

**EFFECT OF RACE/ETHNICITY AND PERSISTENT RECOGNITION OF  
DEPRESSION ON MORTALITY IN ELDERLY MEN WITH TYPE 2  
DIABETES AND DEPRESSION**

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## **ABSTRACT**

*Objective:* To determine whether mortality risk from depression among elderly men with type 2 diabetes differs by persistent recognition of depression and ethnicity.

*Research Design and Methods:* Data on a cohort of 14, 500 male veterans with type 2 were analyzed. Diagnoses of depression and diabetes were based on ICD-9 codes. Persistent recognition was defined as individuals with ICD-9 code for depression documented at  $\geq 2$  and  $\geq 3$  visits after initial diagnosis of depression. Hazards of death were compared using Cox proportional hazards regression models adjusting for relevant covariates.

*Results:* Over 10 years, 2, 305 deaths were documented. Mortality risk was higher for depressed compared to non-depressed veterans with diabetes (HR 1.6 [1.3-1.8]). Among those with depression, mortality risk was lower with persistent recognition (0-2 vs.  $\geq 3$ , HR 0.58 [0.40-0.89]), but higher for whites compared to blacks (1.60, 95% CI 1.11-2.31).

*Conclusion:* Increased mortality from depression differs by ethnicity and persistent recognition.

Coexisting depression increases the risk of death in people with diabetes [1, 2]; however, there is scant data on ethnic differences in mortality. Recognition of depression is less than optimal in primary care [3]; however, there is conflicting data on whether recognition of depression improves patient outcomes [4, 5]. To address these unanswered questions, we followed a cohort of elderly men with type 2 diabetes over a 10-year period to evaluate the effect of depression on risk of death, determine whether this risk differs by race/ethnicity, and determine whether persistent recognition of depression is associated with decreased mortality. We hypothesized that: 1) comorbid depression would be associated with increased mortality; 2) there would be no significant differences in mortality by race/ethnicity; and 3) persistent recognition of depression would be associated with decreased mortality.

## RESEARCH DESIGN AND METHODS

**Study Sample.** We created a cohort of adults with type 2 diabetes at a VA facility in the Southeastern United States based on having at least two ICD-9 codes for diabetes in either outpatient or inpatient files, and having two or more visits each year since diagnosis based on a previously validated algorithm [6]. The study was approved by our institutional IRB and local VA Research and Development committees.

**Outcome Measures.** The main outcome measure was all-cause mortality. Death was ascertained through the Beneficiary Identification and Record Location files (BIRL), a national database of veterans who applied for death benefits, which is 95% complete [7]. Length of follow-up was calculated from January 8, 1996, to either date of death or date of final follow-up on March 2, 2006.

**Demographic Variables.** These included age, race/ethnicity (non-Hispanic White, non-

Hispanic Black, and Other), marital status, and employment.

**Comorbidity.** We used a previously validated enhanced algorithm to identify depression (ICD-9 codes = 296.2, 296.3, 296.5, 300.4, 309.4, 311), CHD (ICD-9 = 410-414), stroke (ICD-9 = 430-438), cancer (ICD-9 = 140-208) and hypertension (ICD-9 = 401-405) [8].

**Persistent Recognition of Depression.** We created a variable, “persistent recognition of depression”, to identify patients who had a documented diagnosis of depression on multiple clinic visits. We categorized this variable as ICD-9 codes for depression documented at 0/1,  $\geq 2$ , and  $\geq 3$  visits after the initial diagnosis of depression.

**Statistical analysis.** Baseline values for demographic and clinical variables among those with and without depression were compared using pooled t-test for continuous and chi-square tests for categorical variables. Cox proportional hazards model regression analysis was used to compare survival times for depressed versus non-depressed patients adjusting for age at baseline, race/ethnicity, marital status, employment status, and comorbidity (CHD, hypertension, stroke and cancer). Depression and other comorbid conditions (CHD, hypertension, stroke and cancer) were treated as time-dependent variables. Among those with diabetes and depression, separate models were run to assess differences in hazards of death by race/ethnicity and persistence of recognition of depression, controlling for relevant covariates. All statistical analyses were performed with SAS statistical software, version 9 (SAS Institute Inc, Cary, NC).

## RESULTS

In this representative sample of 14,500 male veterans with diabetes followed for an average duration of 10 years, 2,305 (15.9 %) of the study subjects died. Deaths occurred in 162 (20.1 %) cases of individuals with diabetes and comorbid depression (n=806)

and 2,143 (15.6 %) cases of individuals with diabetes only (n=13,694). Table 1 shows the baseline characteristics of the study participants.

Multivariate adjusted hazard ratio of deaths from all-causes was significantly higher for people with depression compared to those without depression (HR 1.6; 95% C.I. 1.3-1.8). Mortality risk decreased from 0.80 (95% C.I. 0.57-1.11) when ICD-9 codes for depression was recorded in > 2 visits to 0.58 (95% C.I. 0.40-0.89) when codes for depression was recorded in >3 visits. Mortality risk was greater for Whites compared to Blacks (1.60, 95% CI 1.11-2.31) or Others (1.78, 95% CI 1.25-2.53).

## CONCLUSIONS

This study confirms prior findings that coexisting depression increases the risk of death in people with diabetes [1, 2]. There are two important new contributions of this study. This is the first study to show racial/ethnic differences in mortality in individuals with diabetes and depression. The finding suggests that older, white men with diabetes are at increased risk of dying if they have coexisting depression, compared to people from ethnic minority groups. These differences are independent of demographic, socioeconomic, or comorbidity characteristics. Future studies need to replicate these findings and identify potential explanatory factors.

Another major contribution is that persistent recognition of depression is associated with decreased risk of death. The

risk of death decreased if depression was documented in the medical records at  $\geq 3$  visits. This is the first study to document this association and suggests that recognition of depression improves outcomes. Because VA guidelines mandate annual screening for depression in primary care and patients identified through this screening process usually receive ongoing treatment or referral for mental health services, it is very likely that persistent recognition is a surrogate for treatment. However, future studies need to confirm this finding.

Strengths of the study include large sample size, longitudinal cohort design, availability of comorbidity data, and treatment of comorbidity as time-dependent variables. Limitations include limited explanatory variables in our datasets, use of ICD-9 codes instead of diagnostic interviews, and unique characteristics of veterans (older age, 97% men, and more comorbidity) [6] that may limit generalizability.

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**TABLE 1.** Baseline characteristics (n=14,500)

	Not depressed	Depressed	p-value
Sample size (n)	13,694	806	
Mean age (years)	61.9	56.0	<0.0001
Race/ethnicity (%)			<0.0001
Non-Hispanic White	46.8	62.5	
Non-Hispanic Black	25.7	29.2	
Other (including missing race/ethnicity)	27.5	8.3	
Marital status (%)			<0.0001
Never married	5.8	8.6	
Married	66.9	54.3	
Separated, widowed, or divorced	27.2	37.1	
Employment status (%)			<0.0001
Active duty or employed	21.2	10.8	
Not employed	46.8	66.9	
Retired	31.9	22.3	
Comorbid conditions (%)			<0.0001
Cancer	5.0	13.2	
Hypertension	21.7	80.2	
Coronary heart disease	12.2	40.7	
Stroke	2.6	9.4	
Mean follow-up in months	57.5	74.2	<0.0001