

Factors Influencing Disease Self-Management Among Veterans with Diabetes and Poor Glycemic Control

Karin M. Nelson, MD, MSHS^{1,2,3}, Lynne McFarland, PhD^{3,4}, and Gayle Reiber, PhD, MPH^{3,4}

¹Primary and Specialty Medical Care Service, VA Puget Sound Health Care System, Seattle, WA, USA; ²Department of Medicine, University of Washington, Seattle, WA, USA; ³Health Services Research and Development, VA Puget Sound Health Care System, Seattle, WA, USA; ⁴Departments of Health Services and Epidemiology, University of Washington, Seattle, WA, USA.

SPECIFIC AIM: Although the Department of Veterans Affairs (VA) has made significant organizational changes to improve diabetes care, diabetes self-management has received limited attention. The purpose of this study is to assess factors influencing diabetes self-management among veterans with poorly controlled diabetes.

METHODS: Surveys were mailed to patients with type 2 diabetes and a HbA1c of 8% or greater who attended 1 of 2 VA Medical Centers in Washington State ($n=1,286$). Validated survey instruments assessed readiness to change, self-efficacy, provider advice, and diabetes self-care practices.

RESULTS: Our response rate was 56% ($n=717$). Most respondents reported appropriate advice from physicians regarding physical activity, nutrition, and glucose monitoring (73%, 92%, and 98%, respectively), but many were not ready to change self-management behaviors. Forty-five percent reported non-adherence to medications, 42% ate a high-fat diet, and only 28% obtained either moderate or vigorous physical activity. The mean self-efficacy score for diabetes self-care was low and half of the sample reported readiness to change nutrition (52%) or physical activity (51%). Individuals with higher self-efficacy scores were more likely to adhere to medications, follow a diabetic meal plan, eat a lower fat diet, have higher levels of physical activity, and monitor their blood sugars ($P<.001$ for all).

CONCLUSIONS: Although veterans with poor diabetes control receive appropriate medical advice, many were not sufficiently confident or motivated to make and maintain self-management changes. Targeted patient-centered interventions may need to emphasize increasing self-efficacy and readiness to change to further improve VA diabetes outcomes.

KEY WORDS: diabetes; diabetes self-management; veterans.
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INTRODUCTION

While the Department of Veterans Affairs (VA) has implemented many organizational changes to improve diabetes care,¹⁻³ less

emphasis has been placed on disease self-management. Although significant improvements in outcomes have been achieved, a large number of veterans still have poorly controlled diabetes. Because disease self-management including medication adherence, nutrition therapy, and physical activity is strongly related to disease control,⁴ information about current diabetes self-management practices is needed to guide quality improvement efforts.

Many factors influence diabetes self-management; however, most models have not been tested among veterans, a unique population with high rates of diabetes, comorbidity and disability.⁵⁻⁷ An individual's "readiness to change," their confidence in being able to make change (or self-efficacy), in addition to appropriate advice from medical providers, may impact diabetes self-management behavior (Fig. 1).^{8,9} Among nonveterans with diabetes, interventions designed to increase self-efficacy have improved quality of life, patient satisfaction, and glycemic control,^{10,11} and recent studies validate readiness to change as an important predictor of dietary behavior,^{12,13} physical activity,¹⁴⁻¹⁶ and improved glycemic control.^{17,18} The purpose of this study is to assess current levels of diabetes self-management and their association with self-efficacy, readiness to change, and provider advice among veterans with poorly controlled diabetes.

METHODS

Study Design

We performed a mailed survey among patients with type 2 diabetes and an HbA1c value of 8% or greater who received primary care at two VA clinics in Washington State. Each patient was mailed an introductory letter, the 50-question survey, and a stamped postcard to return if they declined participation. After the first mailing, a second survey was mailed to nonresponders. Administrative databases were used to ascertain HbA1c, service-connected status, health care utilization, prescription refills, and race/ethnicity. This study was approved by the Institutional Review Board of the University of Washington.

Study Population

The diagnosis of diabetes was based on assignment of the diagnosis (ICD-9 codes 250, 357.2, 362.0, 366.4) during either an outpatient visit or inpatient admission.^{5,19} Eligibility criteria included enrollment in the VA primary care for more than 1 year; 2 or more clinic visits within the year before the study

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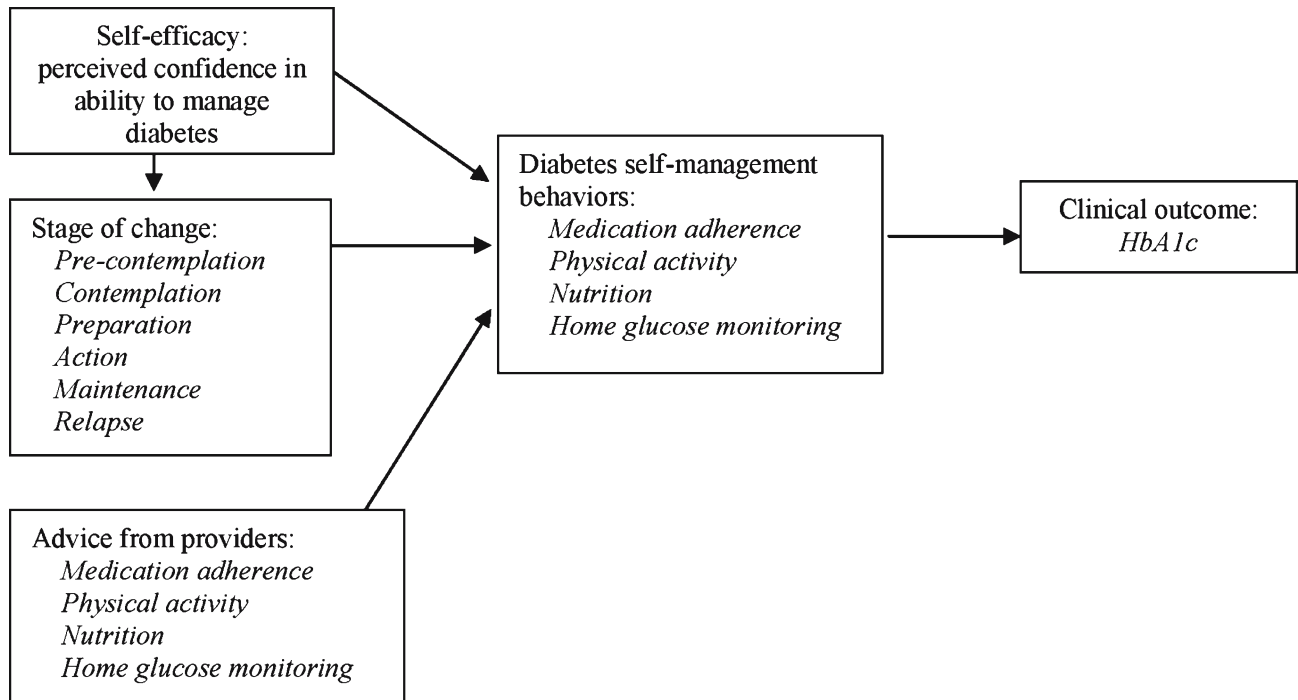


Figure 1. Conceptual model

(June 30, 2003–June 30, 2004); and geographic proximity to two VA clinics in Washington state (zip codes 98001–98951). Patients under the age of 30 were assumed to have type 1 diabetes and were excluded from the study. Of 9,221 patients with diabetes at these two VA facilities, 1,340 (14.5%) were initially identified as eligible for study participation. Of those not eligible for the study ($n=7,881$), 56.4% had HbA1c values of less than 8.0%, 21.6% did not live in the specified zip code range, 18.1% had less than 2 clinic visits in the previous year or were not enrolled in a primary care clinic, and 3.4% died during the study year.

Study Variables

The survey included information on demographics, smoking history, and self-reported health status,²⁰ and used a previously validated measure of comorbidity among veterans.²¹ To measure self-efficacy, we used the Perceived Competence in Diabetes Scale, a validated 4-item scale that assessed respondent’s confidence in their ability to manage their diabetes care (Table 2).¹⁰ For each of the four components, the scale ranged from 1 (not at all true) to 7 (very true). For ease of interpretation, the total score was converted to 0–100.²² Readiness to change health behavior was assessed using validated questionnaires for physical activity and nutrition.^{23,24}

To assess levels of diabetes self-management, we used the Summary of Diabetes Self-Care Activities.²⁵ Respondents reported on the frequency they performed recommended self-care activities over the past 7 days. Items from this scale assess provider advice regarding medication adherence, physical activity, nutrition, and smoking. Medication adherence was measured using a validated index by Choo et al.²⁶ The impact of financial concerns on medication adherence was assessed using the questions from Piette et al.²⁷

Physical activity level was assessed using the Physical Activity Scale for the Elderly (PASE).²⁸ This scale measures total leisure, housework, and occupational activity through a weighted scoring of hours per activity in the previous 7 days. Scores range from 0 to 400, with a higher score signifying more physical activity. The PASE score has construct validity with health status measures and test–retest reliability among older individuals.^{28,29}

The nutritional assessment included the Diet Habits Questionnaire (DHQ) and a short food frequency questionnaire.^{30,31} The DHQ has 21-items that assess five dimensions of low-fat dietary habits: substituting fat-modified food for high-fat foods, modifying meat to be lower in fat, avoiding fried food or fat as a flavoring, and replacing high-fat food with fruits or vegetables. These scales are reliable, sensitive to change, correlate with longer food frequency questionnaires among individuals with type 2 diabetes³² and can classify individuals as eating a high-fat diet.³¹

Data Analysis

We used bivariate analyses to assess the association between self-efficacy, stage of change, and provider advice with diabetes self-care behaviors. We used *t*-tests or analysis of variance (ANOVA) to determine the bivariate association of the self-efficacy score with medication adherence, physical activity, nutrition, glucose self-monitoring and stage of change. Multivariate regression analyses were used to determine the independent association of self-efficacy with self-care behaviors, controlling for age and comorbidity. Multivariate linear regression analysis was used to assess the independent relationship between diabetes self-care behaviors and HbA1c, controlling for age and comorbid disease. Analyses were performed using STATA, version 8.2 (StataCorp, College Station, TX).

Table 1. Population Characteristics and Diabetes Self-Management Among Veterans with Type 2 Diabetes and Poor Glycemic Control, n=717

Variables	Results
Demographics and medical comorbidity	Percentage (%)
Male	96
Age	22
30–54 years	44
55–64 years	34
≥65 years	26
Comorbid conditions	24
COPD, asthma, or bronchitis	18
Myocardial infarction	13
Congestive heart failure	10
Stroke	20
Cancer	56
Smoking status	23
Current	9
Past	33
Never	38
Self-rated health	19
Excellent	1
Very Good	9
Good	33
Fair	38
Poor	19
Diabetes control	
HbA1c %	
Mean ± SD = 9.4 ± 1.5	
HbA1c ≥ 9%, n(%)	358 (50)
Diabetes self-management behaviors	
Medication adherence	
Highly adherent (missed medications 0 days per week)	55
Moderately non-adherent (missed medications 1 day per week)	24
Non-adherent (missed medications 2 or more days per week)	21
Physical activity (prior week)	
Walk outside your home	81
Light physical activity	33
Moderate physical activity	16
Vigorous physical activity	12
Isometric exercise	30
Nutrition	
Follow diabetic meal plan	67
Ate ≥ 5 fruits/vegetables per day/past week	14
Ate no fruits/vegetables per day/past week	22
High-fat diet*	42
Blood glucose self-monitoring	Mean ± SD
Number of times per day monitored blood glucose	2 ± 1
Number of days/week monitored blood glucose	5 ± 2

*Based on Dietary Habit Questionnaire³¹; column totals may vary due to rounding error.

RESULTS

A total of 1,340 surveys were mailed, of which 46 were returned with invalid addresses and 8 individuals were deceased. Of 1,286 eligible potential participants, 114 (9%) returned a postcard refusing participation, 717 (56%) sent back completed surveys, and 455 (35%) did not respond. There were no significant differences in demographics, race/ethnicity, glycemic control, health care utilization or service-connected disability between responders and nonresponders (data not shown).

Population Characteristics and Diabetes Self-Management Behaviors

There were significant levels of non-adherence to medications with one-fifth of respondents missing their medications 2 or more days per week (Table 1). Most respondents reported low levels of

physical activity. The average physical activity score (PASE) was 99.6 (SD 73.4), significantly lower than scores reported in community-dwelling older populations.^{28,33} Although 67% of respondents reported following a diabetic meal plan, 42% of respondents were classified as having a high-fat diet.

Independent Variables: Self-Efficacy, Stage of Change, and Provider Advice

On average, respondents reported low levels of self-efficacy and were not ready to change lifestyle behaviors (Table 2). For both physical activity and diet, one-third of respondents were precontemplative or contemplating a change. The majority of respondents reported provider advice regarding daily, low-level exercise and appropriate recommendations for nutritional

Table 2. Self-Efficacy, Stage of Change and Provider Advice for Disease Self-Management, n=717

Variables	Results
Self-efficacy (perceived competence for diabetes care)*	Mean score
Four components	67.9 (SD ± 25.7); range 14.3–100
Confident in ability to manage diabetes	
Capable of handling my diabetes	
Able to do my own routine diabetes care	
Able to meet the challenge of controlling my diabetes	
Participant Stage of change [†]	Percentage (%)
Physical activity	
Precontemplative	10
Contemplative	17
Preparation	6
Action	22
Maintenance	29
Relapse	16
Nutrition	
Precontemplative	10
Contemplative	23
Preparation	8
Action	22
Maintenance	30
Relapse	7
Provider/physician advice for	
Physical activity	
Daily low level exercise	73
20 minutes exercise	44
Fit exercise into daily routine	43
Specific exercise program	40
No advice reported	27
Nutrition	
Follow a low-fat meal plan	66
Follow complex carbohydrate diet	59
Reduce calories	58
Increase dietary fiber	54
Eat 5 or more fruits and vegetables	59
Limit intake of sweets	81
No advice reported	8
Provider assessed medication adherence	69
Provider advised self-monitoring blood glucose	98

*Range of scores from 0–100, higher score with higher self-efficacy in managing diabetes.⁷

[†]The stages of change assessed are precontemplation: no intention of making a change; contemplation: considering change but not in the immediate future; preparation: solidifying commitment and planning for change; action: engaging in a new behavior; maintenance: sustaining the ongoing practice of a new behavior and relapse: previously engaged, but not currently practicing the health behavior.⁵

Table 3. Association of Diabetes Self-Management and Perceived Competence and Provider Advice, n=717

Self-management behavior	Perceived competence score (range 0–100) (mean score)	Received provider advice (%)
Medication adherence*		
Highly adherent	74.2	67
Moderately non-adherent	66.3	68
Non-adherent	47.8 [†]	76
Physical activity		
Walking for exercise	69.8	82
No walking	53.9 [†]	65 [†]
Nutrition		
Follow diabetic meal plan	70.5	97
Does not follow diabetic meal plan	60.0 [†]	83 [†]
High-fat diet [‡]	59.1	90
Lower fat diet	72.4 [†]	94 [§]

*Choo's Index of Medication Adherence.²⁶

[†]P<0.001.

[‡]Diet Habits Questionnaire (DHQ).³¹

[§]P<0.05.

intake. Most participants reported that their health care provider asked about medication adherence (69%) and recommended self-monitoring blood glucose (98%).

Association of Self-Efficacy, Stage of Change, and Provider Advice with Diabetes Self-Management

Individuals with higher self-efficacy scores or who reported provider advice were more likely to be adherent to medications, walk for exercise, follow a diabetic meal plan, and eat a low-fat diet (Table 3). Individuals in an action or maintenance stage of change for nutrition had lower HbA1c levels (P<0.001), were more likely to report provider advice regarding diet (P<0.001), and had higher self-efficacy scores (P<0.001) (Fig. 2). Individuals who relapsed with their diets had significantly higher HbA1c levels (P<0.001) and lower self-efficacy scores (P<0.001). Individuals in the relapse stage for physical activity had higher HbA1c levels (P<0.05), were less likely to report provider advice regarding physical activity (P<0.001), and had lower self-efficacy scores (P<0.001).

In multivariate models for each diabetes self-management practice, the self-efficacy score was independently associated with following a meal plan, physical activity score (PASE), adherence to medication, and daily glucose self-monitoring, controlling for age and comorbidity (data not shown). In a multivariate linear regression model controlling for age and comorbidity, non-adherence to medications was the strongest independent predictor for a higher HbA1c [Odds ratio (OR)=1.42, 95% C.I.=1.31, 1.55]. Protective factors that were significantly associated with lower HbA1c levels included moderate to vigorous exercise (OR=0.80, 95% C.I.=0.64, 0.99) and following a diabetic meal plan (OR=0.71, 95% C.I.=0.57, 0.89).

DISCUSSION

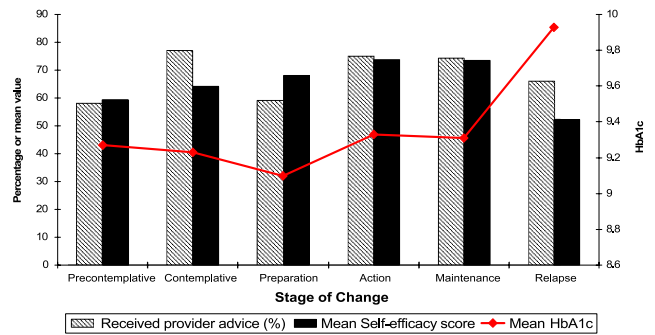
In our study of veterans with poor glycemic control, we found suboptimal diabetes self-management practices similar to

levels reported in the nonveteran population.^{34–41} Despite appropriate provider advice, a significant number of respondents reported limited confidence in their ability to manage their diabetes and were not sufficiently motivated to make behavior changes. Although the majority of respondents perform home glucose monitoring, they may not take appropriate action with this information, as evidenced by their poor glycemic control.

Although the VA has been very successful at implementing many organizational features to improve diabetes care,² less emphasis has been placed on supporting patient diabetes self-management. The VA has implemented an electronic medical record and electronic prescriptions, chronic disease registries, provider feedback, and decision support with national guidelines.¹ Although there is evidence that the quality of care at the VA is high,^{3,42} diabetes outcomes are still not optimal. The VA quality improvement organization identifies diabetes self-management as a key element to improve clinical outcomes.⁴³ Ours is one of the first studies to look specifically at potential barriers to veteran diabetes self-management in a high-risk population.

Studies of collaborative, patient-directed disease self-management programs among nonveterans have more favorable outcomes than traditional diabetes education programs.^{44,45} Self-efficacy theory and the stage of change model has been used as a framework to design interventions to increase physical activity and improve nutrition and glucose control among individuals with type 2 diabetes, but none, to our knowledge, have studied behavior change among veterans.^{12,15,17,46,47} Our findings that HbA1c is

Associations between Physical Activity Stage of Change, Self-efficacy, Provider Advice and HbA1c



Associations between Nutritional Stage of Change, Self-efficacy, Provider Advice and HbA1c

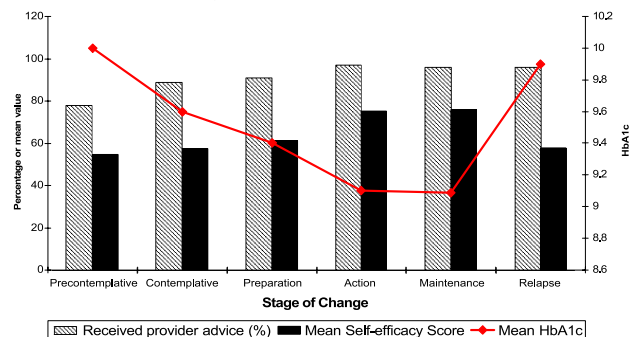


Figure 2. Stage of change, self-efficacy, provider advice and HbA1c

reduced among individuals in an action or maintenance stage of change and among those with higher levels of self-efficacy support the hypothesis that outcomes among veterans may be improved by focusing on these patient-related factors.

Our study has several limitations. The data are cross-sectional, and causality cannot be assumed. Data on medication adherence, nutritional intake, and physical activity were obtained by self-report and may be limited by recall and other biases. Although the survey did not collect data on type of medications, duration of diabetes, and several comorbid conditions, data is available from several national surveys. Most veterans with diabetes use oral medications (69%), 25% use insulin, and 6% do not use any medications.⁷ In a survey of 1,593 patients with diabetes in 14 VA facilities, 95.5% had type 2 diabetes, 37% had diabetes for 5 years or less, two-thirds had hypertension, and 22% reported depression.³⁸ Ten percent of veterans with diabetes have comorbid renal disease.⁴⁸ We do not have information about psychiatric comorbidity in our population, but given the high rates of depression and other psychiatric disorders among veterans, this may impact diabetes self-management.^{49,50} Our study population with poor glycemic control represented 15% of the veterans with diabetes at the two VA facilities; however, our surveyed population had similar demographics to the general veteran population with diabetes.^{5-7,34,51} Our study population was predominantly older men; thus, results may not apply to women or younger individuals. The results of this study may be generalizable to other veteran populations and other populations where the patient demographics are similar, such as males enrolled in Medicare.⁵²

Although our population had available health care and diabetes education programs and received appropriate medical advice about diabetes self-management, veterans with poor glycemic control were found to be lacking in self-efficacy and were not appropriately motivated to make changes in health behaviors. The high level of medication non-adherence and the unhealthy lifestyles reported by our sample suggest that interventions aimed only at provider behavior may not be effective. Targeted patient-centered interventions, specifically to increase self-efficacy and readiness to change health behaviors, may be needed to achieve further gains in VA diabetes outcomes.

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Corresponding Author: Karin M. Nelson, MD, MSHS; 1660 South Columbian Way, S-111-GIMC, Seattle, WA 98108-1597, USA (e-mail: Karin.Nelson@va.gov).

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