Glycemic Control in English- vs Spanish-Speaking Hispanic Patients With Type 2 Diabetes Mellitus

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**Background:** Hispanic individuals compose the fastest growing minority group in the United States, yet little is known about how language impacts their health care. The primary objective of this study was to determine whether the inability to speak English adversely affected glycemic control in Hispanic patients with type 2 diabetes mellitus.

**Methods:** This retrospective cohort study selected 183 Hispanic patients with type 2 diabetes mellitus aged 35 to 70 years from a public health care system; patients were Spanish-speaking (SS) only, and control patients were English-speaking (ES) or bilingual. Clinical information was collected via telephone survey, and data on health care use, diagnosis, and glycosylated hemoglobin A1c (HbA1c) values were obtained from administrative and laboratory information systems.

**Results:** Values of HbA1c for SS (mean, 9.1%; range, 5.0%-15.3%) and ES (mean, 9.0%; range, 4.9%-16.2%) patients with diabetes mellitus and the total number of hospitalizations related and unrelated to diabetes mellitus did not differ ($P = .86$). Spanish-speaking patients had a diagnosis of diabetes mellitus for fewer years than ES patients (8.2 and 11.2 years, respectively; $P = .01$). Spanish-speaking patients were less likely to understand their prescriptions; 22% of SS patients reported no comprehension vs 3% of ES patients ($P = .001$). There was a trend toward decreased prevalence of insulin use among SS patients compared with ES patients (30% vs 42%, respectively; $P = .07$).

**Conclusions:** Glycemic control in Hispanic patients was not related to their ability to speak English. This finding may be explained by a high degree of language concordance between patients and providers.

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The role that English fluency and proficiency play in the health care of Hispanic patients with diabetes mellitus in the United States is not completely understood. Language barriers to care may have important health and medical economic implications since Hispanic individuals compose the fastest growing minority group in the United States, and Hispanic individuals have higher rates of mortality due to diabetes mellitus and complications, such as peripheral vascular disease, amputations, and end-stage renal disease, than whites. Spanish-speaking (SS) adults are more likely to be older, to live in urban areas, to be less well educated, to be unemployed, to lack medical insurance, to report poorer health status, and to score lower on measures of self-determination than English-speaking (ES) adults. Self-determination is a construct that refers to individuals’ perception of the degree to which their behavior is responsible for their health. Schur et al measured self-determination using several health belief statements rated by patients according to how strongly they agreed or disagreed with each. For example, SS patients were more likely than ES patients to attribute a large role in the recovery from an illness to luck. Studies have shown that SS Hispanic patients are less likely than ES Hispanic patients to have a regular source of medical care, to undergo screening, to use preventive services, and/or to be referred to a specialist. In other studies, SS was not significantly associated with limited access to health care services after controlling for socioeconomic and cultural factors known to decrease use of health care services. Language acculturation that is, learning to speak English, among Hispanic individuals has been found to predict use of preventive screening in some studies. Although the negative impact of the inability to speak English fluently on access to health care has been fairly well characterized, its impact on other aspects of health care has received less scrutiny.
METHODS

PATIENT POPULATION

Patients in this study received their health care through Denver Health, a vertically integrated public health care system that includes Denver Health Medical Center, an urban hospital and ambulatory care center, and 10 community health centers, serving primarily minority, low-income patients in Denver, Colo. Approximately 130,000 patients are treated annually at Denver Health. Of those, approximately 49% of the patients are Hispanic; 27%, white; and 17%, black. Almost half of the patients lack any form of medical insurance, and the majority of the remaining patients receive health insurance through Medicaid or Medicare. However, in our system, low income does not preclude the ability to afford care because the Colorado Indigent Care Plan, a state-funded program for adults who are ineligible for Medicaid and lack private health insurance, uses an income-based sliding scale to determine patients’ copayment requirements and prescription costs.

There is no uniform way patients are taught about diabetes mellitus or the use of insulin in our system. Education is determined by provider discretion, and the following methods are used: patients are referred to a series of free classes; they are referred to an endocrine specialist; or they are taught how to use insulin by either a nurse or the provider. Educational videotapes are available in Spanish and English, but not all providers use this resource. The availability of bilingual staff differs by clinic location; as a result, the use of interpreters is highly variable.

Subjects were identified through a computer search of administrative databases with the following selection criteria: age between 35 and 70 years, recorded Hispanic ethnicity, diagnosis of type 2 diabetes mellitus or related complications (International Classification of Diseases, Ninth Revision, Clinical Modification codes 250.00-250.50), with at least 2 visits to Denver Health between January 1, 1995, and December 31, 1997, and a minimum of 1 HbA1c test performed between June 1, 1997, and December 31, 1997. We chose this more recent period to minimize recall bias. Seeing patients at least twice in the outpatient setting ensured inclusion of established, not newly enrolled, patients. The primary care provider for each patient was determined either by patient report or through a review of the administrative database to identify the predominant family practice or internal medicine provider who treated the patient during the year preceding the study period. Exclusionary criteria were a diagnosis of type 1 diabetes mellitus recorded in the administrative database, corticosteroid-induced hyperglycemia, and no available HbA1c value from June 1, 1997, to December 31, 1997. Patients younger than 35 years were excluded to avoid potential misclassification of type 1 diabetes mellitus, and those older than 70 years were excluded as their level of optimal glycemic control might be defined differently.

STUDY DESIGN

This was a retrospective cohort study. Patients who fulfilled inclusion criteria were divided into 2 groups, ES or SS, based on language ability as recorded in the administrative database. A random number generator ordered the 2 groups; patients were then contacted sequentially by a bilingual research assistant to participate in a telephone survey between June 9, 1998, and July 29, 1998. Those who were successfully contacted were asked for informed consent to participate. The study was approved by the Colorado Multiple Institutional Review Board.

Additional information was obtained from administrative and laboratory databases and a health care provider written questionnaire. Laboratory databases provided HbA1c test results (normal range, 4.0%-6.0%), while administrative data sets provided patient demographics and visit-specific information (date, clinic site, frequency, provider, and diagnoses).

RESULTS

For patients who are able to successfully surmount barriers to access, language concordance, namely the patient’s and provider’s ability to speak the same language, may still affect both the process of care and patients’ perceptions of their health status. A study12 on language concordance suggested that patients’ adherence to their health care plan and appointment-keeping behavior, 2 markers of effectiveness of medical care, were associated with the ability of medical care providers to speak the same language as their patients. Spanish-speaking patients with SS providers had better recall of recommendations made during a visit and asked more questions.13 Patients reported significantly better health status when their provider spoke the same language as they did.14 The role language concordance plays in patient satisfaction has not been extensively evaluated, and, despite the potential negative impact of language barriers on medical outcomes, there is a paucity of research in this area.

We chose to use diabetes mellitus as a disease model for studying how medical care provided to Hispanic patients varies as a function of the patients’ primary language because of the high prevalence and complication rates of diabetes mellitus in the Hispanic population. In addition, the value of glycosylated hemoglobin A1c (HbA1c) serves as a useful marker for disease management and outcomes.15 The primary hypothesis was that glycemic control in SS patients with diabetes mellitus would be worse than it is in ES patients with diabetes mellitus.

We attempted to contact 327 (82%) of the 399 patients who met the inclusion criteria. We were unable to contact 81 (25%) of these patients after 3 telephone attempts. An additional 55 patients (17%) could not be reached because of a disconnected telephone, an incorrect telephone number, or a changed address. Of 191 patients contacted, 183 agreed to participate; of those, there were 79 SS and 104 ES patients.

Baseline data characteristics of the study sample are presented in Table 1, with significant differences between ES and SS patients noted on most measures. Spanish-speaking patients had completed a mean of only 3.4
MEASURES

The telephone survey, conducted by a trained bilingual interviewer, initially confirmed Hispanic ethnicity to meet inclusion criteria, followed by language fluency to ensure that the correct language version of the survey was used for each participant and that the patient was assigned to the correct cohort. The Spanish translation of the survey had been reviewed by 2 native Spanish speakers before its final implementation. Hispanic ethnicity was self-reported. Of the approximate 65,000 Hispanic patients, more than 90% were Mexican American, and we did not determine the country of origin for the remainder. The patients’ language fluency was operationally rather than subjectively defined as this method has greater validity. Subjects were asked, “How would you describe your ability to speak English?” and chose 1 of 4 possible responses: (1) not at all; (2) basic communication is difficult; (3) everyday conversation is possible; and (4) as well as a native speaker. The patient survey collected the following information: age; sex; weight; height; years with a diagnosis of type 2 diabetes mellitus; years of residency in the United States; household income; education level; name and type (either family practice or internal medicine) of primary care provider; use of an interpreter (either professional or family member) during clinic visits; use of insulin; whether written information (including prescriptions) was provided in English, Spanish, or a combination; whether the provider spoke Spanish; quality of communication between patient and provider; and number of admissions to the hospital and visits to the emergency department during the past year.

To assess each provider’s ability to speak Spanish, a questionnaire was circulated to 58 primary care providers at Denver Health identified through patient surveys. Providers were asked to “place a check mark next to the statement below that best describes your ability to speak Spanish,” and there were 4 possible responses: (1) not at all; (2) use of basic communication is difficult; (3) everyday conversation is possible and/or need an interpreter; and (4) able to provide routine care comfortably and/or only need interpreter for complex discussions (ie, psychiatric or end-of-life issues); and (4) as well as a native speaker. In addition, providers were asked for their country of origin and whether they considered themselves to be Latino and/or Hispanic. For purposes of the analysis, providers selecting either of the first 2 responses were categorized as non-SS, and providers who selected the third or fourth response were categorized as SS. Overall, 40 (69%) of the 58 providers responded. For providers who could not be contacted, we used the results of a different administrative survey as a proxy. One question on this survey asked the participant to list any languages in which they were fluent but did not ask for an estimation of degree of fluency. The 2 surveys were concordant for responders.

STATISTICAL ANALYSIS

Data entry and statistical analysis were performed using SAS statistical software (version 6.12; SAS Institute Inc, Cary, NC). The primary analysis compared glycemic control between SS and ES patients with diabetes mellitus. The null hypothesis would have suggested no difference between the SS and ES groups. To compare bivariate relationships (between patient groups) for continuous variables (ie, HbA1c, value, age, and weight), a 2-sample t test was used, and Wilcoxon rank sum test was used for nonparametric data. χ² Analyses were used for categorical variables, and Fisher exact test was used for small cell sizes. Two-sided P < .05 was considered statistically significant. Sample size calculations were performed using Epi Info (USD Inc, Stone Mountain, Ga). To estimate the sample required, we used the distribution of HbA1c, test results (N = 22093) from Denver Health in 1997. An independent estimate of the distribution would take only 1 value (eg, the lowest) for each patient (n = 3228). Forty-five percent of the patients had a value of 7.5% or less. The detection of a 1.5% (eg, 7.5%-9.0%) mean difference in HbA1c values between groups (α = .05 and β = .20) would require a total sample size of 178 (89 patients per group).

years of school, whereas ES patients had completed a mean of 9.3. In addition, SS patients were more likely to be immigrants, to have a more recent diagnosis of diabetes mellitus, and to be receiving care at Denver Health for fewer years.

The main outcome measure, mean HbA1c values, did not differ significantly between the SS and ES groups (9.0% vs 9.1%; P = .86; Table 2). We analyzed the following patient characteristics to determine whether any characteristic distinguished patients with better glycemic control (HbA1c value < 8.0%) from those with less glycemic control (HbA1c ≥ 8.0%): age, sex, income, use of insulin, years with a diagnosis of diabetes mellitus, years receiving care at Denver Health, number of hospitalizations, number of visits to the emergency department, years of school completed, body mass index, and language concordance with the provider. The only characteristics that approached statistical significance were the use of insulin (P = .08) and language concordance (P = .12). Insulin use correlated with poorer glycemic control (P = .08), and this finding remained after adjusting for the number of years with diabetes mellitus and age. Spanish-speaking patients with SS providers tended to have better glycemic control (HbA1c value < 8.0%) than SS patients with ES providers (41% vs 12%, respectively; P = .12). This difference, although clinically important, was not statistically significant given our sample size. Spanish-speaking patients were no less likely to have an established primary care provider (P = .12) but were more likely to have a Hispanic and/or SS provider than ES patients (P < .05; Table 2). The mean number of hospitalizations in the past year and emergency department visits in the past 2 years did not differ significantly between the 2 groups.

There were significant differences in the process of care between the 2 groups: SS patients were less likely than ES patients to receive written educational materials (P = .05), and a trend was evident among SS patients toward less insulin use (P = .07). Subgroup analysis showed that SS patients with an SS provider were more likely to be taking insulin than SS patients with an ES provider (odds ratio, 1.4; 95% confidence interval, 0.25-7.55). However, this association was not statistically significant (P = .72) because of the small sample size and resulting...
limited power to detect a difference. Only 51 (66%) of the 77 SS patients received prescriptions with labels written in Spanish.

**COMMENT**

We found no difference in the main outcome measure, glycemic control, in SS vs ES Hispanic patients with diabetes mellitus; however, the results of this study suggest that some potentially important processes of care for Hispanic patients with type 2 diabetes mellitus differ based on English fluency. First, SS patients were less likely than ES patients to be taking insulin. We were not able to determine whether this finding was due to different provider prescribing practices or patient preference. Health care providers identified Hispanic patients with diabetes mellitus, in general, as having a greater fear of insulin and a reluctance to use it compared with white patients. The fact that SS patients were less likely than ES patients to receive written materials may reflect the providers’ recognition or assumption of lower reading ability or may relate to lack of availability of translated materials. We do not know how many of the ES or SS patients in the present study were unable to read; however, based on published data from similar populations, we estimated that the prevalence of inadequate or marginal functional health literacy was 35% in the 106 ES patients and 62% in the 77 SS patients. A study in the United States established that the number of years of school completed overestimates actual reading level by 4 to 5 grade levels. Whether this discrepancy applies to individuals educated outside the United States, as a large number of the SS patients in our study were, is not clear. While some patient educational materials in Spanish are available at our institution, not all materials are culturally sensitive or written at an appropriate reading level. Two studies showed that patient educational materials are often written at an inappropriately high level and cannot be understood by the target population. With an average of 3.4 years of school, the SS patients in our study undoubtedly would have difficulty understanding written educational materials found in most hospitals.

Language discordance between providers and patients may also impact the process of patient education. Providers who do not speak Spanish fluently may spend less time on educational efforts that depend on communication with the patient. This hypothesis has never been tested formally; however, one study used physician self-assessment and observers with stopwatches to demonstrate no difference in the total amount of time an ES provider spent with non-ES patients vs ES patients. In the present study, despite a high rate of language concordance, SS patients tended to rate communication with their providers less favorably than ES patients. This dissatisfaction, which has been noted in another study of primary care in Hispanic ethnic groups, may reflect language barriers imposed by the high prevalence of illiteracy among the SS patients or overrating of SS skills by ES providers. Alternatively, despite good SS skills, cultural barriers between Hispanic patients and non-Hispanic providers could adversely affect communication. A recent survey-based study also demonstrated decreased satisfaction with communication among SS Hispanic patients vs ES Hispanic patients. However, this study made no attempt to account for the degree of language concordance between patients and providers. Using family members

**Table 1. Characteristics of 183 Hispanic Patients With Diabetes Mellitus**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>English-Speaking Patients (n = 106)</th>
<th>Spanish-Speaking Patients (n = 77)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y, mean</td>
<td>55.9</td>
<td>56.1</td>
<td>.88</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td>31.8</td>
<td>32.2</td>
<td>.75</td>
</tr>
<tr>
<td>Annual income, $, mean</td>
<td>11 592</td>
<td>12 029</td>
<td>.83</td>
</tr>
<tr>
<td>School completed, y, mean</td>
<td>9.3</td>
<td>3.4</td>
<td>.001</td>
</tr>
<tr>
<td>Female, No. (%)</td>
<td>69 (65)</td>
<td>67 (87)</td>
<td>.001</td>
</tr>
<tr>
<td>US residence, y, mean</td>
<td>55.8</td>
<td>16.6</td>
<td>.001</td>
</tr>
<tr>
<td>Lived with diabetes mellitus, y, mean</td>
<td>11.2</td>
<td>8.2</td>
<td>.01</td>
</tr>
<tr>
<td>Received care at DH, y, mean</td>
<td>26</td>
<td>8</td>
<td>.001</td>
</tr>
<tr>
<td>Used insulin, %</td>
<td>44 (42)</td>
<td>22 (29)</td>
<td>.07</td>
</tr>
<tr>
<td>Born in Spanish-speaking country, %</td>
<td>3 (3)</td>
<td>74 (96)</td>
<td>.001</td>
</tr>
</tbody>
</table>

*Patients were treated at Denver Health (DH), Denver, Colo, between June 1, 1997, and December 31, 1997.

**Table 2. Differences in the Outcomes and Process of Care Measures in 183 Hispanic Patients With Diabetes Mellitus**

<table>
<thead>
<tr>
<th>Measures</th>
<th>English-Speaking Patients (n = 106)</th>
<th>Spanish-Speaking Patients (n = 77)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c value, mean (range)</td>
<td>9.0 (4.9-16.2)</td>
<td>9.1 (5.0-15.3)</td>
<td>.86</td>
</tr>
<tr>
<td>No. of hospitalizations in past year</td>
<td>0.5</td>
<td>0.4</td>
<td>.67</td>
</tr>
<tr>
<td>No. of visits to the emergency department in past 2 years, mean</td>
<td>0.8</td>
<td>1.2</td>
<td>.46</td>
</tr>
<tr>
<td>Use of insulin</td>
<td>44 (42)</td>
<td>22 (29)</td>
<td>.07</td>
</tr>
<tr>
<td>Established primary care provider</td>
<td>97 (91)</td>
<td>75 (97)</td>
<td>.12</td>
</tr>
<tr>
<td>Latino provider</td>
<td>18 (17)</td>
<td>24 (31)</td>
<td>.03</td>
</tr>
<tr>
<td>Spanish-speaking provider</td>
<td>55 (52)</td>
<td>64 (83)</td>
<td>.001</td>
</tr>
<tr>
<td>Always feel their provider understands what they are saying</td>
<td>93 (88)</td>
<td>64 (83)</td>
<td>.16</td>
</tr>
<tr>
<td>Always understand their provider</td>
<td>49 (64)</td>
<td>49 (64)</td>
<td>...</td>
</tr>
<tr>
<td>Use of hospital interpreter</td>
<td>8 (10)</td>
<td>8 (10)</td>
<td>...</td>
</tr>
<tr>
<td>Sometimes</td>
<td>31 (40)</td>
<td>31 (40)</td>
<td>...</td>
</tr>
<tr>
<td>Never</td>
<td>37 (48)</td>
<td>37 (48)</td>
<td>...</td>
</tr>
<tr>
<td>Prescription labels written in Spanish</td>
<td>51 (66)</td>
<td>51 (66)</td>
<td>...</td>
</tr>
</tbody>
</table>

*Patients were treated at Denver Health, Denver, Colo, between June 1, 1997, and December 31, 1997. Data are presented as number (percentage) of patients unless indicated otherwise. HbA1c indicates glycosylated hemoglobin A1c; and ellipses, not applicable.
and friends as interpreters for SS patients has been proposed as a viable method to improve satisfaction.25

Our study corroborated the findings of Tocher and Larson26 in the only other published study that addressed whether glycemic control is compromised in SS patients. They found that the quality of care for diabetes mellitus in terms of several medical outcomes for non-ES patients with established primary care providers and consistent use of professional interpreters was equal to that for ES patients. In the present study, interpreters were not consistently provided, but language barriers had been largely circumvented through a process of selection of SS providers by SS patients. We believe that this situation more closely approximates the actual experience (ie, effectiveness study) of most health care providers and patients, whereas the results of the study by Tocher and Larson seem to apply only in ideal conditions (ie, efficacy study), in which a professionally trained interpreter is always available. Of the 77 SS patients in our study, 64 (83%) had SS providers. The provision of education about diabetes mellitus in Spanish may have played a large beneficial role in the equivalent degree of glycemic control seen; this impact is similar to the previously observed impact of language-appropriate education on influenza vaccination rates among SS patients.27 Spanish-speaking Hispanic patients may be able to overcome potential language barriers when care is provided in a more culturally and linguistically congruent setting. To our knowledge, no studies have compared how the content and outcomes of a clinical encounter differ when communication is mediated by an interpreter as opposed to a bilingual primary care provider.

Although glycemic control did not differ based on the primary language spoken by patients, it was suboptimal overall in both study groups. This finding alone should warrant a greater focus on Hispanic health issues, since poor glycemic control in patients with type 2 diabetes mellitus has been linked to a greater incidence of many microvascular and macrovascular diabetic complications and an increased cost of health care for this population.28 Even a 1% improvement in the \( \text{HbA}_{1c} \) value can result in a 10% reduction in the risk for coronary artery disease.29,30

Of 183 patients, 168 (92%) reported having a regular medical care provider, and 64 (83%) of the 77 SS patients reported having an SS or Hispanic provider. These health care system results contrast markedly with those obtained in the 1997 population-based National Medical Expenditure Survey,31 which showed that only 51% of Hispanic adults had a regular physician, and among the SS adults with a physician, 29% had a Hispanic physician. The SS population in the present study appeared to more often have a primary care provider, which reflects the study inclusion design that stipulated that patients must have at least 2 outpatient visits. In addition, patients needed an \( \text{HbA}_{1c} \) value for study inclusion. Thus, all these patients had providers who were attempting to take clinical responsibility for their care. Simply having a regular clinician has been shown to result in a linear trend in increasing health care use.32,33 The present findings demonstrate that a well-integrated health care system may overcome potential barriers to receiving comparable care in SS and ES Hispanic patients with diabetes mellitus.

Our study has several limitations. First, the sample was small, which might jeopardize the generalizability of the results. We tried to circumvent this problem by selecting replacements sequentially from the 2 lists of patients that had been generated previously. Second, we relied on patient reporting for most of our data. Such retrospective accounts are subject to recall bias, but we have no reason to believe that the potential for bias would differ between the 2 cohorts. Finally, results of subset analyses of the process of care for SS patients based on the degree of language concordance with their providers had limited statistical power because of the small sample size and were, therefore, inconclusive.

In summary, this study shows that glycemic control is no worse in SS Hispanic patients compared with ES Hispanic patients with type 2 diabetes mellitus, perhaps because of language concordance in the patient-physician partnership. However, overall control was suboptimal in both groups according to current guidelines.34 A provider’s ability to speak Spanish as fluently as a native speaker does not appear to be mandatory to confer the metabolic benefit observed in this study. Even with those providers who ranked their SS ability as able to provide routine care comfortably in Spanish and/or only need interpreter for complex discussions (ie, psychiatric or end-of-life issues), the benefit was seen. This finding should prompt additional initiatives to teach cultural and communication competence to health care providers of ethnically and culturally diverse populations, starting early in the educational process. Although glycemic control did not differ between ES and SS patients, we found several discrepancies in the care provided, particularly around patient education. Because most SS patients had less schooling, the challenge is how to effectively educate that population. New methods that rely less on written materials need to be investigated.

Additional studies are needed to investigate in more depth how patient satisfaction, the quality and process of a medical visit, adherence to the treatment plan, and medical outcomes, including cost of care, differ based on the degree of language concordance between patient and provider. An overriding goal of future studies should be to optimize health care delivery to the rapidly growing, underserved Hispanic segment of the population by finding ways to bridge cultural and language differences between health care providers and patients. Non-ES individuals already compose 30% of the population in urban areas, and the number is likely to increase even further given the projected demographic trends.35 Barriers that may prevent optimal use of our health care system by ethnic minorities should be identified and addressed to ensure that quality primary care is provided in all settings and to individuals of all colors.

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