Language Barriers and LDL-C/SBP Control Among Latinos With Diabetes

Alicia Fernandez, MD; E. Margaret Warton, MPH; Dean Schillinger, MD; Howard H. Moffet, MPH; Jenna Kruger, MPH; Nancy Adler, PhD; and Andrew J. Karter, PhD

As the number of Latinos with limited English proficiency and diabetes increases,[1-3] health plans and physicians need to know if language barriers contribute to diabetes outcomes. Understanding the role of language barriers in health outcomes will assist in workforce planning (ie, hiring of bilingual clinicians) and contribute to quality improvement efforts.

Prior research has reported on the association of language barriers with glycemic control among patients with type 2 diabetes.[4-6] Using data from an integrated health plan with language access services available, researchers found that rates of poor glycemic control (glycated hemoglobin >9%) were nearly twice as high among Latino patients compared with white patients, regardless of the Latino patients' English language proficiency.[4] Among limited English proficient (LEP) Latino patients, however, those with a language-discordant (ie, non–Spanish-speaking) physician were nearly twice as likely to have poor glycemic control compared with those who had a language-concordant physician. These differences persisted after adjustment for other demographic and clinical factors. A recent study in the same setting found a 10% increase in the proportion of LEP patients with good glycemic control among those who switched from a language-discordant primary care physician (PCP) to a language-concordant (Spanish-speaking) PCP compared with those who switched from a language-discordant PCP to another language-discordant PCP.[7]

Control of serum lipid levels and blood pressure is particularly important in diabetes, and over the last 10 years, diabetes care guidelines have underscored the need for monitoring and control of these powerful risk factors for cardiovascular and renal disease among patients with diabetes.[8-10] Studies of Latinos with diabetes indicate a complex relationship among acculturation, diet, and exercise,[11-14] with several studies finding that LEP Latinos have better lipid profiles than more acculturated English-speaking Latinos. Systolic blood pressure (SBP) may also vary with acculturation, although some study findings suggest no impact.[11,15] In this study, however, we focused on the role of language barriers in healthcare and sought to determine the extent to which language barriers between physicians and patients may have impacted lipid and

ABSTRACT

OBJECTIVES: Language barriers in healthcare are associated with worse glycemic control among Latino patients with limited English proficiency and diabetes. We examined the association of patient–physician language concordance with lipid (low-density lipoprotein cholesterol [LDL-C]) and systolic blood pressure (SBP) control.

STUDY DESIGN: Retrospective cohort study.

METHODS: Data were obtained from a survey and the electronic health records of Latino and white patients with diabetes receiving care within 1 integrated health plan with interpreter services available. Limited English proficiency and patient–physician language concordance were defined by patient report. Outcomes were poor lipid control (LDL-C >100 mg/dL) and poor SBP control (SBP >140 mm Hg).

RESULTS: In total, 3463 Latino (2921 who spoke English and 542 who were limited English proficient [LEP]) and 3896 English-speaking white patients participated. One-third of the patients had poor lipid control and one-fifth had poor SBP control. English-speaking white patients were slightly less likely to have poor lipid control than English-speaking Latino patients, but the difference did not persist after adjustment for age and sex. Among Latinos, LEP patients were less likely to have poor lipid control than English-speaking patients (odds ratio, 0.71; 95% CI, 0.54-0.93), with no difference by LEP patient–physician language concordance. Poor SBP control did not differ by ethnicity, primary language, or patient–physician language concordance.

CONCLUSIONS: We found no evidence that ethnicity or language barriers in healthcare were associated with poorer lipid or blood pressure control among Latino and white patients with diabetes receiving care in settings with professional interpreters.

Am J Manag Care. 2018;24(9):405-410

TAKEAWAY POINTS

Health systems are struggling to provide effective care and meet quality metrics for the large numbers of Latino patients with diabetes.

- Language barriers are known to impact patient satisfaction and trust. Recent research indicates that language barriers are associated with poor glycemic control and that switching patients to language-concordant (Spanish-speaking) physicians may improve glycemic control in a population of patients.
- This study found that language barriers and language concordance are not associated with lipid and blood pressure control.
- Quality improvement efforts for lipid and blood pressure control should focus on barriers beyond language.

blood pressure control among LEP Latino patients with diabetes. By focusing on an insured population with uniform and continuous access to care, we are better able to isolate any contribution of language barriers to clinical outcomes.

METHODS

This analysis used data from the Diabetes Study of Northern California (DISTANCE), an NIH-funded survey follow-up cohort study among members of the Kaiser Permanente Northern California (KPNC) Diabetes Registry.[16] Conducted in 2005-2006, the DISTANCE survey included 184 questions designed to assess a wide range of social and behavioral factors that may influence diabetes-related outcomes. This survey was offered in multiple modes and languages to a race-stratified random sample of members of the KPNC Diabetes Registry. The survey had a response rate of 62%. DISTANCE was approved by the institutional review boards of the Kaiser Foundation Research Institute and the University of California, San Francisco.

Setting

KPNC is a nonprofit integrated healthcare delivery system providing comprehensive medical care to a diverse population of approximately 3.2 million members in Northern California. Distribution of patient demographic and socioeconomic factors is similar to that of the area population except in the extremes of the income distribution.[17] Each KPNC facility provides bilingual clinicians and interpreter services through qualified bilingual staff, telephone language interpreters, and on-site professional interpreters for their LEP patients.

Study Population

For this study, we used the same patient cohort as in the study of language and glycemic control by Fernandez et al.[4] Study participants were DISTANCE respondents whose self-identified race/ethnicity was Latino (n = 3877) or white (n = 4521). We excluded those who had longer than a 60-day gap in health plan enrollment in the year prior to the survey date (n = 205), who did not have type 2 diabetes (n = 436), who did not respond to the question about their English language proficiency (n = 104), and who did not have either a low-density lipoprotein cholesterol (LDL-C) test or SBP measure (n = 294), leaving a total of 3463 Latinos and 3896 whites. For analysis of LDL-C, respondents who had no LDL-C measure (n = 683), had an abnormal liver function test (aspartate aminotransferase >150) (n = 34), or were missing physician information (n = 86) were also excluded from analysis. For analysis of SBP, respondents who had no SBP measure (n = 385), had end-stage renal disease or glomerular filtration rate less than 15 mL/min/1.73m^2 (n = 228), or were missing physician information (n = 49) were also excluded from analysis.

Measures

Patient language status was assessed by the following DISTANCE survey question: "How often do you have difficulty understanding or speaking English?" Latino respondents who answered "usually" or "often" were designated as having limited English proficiency ("LEP Latino"), whereas those who responded "sometimes," "rarely," or "never" were designated as English-speaking ("English-speaking Latino"). Physician language ability was assessed by response to another DISTANCE survey question: "Without using an interpreter, how well does your personal physician speak your language?" Responses to this question were also dichotomized; participants who answered "well," "very well," or "excellent" were considered to have a language-concordant (ie, Spanish-speaking) PCP (LEP-concordant), whereas those who responded "fair," "poorly," or "does not speak my language" were considered to have a non–Spanish-speaking language-discordant PCP (LEP-discordant).[4] LEP patients who did not respond to the question on physician language proficiency were excluded from the analysis of language concordance.

Other measures of interest determined from survey responses included demographic information and time since diabetes diagnosis. KPNC data from 2005 were used to generate individual comorbidity scores using the DxCg, a validated risk assessment tool designed to quantify a patient's illness burden, in which higher numbers indicate greater illness burden.[18] Patients whose benefit records showed no gap of greater than 1 month in pharmacy coverage in the year prior to the survey response date were categorized as having continuous pharmacy benefits. Patients were considered to be using antihypertensive medications or lipid-lowering agents if electronic records showed that they were dispensed any prescriptions on a list of commonly used agents in the year prior to the survey.

Outcome Measures

Our 2 main outcome measures were the patients' most recent measurements of LDL-C and SBP obtained during routine clinical care in the year prior to the survey date. Poor lipid control was defined as LDL-C higher than 100 mg/dL and poor hypertension control as SBP higher than 140 mm Hg, using widely accepted clinical guidelines in place during study years. Secondary outcomes were mean LDL-C and SBP.

Statistical Analyses

We compared characteristics of English-speaking white, English-speaking Latino, and LEP Latino patients using χ^2 tests for categorical variables and Student's *t* tests for continuous variables. Among the LEP Latino patients, we compared language-discordant and -concordant groups. We compared the odds of poor lipid control and poor SBP control among the different patient groups using generalized estimating equations (GEE) models to account for covariates (age, sex, education, income, diabetes duration, comorbidities, continuous prescription benefits, and control medications) and clustering of patients by physician and healthcare facility. Because of sample size constraints, in the comparison of LEP language-discordant versus LEP language-concordant groups, we used a parsimonious GEE model accounting for clustering by facility and adjusting for age, sex, education, diabetes duration, missing comorbidity score, and control medications. We also specified models that included an interaction term to evaluate whether the LEP-LDL-C or LEP-SBP relationships differed by patient–physician language concordance. To determine if our results were sensitive to our definition of LEP, we repeated our analyses including patients who reported "sometimes" having difficulty with English in the LEP Latino group.

TABLE 1. Characteristics of 7359 Insured Patients With Type 2 Diabetes by Ethnicity, English Language Proficiency, and Patient–Physician Language Concordance

	Ethnicity and English Language Proficiency			Among LEP Latino	
	English-Speaking White	English-Speaking Latino	LEP Latino	Language-Concordant	Language-Discordant
Total	n = 3896	n = 2921	n = 542	n = 147	n = 120
Age, years, mean (SD)	60.4 (9.5)*	56.9 (10.9)	56.8 (10.8)	57.4 (11.7)	56.1 (10.4)
Male, %	55.4*	49.8	36.7**	38.1	32.5
Education, %					
Less than high school	11.0*	27.4	70.5**	73.5	71.7
High school and above	88.2	69.8	28.2	23.1	26.7
Missing	1.0	2.8	1.3	3.4	1.7
Income, %					
$0-$34,999	23.0*	33.1	57.0**	63.3	59.2
$35,000 or above	66.5	56.6	24.2	27.9	22.5
Missing	10.5	10.3	18.8	8.8	18.3
Lifetime in US, %					
<1/3	3.9*	14.6	13.8**	13.6	16.7
1/3 to 2/3	2.9	20.8	59.8	68.7	55.8
>2/3	0.5	1.9	14.9	13.6	20.8
US-born	92.5	60.5	8.9	1.4	1.7
Unknown/missing	0.3	2.3	2.6	2.7	5.0
Diabetes duration, years, mean (SD)	9.1 (7.9)*	9.8 (8.0)	9.8 (8.4)	9.9 (8.1)	10.5 (9.9)
Comorbidities score (DxCg),[a] mean (SD)	2.7 (2.5)*	2.5 (2.4)	2.5 (2.3)	2.2 (1.9)	2.7 (2.4)
Continuous pharmacy benefits,[b] %	97.9*	94.6	86.4**	83.0	90.0
LDL-C medications, %	81.3*	76.1	71.2**	73.5	73.3
HTN medications, %	62.8*	50.8	41.5**	36.7	40.8

HTN indicates hypertension; LDL-C, low-density lipoprotein cholesterol; LEP, limited English proficient.

*$P \leq .05$ for comparison between English-speaking white patients and English-speaking Latino patients.

**$P \leq .05$ for comparison between English-speaking Latino patients and LEP Latino patients.

[a]DxCg is a validated risk assessment tool designed to quantify a patient's illness burden, in which higher numbers indicate greater illness burden.

[b]Continuous pharmacy benefits were defined as patients whose benefit records showed no gap of greater than 1 month in pharmacy coverage in the year prior to the survey response date.

RESULTS

The study population (N = 7359) included 3896 English-speaking white, 2921 English-speaking Latino, and 542 LEP Latino patients. Clustering of LEP patients by physician was not common, as most (90%) of the LEP Latino patients were cared for by a Kaiser physician with 3 or fewer LEP patients in the study (range, 1-17).

English-speaking white, English-speaking Latino, and LEP Latino patients differed in several ways (**Table 1**). Compared with either of the Latino patient groups, white patients were more likely to be male, report more education, and report greater income. When compared with their LEP counterparts, English-speaking Latino patients were more likely to be male (49.8% vs 36.7%; $P = .001$), have finished high school (69.8% vs 28.2%; $P < .001$), have annual incomes of $35,000 or above (56.6% vs 24.2%; $P < .001$), and have continuous pharmacy benefits during the year prior to the survey (94.6% vs 86.4%; $P < .05$). Mean comorbidity index values were similar among the 2 Latino patient groups and slightly lower than the mean comorbidity index for English-speaking white patients. Among the LEP patients, LEP-concordant and LEP-discordant groups had similar patient characteristics. English-speaking white patients were somewhat more likely to be dispensed lipid-lowering medications than English-speaking Latino patients (81.3% vs 76.1%; $P < .001$), who were somewhat more likely to be dispensed these medications than LEP Latino patients (76.1% vs 71.2%; $P = .01$). A similar pattern across patient groups was observed for antihypertensive medication dispensing.

Slightly more than one-third of all patients had poor LDL-C control, with a recent LDL-C level higher than 100 mg/dL. English-speaking Latino patients were somewhat more likely to have poorly controlled LDL-C than English-speaking white patients in

TABLE 2. Lipid and SBP Control Among Insured Patients With Diabetes by Ethnicity, English Language Proficiency, and Patient–Physician Language Concordance

	Ethnicity and English Language Proficiency			Among LEP Latino	
	English-Speaking White	English-Speaking Latino	LEP Latino	Language-Concordant	Language-Discordant
LDL-C measures					
n[a]	3476	2589	491	135	109
LDL-C >100 mg/dL, %	33.7*	36.8	32.4	29.6	29.4
LDL-C, mg/dL, mean (SD)	94.1 (29.2)*	95.8 (30.7)	94.7 (29.7)	92.0 (26.9)	93.8 (27.9)
SBP measures					
n[a]	3515	2673	509	142	107
SBP >140 mm Hg, %	21.7	20.0	16.7	13.4	13.1
SBP, mm Hg, mean (SD)	132.4 (13.4)*	131.4 (13.2)**	130.0 (13.0)	128.1 (10.6)	129.7 (12.5)

LDL-C indicates low-density lipoprotein cholesterol; LEP, limited English proficient; SBP, systolic blood pressure.

*$P \leq .05$ for comparisons between English-speaking white and English-speaking Latino patients.

**$P \leq .05$ for comparisons between English-speaking Latino patients and LEP Latino patients.

[a]Number of individuals meeting all inclusion criteria for each outcome measure.

TABLE 3. Odds Ratios for Poor Lipid and SBP Control by Ethnicity, English Language Proficiency, and Patient–Physician Language Concordance

	English-Speaking Latino vs English-Speaking White	LEP Latino vs English-Speaking Latino	LEP Language-Discordant vs LEP Language-Concordant
	AOR[a] (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)
LDL-C >100 mg/dl	1.05 (0.93-1.18)	0.71 (0.54-0.93)	0.97 (0.55-1.81)
SBP >140 mm Hg	0.98 (0.86-1.11)	0.88 (0.68-1.13)	0.96 (0.51-1.81)

AOR indicates adjusted odds ratio; LDL- C, low-density lipoprotein cholesterol; LEP, limited English proficient; SBP, systolic blood pressure.

[a]Models adjusted for patient age, sex, education, income, diabetes duration, comorbidities, continuous prescription benefits, and control medications.

[b]The fully adjusted model did not converge due to small sample sizes of ~250 observations (depending on outcome) and the complexity of accounting for clustering by facility (43 total) and primary care physician (~170 physicians, depending on outcome). Results presented are for a parsimonious model accounting for clustering by facility and adjusting for age, sex, education, diabetes duration, missing comorbidity score, and control medications.

unadjusted analysis (36.8% vs 33.7%; $P = .01$) (Table 2), whereas differences in lipid control between English-speaking Latino and LEP Latino patients were not statistically significant. We found no differences in lipid control among the LEP Latino patients by patient–physician language concordance. Similar patterns were observed for mean LDL-C by patient group.

Approximately one-fifth of patients had poor SBP control. The unadjusted percentage of patients with poor SBP control did not differ between English-speaking white patients and English-speaking Latino patients (21.7% vs 20.0%; $P = .11$) or between English-speaking Latino patients and LEP Latino patients (20.0% vs 16.7%; $P = .08$). Mean SBP was marginally lower (ie, better) in the LEP Latino group than the English-speaking Latino group (130.0 vs 131.4; $P = .03$).

Multivariate models adjusting for age and sex eliminated the small differences in lipid control between English-speaking white patients and English-speaking Latino patients, and further adjustment for other demographic and clinical factors did not change this finding (Table 3) (adjusted odds ratio [AOR], 1.05; 95% CI, 0.93-1.18). However, among Latinos, LEP patients were less likely than English-speaking patients to have poorly controlled LDL-C (AOR, 0.71; 95% CI, 0.54-0.93). The interaction term for patient–physician language concordance by LEP status was not significant ($P > .05$), indicating that the LEP-SBP and LEP-LDL-C relationship did not differ according to patient–physician language concordance. Analyses using mean LDL-C and SBP as outcomes in linear GEE models showed similar results. Sensitivity analyses including Latino patients who reported "sometimes" having difficulty with English (n = 598) in the LEP Latino group did not alter the findings (data not shown).

DISCUSSION

In a study of language barriers and lipid and blood pressure control among insured patients with diabetes receiving uniform access to care in an integrated health plan, we found no substantive differences in the prevalence of poor lipid control or poor blood pressure control among LEP Latino patients by the language ability of their physician. This contrasts markedly with the prior finding of large differences in poor glycemic control by ethnicity, language status, and language concordance in the same patient population.[4] However, it is in line with the findings of a recent study reporting no improvement in lipid or blood pressure control when Latino patients with limited English proficiency switched from a language-discordant to a language-concordant PCP.[7]

We can only speculate as to why language barriers did not lead to differences in lipid or blood pressure control. First, about one-third of the patients in each group had poor lipid control despite high rates of dispensing of lipid-lowering medications, suggesting that

difficulties in achieving patient adherence to lipid-lowering therapy may apply to patients regardless of their primary language.[19-21] English-speaking Latinos had a somewhat higher prevalence of poor lipid control than LEP Latinos, even though LEP Latinos were less likely to have been dispensed medications for hyperlipidemia, suggesting a lower prevalence of high lipid levels among the LEP patients at baseline. In this context, limited English proficiency may function not only as a marker for language barriers, but also as a proxy for acculturation, which is known to adversely impact diet and lifestyle. Second, LDL-C and SBP control may be less sensitive to patient–physician communication than glycemic control. Lipid and blood pressure control are primarily functions of adherence to the appropriate medications; glycemic control often requires both medication and lifestyle changes. In another study from the DISTANCE cohort, Ratanawongsa et al reported better adherence for cardiometabolic therapies among patients who felt their doctors listened to them, involved them in decisions, and gained their trust; however, the communication–adherence association was stronger for glycemic control medications than for lipid and blood pressure medications.[22] Clinicians in interpreted encounters often have difficulty eliciting patient viewpoints and values.[23] Common misconceptions about insulin among LEP Latinos (eg, that insulin causes blindness or death)[10,24] and discussions about patient lifestyle modification involved in glycemic control may be more easily addressed in language-concordant relationships than in interpreter-mediated clinical encounters, which tend to stay narrowly focused on symptoms and therapy.[25,26] In short, counseling patients on lifestyle changes is likely easier and more effective in a language-concordant encounter than in one mediated through an interpreter.

Limitations

Our study has several limitations. First, prior work has established that Kaiser Permanente patients with limited English proficiency are less likely to report problems with access to care or care quality than LEP patients in other major health plans,[27] so our results may not generalize to other insured LEP Latino patients, particularly if their services are less robust. Robust language access services, such that clinicians and patients have easy access to interpreters, can greatly mitigate the impact of language barriers. Second, although it is possible that survey participants differ from nonrespondents, we found no substantive differences based on clinical data and Census-based socioeconomic data, which were available for all members of the cohort.[16] Third, most Latinos in the DISTANCE cohort are of Mexican ancestry, so our results may not be generalizable across Latinos of other nationalities.[28,29] Fourth, sample size limitations, particularly among LEP Latinos, could mean that we missed a small language-associated difference in outcomes, although this is unlikely to be of clinical significance. Fifth, we used exclusion criteria similar to those of an earlier study on glycemic control in order to create comparable populations; results might vary in other patient samples. In particular, we should note that patients who underwent no LDL-C or SBP testing were excluded from the study. These patients may be particularly vulnerable to language barriers, and their exclusion may bias our study toward the null.

CONCLUSIONS

We found no evidence that language barriers for LEP Latino patients with diabetes resulted in worse lipid or blood pressure control relative to English-speaking Latino patients or English-speaking white patients in a health system with access to interpreter services and low financial barriers to medications and clinical care. This contrasts with other research showing a strong association between language barriers and glycemic control and suggests that more research is needed to further our understanding of how patient–physician communication impacts healthcare outcomes. There is room for improvement in clinical outcomes among all patients with diabetes, including the growing Latino population. Effective strategies to improve lipid and blood pressure control for both English- and Spanish-speaking populations need to be developed, tested, and deployed. ■

Author Affiliations: Department of Medicine (AF, DS, JK), and Department of Psychiatry (NA), University of California, San Francisco, San Francisco, CA; Division of Research, Kaiser Permanente (EMW, HHM, AJK), Oakland, CA.

Source of Funding: Funding for this study was provided by R01 DK090272 from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). This study was an ancillary study of DISTANCE, which was supported by R01 DK090272, DK65664, DK081796, DK080726, P30DK092924 from NIDDK and R01 HD046113 from the National Institute of Child Health and Human Development. Dr Fernandez was partly supported by NIDDK K24DK102057.

Author Disclosures: The authors report no relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

Authorship Information: Concept and design (AF, DS, HHM, AJK); acquisition of data (AF, EMW, HHM, NA, AJK); analysis and interpretation of data (AF, EMW, HHM, JK, AJK); drafting of the manuscript (AF, DS, JK, NA); critical revision of the manuscript for important intellectual content (AF, EMW, DS, HHM, NA, AJK); statistical analysis (AF, EMW); provision of patients or study materials (AJK); obtaining funding (AF, HHM, AJK); administrative, technical, or logistic support (HHM, JK); and supervision (AF, AJK).

Address Correspondence to: Alicia Fernandez, MD, UCSF Box 1364, DGIM Zuckerberg San Francisco General Hospital, San Francisco, CA 94143. Email: alicia.fernandez@ucsf.edu.

REFERENCES

1. Boyle JP, Honeycutt AA, Narayan KM, et al. Projection of diabetes burden through 2050: impact of changing demography and disease prevalence in the U.S. *Diabetes Care.* 2001;24(11):1936-1940. doi: 10.2337/diacare.24.11.1936.
2. Narayan KM, Boyle JP, Thompson TJ, Sorensen SW, Williamson DF. Lifetime risk for diabetes mellitus in the United States. *JAMA.* 2003;290(14):1884-1890. doi: 10.1001/jama.290.14.1884.
3. Annual estimates of the resident population by sex, age, race, and Hispanic origin for the United States and states: April 1, 2010 to July 1, 2017: 2017 population estimates. US Census Bureau website. factfinder.census.gov/bkmk/table/1.0/en/PEP/2017/PEPASR6H. Accessed July 30, 2018.
4. Fernandez A, Schillinger D, Warton EM, et al. Language barriers, physician-patient language concordance, and glycemic control among insured Latinos with diabetes: the Diabetes Study of Northern California (DISTANCE). *J Gen Intern Med.* 2011;26(2):170-176. doi: 10.1007/s11606-010-1507-6.
5. Baig AA, Locklin CA, Foley E, Ewigman B, Meltzer DO, Huang ES. The association of English ability and glycemic control among Latinos with diabetes. *Ethn Dis.* 2014;24(1):28-34.
6. Rosal MC, Ockene IS, Restrepo A, et al. Randomized trial of a literacy-sensitive, culturally tailored diabetes self-management intervention for low-income Latinos: Latinos en Control. *Diabetes Care.* 2011;34(4):838-844. doi: 10.2337/dc10-1981.
7. Parker MM, Fernández A, Moffet HH, Grant RW, Torreblanca A, Karter AJ. Association of patient-physician language concordance and glycemic control for limited-English proficiency Latinos with type 2 diabetes. *JAMA Intern Med.* 2017;177(3):380-387. doi: 10.1001/jamainternmed.2016.8648.
8. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10-year follow-up of intensive glucose control in type 2 diabetes. *N Engl J Med.* 2008;359(15):1577-1589. doi: 10.1056/NEJMoa0806470.

9. American Diabetes Association. Standards of medical care in diabetes—2015. abridged for primary care providers. *Clin Diabetes.* 2015;33(2):97-111. doi: 10.2337/diaclin.33.2.97.
10. Lynch EB, Fernandez A, Lighthouse N, Mendenhall E, Jacobs E. Concepts of diabetes self-management in Mexican American and African American low-income patients with diabetes. *Health Educ Res.* 2012;27(5):814-824. doi: 10.1093/her/cys058.
11. Eamranond PP, Wee CC, Legedza AT, Marcantonio ER, Leveille SG. Acculturation and cardiovascular risk factor control among Hispanic adults in the United States. *Public Health Rep.* 2009;124(6):818-824. doi: 10.1177/003335490912400609.
12. Fisher-Hoch SP, Vatcheva KP, Laing ST, et al. Missed opportunities for diagnosis and treatment of diabetes, hypertension, and hypercholesterolemia in a Mexican American population, Cameron County Hispanic Cohort, 2003-2008. *Prev Chronic Dis.* 2012;9:110298. doi: 10.5888/pcd9.110298.
13. Mainous AG 3rd, Diaz VA, Geesey ME. Acculturation and healthy lifestyle among Latinos with diabetes. *Ann Fam Med.* 2008;6(2):131-137. doi: 10.1370/afm.814.
14. Mainous AG 3rd, Majeed A, Koopman RJ, et al. Acculturation and diabetes among Hispanics: evidence from the 1999-2002 National Health and Nutrition Examination Survey. *Public Health Rep.* 2006;121(1):60-66. doi: 10.1177/003335490612100112.
15. Moran A, Diez Roux AV, Jackson SA, et al. Acculturation is associated with hypertension in a multiethnic sample. *Am J Hypertens.* 2007;20(4):354-363. doi: 10.1016/j.amjhyper.2006.09.025.
16. Moffet HH, Adler N, Schillinger D, et al. Cohort profile: the Diabetes Study of Northern California (DISTANCE)—objectives and design of a survey follow-up study of social health disparities in a managed care population. *Int J Epidemiol.* 2009;38(1):38-47. doi: 10.1093/ije/dyn040.
17. Karter AJ, Moffet HH, Liu J, et al. Achieving good glycemic control: initiation of new antihyperglycemic therapies in patients with type 2 diabetes from the Kaiser Permanente Northern California Diabetes Registry. *Am J Manag Care.* 2005;11(4):262-270.
18. Zhao Y, Ellis RP, Ash AS, et al. Measuring population health risks using inpatient diagnoses and outpatient pharmacy data. *Health Serv Res.* 2001;36(6 pt 2):180-193.
19. Kuznik A, Mardekian J. Trends in utilization of lipid- and blood pressure-lowering agents and goal attainment among the U.S. diabetic population, 1999-2008. *Cardiovasc Diabetol.* 2011;10:31. doi: 10.1186/1475-2840-10-31.
20. Nag SS, Daniel GW, Bullano MF, et al. LDL-C goal attainment among patients newly diagnosed with coronary heart disease or diabetes in a commercial HMO. *J Manag Care Pharm.* 2007;13(8):652-663. doi: 10.18553/jmcp.2007.13.8.652.
21. Toth PP, Zarotsky V, Sullivan JM, Laitinen D. Dyslipidemia treatment of patients with diabetes mellitus in a US managed care plan: a retrospective database analysis. *Cardiovasc Diabetol.* 2009;8:26. doi: 10.1186/1475-2840-8-26.
22. Ratanawongsa N, Karter AJ, Parker MM, et al. Communication and medication refill adherence: the Diabetes Study of Northern California [erratum in *JAMA Intern Med.* 2013;173(9):731. doi: 10.1001/jamainternmed.2013.6768]. *JAMA Intern Med.* 2013;173(3):210-218. doi: 10.1001/jamainternmed.2013.1216.
23. Rivadeneyra R, Elderkin-Thompson V, Silver RC, Waitzkin H. Patient centeredness in medical encounters requiring an interpreter. *Am J Med.* 2000;108(6):470-474. doi: 10.1016/S0002-9343(99)00445-3.
24. Hatcher E, Whittemore R. Hispanic adults' beliefs about type 2 diabetes: clinical implications. *J Am Acad Nurse Pract.* 2007;19(10):536-545. doi: 10.1111/j.1745-7599.2007.00255.x.
25. Carbone ET, Rosal MC, Torres MI, Goins KV, Bermudez OI. Diabetes self-management: perspectives of Latino patients and their health care providers. *Patient Educ Couns.* 2007;66(2):202-210. doi: 10.1016/j.pec.2006.12.003.
26. Fernandez A, Schillinger D, Grumbach K, et al. Physician language ability and cultural competence: an exploratory study of communication with Spanish-speaking patients. *J Gen Intern Med.* 2004;19(2):167-174.
27. Fernandez A, Viloria J, Wu E, Martinez M, Wang F, Selig SJ. The impact of race/ethnicity and language on access and experience of care among California's commercially insured adults. California's Pan-Ethnic Health Network website. cpehn.org/sites/default/files/resource_files/cpacfernandez_findingsfinal2_07.pdf. Published February 2007. Accessed July 30, 2018.
28. Mainous AG, 3rd, Diaz VA, Saxena S, Geesey ME. Heterogeneity in management of diabetes mellitus among Latino ethnic subgroups in the United States. *J Am Board Fam Med.* 2007;20(6):598-605.
29. Weinick RM, Jacobs EA, Stone LC, Ortega AN, Burstin H. Hispanic healthcare disparities: challenging the myth of a monolithic Hispanic population. *Med Care.* 2004;42(4):313-320.

Full text and PDF at **www.ajmc.com**