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Diabetes Self-management Behaviors, Medical Care, Glycemic Control, and Self-rated Health in US Men by Race/Ethnicity

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Diabetes self-management behaviors, medical care, glycemic control, and self-rated health in US men by race/ethnicity

Abstract

Men, particularly minorities, have higher rates of diabetes as compared to their counterparts. Ongoing diabetes self-management education and support by specialists are essential components to prevent the risk of complications such as kidney disease, cardiovascular diseases, and neurological impairments. Diabetes self-management behaviors, in particular as diet and physical activity, have been associated with glycemic control in the literature. Recommended medical care for diabetes may differ by race/ethnicity. This study examined data from the National Health and Nutrition Examination Surveys (NHANES), 2007-2010 for men with diabetes ($N=646$) from four racial/ethnic groups: Mexican Americans, other Hispanics, non-Hispanic Blacks, and non-Hispanic Whites. Men with adequate dietary fiber intake had higher Odds of glycemic control [OR = 4.31 (1.82, 10.20)], independent of race/ethnicity. There were racial/ethnic differences in reporting seeing a diabetes specialist. Non-Hispanic Blacks had the highest Odds of reporting ever seeing a diabetes specialist (84.9%) followed by White non-Hispanics (74.7%); whereas, Hispanics reported the lowest proportions (55.2% Mexican Americans and 62.1% other Hispanics). Men seeing a diabetes specialist had the lowest Odds of glycemic control [OR = 0.54(0.30, 0.96)]. The results of this study suggest that diabetes education counseling may be selectively given to patients who are not in glycemic control. These findings indicate the need for examining referral systems and quality of diabetes care. Future studies should assess the effectiveness of patient-centered medical care provided by a diabetes specialist with consideration of sociodemographics, in particular race/ethnicity and gender.

Key Words: health promotion, diabetes, diabetes self-management, medical care, race/ethnicity

Background

In the United States 9.3% of the population, 29.1 million people, have diabetes. Diabetes was the seventh leading cause of death in the United States in 2010 and is likely to be underreported as a cause of death (Center for Disease Control and Prevention [CDC], 2014). A greater percentage of men have diabetes (13.6%) as compared to women (11.2%) (CDC, 2014). Moreover, race/ethnicity disparities exist in the age-adjusted percent of people in the US, with American Indians/Alaska Native having the highest (15.9) followed by non-Hispanic Blacks (NHB) (13.2), Hispanics (12.8), Asian Americans (9.0) and non-Hispanic White (NHW) having the lowest (7.6) (CDC, 2014).

Critical to diabetes care is receiving national standardized diabetes self-management (DSM) education and support (American Diabetes Association [ADA], 2014). Ongoing DSM education and support are essential components to prevent the risk of complications such as kidney disease, cardiovascular diseases, and neurological impairments (eye and peripheral nervous system damage) (ADA, 2014). The effectiveness of DSM education may be a factor of health care utilization. Medical care for individuals with diabetes should include seeing a diabetes specialist (diabetes nurse practitioner, physicians' assistant or dietitian certified in diabetes education) qualified to administer DSM education (ADA, 2014).

Diabetes standards of care have shifted focus from self-monitoring blood glucose toward strategies to improve blood glucose and diabetes outcomes. Diet is a major strategy to prevent diabetes-related complications and the American Diabetes Association recommends that all individuals with diabetes receive individualized medical nutrition therapy a registered dietitian (ADA, 2014). There are several dietary patterns that evidence suggests improvements in glycemic and cardiovascular disease risk factors such as the Mediterranean, low-fat, low-

carbohydrate, and vegetarian, (Wheeler et al, 2012) as well as the Dietary Approach to Stop Hypertension (DASH) diet (ADA, 2014). The common elements of these diets are sufficient dietary fiber (from whole grains, fruits and vegetables) and low saturated fat. [According to *Standards of Medical Care in Diabetes—2014*](#), saturated fat and fiber recommendations for persons with diabetes are the same as those for the general population: 14 grams/1000 Kcal of fiber and no more than 10% of daily calories from saturated fat (ADA, 2014).

Other components of DSM are physical activity, eye examinations, and foot care. Regular exercise has been demonstrated to improve glycemic control, reduce cardiovascular risk factors, support weight loss, and improve quality of life and mental outlook (ADA, 2014). The recommendations for adults with diabetes correspond to that of the general population: 150 minutes per week of aerobic activity (50–70% of maximum heart rate), spread over at least 3 days/week with no more than 2 consecutive days without exercise (ADA, 2014). Physical resistance training should be performed at least twice per week unless contraindicated (ADA, 2014). Annual examinations for retinopathy and patient education for self-foot care are important components of diabetes care (ADA, 2014). A factor often considered in DSM is self-monitoring blood glucose (SMBG) when used a guide to DSM; however, SMBG frequency and timing is largely a factor of patient’s goals (ADA, 2014).

Having diabetes may influence quality of life which may affect self-assessment of health (Vadstrup, Frølich, Perrild, Borg, & Røder , 2010). Self-rated health (SRH), as an ordinal question asking individuals to rank their health (World Health Organization [WHO], 2002), has been established as a marker of morbidity (Sheldon, Kaplan, & Salonen, 1999) and a determinant of the population’s well-being throughout the literature (DeSalvo, Fan, McDonnell, & Fihn, 2005; Idler & Benyamini, 1997; Jylhä, 2009; Tsai, Ford, Li, Zhao, & Balluz, 2010).

Diabetes care depends on continuous support and health care utilization is a necessary component to patient-centered treatment. It has been well-documented that men have lower rates of health care utilization compared to women; however, few studies compared genders for health care utilization for persons with diabetes. Men with diabetes had fewer appointments with primary care physicians and specialist as compared to women with diabetes despite access to health care in Israeli (Shalev, Chodick, Heymann, & Kokia, 2005) and German cohorts (Krämer et al, 2012).

Purposes and Hypotheses

The purpose of this study was to examine diabetes self-management (DSM) differences between race/ethnicity in men with diabetes and the relationships among glycemic control, type of medical care, and self-rated health (SRH). This article explores racial/ethnic differences in glycemic control for men with diabetes. There are racial/ethnic differences in glycemic control for both males and females, with Mexican Americans having the lowest percent of glycemic control (A1C <7.0): 40.5 followed by non-Hispanic Blacks: 51.8, and non-Hispanic Whites: 52.2, for US adults ages ≥ 40 year (Agency of Healthcare Research and Quality [AHRQ], 2014). Although there were no significant difference in glycemic control between NHB and NHW, based on this report, racial differences have been identified for A1C between NHW (7.4 ± 1.7) and African American (8.1 ± 2.5) from an urban setting, even when adjusting for clinical, demographic, and diabetes-related psychosocial factors (Hansmann, Ren, & Sevic, 2010).

Hypothesis 1: Men having adequate diet (measured by recommended levels of fiber and saturated fat) and adequate physical activity will have higher Odds of glycemic control (A1C ≤ 8.5) as compared to those who have inadequate diet and less than recommended physical activity, independent of race/ethnicity.

Hypothesis 2: Diabetes self-management (DSM) factors in diet, SMBG, foot care, and eye care will vary by race/ethnicity with MA, OH, and NHB being more likely to have poor DSM as compared to NHW.

Some disparities may be due to unequal treatment across race/ethnicity in health care even when health care status, age, income and disease state are comparable (Nelson, 2002). For individuals with diabetes, type of medical care may reflect quality: seeing a diabetes specialist may represent a higher level of care than those persons not referred to a diabetes specialist. According to a patient survey, DSM and nutrition education, interpersonal care, and a skilled health care team are vital elements for diabetes care (Fleming et al, 2001). Diabetes self-management education and training that includes healthy eating, SMBG is recommended for individuals with diabetes (CDC, 2014). Medical care that helps diabetes self-management may improve perceived health.

Hypothesis 3a: Men with diabetes will have greater Odds of good to excellent self-rated health (SRH) versus fair/poor SRH if they report ever seeing a diabetes educator/specialist as compared to those not seeing a diabetes specialist, independent of race/ethnicity and adjusting for age.

Hypothesis 3b: Men with diabetes who report seeing a diabetes educator/specialist will have greater Odds of glycemic control ($A1C \leq 8.5$) as compared to those not seeing a diabetes specialist, independent of race/ethnicity and adjusting for age and health insurance.

Method

Source of Data

Data for this study were from appended 2-year cycles of datasets from the National Health and Nutrition Examination Survey (NHANES) 2007-2008 and 2009-2010 (National Center for Health Statistics [NCHS], 2015). NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States by combining interviews and physical examinations. The sample for the survey is selected to represent the U.S. population of all ages. Persons 60 and older, African Americans, Asians, and Hispanics are over-sampled to produce reliable statistics. NHANES uses a complex, multistage, probability sample design to obtain representative samples of the noninstitutionalized, civilian US population.

Description of Sample

This study acquired data for males ≥ 21 years of age with self-reported diabetes from four out of five racial/ethnic categories: Mexican Americans (MA); Other Hispanics (OH); non-Hispanic Blacks (NHB); and non-Hispanic Whites (NHW). The classification 'other races' (Asian and mixed-races) was excluded since numbers in this category were not sufficient for multiple comparisons. The final sample size with complete data for hemoglobin A1c (A1C) and diabetes self-management variables was $N=646$ (MA=121, OH=69, NHB=159, NHW=297). *Ethical*

Considerations: The data used for this study were publically available. Prior to public release, the study protocols (continuation of *protocol #2005-06* for both datasets) were approved by the National Center for Health Statistics Research Ethics Review Board (NCHS-ERB, 2015).

Separate informed consent forms were signed by participants for the interview and health examination, or just the interview. Participants for this study read, understood, and signed

informed consent forms for the interview and health examination. Detailed information concerning the data collection procedure for the surveys is found at the website (NCHS, 2015).

Study Design

For this study, a population was categorized as having diabetes based on diagnosed diabetes. Several questions were considered for the construction of the variable ‘*diagnosed diabetes*’: 1) “The next questions are about specific medical conditions. Other than during pregnancy, have you ever been told by a doctor or health professional that you had diabetes or sugar diabetes?”; 2) “How old were you when a doctor or other health professional first told you that you had diabetes or sugar diabetes?”; and 3) “When was your diabetes diagnosed?” Each question was by self-report and subject to recall-bias. Since there were missing values for questions 2 and 3, construction of the variable, ‘diagnosed diabetes’ was based on question 1. A variable for years with diagnosed diabetes was created by subtracting age at diagnosis from current age.

Diabetes self-management variables. 1) Indicators of a healthy diet: recommended saturated fat and dietary fiber were constructed based on the first 24-hour recall. The second dietary recall was not used due to missing values and difference in how the data was collected between the two recalls. The first recall was an in-person interview and the second recall was by telephone. Fiber was constructed as grams per 1000 Kcal and converted to a binary variable: inadequate/adequate fiber intake. Inadequate fiber intake was considered <14 grams/1000 Kcal, based on the dietary guidelines for Americans (Institutes of Medicine, Food and Nutrition (2002/2005). Adequate fiber was formed for ≥ 14 grams/1000 Kcal. Saturated fat was based on percent of calories using 9 kcal per gram. 2) Hemoglobin A1c (A1C) ≤ 8.5 was considered having glycemic control; the cutoff value is based on the less-stringent goal of A1C between 7-8 (ADA, 2014) and the Department of Veterans Affairs (VA) and the Department of Defense (DoD) recommendation of

<9 for older adults (Veteran's Administration/Department of Defence [VA/DoD], 2010), as well as the estimated marginal means of the study population. 3) Self-monitoring blood glucose (SMBG) was formed using variables for frequency and unit. Unit of measure was converted to weeks, then multiplied by frequency. The frequency table was interpreted and collapsed based on percent responses and clinical significance. The descriptive variable for SMBG consisted of four levels: never, less than once per week, once per week, and more than once per week. 5) Frequency of checking feet for sores was calculated using two variables: frequency and unit. Unit of measure was converted into weeks and multiplied by frequency. The descriptive variable for checking feet was collapsed to three levels: never, less than once per week, and \geq once per week based on participant response and clinical significance. 6) Eye care was based on having or not having retinal damage. Hypothesis tests were conducted with binary outcomes for adequate diabetes self-management behaviors. SMBG and checking feet were considered adequate at once per week or more versus inadequate behavior at less than once per week or never. Performing physical activity was a positive response to moderate to vigorous recreational activity and/or work-related physical activity.

Major independent variables and covariates

This study compared men from 4 race/ethnicity categories as the major independent variable for diabetes self-management behaviors as dependent variables. Covariates chosen were based on their clinically known confounders of health behavior and their availability in the data set. Age, currently smoking (yes, no), obesity (yes, no) education level, poverty level, marital status, glycemic control, health insurance, and seeing a diabetes specialist were the major adjustment variables. Age was used as a continuous variable in years. Smoke status was generated from two variables about ever smoking 100 cigarettes in a lifetime or not and still smoking. The new

variable, currently smoking, was considered as answering “yes” or “no” to currently smoking. Body mass index (BMI), calculated as weight in kg divided by the square of height in meter, was used to form a binary variable “obesity/no obesity” with $BMI \geq 30 \text{ kg/m}^2$ as the cutoff for obesity. Education level was collapsed into 4 levels: less than high school, high school, some college, college degree or higher. The poverty level was formed based on the ratio of family income to poverty, where a score of 1 or lower represented poverty versus >1 as above the poverty level. According to the Office of the Secretary of Planning and Evaluation, poverty levels for 2007-2010 were approximately \$21,000-22,000 per year for a family of four and 24,000-26,000 per year for a family of five (ASPE, 2015). Marital status was converted into a binary variable: considered living with a partner or married versus other. Ever seeing a diabetes educator/specialist (was coded as “yes” and never seeing a diabetes specialist was coded as “no”based on the last time the participant saw a diabetes nurse educator or dietitian or nutritionist for their diabetes. Two participants reporting “don’t know” were coded as missing. Having health insurance in the past 12 months was considered affirmative with a positive response and a negative responses was considered not having health insurance (there were less than 1% answering “not sure” and they were coded as not having health insurance in the past 12 months). Self-rated health (SRH) was reported as one of five responses: excellent, very good, good, fair, or poor. A binary variable was created with good to excellent versus fair or poor.

Data Analysis

All data were analyzed with the Statistical Package for Social Sciences (SPSS, Version 22) with the module for complex design analysis. The sample weights for the first 24-hour dietary recall were computed using the average of the 2-year sample weights for each cycle, as per guidelines

set by NHANES. The sample weights used were based on the data file with the smallest sample size (Johnson & Paulose-Ram, Ogden, & National Center for Health Statistics, 2013). All analysis took into account differential probabilities of selection and the complex sample design, with SPSS, using the Taylor series linearization. A *p*-value of less than 0.05 (two-sided) was considered statistically significant. Participants' characteristics were presented as frequency and percent by race/ethnicity and were performed with cross-tabulations and tested with the Chi Squared Test. Logistic regression models for complex sample analysis, reduced (adjusted for age and race/ethnicity) fully adjusted (age, race/ethnicity, smoking status, obesity, education, poverty, marital status, health insurance, self-rated health, ever seeing a diabetes specialist/educator) and final models (most clinically important variables retained to achieve significant models) were performed to test the differences across race for diabetes self-management behaviors.

Results

The demographics of the study population are presented in **Table 1**. Hispanics and Blacks were significantly younger than NHW. Mexicans and OH had a higher proportion married or partnered as compared to NHB and NHW. **Compared to NHW, Mexican Americans were the least educated.** Minority groups had the lowest percent covered by health insurance as compared to NHW. Non-Hispanic Blacks had the highest proportion 'ever seeing a diabetes specialist/educator' (85%) followed by NHW (75%); **whereas Hispanics had a considerably lower proportion of reporting visiting a diabetes specialist (OH, 62% and MA, 55%).** There were no significant differences by race/ethnicity for obesity, smoking, and glycemic control.

Effect of diet and physical activity on glycemic control (Hypothesis 1)

The reduced and final adjusted models for the Odds of glycemic control with dietary factors and physical activity are presented in **Table 2**. A model with all the proposed adjustment variables could not be fit. The list of covariates were ordered by clinical importance: age, race/ethnicity, smoking status, obesity, health insurance, education, poverty, marital status, ever seeing a diabetes specialist/educator, and self-rated health and removed by least importance one at a time until a fit model could be achieved. The final model included the adjustment variable age, race/ethnicity, smoking status, obesity and health insurance. The consumption of adequate fiber increased the Odds of having glycemic control [OR = 4.22 (1.77, 10.10), reduced model; OR = 4.31 (1.82, 10.20), final model]. There were no significant differences in glycemic control with following the recommendations for adequate saturated fat ($p = .501$, reduced model; $p = .797$, final model) and for performing physical activity at work and/or for recreation ($p = .884$, reduced model; $p = .601$, final model).

Diabetes self-management skills in men with diabetes across race/ethnicity (Hypothesis 2)

There were significant differences by race/ethnicity for consumption of higher than adequate saturated fat ($p < .001$), checking feet ($p = .024$), physical activity ($p = .002$) and SMBG ($p = .007$). The results indicated that NHW has the lowest percent of adherence to saturated fat recommendations (<10 % of calories from saturated fat). Non-Hispanic Blacks had the lowest adherence to fiber guidelines (7.3%); albeit, the differences were not significant ($p = .085$). Non-Hispanic Whites had the highest percent reporting performing physical activity at work and/or for leisure as compared to other ethnicities. Non-Hispanic Blacks, followed by NHW had the lowest percent of reporting 'never checking feet' (17% and 20%, respectively). Non-Hispanic

Blacks had the highest percent (70%) of adhering to the guidelines (checking feet at least once per week). **Table 3** depicts the estimate (percent) and standard error (percent) for each skill.

Self-rated health, seeing a diabetes specialist, and glycemic control (Hypothesis 3)

A model could not be fit for ‘ever seeing a diabetes specialist’ with the Odds of good to excellent self-rated health ($p = .104$) (hypothesis 3a). Self-rated health and glycemic control were not significantly associated ($p = .297$). The logistic regression models for ‘seeing diabetes specialist’ and glycemic control (hypothesis 3b) are presented in **Table 4**. Model 1 was adjusted by age ($p = .152$), health insurance ($p = .087$) and smoking ($p = .583$). Model 2 was adjusted by years with diagnosed diabetes ($p = .043$) and health insurance ($p = .016$) and smoking ($p = .311$).

In contrast to the proposed hypothesis, Odds of having glycemic control was less for those who reported ‘ever seeing a diabetes specialist’ [OR = 0.57 [.34, .98], Model 1; 0.54[0.30, 0.96], Model 2]. There were no significant differences in reporting ‘ever seeing a diabetes specialist’ by race/ethnicity.

Discussion

Health determinants for men with diabetes assessed by race/ethnicity in this study were obesity, marital status, education level, smoking status, health insurance status, self-rated health, poverty level, glycemic control, ever seeing a diabetes specialist and DSM behaviors. Non-Hispanic Whites had higher Odds of protective health determinants as compared to Blacks and Hispanics for higher education, above poverty level, having current health insurance, reporting good to excellent SRH and SMBG. Hispanics had higher Odds of currently living with a partner or being married but lower Odds of reporting ever seeing a diabetes specialist as compared to NHB and NHW. Non-Hispanic Blacks had the highest Odds of reporting ever seeing a diabetes specialist.

Both NHB and NHW had higher Odds of frequently checking feet as compared to Hispanics. Hispanics and Blacks had higher Odds of saturated fat intake at or below the recommendation as compared to NHW. There were no significant differences in obesity, physical activity, and fiber intake across race/ethnicity; however, adequate fiber and performing physical activity were associated with glycemic control across race/ethnicity.

Diabetes self-management behaviors, in particular as diet and physical activity, have been associated with glycemic control in the literature. For this population, adequate fiber intake was associated with lower A1C; however, regulating saturated fat and performing physical activity were not significantly associated with glycemic control. In contrast, Bernard et al (2006) reported that individuals randomized to the low-fat vegan group (10% of energy from fat) consumed less saturated fat and had a greater reduction in A1C as compared to those randomized to the group following the omnivorous American Diabetes Association diet after 22 weeks while physical activity did not differ between groups. Bernard et al (2006) adjusted for medication use; however, medication use may be a confounder in saturated fat intake and glycemic control by race/ethnicity in our study.

Self-rated health was not associated with glycemic control for our population. Our results of no significant relationship between A1C and SRH were in agreement with an earlier study of a primarily NHW patients with type 2 diabetes (Blaum, Velez, Hiss and Halter 1997) and for a German cohort with type 2 diabetes (Boehme, Geiser & Renneberg, 2014). Higher A1C was associated with poorer SRH for patients with diabetes from a primary care facility in Denmark (Nielsen, Gannik, Siersma, & DeFine Olivarius, 2011). The disagreement in the literature may be due, in part, to the association of poorer health for persons with diabetes. Persons with diabetes were more likely to report fair to poor SRH as compared to persons without diabetes for an

African American and Hispanic cohort (Huffman et al, 2013) and a Mexican-American sample (Otiniano, Du, Ottenbacher, & Markide, 2003). Persons with diabetes who reported poor SRH consistently over a four-year interval were more likely to have comorbidities as compared to those whose SRH decreased from good to poor over the same interval (Schmitz et al., 2013). Diabetes complications may be a confounder for SRH and glycemic control (Nielsen, Gannik, Siersma, & DeFine Olivarius, 2011). Higher self-rated health measured by a visual analog scale was associated with lower risk of diabetes complications for a large New Zealand/Australian cohort (Hayes et al., 2008).

Medical care is an important factor in diabetes self-management behaviors and outcomes for men with diabetes. In this study, those who reported ever seeing a diabetes specialist/educator had less Odds of glycemic control as compared to those reporting never visiting a specialist across racial and ethnic groups. These findings suggest that physicians may selectively recommend diabetes education based on glycemic control as a basis of the patient's diabetes self-management. In agreement with the Agency for Healthcare Research and Quality (AHRQ, 2013) there were no racial/ethnic differences in glycemic control; however, [in this study](#) NHB had the highest Odds followed by NHW and Hispanic had the lowest Odds of reporting ever seeing a diabetes specialist. In contrast, the American Diabetes Association (2014) recommends ongoing diabetes education by specialist for all persons with diabetes regardless of their A1C levels. Improvements in glycemic control made by patients with a physician-nurse practitioner team as compared to treatment with a physician were lost upon termination of the team intervention (Litaker et al, 2003). The relationship between seeing a diabetes specialist/educator and glycemic control could not be established as causal. The literature indicates better glycemic outcomes for patients seen by a diabetes specialist (Healy, Black, Harris, Lorenz & Dungan, 2013; Rothman et

al, 2005; Wexler, et al, 2012). Treatment by an intense intervention with clinical pharmacists and a diabetes educator reduced A1C by 1.7% as compared to treatment with a diabetes physician (Rothman et al, 2005). One-time care session from a pharmacist followed by usual care from a primary care provider reduced A1C by 0.8% in a 12-month study of patients with type 2 diabetes and poor glycemic control (A1C>8.0) (Rothman et al, 2005). Glycemic control was improved after 12-month follow-up in a randomized control trial of adults with type 2 diabetes and A1C $\geq 7.5\%$ for the group receiving diabetes education by specialists (enhanced treatment) as compared to the group receiving usual care (control group) (Wexler et al., 2012). For their study, usual care included non-specialist physicians administering diabetes education and dietitians (not certified in diabetes education) providing nutrition counselling (Wexler et al., 2012). The enhanced treatment group received 60-90 minutes of diabetes education provided by a certified diabetes educator (Wexler et al., 2012). Healy, Black, Harris, Lorenz, & Dungan (2013) reported that formal diabetes education for patients with poorly controlled diabetes was associated with reduced Odds of hospital readmission by 34% for 30 days and 20% for 180 days. These studies indicate improvements in diabetes outcomes and support the need for diabetes education in the management of diabetes.

Limitations

There were several limitations of this study. Cause and effect could not be established by this study since the data were comparing groups from a single time point. There may have been subject bias in some of the variables. Whether or not the treatment received was patient-centered and identified useful by the participants was not available in this secondary analysis. Similarly, the frequency and duration of diabetes education counseling was not indicated. It is not clear whether some men were not referred or that they chose not to comply with the recommendation

to see a diabetes specialist. Despite the limitations, a major strength of this study was the use of a national database (NHANES), which has specialized in collecting health data by race/ethnicity.

Implications for Clinical Practice and Future Research

The results of this study suggest that diabetes education counseling may be selectively given to patients with high A1C; albeit, glycemic control can fluctuate between physician's visits and may not be a definitive marker of diabetes self-management. Glucose-lowering drugs may lose their effectiveness for persons not following dietary and physical activity recommendations. Several studies indicated that lower A1C could be achieved by a combination of medication and lifestyle factors that reduced obesity and helped to prevent diabetes for those at risk (Knowler et al, 2002; Kosaka, Noda & Kuzuya, 2005; Ramachandran et al, 2006; Tuomilehto et al, 2001). Continued change of lifestyle factors after follow-up identified prevention or delay in diabetes for a Finnish cohort after 7 years (Lindström et al., 2006) and a Chinese cohort after 20 years (Li et al, 2008).

The complex dynamics of interpersonal relationships makes assessment of 'culturally sensitive and collaborative,' patient-centered treatment difficult. Moreover, few studies have investigated whether the message was received in the manner it was intended for men with diabetes and if race/ethnicity affected the communication process. Several studies have indicated health disparities by race/ethnicity have occurred in patient-centered, participatory provider-patient relationships (Cooper-Patrick et al, 1999; DiMatteo, Murray, & Williams, 2009; Johnson, Roter, Powe, & Copper, 2004). There is some evidence that improvements in diabetes outcomes may not occur for minority patients, even when physicians are made aware of racial disparity in diabetes care and outcomes (Sequist et al, 2010). Patient-centered medical care may improve glycemic control in older adults with diabetes (Heisler, Cole, Weir, Kerr, & Hayward, 2007).

Targeting diet and physical activity for those at risk for or with diabetes by diabetes education counselors with a patient-centered approach is supported by the literature. Future studies should assess the effectiveness of patient-centered medical care provided by a diabetes specialist with consideration of sociodemographics, in particular race/ethnicity and gender.

References

Agency for Healthcare Research and Quality (AHRQ) (2013) *2012 National Healthcare Quality and Disparities Reports Data Tables Appendix: 2012 National Healthcare Quality and Disparities Reports*. Agency for Healthcare Research and Quality, Rockville, MD.

Author. Retrieved from:

<http://www.ahrq.gov/research/findings/nhqrdr/nhqrdr12/index.html>

American Diabetes Association (2014). Standards of Medical Care in Diabetes—2014
Diabetes Care 37, S14-S80; doi:10.2337/dc14-S014

ASPE (2015). Office of the Secretary of Planning and Evaluation, Department of Health and Human Services. Retrieved from: <http://aspe.hhs.gov/>

Barnard, N. D., Cohen, J., Jenkins, D. J. A., Turner-McGrievy, G., Gloede, L., Jaster, B., . . . Talpers, S. (2006). A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. *Diabetes Care*, 29, 1777-1783.

Blaum, C. S., Velez, L., Hiss, R. G., & Halter, J. B. (1997). Characteristics Related to Poor Glycemic Control in NIDDM Patients in Community Practice. *Diabetes Care* 20 (1), 7-11.

Boehme, S., Geiser, C. & Renneberg, B. (2014). Functional and self-rated health mediate the association between physical indicators of diabetes and depressive symptoms. *BMC Family Practice*, 15, 157. Retrieved from: <http://www.biomedcentral.com/1471-2296/15/157>

- Centers for Disease Control and Prevention. (2014). *National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014*. Atlanta, GA: U.S. Department of Health and Human Services. Retrieved from:
<http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf>
- Cooper-Patrick, L., Gallo, J. J., Gonzales, J. J., Vu, H. T., Powe, N. R., Nelson, C., & Ford, D. E. (1999). Race, gender and partnership in the patient-physician relationship. *Journal of the American Medical Association*, 282(6), 583-589.
- Department of Veterans Affairs (VA) and Department of Defense (DoD) (2010). VA/DoD *Clinical practice guideline for the management of diabetes mellitus*. Retrieved from:
http://www.healthquality.va.gov/guidelines/CD/diabetes/DM2010_FUL-v4e.pdf
- DeSalvo, K. B., Fan, V. S., McDonnell, M. B., & Fihn, S. D. (2005). Predicting mortality and healthcare utilization with a single question. *Health Service Research*, 40(4), 1234-1246.
- DiMatteo, M. R., Murray, C. B., & Williams, S. L: (2009). Gender disparities in physician-patient communication among African American patients in primary care. *Journal of Black Psychology*, 35(2), 204-227.
- Fleming, B. B, Greenfield, S., Engelgau, M. M., Pogach, L.M., Clauser, S. B., and Parrott , M., for the DQIP Group (2001). The Diabetes Quality Improvement Project: moving science into health policy to gain an edge on the diabetes epidemic. *Diabetes Care*, 24, 1815–1820.
- Hansmann, L. H. , Ren, D., & Sevick, M. A. (2010). Differences in diabetes-related psychosocial factors and glycemic control in patients with type 2 diabetes. *Patient Preference and Adherence*, 4, 291-299. Doi:10.2147/PPA.S12353

- Hayes, A. J., Clarke, P. M., Glasziou, P. G., Simes, R. J., Durury, P. L. & Keech, A. C. (2008). Can self-rated health scores be used for risk prediction in patients with type 2 Diabetes? *Diabetes Care*, 31, 795–797.
- Healy, S. J., Black, D., Harris, C., Lorenz, A., and Dungan, K. M. (2013). Inpatient diabetes education is associated with less frequent hospital readmission among patients with poor glycemic control. *Diabetes Care*, 10, 2960-2967. doi: 10.2337/dc13-0108. Epub 2013 Jul 8
- Heisler, M., Cole, I., Weir, D., Kerr, E. A., Hayward, R. A. (2007) Does a physician communication influence older patients' diabetes self-management and glycemic control? Results from the health and retirement study. *Journal of Gerontology* 2007, 62A(12), 1435-1442.
- Huffman, F. G., Vaccaro, J. A., Ajabshir, S. Zarini, G. G., Exebio, J. & Dixon, Z. (2013). Perceived stress and self-rated health of Haitian and African Americans with and without Type 2 diabetes. *Journal of Research and Medical Science*, 18(3), 198-204.
- Idler, E. L. & Benyamini. Y. (1997). Self-rated health and mortality: a review of twenty-seven community studies. *Journal of Health and Social Behavior*, 38(1), 21-37.
- Institutes of Medicine, Food and Nutrition (2002/2005). Dietary Reference Intakes: Macronutrients. Retrieved from: http://www.iom.edu/~media/Files/Activity%20Files/Nutrition/DRI/DRI_Macronutrients.pdf
- Johnson, C. L., Paulose-Ram, R., Ogden, C. L. & National Center for Health Statistics. (2013). National Health and Nutrition Examination Survey: Analytic guidelines, 1999–2010. National Center for Health Statistics. *Vital Health Statistics*, 2(161).

- Johnson, R. L., Roter, D., Powe, N. R., & Copper, L. A (2004). Patient race/ethnicity and quality of patient-physician communication during medical visits. *American Journal of Public Health, 94*(12), 2084-2090.
- Jylhä, M. (2009). What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Social Science Medicine, 69*, 307-316.
- Knowler, W. C., Barrett-Connor, E., Fowler, S. E. Hamman, R. F., Lachin, J. M., Walker, E. A., . . . Diabetes prevention Program Research Group (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine, 346*, 393-403.
- Kosaka, K, Noda, M. & Kuzuya, T. (2005). Prevention of type 2 diabetes by lifestyle intervention: a Japanese trial in IGT males. *Diabetes Research and Clinical Practice, 67*, 152-162.
- Krämer, H. U., Rüter, G., Schöttker, B., Rothenbacher, D., Rosemann, T., Szecsenyi J, . . . Raum E (2012). Gender differences in healthcare utilization of patients with diabetes. *American Journal of Managed Care, 18*(7), 362-369.
- Li, G., Zhang, P., Wang, J., Gregg, E. W., Yang, W., Gong, Q., . . . Bennett, P., H. (2008). The long-term effect of lifestyle intervention to prevent diabetes in the China Da Quig Diabetes prevention study: a 20-year follow-up study. *Lancet, 371*, 1783-1789
- Lindström, J., Ilanne-Parikka, P., Peltonen, M., Aunola, S., Eriksson, J.. G., Hemio, K., . . . Finish Diabetes Prevention Study Group. (2006). Sustained reduction in the incidence of type 2 diabetes by lifestyle intervention: follow-up of the Finnish Diabetes Prevention study. *Lancet, 368*, 1673-1679.

Litaker, D., Mion, L. C., Planavsky, L., Kippes, C., Metha N., & Frolkis, J. (2003). Physician-nurse practitioner teams in chronic disease management: the impact on costs, clinical effectiveness, and patients' perception of care. *Journal of Interprofessional Care, 17*(3), 223-237.

National Center Health Statistics. (2015) *National Health and Nutrition Examination Survey, questionnaires, datasets and related documentation*. Retrieved from:
http://www.cdc.gov/nchs/nhanes/nhanes_questionnaires.htm

NCHS Research Ethics Review Board (ERB): Approval National Health and Nutrition Examination, National Center of Health Statistics (NHANES-NCHS), *NCHS Research Ethics Review Board (ERB) Approval*. Retrieved from:
<http://www.cdc.gov/nchs/nhanes/irba98.htm>.

Nelson, A. (2002). Unequal treatment: Confronting racial and ethnic disparities in health care. *Journal of the National Medical Association, 94*, 666-668.

Nielsen, A. B. S, Gannik, D. Siersma, V., & DeFine Olivarius, N. (2011). The relationship between HbA1c level, symptoms and self-rated health in type 2 diabetic patients. *Scandinavian Journal of Primary Health Care, 29*, 157-164.

Otiniano, M. E., Du, X. L., Ottenbacher, K. & Markides, K. S. (2003). The Effect of Diabetes Combined With Stroke on Disability, Self-Rated Health, and Mortality in Older Mexican Americans: Results From the Hispanic EPESE. *Archives of Physical Medicine and Rehabilitation, 84*, 725-730.

- Ramachandran, A., Snehalatha, C. Mary, S., Mukesh, B., Vijay, V, Indian Diabetes Prevention Programme (2006). The Indian Diabetes prevention Programme shows that lifestyle modification and metformin prevent type 2 diabetes in Asian Indian subjects with impaired glucose tolerance (IDPP-1). *Diabetologia*, 49, 289-297.
- Rothman, R. L., Malone, R., Bryant, B., Shintani, A.,K., Crigler, B., Dewalt, D. A., . . . Pigone, M. P. (2005). A randomized trial of a primary care-based disease management program to improve cardiovascular risk factors and glycated hemoglobin levels in patients with diabetes. *American Journal of Medicine*, 118, 276-284.
- Schmitz, N., Gariépy, G., Smith, K. J., Malla, A., Boyer R., Strychar, I, . . . Wang J-L. (2013) Trajectories of Self-Rated Health in People with Diabetes: Associations with Functioning in a Prospective Community Sample. *PLoS ONE* 8(12), e83088.
doi:10.1371/journal.pone.0083088
- Sequist, T. D., Fitzmaurice, G. M., Marshall, R., Shaylevich, S., Marston, A, Safron, D. G., & Ayanian, J. Z. (2010). Cultural competency training and performance reports to improve diabetes care for Black patients. *Annals of Internal Medicine*, 152, 40-46.
- Shalev, V., Chodick, G., Heymann, A. D., & Kokia, E. (2005). Gender differences in healthcare utilization and medical indicators among patients with diabetes. *Public Health*, 119(1), 45-49.
- Sheldon, C., Kaplan, G. A., & Salonen, J. T. (1999). The role of psychological characteristics in the relation between socioeconomic status and perceived health. *Journal of Applied Social Psychology*, 29, 445-468.

- Tsai, J., Ford, E. S., Li, C., Zhao, G., & Balluz, L. S. (2010). Physical activity and optimal self-rated health of adults with and without diabetes. *BMC Public Health*, *10* (365) [online journal] Retrieved from: <http://www.biomedcentral.com/1471-2458/10/365>.
- Tuomilehto, J., Lindström, J. Eriksson, J. G., Valle, T. T., Hämäläinen, H. Ilanne-Parikka, P., . . . Diabetes Prevention Program Research Group (2001). Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine*, *344*, 1343-1350
- Vadstrup, E. S., Frølich, A., Perrild, H., Borg E., & Røder, M. (2011). Health-related quality of life and self-related health in patients with type 2 diabetes: Effects of group-based rehabilitation versus individual counselling. *Health and Quality of Life Outcomes*, *9*(110) Retrieved from: <http://www.hqlo.com/content/9/1/110>.
- Wexler, D. J., Catherine C. Beauharnais, C. C., Susan Regan, S., Nathan, D. M., Cagliero, E., and Larkin, M. E., (2012). Impact of inpatient diabetes management, education, and improved discharge transition on glycemic control 12 months after discharge. *Diabetes Research and Clinical Practice* *98*(2), 249-256. doi:10.1016/j.diabres.2012.09.016.
- Wheeler, M. L., Dunbar, S. A., Jaacks, L. M., Karmally, W., Mayer-Davis, E. J., Wylie-Rosett, J. & Yancy Jr., W. S. (2012). Macronutrients, food groups, and eating patterns in the management of diabetes: a systematic review of the literature, 2010. *Diabetes Care*, *35*, 434-445.
- World Health Survey 2002: individual questionnaire. Geneva: World Health Organization; (2002). Retrieved from: Website: <http://www.who.int/healthinfo/survey/whslongindividuala.pdf?ua=1>

Table 1. Characteristics of US population of Men with Diabetes by Race/Ethnicity

Variable	Mexican Americans	Other Hispanics	Non- Hispanic Blacks	Non- Hispanic Whites	<i>p</i>
	Mean (SE)				
Age	55.0(1.8) ^a	58.7(2.1) ^{a,b}	57.3(.91) ^b	60.5(.78) ^c	.009
Years with diabetes	9.94 (1.2)	11.1 (1.3)	8.45 (0.61)	10.8 (0.70)	.102
	Percent (SE)				
Obesity (BMI \geq 30 kg/m ²)	49.3(7.7)	58.4(6.2)	60.4(3.9)	62.0(3.7)	.299
Married or living with a partner	81.4(4.8) ^a	73.5(6.8) ^a	60.0(5.3) ^b	66.5(3.3) ^b	.044
Education					<.001
< High school	62.3(5.1) ^a	47.7(9.4) ^b	35.9(4.3) ^b	20.1(2.8) ^c	
High school or GED	12.2(4.5) ^a	15.6(5.4) ^a	19.6(4.7) ^a	28.0(4.7) ^a	
Some college	17.5(5.2) ^a	19.6(5.1) ^a	31.7(4.0) ^a	27.3(4.2) ^a	
\geq College degree	8.0(4.1) ^a	17.1(5.4) ^b	12.9(2.6) ^b	24.7(2.5) ^c	
Current smoker (yes)	21.3(6.2)	16.2(5.2)	25.4(3.9)	20.7(2.0)	.624

Covered by health insurance (yes)	64.3(6.2) ^a	85.2(5.3) ^a	74.6(3.7) ^a	92.9(1.3) ^b	<.001
Self-rated health (good to excellent)	13.6(5.0) ^a	16.2(7.0) ^a	12.4(3.1) ^a	26.2(3.8) ^b	.017
Poverty level (yes)	31.8(5.5) ^a	30.6(9.3) ^a	20.0(3.8) ^a	8.1(1.5) ^b	<.001
Glycemic control (A1C ≤8.5)	73.7(4.0)	72.4(9.9)	77.8(4.5)	81.5(2.6)	.392
Ever saw diabetes specialist (yes)	55.2(6.8) ^a	62.1(7.3) ^a	84.9(2.1) ^b	74.7(3.5) ^c	<.001

Note. SE = standard error; BMI = Body mass index; GED = General Equivalency Diploma; A1C = hemoglobin A1c. Columns with the same letter are not significantly different. The test of independence was analyzed by complex analysis. The estimates were based on Chi Squared between groups (race/ethnicity) for categorical variables and the Wald F for age and years diagnosed with diabetes. The results are presented by the estimates: percentage of the population and standard error: *N*= 646 for the unweighted sample. Married or partnered was created by combining the two categories for yes and the other marital status (widowed, divorced, single) was considered as “currently single.”

Table 2. Logistic Regression Analyses Assessing Dietary Factors and Physical Activity with Glycemic Control (A1C \leq 8.5)

Independent variables	Reduced Model		Full Model	
	OR [95% CI]	<i>p</i>	OR [95% CI]	<i>p</i>
Race/ethnicity		.723		.871
Mexican American	0.79 [0.49, 1.28]	.327	0.94 [0.53, 1.63]	.823
Other Hispanic	0.68 [0.21, 2.20]	.511	0.71 [0.21, 2.38]	.570
Non-Hispanic Black	.995 [0.51, 1.93]	.989	1.12 [0.60, 2.07]	.715
Non-Hispanic White (reference)	1.00		1.00	
Adequate fiber (\geq 14 g/1000 Kcal) per day	4.22 [1.77, 10.1]	.002	4.31 [1.82, 10.2]	.002
Adequate saturated fat (\leq 10 grams) per day	0.82 [0.45, 1.48]	.501	0.84 [0.46, 1.53]	.559
Physical Activity	1.05 [0.55, 1.99]	.884	1.11 [0.55, 2.23]	.770

Note: OR = Odds ratio; CI = 95% Confidence interval; Dependent variable = Glycemic control (hemoglobin A1c \leq 8.5). The reduced Model was adjusted for age ($p = .009$). The full model was adjusted for age ($p = .084$), obesity ($p = .340$), smoking ($p = .823$), and health insurance ($p = .134$).

Table 3. Diabetes self-management skills in men with diabetes across race/ethnicity

	MA	OH	NHB	NHW	<i>p</i>
Variable	Percent (SE)				
Adequate fiber (≥ 14 g/1000 Kcal per day)	12.3 (3.6)	12.3 (5.0)	7.3 (2.6)	17.1 (3.5)	.085
Adequate saturated fat (≤ 10 grams per day)	49.0 (5.0) ^a	56.1 (6.8) ^a	48.4 (4.7) ^a	31.3 (3.3) ^b	<.001
Physical activity (work and/or leisure) (yes)	52.5 (5.4) ^a	35.5(7.7) ^a	45.9 (5.3) ^a	62.9 (3.1) ^b	.002
Check feet					.024
never	27.2 (6.2) ^a	37.1 (7.1) ^a	11.9 (3.3) ^b	19.6 (2.9) ^b	
Less than once per week	19.0 (3.8) ^a	23.7 (7.4) ^a	17.9 (5.5) ^a	28.4(3.2) ^a	
Greater or equal to once per week	58.8 (7.1) ^a	39.3 (6.0) ^a	70.2 (7.2) ^b	52.0 (4.2) ^a	
Self-monitoring blood glucose (SMBG)					.007
never	25.7 (5.6) ^a	21.7 (6.7) ^a	17.3 (4.4) ^a	19.8 (3.1) ^a	
Less than once per week	45.4 (8.0) ^a	36.0 (5.9) ^{ab}	29.7 (4.7) ^{ab}	24.9 (2.4) ^c	
Once per week	13.3 (5.0) ^a	14.5 (5.3) ^a	30.3 (4.2) ^a	20.9 (2.2) ^a	
Twice a week or more	15.7 (3.8) ^a	27.8 (6.0) ^a	22.7 (3.4) ^a	34.4 (3.2) ^b	

Eye exam (diabetes) 19.2 (4.7) 19.7 (5.6) 22.4 (3.8) 16.6 (2.3) .506
(yes)

Note: MA = Mexican Americans; OH = Other Hispanics; NHB = Non-Hispanic Blacks; NHW = Non-Hispanic Whites. Columns with the same letter are not significantly different.

Table 4. Logistic Regression Analysis Assessing Seeing a Diabetes Specialist and Glycemic Control (hemoglobin A1c ≤ 8.5)

Variable	Model 1		Model 2	
	OR [95% CI]	<i>p</i>	OR [95% CI]	<i>p</i>
Race/ethnicity		.709		.661
Mexican Americans	0.76 [0.44, 1.32]	.322		.238
Other Hispanics	0.59 [0.17, 2.05]	.395		.384
Non-Hispanic Blacks	1.02 [0.57, 1.82]	.948		.908
Non-Hispanic Whites (reference)	1.00		1.00	
Saw a diabetes specialist (yes)	0.57 [.34, .98]	.042	0.54[0.30, 0.96]	.036

Note: Model 1 adjusted by age ($p = .152$), health insurance ($p = .087$) and smoking ($p = .583$).
 Model 2 adjusted by years with diagnosed diabetes ($p = .043$) and health insurance ($p = .016$) and smoking ($p = .311$).