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DIABETES CARE AMONG VETERAN WOMEN WITH DISABILITY

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Abstract

Objective— The primary objective of this study was to analyze predictors of diabetes care consistent with performance standards among women Veterans Health Administration (VHA) clinic users with disability enrollment status.

Methods— This is a retrospective cohort study using VHA and Medicare files of VHA clinic users with diabetes. Diabetes care measures consisted of annual testing for hemoglobin A_{1c} (>9%) and LDL-C (HbA_{1c}), low-density lipoprotein cholesterol (LDL-C), and poor HbA_{1c} (≥130 mg/dL) control in fiscal year 2000. Chi-square tests and logistic regressions were used to assess subgroup differences in diabetes care. Independent variables included demographic characteristics and physical and psychiatric comorbidities.

Population— Study population was based on veteran women <65 years of age who used VHA clinics; we identified 2,344 women as having coexisting disability and diabetes and 2,766 women with diabetes and without disability.

Findings— Among veteran women with diabetes and disability, 65% received ≥1 HbA_{1c} test, and 54% received a LDL-C test; 25% and 30% had poor HbA_{1c} and LDL-C control, respectively. In logistic regressions, none of the independent variables had significant effects on poor HbA_{1c} or LDL-C control, except that African Americans were more likely to have poor HbA_{1c} control than whites. Significant age effects were noted in rates of HbA_{1c} and LDL testing. Comparison of diabetes care measures between women with and without disability indicated that those with disability were more likely to receive HbA_{1c} and LDL-C tests; no significant differences in HbA_{1c} and LDL-C control were noted.

Conclusions— Disability status of women veterans was not a barrier to diabetes care consistent with performance standards. Our findings suggest that to improve diabetes care, subgroup-specific interventions, rather than a global approach, are warranted.

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Introduction

The cooccurrence of disability and type II diabetes mellitus is becoming very common (Gregg & Brown, 2003). As the duration of diagnosed diabetes increases, there is greater likelihood that nerve, eye, or physical impairments will occur that lead to disabilities (American Diabetes Association, 1995). Conversely, the longer a person lives with a disability, the greater the likelihood that type II diabetes will develop as a result of the aging process (US Department of Health and Human Services, 1996). Although the relationship between diabetes and disability is complex and multifaceted, the coexistence of type 2 diabetes and disabilities may result in higher cost (Weiner et al., 2003;Yassin et al., 2002) and long-term health risks, which may result in excess mortality (Blaum et al., 2005).

Unfortunately, studies on quality of care among individuals with disabilities and chronic illness, specifically in individuals with diabetes, have been scarce. Research in this area has been hindered by suitable measures of quality of care (Fiscella, 2003). The few available studies that focus on Medicare beneficiaries show lower rates of diabetes care process measures (hemoglobin A_{1c} [HbA_{1c}] tests, eye examinations, and lipid profile tests) among disabled beneficiaries compared to elderly Medicare beneficiaries (Arday et al., 2002;Massing et al., 2003). For example, 48.5% of the disabled individuals did not receive a lipid profile (Arday et al., 2002). Even after adjusting for other characteristics, disabled Medicare beneficiaries in the age group 55–64 years were 20% less likely to receive HbA_{1c} tests or lipid tests compared to older Medicare recipients (Massing et al., 2003).

An adequate understanding of diabetes care and disability requires the separate study of women with disabilities because among women, significant associations between diabetes and mobility problems have been specifically reported (Gregg et al., 2002; Volpato et al., 2002,2003). Women with diabetes have higher rates of disability than men (Songer, N.D.). Furthermore, working women with diabetes have higher rates of work-related disability than working men (Mayfield, Deb, & Whitecotton, 1999). In the study, *work-related disability* was defined as a self-report of having been unable to work because of illness or disability. The study of diabetes care among women veterans may be especially important because of the high prevalence of diabetes in the veteran population in general (Miller, Safford, & Pogach, 2004).

To our knowledge, there are no studies on diabetes care among younger (<65 years of age) women with diabetes and disability. Therefore, the primary objective of this study was to assess diabetes care process measures and the intermediate outcomes of diabetes care consistent with performance standards during the observation period among veteran women with diabetes. In addition, we compared these performance measures between women with and without disability after controlling for relevant demographic and health characteristics. Evaluating diabetes care in this unique population is essential to developing interventions aimed at achieving equity and improving the quality of diabetes care.

Methods

Data

The dataset used in this study is derived from the Veterans Health Administration's (VHA) national *Diabetes Epidemiologic Cohort* (DEpiC) database (Miller et al., 2004). DEpiC is a merged research dataset of information from the VHA and the Medicare claims for all VHA patients with diabetes. Briefly, the dataset contains all VHA users with possible diabetes from fiscal year (FY) 1997 onward. Patients with diabetes were identified using 2 inpatient or outpatient *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes indicative of diabetes or the prescription of antiglycemic specific

medication. Details of the identifying algorithm and sensitivity and specificity of algorithm used in the study can be found elsewhere (Miller et al., 2004).

For the present study, we used a cohort of veterans with diabetes during FY1999 and followed through the end of FY2000. Demographic information was derived from both the VHA National Patient Care Data (NPCD) files and from the Medicare denominator files. We used claim files from Medicare (MED-PAR) Physician/Supplier and Outpatient Institutional files and the administrative data from NPCD inpatient and outpatient clinics for quantifying utilization and comorbidity information.

Identification of veteran women with disability

There are a variety of definitions of disability and no uniform or gold standard definition has been established (Altman, 2001;Freedman, Martin, Schoeni, Martin, & Schoeni, 2004;McNeil, 1997). Although some studies define disability in terms of functional limitations in activities of daily living (Findley & Sambamoorthi, 2004), presence of a condition such as multiple sclerosis (Cheng et al., 2001), and mobility limitations (Iezzoni, McCarthy, Davis, & Siebens 2000), we have defined disability in terms of eligibility for government health insurance programs. Disability status was measured using VHA enrollment priority groups (VHA, 2006) and Medicare enrollment. All veteran women under the age of 65 and 1) enrolled in Medicare Fee-for-Service (FFS) or 2) with a priority status 1 (service connected disability of ≥50% or not employable owing to service connected disability) or priority status 2 (service connected disability between 30% and 40%) in VHA enrollment files were classified as individuals with disability. We used Medicare enrollment for those under age 65 as an indicator of disability status; for adults between the ages of 18 and 64 years, Medicare eligibility is tied to Social Security Disability Income (SSDI) eligibility. It has to be noted that individuals under age 65 with qualifying work histories may receive SSDI benefits owing to a severe physical or mental impairment (US Social Security Administration, N.D.).

Study population

The analytical population for our primary objective consisted of women veterans with diabetes under age 65 and alive at the end of FY2000. Among women VHA clinic users who were Medicare enrolled, we restricted our analysis to FFS enrollees (FFS enrollment during FY1999 and FY2000), because data for these Medicare managed care participants are not yet available. We excluded decedents to ensure a uniform exposure period for all the veterans in the study population. Deaths were identified using the VHA Beneficiary Identification and Records Locator Subsystem and the Medicare Denominator File (Cowper, Kubal, Maynard, & Hynes, 2002;Page et al., 1996).

Of 5,854 veteran women with diabetes and under 65 years of age, we excluded 34 women who were Medicare eligible owing to end-stage renal disease because they are a special subpopulation. Of these women, 2,626 women qualified for VHA care through service-connected disability (VA priority group 1 or 2) or through enrollment in Medicare FFS owing to disability. We then further removed 48 women who died in FY2000. We also excluded 234 patients with missing covariates (physical comorbidity [n = 18]; race/ethnicity [n = 126]; marital status [n = 62]; not mutually exclusive). We also excluded those of “Other Races” (Asians, Pacific Islanders, American Indians, etc.) because sample sizes were too small (n = 45) for any meaningful analysis. The final study population consisted of 2,344 veteran women with diabetes and disability between 18 and 64 years old.

Measures

We utilized the diabetes care measures that were first developed by Diabetes Quality Improvement project (Fleming et al., 2001). These performance measures consist of 1) receipt

of ≥1 HbA_{1c} test in a year; 2) having HbA_{1c} levels > 9.5%; 3) receipt of test for lipid profile once in 2 years; 3) having low-density lipoprotein cholesterol (LDL-C) levels ≥130 mg/dL; and 5) receipt of an annual dilated eye examination.

We used these measures with the slight modification of the LDL-C testing based on a single year period, rather than a 2-year period (National Committee for Quality Assurance, 2003). For HbA_{1c} control, we chose the 9.0% cutoff point because it is the current public reporting measure for HbA_{1c} levels (National Committee for Quality Assurance, 2003). We did not assess other aspects of diabetes care, such as screening for foot risk factors, nephropathy status, or blood pressure control.

Dependent variables: Diabetes process of care measures The process measures included receipt of ≥1 test for HbA_{1c}, LDL-C levels, or eye examination in FY2000 and were derived from VHA Health Analysis Information Group (HAIG) data laboratory reports and/or from the *Current Procedural Terminology* (CPT) codes from Medicare Physician/Supplier and Outpatient Institutional files. For HbA_{1c} tests, the CPT codes were 83036, 82985, and 82962; for LDL-C tests the codes were 83716, 83721, 80061, 80062, 82465, 83718, and 84478. Eye examinations in the VHA were defined by Clinic Stop codes 407 and 408. In Medicare, eye examinations were defined by CPT, ICD-9-CM procedure and diagnosis, and physician specialty codes.

Dependent variables: Intermediate outcomes of diabetes care The intermediate outcomes used for the analysis were the last reported HbA_{1c} and LDL-C values from the VHA HAIG data in FY2000. Because Medicare claims do not contain information on the results of tests, the study population was restricted to veterans who had their HbA_{1c} and LDL-C tests completed at VHA facilities and had no missing values for HbA_{1c} (n = 1,398) and LDL-C levels (n = 1,104).

Independent variables—It has to be noted that all the independent variables were measured as of FY1999 to ensure that these were measured prior to the measurement of dependent variables. *Demographic characteristics* included race/ethnicity (white, African American, or Latina), age (<45, 45–49, 50–54, 55–59, or 60–64 years), marital status (married, widowed, divorced/separated, or never married) and area of residence. The urban/rural continuum of a woman's residence was determined by ZIP code/county of subject residence using the Urban Influence Coding scheme (Larson & Fleishman 2003). This measure is a 10-level summary variable with the value 0 representing the most urban areas and the value 9 representing the most rural areas. Nearly 2.4% of disabled women had missing data on urban/rural continuum; for these women, we substituted the mean of this variable. Our preliminary analysis revealed that this variable was not significant in any of the models and inclusion of this variable did not affect other independent variables. Therefore, for the final analysis this variable was dropped.

Access to care consisted of the use of Medicare FFS system for those with enrollment in the VHA and Medicare. The dual use of VHA and non-VHA care is common among veterans (Borowsky & Cowper, 1999; Reiber et al., 2001; Wright, Daley, Fisher & Thibault, 1997). Therefore, we controlled for VHA and Medicare system use with the percentage of Medicare face-to-face visits to total number of face-to-face visits made during FY1999. We categorized this variable into 4 groups: 1) no use (0 visits to Medicare providers); 2) low use (>0–25%); 3) moderate use (25–75%); and 4) predominant use (>75%).

Health status was measured by the Charlson Comorbidity Index (CCI) for physical comorbidities and Selim Mental Health Index for psychiatric comorbidities. The CCI is a risk-adjustment measure that is primarily based on ICD-9-CM diagnosis codes. The CCI is not an exhaustive list of all possible comorbid conditions, but is rather a weighted index of 19 selected

disease categories that are associated with mortality and other important health outcomes (Charlson, Pompei, Ales, & MacKenzie, 1987;Deyo, Cherkin, & Ciol, 1992). The overall comorbidity score reflects the burden of comorbid conditions, with higher scores indicating more severe burden of comorbid illness. We classified physical comorbidity into 4 categories based on CCI scores: 1) none (0); 2) low (1 and 2); 3) moderate (3 and 4); and 4) severe (≥5). In multivariate analyses, the continuous scale of this variable was used as a predictor.

The Selim Mental Health Index score is a summary of presence of six mental conditions (Selim et al., 2004). These conditions were based on ICD-9-CM codes and included anxiety, depression, bipolar disorder, schizophrenia, posttraumatic disorder, and substance abuse disorder. These conditions were selected from the medical history questionnaires in the Medical Outcomes Study and were screened for prevalence in veteran populations.

An additional covariate included was source of disability identification. It was categorized into 3 groups (Medicare only, VHA only, and both).

Statistical techniques

χ^2 tests were used to assess unadjusted subgroup differences in process of diabetes care measures and intermediate outcomes of diabetes care. We used logistic regression models to investigate the predictors of diabetes care and reported the results at 95% confidence intervals (CI). All our regressions on women with disability included race/ethnicity, age, marital status, physical comorbidity, psychiatric comorbidity, Medicare utilization, and source of disability identification as independent variables. These variables are also interchangeably referred to as independent variables, covariates, or control variables. Although our study includes several dependent variables, as suggested by Rothman, to minimize errors of interpretation, we do not adjust for multiple comparisons but report *p*-values at .01, .05, and .10 levels (Rothman, 1990).

Findings

Of the 2,344 disabled women, 72% (*n* = 1,694) were identified as having a disability through service connected disability categories—priority status 1 or 2 (552 were identified as disabled through VHA priority status 1 or 2 and Medicare enrollment), and 28% (*n* = 650) were identified as being disabled through Medicare enrollment but not VHA priority status. Of the 1,202 veteran women with Medicare enrollment, a substantial percentage (54%) of these dually enrolled women relied only on VHA for their care during FY1999. Only 6% of the study women used Medicare predominantly, defined as having ≥75% of the total face-to-face visits in FY1999 at Medicare physicians or outpatient clinics.

The study population was 64% white, 32% African Americans, and 4% Latina (Table 1). The mean and median age of women with disability were both 48 years. Fifty-eight percent of the disabled women had at least 1 of the 6 mental conditions as measured by Selim Mental Health Index. Only 5% of the study population did not have any physical comorbidity burden and 6% of the disabled women had severe comorbidity burden, as defined by the CCI.

Table 2 displays the unadjusted rates of having at least one HbA_{1c} test, LDL-C test, and eye examination by characteristics of the study population. We also present 95% CIs around these rates for comparison with other published studies. Overall, 65% of the disabled veteran women were tested for HbA_{1c} values in FY2000 and we found significant group differences in rates of testing by race/ethnicity, age, physical comorbidity, and Medicare utilization. A marginally significantly (*p* = .06) higher percentage of white women (65%) than Latinas (54%) received HbA_{1c} tests. Older women were more likely to receive HbA_{1c} tests than younger women. For example, 73% women in the age group 60–64 years were tested compared to 59% of women

<45 years of age. These findings remained significant in multivariate analysis (Table 3). Latinas were 37% less likely than white women to receive a HbA_{1c} test. Based on the multivariate analysis (see Table 3), for women in the age group 60–64 years of age compared to those <45 years old, the adjusted odds ratios of receiving HbA_{1c} tests was 1.67 (95% CI = 1.19, 2.34). Additionally, each unit increase in physical comorbidity index was associated with significantly higher odds of HbA_{1c} testing.

Fifty-four percent of veteran women with diabetes and disability received ≥1 LDL-C test during FY2000 (see Table 2). Again, we observed significant associations between age, physical comorbidity, and Medicare utilization and receipt of LDL-C tests. A significantly higher percentage of women in the age group 60–64 years (65%) were tested for LDL-C compared to only 46% of women in the <45 years age group. Similarly, a lower percentage of disabled veteran women who had no Medicare utilization (50%) received an LDL-C test compared to women who relied on Medicare predominantly (68%). Further exploration of the data on the site of testing (VHA versus Medicare) indicated that an overwhelming majority of those having LDL-C tests received them in the VHA setting (88%). All these bivariate findings remained significant in the multivariate analysis as well (see Table 3). The adjusted odds ratio of having an LDL test for women in the age group 60–64 years compared to those <45 years old, was 2.06 with a 95% CI of 1.50 and 2.84.

In bivariate analyses, physical comorbidity was associated with receipt of eye examination. However, none of the independent variables were significant in the multiple logistic regression on receipt of an eye examination. Therefore, in this paper we do not report the results from logistic regression on having an eye examination for veteran women with disability.

Among veteran women with disability who had their HbA_{1c} tests and LDL-C tests in the VHA and for whom laboratory values were available, we also examined variation in intermediate outcomes (Table 4). Of the study population, 25% had poor HbA_{1c} control, defined as >9% HbA_{1c} values. As in the case of HbA_{1c} tests, we observed significant racial disparities among women who had poor HbA_{1c} control. A significantly higher percentage of African American women than white women (34% versus 20%) had poor HbA_{1c} control. Even after controlling for other covariates, African American women were nearly twice as likely as white women to have poor HbA_{1c} control (see Table 4). Although age and physical comorbidity were significantly associated with poor glycemic control, these became insignificant after controlling for other covariates (see Table 4).

None of the independent variables were associated with poor LDL-C control, defined as having LDL-C values ≥130 mg/dL. Therefore, we do not present results for this outcome from the multivariate analysis.

Gender, disability, and diabetes care

To explore whether the diabetes care performance measures are related to gender or disability, we also conducted 2 additional sets of analyses. In the first set, we assessed whether gender is associated with the diabetes care measures on all VHA users with disability (total N = 76,874 with 2,344 women and 74,530 men). We used the same disability definition for men as well. In the second set, we assessed whether disability is associated with diabetes care measures on all VHA women veterans aged <65 years (total N = 5,110 with 2,344 with disability and 2,766 without disability). For both sets of analyses, we performed separate logistic regressions on each of the diabetes care measures by including all independent variables listed in the Measures section and gender for the first set of regressions and disability for the second set.

Table 5 summarizes results from these additional regressions that we performed to explore associations between diabetes care performance measures and gender and disability. In the

logistic regressions for all VHA users with disability, we found that women were 13% more likely to receive LDL-C tests but were 16% more likely to have poor LDL-C control than men. Women were equally likely to receive HbA_{1c} tests and less likely to have poor HbA_{1c} control than men.

In the multiple regressions for all women VHA users, the results indicated that women with disability were more likely to receive both HbA_{1c} and LDL-C tests compared to women without disability. The adjusted odds ratio for HbA_{1c} test was 1.14 and for LDL-C testing it was 1.15. We did not observe any significant differences in HbA_{1c} and LDL-C control by disability status.

Discussion

Our key finding is that the disability was not a barrier for diabetes care as measured by performance standards; in fact, veteran women with disability were more likely to receive recommended tests compared to veteran women without disability. These findings are consistent with prior reports of systematization of care for diabetes within the VHA (Jha, Perlin, Kizer, & Dudley, 2003;Kerr et al., 2004). It may also reflect the use of the VHA as a system of care whose mission is to care for disabled veterans (Wilson & Kizer, 1997).

We observed that women with disability were more likely to have LDL-C testing and less likely to have poor HbA_{1c} control compared to men with disability, suggesting that gender is not associated with poor care among veterans with disability. This may also reflect the increased emphasis of integrating women's care in a predominantly male-oriented system. However, we found that women with disability were more likely to have poor LDL-C control than men with disability, which is consistent with another study on general veterans (Tseng et al., 2006). Therefore, further emphasis needs to be placed on better LDL-C control for women.

Among women veterans with disability, a noteworthy finding is the lack of demographic, socioeconomic, and health status predictors on HbA_{1c} control and LDL-C control, except for the association between the African-American race and poor HbA_{1c} control. However, these findings on racial differences are not exclusive to veteran women with disability. Prior literature in the general population (Harris, 2001;Harris et al., 1999;Sequist, Adams, Zhang, Ross-Degnan, & Ayanian, 2006) have reported racial differences on diabetes outcomes or care. Thus, our findings add to the larger body of literature that suggests racial differences persist in some diabetes process of care measures and outcomes (Brown et al., 2005;Harris, 2001;Harris et al., 1999;Heisler, Smith, Hayward, Krein, & Kerr, 2003;Sequist et al., 2006).

We did not find a significant association between urban/rural continuum and diabetes care among women with disability (data not shown). A comprehensive literature review documents substantial access problems to appropriate health care among individuals with disabilities in the rural areas (Lishner, Richardson, Levine, & Patrick, 1996). Rural women with disabilities may face additional cost, a lack of transportation, and other barriers to treatment for chronic diseases (The Rural Women's Work Group, 2006). Among patients with diabetes, rural residents do not receive the same services for diabetes care as their urban counterparts (Dansky & Dirani, 1998;Zgibor & Songer, 2001). Lack of rural/urban differences in our study might suggest that VHA patients with disability may not face some of the access barriers such as availability of necessary providers as a result of access to the VHA system of Community Based Outpatient Clinics (Weeks, Mahar, & Wright, 2005) in many areas.

Among women with disability, we found that older veteran women were more likely to be tested for HbA_{1c} and LDL-C values, although our overall rates of testing (HbA_{1c}, 65%; LDL-C, 54%) are comparable to those found in Medicare beneficiaries with disability. For example, 62% and 49% of the disabled Medicare beneficiaries received HbA_{1c} tests and lipid profile

respectively (Arday et al., 2002). Similarly, we found that 25% of our study population had poor HbA_{1c} control, consistent with the rates found in a nationally representative study of the US population (Saaddine et al., 2006). It is possible that the age discrepancies could be related to factors that cannot be ascertained in this study, such as the proportion of individuals with type I diabetes or duration of type II diabetes, or to unmeasured socioeconomic or position variables (Brown et al., 2005). The observation that among women with disability younger women were less likely to be tested is intriguing, and suggests the possible role of other factors such as health literacy; further research in this area is needed.

In our study, the percentage of women receiving eye examinations was 33%, which is comparable to earlier studies (Jones et al., 2000). Because elderly veterans with diabetes have been noted to receive a large percentage of their eye care in FFS Medicare as opposed to the VHA, it is possible that our findings may reflect differential usage of private sector services not captured by paid claims and VHA administrative data. Medicare did not reimburse ophthalmologists for preventive eye care until 2000, when it initiated the National Eye Care Project, a program for voluntary, free screening of patients with diabetes who had not had an eye examination in the previous 3 years (Centers for Medicare & Medicaid Services, 2006). However, Brown et al. (2005) have found that receipt of eye examinations was sensitive to socioeconomic status with managed health care plans, even when access was equal. In addition, it has to be noted that our study used presence or absence of annual examination rather than biennial eye examinations measured in other studies.

Results from our study need to be interpreted with caution. Our study cannot be generalized to the entire veteran women population because most of the veteran women do not use the VHA system (Hoff & Resenheck, 1998; Sambamoorthi, Findley, & Wei, 2005). Our study lacked some important covariates such as health literacy that have been shown to affect diabetes outcomes (Schillinger et al., 2002). In addition, we were not able to determine whether women with disabilities were Medicaid eligible or had private insurance coverage and, therefore, care provided in these sectors was not captured. Also, there were only 92 Latina women studied, so the results for this group may need to be interpreted carefully.

In conclusion, in the VHA setting, we did not find disability to be a barrier for diabetes care among veteran women. However, subgroup differences by age in testing and by race/ethnicity in HbA_{1c} testing and outcomes among disabled women suggest that subgroup-specific interventions may be needed to improve diabetes care. This is also consistent with a larger body of literature suggesting the lack of efficacy of global quality improvement programs for diabetes and hypertension (Grant et al., 2004;Murray et al., 2004;O'Connor et al., 2005).

We recommend that quality improvement efforts for veteran women with disability especially target younger women for improving diabetes care process measures such as HbA_{1c} and LDL-C testing and African American women for improved HbA_{1c} control. It may be necessary, as proposed by others, to evaluate age and culturally appropriate psychosocial interventions (Adams et al., 2005).

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Biographies

Ms. Mangala Rajan worked in the industry dealing with large marketing database before working with Dr. Pogach at the VHA in NJ. Her extensive experience with large databases

gave her the tools required to consolidate and analyze data from a variety of sources within the VA and from CMS (Medicare). She works with investigators for their analytic needs and manages a team of programmers/analysts.

Dr. Patricia A. Findley holds a Doctorate of Public Health and a Master's Degree in Social Work. Her current research and interests include chronic illness, women's health issues, cancer survivorship, health-care utilization and access for individuals with disabilities living in community-based settings, barriers related to vocational re-entry by individuals with disability, and policy implications of health and continued care of individuals with chronic illnesses and diabilities.

Dr. Pogach is a clinician-administrator-researcher and has devoted his career to improving diabetes care. He has been the VHA-Patient Care Services National Program Director for Diabetes since 1993 and is currently the Chair of the VHA-DOD Diabetes Guideline working group, and represents the VHA on multiple Federal interagency committees. He has been the director of the VA New Jersey Healthcare System Center for Healthcare Knowledge Management (CHeKM) since 2003. His current research interests include the use of large adminstrative data sets to evaluate quality of care and prevention quality indicators among veterans with diabetes.

Dr. Chin-Lin Tseng is a health service researcher with doctoral degrees in Sociomedical Sciences and Biostatistics. She joined the research teams at East Orange VA Hospital in 2002. She has since worked on various projects related to diabetes care with publications in peer-reviewed journals. Her current research and interests include ambulatory care, foot care, lower extremity complications, diabetes related complications, gender and health, mental health, risk adjustment, and longitudinal data analyses.

Dr. Sambamoorthi is an applied health services researcher with doctoral-level training in economics. She has over 20 years of experience in healthcare and has peer-reviewed publications in many areas including chronic physical (HIV, diabetes) and mental illness care, disease management, pharmacotherapy, pharmacoeconomics, healthcare expenditures, clinical preventive services, healthcare issues among vulnerable groups of the population such as women, racial minorities, and the elderly. Her research has been both methodological and substantive. She is committed to moving forward the research agenda on women veteran's health.

Dr. Anjali Tiwari works with Ms. Mangala Rajan to meet investigators' analytic needs and provides analytic support for grant, abstract, and manuscript submission. She participates in clinical and pharmaceutical research projects for various diseases, quality of healthcare and risk factor analysis. She is a co-author on several publications.

Table 1

Characteristics of women veterans with diabetes and disability who were clinic users of Veterans Health Administration—fiscal 2000

	Study Population	
	n	**%**
All	2,344	100
Race/ethnicity		
White	1,505	64
African American	747	32
Latina	92	4
Age (y)		
<45	789	34
45–49	548	23
50–54	455	19
55–59	304	13
60–64	248	11
Marital status		
Married	796	34
Single	577	25
Divorced/separated	857	37
Widowed	114	5
Physical comorbidity (CCI)		
None	127	5
Low (1–2)	1,608	69
Moderate (3–4)	469	20
Severe (≥5)	140	6
Psychiatric comorbidity		
Yes	1,364	58
None	980	42
Medicare utilization		
None	1,856	79
30–325%	144	6
25–375%	196	8
≥75%	148	6
Source of disability identification		
Medicare	650	28
VA and Medicare	552	24
VA	1,142	49

Notes: Based on veteran women with diagnosed diabetes, aged < 65 years who were alive as of the end of fiscal 2000 and qualified for either Medicare or VHA health insurance through disability.

Abbreviations: CCI: Charlson comorbidity index; VA, Veterans Administration.

Percentages do not add up to 100% owing to rounding effects.

Table 2

Unadjusted percentages on diabetes process of care measures among veteran women with diabetes and disability—fiscal 2000

	Received HbA_{1c} Test		Received LDL-C Test		Received Eye Examination	
	%	95% CI	%	95% CI	%	95% CI
All	65	63–67	54	52–56	33	31–35
Race/ethnicity	*c*					
White	65	63–68	55	52–57	34	31–36
African American	65	61–68	51	47–55	31	28–34
Latina	54	43–63	59	49–69	33	23–42
Age y	*a*		*a*			
<45	59	56–62	46	42–49	31	28–35
45–49	64	60–68	53	49–57	34	30–38
50–54	67	63–71	59	55–64	34	30–38
55–59	68	63–74	58	53–64	32	27–37
60–64	73	68–79	65	59–71	33	27–39
Marital status						
Married	67	64–70	52	48–55	35	32–39
Single	62	58–66	52	47–56	32	28–35
Divorced/separated	64	60–67	56	53–59	31	28–34
Widowed	68	60–77	59	50–68	34	26–43
Physical comorbidity CCI	*a*		*a*		*a*	
None	28	21–36	36	28–45	17	10–23
Low 1–2	66	63–68	53	50–55	34	32–36
Moderate 3–4	70	65–74	56	52–61	33	29–37
Severe ≥5	69	62–77	69	61–76	32	24–40
Psychiatric comorbidity						
Yes	64	61–67	54	52–57	34	32–37
None	65	62–68	53	49–56	31	28–34
Medicare utilization	*b*		*a*			
None	64	61–66	50	48–53	34	32–36
>0–<25%	68	60–75	57	49–65	30	22–37
25–<75%	74	67–80	70	63–76	31	25–38
≥75%	64	56–72	68	61–76	26	19–33
Source of disability identification	*a*		*a*			
Medicare	69	66–73	59	55–63	31	27–34
Medicare and VA	65	61–69	57	53–61	31	27–35
VA	62	59–65	49	46–52	35	32–37

Notes: Based on veteran women with diagnosed diabetes, aged <65 years who were alive as of the end of fiscal 2000 and qualified for either Medicare or VHA health insurance through disability.

Abbreviations: Hb_{A1c}, hemoglobin A_{1c}; LDL-C, low-density lipoprotein cholesterol; CCI, Charlson comorbidity index.

[a] $p < .01$.

[b] $.01 \leq p < .05$.

[c] $.05 < p < .10$.

Table 3

Adjusted odds ratios from separate logistic regressions on HbA_{1c} and LDL-C tests among veteran women with diabetes and disability—fiscal 2000

	Received HbA_{1c} Test		Received LDL-C Test	
	AOR	95% CI	AOR	95% CI
Race/ethnicity				
White				
African American	1.09	0.90–1.32	1.00	0.83–1.20
Latina	0.63**	0.41–0.97	1.31	0.85–2.03
Age (y)				
<45				
45–49	1.21*	0.97–1.52	1.30**	1.04–1.62
50–54	1.38***	1.08–1.77	1.71***	1.34–2.17
55–59	1.34**	1.00–1.80	1.52***	1.14–2.02
60–64	1.67***	1.19–2.34	2.06***	1.50–2.84
Marital Status				
Married				
Single	0.80*	0.64–1.01	0.97	0.78–1.21
Divorced/separated	0.80**	0.65–0.98	1.09	0.89–1.34
Widowed	0.84	0.54–1.31	0.96	0.63–1.46
Physical comorbidity-CCI	1.26***	1.12–1.42	1.18***	1.06–1.31
Psychiatric comorbidity				
Yes	0.97	0.81–1.16	1.03	0.86–1.22
No				
Medicare utilization				
<25%				
25–<75%	1.27	0.90–1.80	1.87***	1.34–2.60
≥75%	0.86	0.59–1.24	1.91***	1.31–2.77
Source of disability identification				
Medicare				
Medicare and VA	0.89	0.69–1.14	1.13	0.88–1.44
VA	0.83	0.66–1.06	1.00	0.80–1.26

Notes: Based on veteran women with diagnosed diabetes, aged <65 years who were alive as of the end of fiscal 2000 and qualified for either Medicare or VHA health insurance through disability. Asterisks represent significant group differences in process of care measures based on separate logistic regressions on HbA_{1c} tests and LDL-C tests. The regressions also include intercepts. In multivariate analyses, the continuous scale of physical comorbidity was used as a predictor.

Abbreviations: AOR, adjusted odds ratios; HbA_{1c}, hemoglobin A_{1c}, LDL-C, low-density lipoprotein cholesterol; CCI, Charlson comorbidity index.

* $.05 < p < .10$.

** $.01 \leq p < .05$.

*** $p < .01$.

Table 4

Unadjusted percentages and adjusted odds ratios from logistic regressions on diabetes intermediate outcomes among veteran women with diabetes and disability—fiscal 2000

	HbA_{1C} Value >9%		LDL-C Value ≥ 130 mg/dL		Logistic Regression on HbA_{1C} Value >9%	
	%	95% CI	%	95% CI	AOR	95% CI
All	25	23–27	30	27–33		
Race/ethnicity[a]						
White	20	8–23	29	25–32		
African American	34	30–38	33	28–37	1.92***	1.47–2.49
Latina	30	17–44	31	18–44	1.63	0.84–3.14
Age (y)[a]						
<45	30	25–34	33	28–39		
45–49	24	19–29	31	26–37	0.77	0.56–1.08
50–54	25	20–30	28	22–34	0.88	0.62–1.25
55–59	23	16–28	28	21–36	0.80	0.52–1.22
60–64	18	12–24	25	18–32	0.68	0.42–1.10
Marital status						
Married	25	22–29	30	26–35		
Single	24	19–29	31	26–37	0.87	0.63–1.22
Divorced/separated	27	23–30	29	25–34	1.04	0.78–1.39
Widowed	19	10–28	29	17–40	0.85	0.43–1.65
Physical comorbidity (CCI)[a]					0.97	0.82–1.15
None	22	9–36	36	22–50		
Low (1–2)	26	23–28	32	28–35		
Moderate (3–4)	25	20–29	25	19–31		
Severe (≥5)	20	11–29	23	12–34		
Psychiatric comorbidity						
Yes	26	23–30	30	25–34	0.89	0.69–1.15
No	24	21–27	30	27–34		
Medicare utilization						
None	25	23–28	30	27–33		
>0–<25%	22	13–30	26	16–36		
25–<75%	24	16–32	36	25–47	1.26	0.78–2.02
≥75%	26	13–39	31	15–47	1.36	0.67–2.77
Source of disability identification[a]						
Medicare	23	18–27	28	23–33		
Medicare and VA	24	19–29	33	27–39	0.98	0.67–1.42
VA	27	24–30	30	26–34	1.11	0.79–1.56

Notes: Based on veteran women with diagnosed diabetes, aged <65 years who were alive as of the end of fiscal 2000 and qualified for either Medicare or VHA health insurance through disability.

Abbreviations: AOR, adjusted odds ratios; HbA $_{1C}$, hemoglobin A_{1C}; LDL-C, low-density lipoprotein cholesterol; CCI, Charlson comorbidity index.

[a] Significant association of individual independent variable and process of care measures based on χ^2 tests. Asterisks represent significant group differences in intermediate outcomes. The regressions also include intercepts. In multivariate analyses, the continuous scale of physical comorbidity was used as a predictor. ‘“None” and “>0–<25%” groups were combined in the Medicare utilization variable for the logistic regression analysis.

* $.05 \leq p < .10$.

** $.01 \leq p < .05$.

*** $p < .01$.

Table 5

Adjusted odds ratios from separate logistic regressions for gender and disability status on diabetes care measures — fiscal year 2000

	All VHA Users With Disability[†] (N = 76,874)		All Women VHA Clinic Users[‡] (N = 5,110)	
Diabetes Measures	**Women AOR**	**95% CI**	**Disability AOR**	**95% CI**
Received HbA_{1c} Test	0.98	[0.90–1.07]	1.14**	[1.01–1.29]
Received LDL-C test	1.13***	[1.04–1.23]	1.15**	[1.02–1.28]
HbA_{1c} Value >9%	0.84***	[0.74–0.95]	1.03	[0.86–1.22]
LDL-C Value ≥130 mg/dl	1.16**	[1.01–1.32]	0.85	[0.70–1.02]

Notes: Asterisks represent significant group differences in diabetes care measures.

*.05 < *p* < .10. The regressions also include intercepts. In multivariate analyses, the continuous scale of physical comorbidity was used as a predictor.

Abbreviations: AOR: Adjusted Odds Ratios; HbA_{1c}: Hemoglobin A1c; LDL-C: low-density lipoprotein cholesterol; CCI: Charlson Comorbidity Index.

** .01 ≤ p < .05;

*** p < .01;

[†]Based on veterans with diagnosed diabetes, aged less than 65 years who were alive as of the end of fiscal year 2000 and qualified for either Medicare or VHA health insurance through disability. The independent variables included gender, race/ethnicity, marital status, physical comorbidity, psychiatric comorbidity, Medicare utilization and source of disability identification. Only the adjusted odds ratios for the gender variable (*women compared to men*) are presented.

[‡]Based on veteran women with diagnosed diabetes, aged less than 65 years who were alive as of the end of fiscal year 2000. The independent variables included disability status, race/ethnicity, marital status, physical comorbidity, psychiatric comorbidity, Medicare utilization and source of disability identification. Only the adjusted odds ratios for the disability variable (*disabled compared to non-disabled*) are presented.