good glycemic control- hemoglobin A_{1c} percent less than 7 mg/dl
    - Fair glycemic control- hemoglobin A_{1c} percent between 7 mg/dl and 9 mg/dl
    - Poor glycemic control- hemoglobin A_{1c} percent greater than 9 mg/dl

Research Questions

The following research questions guided the study:

- Is there an association between primary language and hemoglobin A_{1c} percent?

- Is there an association between primary language and hospitalizations for diabetic complications?
- Is there an association between primary language and emergency department (ED) visits for diabetic complications?
- Is there an association between primary language and eye examination referrals?
- Is there an association between primary language and number of years as a clinic patient?
- Is there an association between primary language and adherence with blood glucose monitoring?
- Is there an association between primary language and medication adherence?

Data Collection

Data was extracted from existing medical records and entered into a secure database at the health clinic. This database was developed using Microsoft Excel and included variables of interest to the study and additional information beneficial to the clinic. The review of medical records took place in two waves. The first wave included the medical record of patients identified as having type 2 diabetes that had been included in a previous medical record review regarding routine diabetes care and outcomes. The prior medical record reviews noted glycemic control (hemoglobin A_{1c} percent > 9 mg/dl or < 7 mg/dl) and eye examinations. We added data to the existing tables, including demographic information, the number of visits to the clinic, the number of ED visits and hospitalizations, and whether or not these encounters were related to diabetes (see Table 1).

The second wave also utilized medical records of patients identified in the previous medical record review describe above. Medical records were selected from the list for in-depth review if the patient had a primary diagnosis of type 2 diabetes and the complete medical record was available for review. Twenty in-depth reviews (Wave 2) were used in the analyses. Due to limited availability of medical records of female patients, the analyses used only medical records of male patients. We identified ten medical records of male patients whose primary language was Spanish for in-depth review. Ten medical records of male, English-speaking patients were then selected; we attempted to find medical records of English-speaking patients with similar ages to the Spanish-speaking patients, but exact matches were not easily identifiable.

In-depth medical record reviews built on the data collection in Wave 1, and added information regarding the reason for each clinic visit, prescription history, length of hospitalizations, and lab values for hemoglobin A_{1c}. A complete list of the variables recorded can be found in Table 1. Any information entered into the medical record after December 31, 2012 was not included in the database (i.e., all information entered into the database was part of the existing medical record when the study began on January 1, 2013). When data entry was completed, information needed for analysis was extracted and identifying information was deleted or recoded. All patient characteristics used in data analysis were re-coded to meet the standards for de-identification of patient records (See Table 1; U.S. Department of Health and Human Services, 2012).

We examined two medical records together prior to the second wave of data collection. Any questions throughout data collection were discussed and clarified to improve consistency across reviewers. In addition, descriptions were created for most patient and visit characteristics. When these descriptions were not sufficient, we used a narrative field to add additional information and later discussed how to categorize the information. This narrative field allowed for more comprehensive data collection. We checked for any referrals made for the patient in three places within the medical record. We studied the nurse practitioner or physician notes, progress notes by the clinic staff, and reports from the office or department to whom the patient was referred.

Inclusion and Exclusion Criteria.

All medical records of patients diagnosed with type 2 diabetes were eligible for the study. Medical records were identified through a list of patients generated during a previous chart review by clinic staff. Thus, there are likely patients at the clinic with a diagnosis of type 2 diabetes whose records were not sought during data collection. In order to be included in data collection, medical records also needed to be available to the researchers during data collection.

Medical records were excluded from data collection primarily due to lack of availability. Some medical records could not be located at any time the reviewers were at the clinic. These patients were excluded from both Wave 1 and Wave 2 data collection. Other medical records had been thinned, and we were unable to access archived material. This made it impossible to determine the number of hospitalizations and ED visits, as well as the number of referrals. The latter patient medical records were excluded from Wave 2 data collection. We attempted to find each patient's reported ethnicity, but ethnicity was not routinely recorded by clinic staff. Ethnicity was noted at times within the medical record, such as in a patient description in a referral report. Occasionally, when multiple references to ethnicity were in the medical record, these references conflicted. For example, a patient would be listed as Caucasian during one ED visit and Hispanic during a separate ED visit. However, because the study was intended to examine the impact of language on quality of care and outcomes, the lack of ethnicity data was not a reason to exclude a medical record from the study.

Population Description

Patients came from a variety of backgrounds, including Caucasian, Latino, and African American. Because the clinic serves uninsured adults, no patient was under the age of 18 and most patients were not over the age of 65. As the clinic lacks electronic medical records and does not routinely examine the age or ethnicity of patients, it was not possible to compare the demographics of the sample to those of the clinic's patient population.

Sample Description Wave 1.

We reviewed 88 medical records of patients with type 2 diabetes (Wave 1). Frequencies were used to examine demographic data (see Tables 2-8). In some cases, specific information was not recorded in a medical record, lowering the sample size for that variable. The sample included the medical records of 45.5% male and 54.5% female patients who ranged from 25 to 81 years of age. Patients primarily were identified as Latino/Latina (39.8%) and Caucasian (35.2%). Other ethnicities included African American (14.8%) and Turkish (1.1%). A specific ethnicity was not identified for 9.1% of the sample. Most patients identified English as their primary language (59.1%), and the remaining patients (40.9%) identified Spanish as their primary language.

Frequencies were also used to examine clinical interactions and outcomes. The average number of clinic visits per patient per year was 6.8 for English-speaking patients and 5.1 for Spanish-speaking patients. There were no ED visits for 37.2% of Wave 1 patients. For the remaining patients who had visited the ED, visits ranged from one to 20 per patient. Of the 182 ED visits recorded, 6.0% were directly due to diabetes complications. We were not able to find hospitalization information for all patients in Wave 1. Of those with information available, most (70.9%) had never been hospitalized. Those hospitalized while a patient at the clinic were hospitalized between one and six times. Of the 44 hospitalizations recorded, 6.8% were directly due to diabetes complications. Glycemic control was good (hemoglobin A_{1c} percent of less than 7 mg/dl) for 37.5% of patients, while 30.7% of patients had hemoglobin A_{1c} percents greater than 9 mg/dl, indicating poor control. The remaining 31.9% had fair control, with hemoglobin A_{1c} values between 7 mg/dl and 9 mg/dl.

Sample Description Wave 2.

Frequencies were used to examine patient demographic data in the 20 medical records selected for in-depth review (see Tables 2-8). This sample population was made up of medical records of men between the ages of 31 to 63 years with an average age of 46.7 years. Patients visited the clinic two to 16 times per year, with a mean of six visits per patient per year. The number of clinic visits per patient per year ranged from 1.6 to 15.8 with a mean of 5.9. A majority of patients had visited the ED while a patient at the clinic, ranging from one to 11 per patient; 40% of patients never went to the ED. Twenty percent of patients had been hospitalized at least once, while 80% had no hospitalizations. The most recent hemoglobin A_{1c} percents recorded for each patient ranged from 5.7 mg/dl to 13.8 mg/dl with a mean of 8.3 mg/dl.

Results

Data was analyzed using SPSS Statistics Version 21. Wave 1 ($N = 88$) data were examined using a measure of association to determine whether two categorical variables were associated. Because the sample size was so small, it was impossible to determine whether the data were of a normal distribution, so McNemar's test was used to evaluate the data. McNemar's test is a non-parametric test that uses the chi-square distribution. Wave 2 ($n = 20$) data were examined using the Mann-Whitney *U* test to determine whether there was a difference between the distributions of two unrelated groups. Measures of association were also run on

Wave 2 data. Narrative data gathered in Wave 2 were reviewed to determine medication adherence and blood glucose monitoring. All results utilized primary language as an independent variable. The medical charts of Spanish- and English-speaking patients were compared to determine whether or not significant associations existed between primary language and quality of care and outcome measures. Results were considered significant if the *p*-value was less than .05. See Table 10 for a summary of the results of statistical tests.

Hemoglobin A_{1c} Percent

McNemar tests were conducted for Wave 1 ($N = 88$) to determine if an association existed between primary language and glycemic control, which was noted by the category of hemoglobin A_{1c} percent (good, fair, or poor glycemic control, as defined above). Patients who spoke primarily Spanish were more likely to have a hemoglobin A_{1c} percent greater than 9 mg/dl ($p < .001$). Patients who spoke primarily Spanish were less likely to have a hemoglobin A_{1c} percent less than 7 mg/dl ($p = .007$). There was no association between primary language and having a hemoglobin A_{1c} percent between 7 mg/dl and 9 mg/dl ($p = .280$).

A Mann-Whitney *U* test was run on Wave 2 data ($n = 20$) to determine if primary language was associated with glycemic control, as noted by the most recent percent value of hemoglobin A_{1c}. The mean hemoglobin A_{1c} percent for patients whose primary language was Spanish was 9.6 mg/dl, while the mean hemoglobin A_{1c} percent for patients whose primary language was English was 7.0 mg/dl ($U = 15.0$, $z = -2.648$, $p = .008$; see Figure 1).

McNemar tests were then conducted between primary language and each category of glycemic control in Wave 2 ($n= 20$). Five of the 10 Spanish-speaking patients had poor control, compared to zero of the 10 English-speaking patients (see Table 9). The McNemar test for any category of glycemic control and primary language failed to reach significance (good control, $p = .453$; fair control, $p = .727$; poor control, $p = .302$).

Hospitalizations

There were no significant associations between primary language and whether or not a patient had been hospitalized in Wave 1 ($N = 86$; $p = .164$). However, patients whose primary language was English were more likely to be hospitalized for diabetic complications ($p < .001$). A crosstabulation of Wave 2 data ($n = 20$) revealed that 20% of patients who spoke English and 20% of patients who spoke Spanish had at least one hospitalization, suggesting no relationship between language and hospitalizations. Further analysis via a McNemar test for Wave 2 ($n = 20$) revealed no statistically significant correlation between primary language and number of hospitalizations ($p = .109$).

ED Visits

A McNemar test was run on Wave 1 ($N = 86$) to examine the relationship between primary language and whether or not a patient had visited the ED. A statistically significant association existed between primary language and ED visits ($p = .008$). English-speaking patients were more likely to visit the ED. Additionally, a McNemar test was run to examine the relationship between primary language and whether or not ED visits were due to diabetic complications. A statistically significant relationship existed between language and ED visits due to diabetic complications ($p < .001$); 9.8% of English-speaking patients visited the ED for diabetic complications compared to 5.7% of Spanish-speaking patients. A Mann-Whitney *U* test was run on Wave 2 ($n = 20$) to determine if primary language was associated with number of ED visits. Number of visits to the ED was not statistically significant based on primary language ($U = 43.5$, $z = -.527$, $p = .598$).

Referrals

There was no association between primary language and number of referrals in Wave 2 ($n = 20$). Crosstabulations were run to determine if there was a correlation between primary language and whether or not a patient was referred for an eye examination in both Wave 1 ($N = 78$) and Wave 2 ($n = 20$). A McNemar test for eye examinations revealed that primary language and referrals for eye examinations was not statistically significant in Wave 1 ($p = .360$) or Wave 2 ($p = .607$).

Clinic Visits

Spanish-speaking patients had been patients at the clinic, on average, approximately two years longer than English-speaking patients had been (Wave 1, N=88; $U = 664.5$, $z = -2.304$, $p = .021$). However, English-speaking patients visited the clinic more often than Spanish-speaking patients did. The average number of visits per year for patients who primarily spoke English was 6.8; the average for those who primarily spoke Spanish was 5.1 ($U = 598$, $z = -2.869$, $p = .004$; see Figure 2). There was no association between primary language and number of no-shows for appointments at the clinic ($U = 791.5$, $z = -1.285$, $p = .199$).

A Mann-Whitney *U* test was run on Wave 2 ($n = 20$) to determine if primary language was related to number of years a person had been a patient at the clinic. As in Wave 1, Spanish-speaking patients had been at the clinic, on average, six years longer than English-speaking patients. ($U = 20.0$, $z = -2.268$, $p = .023$; see Figure 3). A similar pattern was also noted for visits per year: English-speaking patients visited the clinic 13.4 times per year, while Spanish-speaking patients visited the clinic 7.6 times per year ($U = 21.0$, $z = -2.192$, $p = .028$; see Figure 3). There was also no association between primary language and number of no-shows for appointments in Wave 2.

Blood Glucose Monitoring

A review of narrative data in the medical record indicated that patients whose primary language was Spanish were more likely to adhere to instructions for self-monitoring of blood glucose than those whose primary language was English were. If the medical record noted that a patient was not checking blood glucose levels at all, irregularly, or less often than instructed, the patient was considered non-adherent. Reasons for non adherence included machine malfunctioning, lack of supplies, or patient refusal. Seven out of 10 English-speaking patients were discovered to be non-adherent in comparison to four out of 10 Spanish-speaking patients.

Medication Adherence

Assessment of narrative data also indicated that patients whose primary language was Spanish were more likely to not adhere to prescribed medication regimens. Patients were considered non-adherent with medications if the medical record noted that the patient was not taking medications regularly; stopped taking medications; had been taking medications incorrectly; or had been taking medications inconsistently. Nine out of 10 patients who primarily spoke Spanish were discovered to be non-adherent in comparison to four out of 10 patients who primarily spoke English.

Discussion

Patients with Spanish as their primary language had poorer outcomes than English speaking patients, but this association was not found for all variables. Spanish language was associated with poorer glycemic control. Both Wave 1 and Wave 2 analyses revealed that glycemic control was poorer in patients whose primary language was Spanish. Primary language had no relationship with the number of hospitalizations, but speaking Spanish as a primary language was protective (in Wave 1 analysis) in relation to the number of hospitalizations related to diabetic complications, as Spanish-speakers were less likely to be hospitalized for diabetic complications. The relationship between number of ED visits and primary language from Wave 1 conflicted with the results from Wave 2. Wave 1 indicated that the number of ED visits was significantly related to the primary language spoken by the patient, but Wave 2 suggested no relationship. No association existed between primary language and number of referrals or referral for an eye examination. For both Wave 1 and Wave 2, the number of years as a patient was correlated with primary language. Patients with Spanish as a primary language were patients for a greater length of time than those who speak English were. Spanish language was protective in the area of blood glucose monitoring. Those who spoke English were less likely to be adherent with blood glucose monitoring. However, medication adherence was lower for those whose primary language was Spanish. Patients who take their medications regularly are more likely to have good glycemic control (Ruelas, Roybal, Mphil, Goldman, & Peters, 2009). Lack of adherence to medication instructions could be the cause of the poorer glycemic control observed in the Spanish-speaking patients.

Limitations

This study was not without limitations. First, the data was collected from one clinic in the Midwestern United States, so the results are not generalizable to other populations. Second, the sample size was small for each wave (Wave 1, $N = 88$; Wave 2, $n = 20$), making identification of real effects difficult. Third, data collected were limited to what was noted in the medical record. Whether or not the variables of interest in this study were included in the medical record, or were correctly recorded, presented a limitation. Inconsistent data included lack of detail and conflicting information over time. For example, smoking status was not always recorded in the assessment at each visit, even if the patient had a history of smoking.

Fourth, medical records were occasionally difficult to find, and these records were excluded from analysis. Since the clinic used a paper charting system, only one medical record was available per patient. Multiple employees needed access to the individual medical records, limiting availability. Additionally, access to full medical records of long-term patients was reduced. Some long-term patient medical records had multiple volumes, and only the most recent volume was located at the clinic. Due to these limitations, the results of this study should be viewed with caution.

Implications

The conflicting findings in the two waves of data collection reflect conflicting findings in larger research studies. Further research is needed to fully determine the impact of primary language on diabetes care and outcomes. Qualitative studies should be completed to analyze the medication non-adherence in the Spanish-speaking population. As medication non-adherence can be related to poorer glycemic control, analyzing the reasons a Spanish-speaking patient may not be adherent can positively influence this particular health disparity in diabetic patients. Unfortunately, in this study, no information was noted in the medical record regarding why patients were not taking medications as prescribed. Cultural values should be researched to determine level of influence on health disparities observed between English- and Spanish-speaking patients.

Although the poorer glycemic control observed among the Spanish-speaking population in this study could be due to medication non-adherence, other factors could also contribute. Further research should analyze diets of people who speak different languages to examine the impact of diet on glycemic control. Cultural norms and cultural values and how they relate to diet should be researched to determine whether or not diet has an influence on diabetic health disparities.

This study did not compare Spanish-speakers receiving care with and without a translator, but it should be noted that Spanish-speaking patients did not have ED visits or hospitalizations for diabetic complications. This occurred despite Spanish-speaking patients having poorer glycemic control. What is not known is if Spanish-speaking patients had the same symptoms but did not go to the ED due to possible undocumented status or cultural norms. Further research should address this question.

The positive results found in this study may partially be due to the fact that the clinic provides in-person translation for the Latino population. Failure to address language barriers can hinder the elimination of health disparities (Ku & Flores, 2005). Nápoles, Santoyo-Olsson, Karliner, and O'Brien (2010) indicated that in-person translation by people who have received formal medical translation training is superior to untrained family, friends, or staff providing interpretation. Interpretation mediated by a professional has been shown to result in better physician-patient communication, higher patient satisfaction, and fewer adverse clinical consequences due to errors in interpretation (Flores et al., 2003; Hornberger, Itakura, & Wilson, 1997; Kuo & Fagan, 1999). The results found in this study concur with the results from these previous studies, indicating that in-person translation can aid in eliminating disparities related to language.

Numerous disparities exist within the diabetic population, and more research is necessary in order to better understand these disparities. Further research should include qualitative data collection to determine reasoning behind medication non-adherence, ED visits or lack of ED visits, and hospitalizations or lack thereof. Additional research will aid in discovering the reasoning behind health disparities in the diabetic population. Interventions can then be implemented to address these inconsistencies and have an impact on the disparities seen within this population.

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Table 1
Data Elements Recorded in the Database

Item	**Wave 1**	**Wave 2**	**De-identification Method**
Sex	X	X	
Birth year	X	X	If >89, indicated as 1922 or before*
Ethnicity	X	X	
Primary language	X	X	
Primary diagnosis	X	X	
Additional diagnoses		X	
Date of first visit to health clinic	X	X	Coded to '0'
Dates of visits to health clinic		X	Coded for number of days following date of first visit
Nature of each visit to health clinic		X	Routine follow-up, new client, new problem, etc.
Dates of visits to hospital emergency rooms	X	X	Coded for number of days after date of first visit to clinic
Reason for each visit to hospital emergency rooms	X (specific reason not recorded; only noted if directly related to diabetes or not)	X	
Dates of hospitalizations	X	X	Coded for number of days after date of first visit to clinic
Length of hospitalizations		X	
Reasons for each hospitalization	X (specific reason not recorded; only noted if directly related to diabetes or not)	X	

*None of the medical records reviewed included anyone older than 89 years, as the clinic only sees uninsured patients

Table 2
Sample Description: Sex

Sex	Wave 1 Frequency	Wave 1 Percent	Wave 2 Frequency	Wave 2 Percent
Female	48	54.5%	0	0.0%
Male	40	45.5%	20	100.0%
Total	88	100.0%	20	100.0%

Table 3
Sample Description: Age

Age Range (years)	Wave 1 Frequency	Wave 1 Percent	Wave 2 Frequency	Wave 2 Percent
<35	7	8.0%	2	10.0%
35-39	7	8.0%	2	10.0%
40-44	8	9.2%	5	25.0%
45-49	21	24.1%	1	5.0%
50-54	14	16.1%	7	35.0%
55-59	12	13.8%	1	5.0%
60-64	13	15.0%	2	10.0%
>64	5	5.7%	0	0.0%
Total	87*	99.9%	20	100.0%

*Age not recorded for 1 patient

Table 4
Sample Description: Race/Ethnicity

Race/Ethnicity	Wave 1 Frequency	Wave 1 Percent	Wave 2 Frequency	Wave 2 Percent
African American	13	16.3%	0	0.0%
Latino/Latina	35	43.8%	10	50.0%
Caucasian	31	38.8%	10	50.0%
Turkish	1	1.3%	0	0.0%
Total	80*	100.2%	20	100.0%

*Race/Ethnicity not recorded for 8 patients

Table 5
Sample Description: # of Clinic Visits per Year

Number of Visits	Wave 1 Frequency	Wave 1 Percent	Wave 2 Frequency	Wave 2 Percent
1.0-3.0	9	10.2	6	30
3.1-6.0	46	52.3	8	40
6.1-9.0	23	26.1	1	5
9.1-12.0	5	5.7	2	10
More than 12.0	5	5.7	3	15
Total	88	100.0%	20	100.0%

Table 6
Sample Description: # of Emergency Department Visits

Number of Visits	Wave 1 Frequency	Wave 1 Percent	Wave 1 Frequency	Wave 1 Percent
0	32	37.2%	8	40.0%
1	25	29.1%	8	40.0%
2	11	12.8%	3	15.0%
3	3	3.4%	0	0.0%
>3	15	17.4%	1	5.0%
Total	86*	99.9%	20	100.0%

*Emergency Department Visits not recorded for 2 patients

Table 7
Sample Description: # of Hospitalizations

Number of Hospitalizations	Wave 1 Frequency	Wave 1 Percent	Wave 2 Frequency	Wave 2 Percent
0	61	71.0%	16	80.0%
1	16	18.7%	4	20.0%
2	5	5.9%	0	0.0%
>2	4	4.7%	0	0.0%
Total	86*	100.3%	20	100.0%

*Hospitalizations not recorded for 2 patients

Table 8
Sample Description: Hemoglobin A_{1c} Levels

Hemoglobin A_{1c} % Category	Wave 1 Frequency	Wave 1 Percent	Wave 2 Frequency	Wave 2 Percent
≤ 7.0	33	37.5%	7	35.0%
7.1-9.0	28	31.9%	8	40.0%
≥9.1	27	30.7%	5	25.0%
Total	88	100.1%	20	100.0%

Table 9
Glycemic Control and Primary Language, Wave 2 (n=20)

Hemoglobin A_{1c} % Category	**Primary Language**		**Total**
	Spanish	English	
≤ 7.0	2	5	7
7.1-9.0	3	5	8
≥9.1	5	0	5
Total	10	10	20

Table 10

Summary of Statistical Test Results Comparing English- and Spanish-Speaking Patients

Result	Wave Analyzed (N)	Statistical Test	Test Results*
Spanish speakers more likely to have hemoglobin A_{1c} percent >9 mg/dl	Wave 1 ($N = 88$)	McNemar	$p < .001$
Spanish speakers less likely to have hemoglobin A_{1c} percent <7 mg/dl	Wave 2 ($n = 20$)	Mann-Whitney U	$p = .008$
Spanish speakers mean hemoglobin A_{1c} percent higher	Wave 2 ($n = 20$)	Mann-Whitney U	$p = .008$
No association between primary language and hospitalized at least once	Wave 1 ($N = 86$)	McNemar	$p = .109$
English speakers more likely to have been hospitalized at least once for diabetes	Wave 1 ($N = 86$)	McNemar	$p < .001$
English speakers more likely to have visited the ED at least once	Wave 1 ($N = 86$)	McNemar	$p = .008$
English speakers more likely to have visited the ED at least once for diabetes	Wave 1 ($N = 86$)	McNemar	$p < .001$
No association between primary language and number of ED visits	Wave 2 ($n = 20$)	Mann-Whitney U	$p = .598$
English speakers had ≈ two more clinic visits per year	Wave 1 ($N = 88$)	Mann-Whitney U	$p = .004$
Spanish speakers had been patients at the clinic ≈ two years longer than English speakers	Wave 1 ($N = 88$)	Mann-Whitney U	$p = .021$
No association between primary language and whether or not referred for eye examination	Wave 1 ($N = 78$)	McNemar	$p = .360$
No association between primary language and "no-show"	Wave 1 ($N = 88$)	Mann-Whitney U	$p = .199$
English speakers less adherent with blood glucose monitoring	Wave 2 ($n = 20$)	Narrative assessment	N/A
Spanish speakers less adherent with medication instructions	Wave 2 ($n = 20$)	Narrative assessment	N/A

*Level of significance $p < .05$

Figure 1
Mann-Whitney U *Test: Primary Language and Last Hemoglobin A_{1c}, Wave 2*

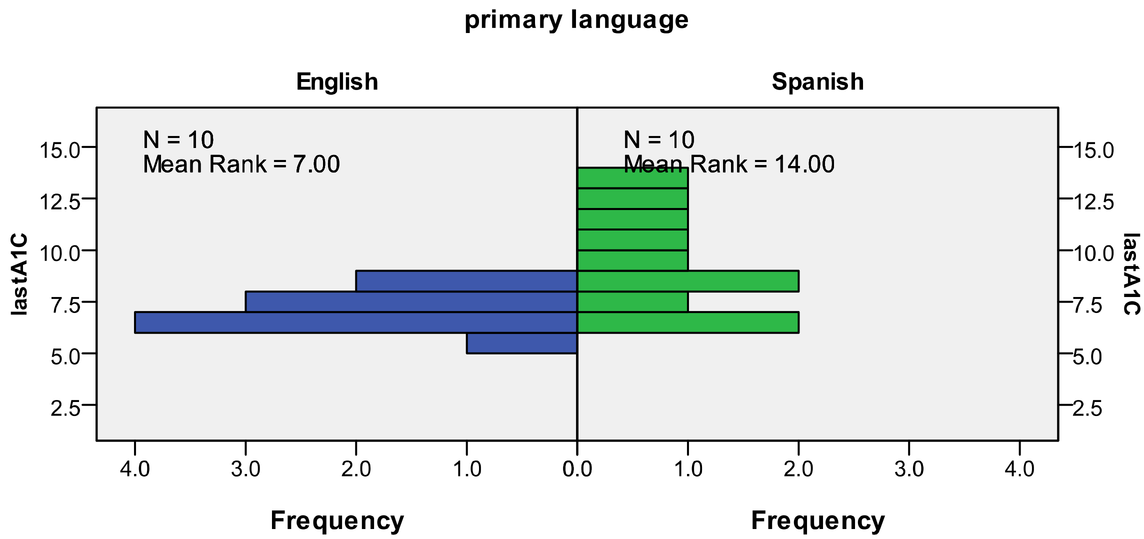

Figure 2
Mann-Whitney U *Test: Primary Language and Patient Years at the Clinic, Wave 1*

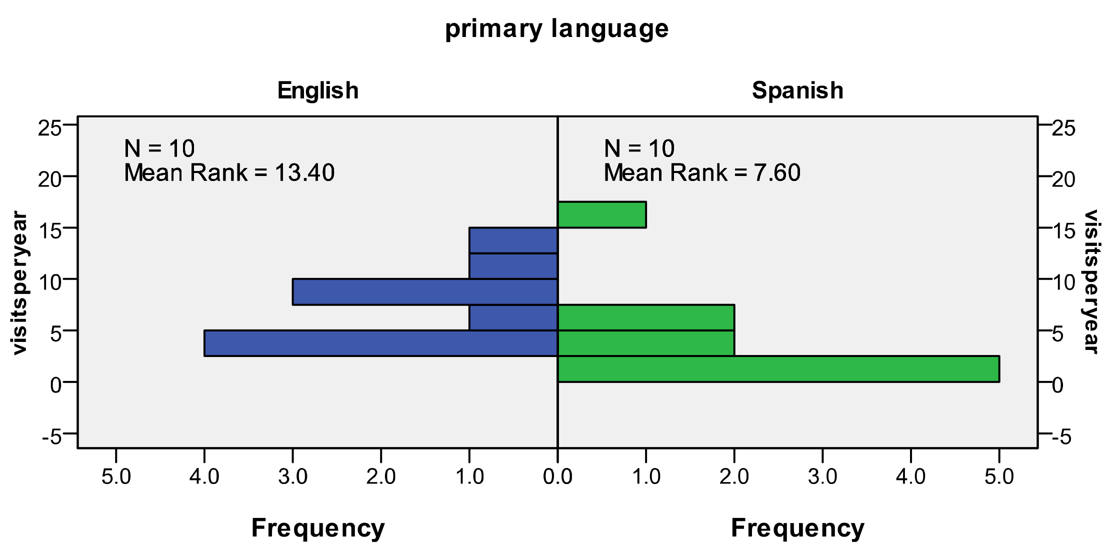

Figure 3

Mann-Whitney U *Test: Primary Language and Visits per Year, Wave 2*