Associations Between Depressive Symptoms and Incident End-Stage Renal Disease in a Diabetic Cohort

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Abstract

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Epidemiology

Context: Though the presence of major depression is associated with adverse health outcomes, little is known regarding its associations with long-term renal outcomes in patients with diabetes. Furthermore, few studies have examined the impact of minor depression in this patient population.

Objective: To evaluate the associations between the presence of major or minor depressive symptoms and risk of incident end-stage renal disease (ESRD) at 10 years in an outpatient diabetic cohort.

Design: The Pathways Study is a prospective, observational cohort study conducted from 2001 to 2012.

Setting and Participants: Large health maintenance organization, population-based primary care cohort study of 3,877 men and women with diabetes without ESRD at baseline.

Exposure: Major or minor depressive symptoms at study entry based on the Patient Health Questionnaire-9 (PHQ-9).

Main Outcome and Measure: ESRD.

Results: During up to 10 years of follow-up, 78 patients (2.0%) initiated dialysis. Major depressive symptoms at study enrollment were associated with an increased risk of incident ESRD (hazard ratio [HR] 1.87, 95% confidence interval [CI] 1.02-3.44), adjusting for age, sex, race/ethnicity, marital status, education, smoking, body mass index, duration of diabetes, hemoglobin A1c, baseline kidney function, microalbuminuria, and adherence to diabetes self-care. There was no association between minor depressive symptoms and incident ESRD (HR 1.11, 95% CI 0.53-2.48).

Conclusion: Major depressive symptoms, but not minor depressive symptoms, were associated with an increased risk of incident ESRD at 10 years. Additional studies are needed to determine whether treatment for depression can improve renal outcomes in patients with diabetes.

INTRODUCTION

Patients with diabetes mellitus have a high prevalence of major depression, with estimates ranging from 11.4% to 31.0% depending on the method of assessment.[1] The presence of comorbid depression with diabetes is associated with a higher symptom burden,[2,3] worse glycemic control,[4] and nonadherence to recommended self-care and treatments.[5-8] Furthermore, depression is a predictor of adverse outcomes including functional disability,[9,10] microvascular and macrovascular diabetic complications,[11,12] and mortality.[13-15] While depression appears to be associated with the occurrence of diabetic kidney disease,[11,12] its role in the progression to end-stage renal disease (ESRD) in this population is still under investigation.

Studies have yielded conflicting results concerning depression as a risk factor for ESRD. In small prospective cohort studies of persons with known mild to severe chronic kidney disease (CKD) not yet on dialysis, depression was a predictor of progression to ESRD after adjustment for demographic variables and comorbidities.[16,17] However, these studies were conducted in patients with high likelihood of progression to ESRD because of preexisting CKD. In contrast, depressive symptoms were not predictive of incident ESRD in the Cardiovascular Health Study, a community-based cohort of individuals aged 65 years and older with a low likelihood of ESRD incidence.[18] The discrepancies in these findings may be attributable to differences in the underlying study populations, baseline level of CKD, and their risk for ESRD. Although diabetes mellitus is the leading cause of kidney failure,[19] information is lacking regarding whether major depression is a risk factor for ESRD in this high-risk population. Moreover, the impact of minor depression on adverse renal outcomes is not known.

The primary objective of this study is to evaluate the associations between major or minor depressive symptoms and risk of incident ESRD in the Pathways Study, a prospective, observational cohort of primary care patients with diabetes.

METHODS

Study Population

The Pathways Study is a prospective, population-based, observational study initially developed by a multidisciplinary team of investigators from the University of Washington and the Group Health Research Institute to study the associations of depression with diabetes outcomes. The study cohort has been described in detail elsewhere.[20,21] Briefly, Group Health (GH) is a vertically integrated health maintenance organization (HMO) with over 600,000 enrollees in Washington and Idaho, USA. Nine primary care clinics were selected for participation in the study based upon geographic location, diabetes population, and racial/ethnic diversity. Potential subjects were identified from the GH diabetes registry, which includes patients that meet at least one of the following criteria: (1) currently taking any diabetic medication, (2) fasting glucose ≥126 mg/dL or random glucose ≥200 mg/dL confirmed by a second test within one year, (3) hospital discharge diagnosis of diabetes, or (4) two outpatient diagnoses of diabetes.

Surveys were mailed to 9,063 patients from the GH diabetes registry at the nine selected clinics in 2001-2002 (Figure 1). Of those, 1,222 patients were found to be ineligible due to death, disenrollment, no diabetes, gestational diabetes, severe illness, language or hearing barriers, or cognitive impairment. Of the 7,841 eligible patients, 4,839 (61.7%) returned the baseline epidemiologic survey regarding patient demographics, diabetes history, diabetes self-care, and depression status. Of the 4,839 subjects in the original study cohort, 4,128 (85.3%) gave

permission to link survey results with GH automated databases regarding laboratory results and clinical encounters. Subjects were followed prospectively until the initiation of dialysis, death, disenrollment from GH, or the end of the 10-year follow up period (March 19, 2011 to August 15, 2012). Subjects were excluded from the present study if they had ESRD at baseline, missing depression status, or underwent kidney transplantation during the follow up period. Since baseline kidney function was ascertained using laboratory data up to 6 months after study enrollment, subjects were also excluded if they developed incident ESRD, died, or disenrolled from GH within 6 months of study enrollment; there were 7 events that occurred during the 6 months after study enrollment. The study protocol was approved by the GH and University of Washington institutional review boards.

Primary Predictor

The primary predictor was the presence of depressive symptoms at study entry, as ascertained by the Patient Health Questionnaire-9 (PHQ-9).[22] The PHQ-9 is a questionnaire based on the Diagnostic and Statistical Manual Fourth Edition (DSM-IV) criteria for major depression and has been validated in patients with CKD.[23] Subjects were considered depressed if they had the required number of depressive symptoms (≥5 symptoms for major depression or 2-4 symptoms for minor depression) including either depressed mood or anhedonia for more than half of the time over the course of at least two weeks.

Covariates

Demographic information and diabetes characteristics were self-reported from the baseline survey completed at entry to the epidemiologic study. Self-reported height and weight were used to calculate body mass index (BMI). Baseline hemoglobin A1c and low-density lipoprotein (LDL) were based on the average laboratory results in the 12 months prior to study enrollment.

Due to a higher proportion of missing values, baseline creatinine was determined by the average creatinine in the 18 months prior to study entry, or the average value in the 6 months after study entry if no prior laboratory results were available. Estimated glomerular filtration rate (eGFR) was calculated using the CKD-EPI equations.[24] Microalbuminuria was defined as the presence of a urine albumin to creatinine ratio ≥30 mg/g in the 24 months prior to or the 6 months after study entry. Patients with hypertension were identified by International Classification of Diseases, Ninth Revision diagnosis code (ICD-9) 401.x.[25] Diabetes self-care was assessed using the modified Summary of Diabetes Self-Care Activities (SDSCA), which is a brief questionnaire that asks how many days per week an activity was performed in different self-care domains (Appendix A).[26] Each self-care domain (general diet, special diet, exercise, blood glucose testing, and foot care) is given a score ranging from 0 to 7, with higher scores indicating maximum compliance with that self-care domain.

Outcome

The primary outcome of interest was the development of ESRD requiring dialysis. The date of first dialysis was determined by GH automated records using the following ICD-9 and procedure codes: ESRD or uremia (585.x or 586.x), or the first dialysis (90945, 90947, G0257), hemodialysis (39.95, 90935, 90937), peritoneal dialysis (54.98), dialysis training (90989, 90993), or ESRD related services (90918-90925, 90960-90970, 90999, G0311-G0319, G0323, G0327) without prior dialysis procedure codes.

Statistical Analysis

Statistical analyses were performed using Stata version 12 (StataCorp, College Station, TX, USA). Baseline characteristics by depression status were determined using one-way ANOVA for continuous variables and χ^2 tests for categorical variables. Cox proportional hazards regression

models were used to analyze the associations between depression and the outcome of interest.[27] A competing risks model was used to incorporate the risk of pre-ESRD death in the hazards estimates for ESRD.[28] The primary predictor was included in the model as major depressive, minor depressive, or no depressive symptoms. Multiple imputation by chained equations was used for covariates with missing values (race/ethnicity, marital status, education, salary, BMI, type of diabetes, duration of diabetes, hemoglobin A1c, eGFR, microalbuminuria, and diabetes self care).[29,30] Subjects were considered at risk starting 6 months after study enrollment and were followed longitudinally for up to 10 years after study entry. Subjects were censored at the date of disenrollment from GH or the end of the study. Unadjusted analyses were performed for each covariate of interest. In the multivariate analysis, it was decided *a priori* to adjust for age, sex, race/ethnicity, marital status, education, BMI, duration of diabetes, hemoglobin A1c, and eGFR as potential confounders. Based on their associations with depression and ESRD, other covariates of interest included smoking status and the presence of baseline microalbuminuria. A second model included additional adjustments for SDSCA scores in order to assess the effect of diabetes self-care on the associations between depression and outcomes of interest. In sensitivity analyses, baseline eGFR was excluded from both models and yielded similar results; we will present the results for analyses that were adjusted for baseline eGFR.

RESULTS

Baseline Characteristics

Of the 3,877 subjects in this study, 447 (11.5%) had major depressive symptoms (mean PHQ-9 score 17.2 ± 3.8) and 326 (8.4%) had minor depressive symptoms (mean PHQ-9 score 9.6 ± 2.2). Subjects with major depressive symptoms tended to be younger, female, non-Hispanic black, and

had lower levels of education and salary compared to subjects without depressive symptoms (Table 1). Depressed subjects were more likely to be smokers and to have a higher BMI than nondepressed subjects. The prevalence of hypertension, dyslipidemia, and type 1 diabetes was similar between groups. Subjects with minor depressive symptoms had the longest duration of diabetes prior to study entry (10.6 ± 9.9 years versus 9.2 ± 7.8 years for major depressive and 9.3 ± 9.3 years for no depressive symptoms). Subjects with major depressive symptoms had the poorest baseline metabolic control (mean hemoglobin A1c 8.1 ± 1.6 versus 7.9 ± 1.6 for minor depressive and 7.7 ± 1.5 for no depressive symptoms), highest baseline eGFR (77.3 ± 23.5 mL/min/1.73 m^2 versus 71.6 ± 24.8 mL/min/1.73 m^2 for minor depressive and 73.6 ± 21.7 mL/min/1.73 m^2 for no depressive symptoms), but also the highest proportion of microalbuminuria (39.5% versus 36.1% for minor depressive and 30.3% for no depressive symptoms) compared to the other groups. Adherence to recommended diet and exercise was lowest in subjects with major depressive symptoms and highest in those with no depressive symptoms; adherence to blood glucose testing and self-foot care was comparable between groups.

Incident ESRD by Depression Status

A total of 78 subjects developed ESRD over 26,361 patient-years at risk, for an incidence rate of 2.96 cases per 1,000 patient-years (Table 2). The incidence of ESRD was 6.28 per 1,000 patient-years for those with major depression symptoms, 3.83 per 1,000 patient-years for those with minor depression symptoms, and 2.46 per 1,000 patient-years for those without depression. The cumulative incidence of ESRD by depression status is shown in Figure 2.

Using Cox proportional hazards models with pre-dialysis death as a competing risk, the presence of major depressive symptoms, but not minor depressive symptoms, was associated

with incident ESRD requiring chronic dialysis (Table 3). After adjustment for age, sex, race/ethnicity, marital status, education, smoking, BMI, duration of diabetes, hemoglobin A1c, baseline eGFR, and presence of baseline microalbuminuria (Model 1), persons with major depressive symptoms at baseline had a 1.92-fold increased risk of incident ESRD (95% CI 1.07-3.43). After additional adjustment for diabetes self-care variables (Model 2), the association between major depression symptoms and incident ESRD persisted (HR 1.87, 95% CI 1.02-3.44). Minor depressive symptoms were not associated with increased ESRD risk in either Model 1 (HR 1.10, 95% CI 0.51-2.37) or Model 2 (HR 1.11, 95% CI 0.53-2.48). In both models, other risk factors for incident ESRD included younger age, longer duration of diabetes, higher baseline hemoglobin A1c, lower baseline eGFR, and the presence of baseline microalbuminuria. None of the diabetes self-care variables were predictive of incident ESRD.

DISCUSSION

The current study found that in this primary care cohort of patients with diabetes, major depressive symptoms were associated with nearly twice the risk of incident ESRD at 10 years, and this association persisted after adjustment for multiple diabetes self-care variables. Minor depressive symptoms were not associated with ESRD risk in this study.

There are several notable limitations of this study to consider. Depression was ascertained by a self-rated questionnaire rather than a clinical interview; although the PHQ-9 has been validated against the gold standard clinical interview,[23] a recent meta-analysis found that self-reported depression scales may overestimate the presence of depression compared to the clinical interview.[31] This study only used depression status at study entry rather than multiple measures over time. However, our group previously found that in this cohort of primary care diabetic patients, over 70% of those with major depressive symptoms had a history of chronic

depression lasting over two years,[32] and over 80% of those with major depressive symptoms after 5 years of follow up had depressive symptoms at study entry.[33] We did not adjust for blood pressure as these values were unavailable; although we did have access to ICD-9 codes for hypertension, we could not discriminate between treated and untreated hypertension, or optimal versus suboptimal blood pressure control. In addition, since this was an insured population, generalizability of our results may be limited to other patient populations with comparable access to healthcare. Given that this was an observational study, unmeasured and residual confounding are concerns. Still, our study has several strengths including its large sample size, prospective design, primary care population, length of follow up, and ability to adjust for multiple covariates, including diabetes self care variables.

Our study observed an association between major depressive symptoms and long-term ESRD risk among primary care diabetic patients. These results are congruent with findings in CKD cohorts, which are also high risk for ESRD. In a prospective cohort study of predominantly male veterans with CKD stages 2-5, Hedayati *et al* found that a history of major depression was associated with a 3.5-fold increased risk of progression to chronic dialysis at one year, after adjustment for age, race, and baseline kidney function.[16] Similarly, Tsai *et al* found that high depressive symptoms in patients with CKD were associated with more rapid decline in kidney function and an increased risk of the combined outcome of incident ESRD or death.[17] In the largest prospective CKD cohort to date, Fischer *et al* found that depressive symptoms in the Chronic Renal Insufficiency Cohort Study were associated with a 21% increased risk of CKD progression over 5 years.[34] However, the Cardiovascular Health Study (CHS) did not find an association between depressive symptoms and incident ESRD in their community-based cohort of elderly subjects.[18] This discrepancy may be related to the low prevalence of CKD in CHS's

study population, and therefore a lower incidence of ESRD (less than 2%) compared to the CKD cohorts in the other studies.

We did not find an association between minor depressive symptoms and long term ESRD risk. Our analysis is limited by the low event rate in this group. Although minor depression is common in patients with ESRD,[35] it is not currently known whether minor depression is associated with CKD incidence or progression. Since minor depression is associated with increased mortality in patients with diabetes,[13] additional research on its associations with adverse renal outcomes is needed.

Although depression is associated with poorer diabetes self-care,[5,7,8] and adherence to self care is associated with reductions in chronic complications of diabetes,[36-40] we found that self-reported diabetes self-care was not associated with long-term ESRD risk, nor did adjustment for self-care substantially alter the association between major depressive symptoms and incident ESRD. There are several potential reasons for these negative findings. Although the SDSCA has been shown to be a valid measure of diabetes self-management,[26] it is still a self-reported rather than objective measurement, which may result in incomplete or imprecise capture of diabetes self-care. Furthermore, our study only ascertained diabetes self-care at study entry, which does not take into account changes in behavior over time. Finally, the effect of diabetes self-care on chronic diabetic complications may be mediated through metabolic control and other cardiovascular risk factors; since these were already adjusted for in our models, this may explain why additional adjustment for diabetes self-care did not have an appreciable impact on the association between major depressive symptoms and ESRD risk.

Depression may be associated with ESRD risk via several potential mechanisms. In patients with diabetes, comorbid depression is associated with a higher number of cardiovascular

risk factors compared to those without depression.[41] Although we attempted to control for common cardiovascular risk factors, we were unable to account for high blood pressure or changes in cardiovascular risk factors over time. Depression is associated with medication nonadherence,[5,7,8] which was not measured in this analysis. As previously discussed, depression is associated with poorer diabetes self-care,[5,7,8] which might to a small extent mediate the association between depression and ESRD despite our study's negative findings. Depression is also associated with elevated levels of proinflammatory cytokines[42] and this proinflammatory state has been linked with an increased risk of diabetic complications, including diabetic kidney disease.[43] Lastly, depression is associated with hyperactivity of the hypothalamic-pituitary-adrenocortical axis and sympathetic nervous system, resulting in reduced insulin sensitivity and potentially poorer glycemic control.[44]

The results from this study lend support to the current American Diabetes Association (ADA) guidelines, which recommend screening for depression in patients with diabetes and poor self management (grade B recommendation).[45] Moreover, the expert opinion is that psychological assessment is a reasonable component of comprehensive diabetes management. Nonetheless, additional studies are needed to determine whether routine screening and treatment of depression in diabetic patients can reduce the risk of ESRD.

Conclusion

Major depressive symptoms were associated with an increased risk of development of ESRD in a primary care population with diabetes, even after adjustment for the quality of diabetes self care. Additional studies are needed to determine whether screening and treatment of depression reduce the incidence of ESRD in patients with diabetes.

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Table 1. Baseline Characteristics of Pathways Study Cohort by Depression Status (N = 3,877)[1]

Variable	Major Depressive Symptoms (N = 447)	Minor Depressive Symptoms (N = 326)	No Depressive Symptoms (N = 3,104)
PHQ-9 score	17.2 ± 3.8	9.6 ± 2.2	3.7 ± 3.4
Age (years)	59.3 ± 13.4	64.5 ± 13.6	64.1 ± 13.1
Male	184 (41.2)	168 (51.5)	1,661 (53.5)
Race/Ethnicity			
Non-Hispanic White	347 (77.8)	242 (74.5)	2,478 (80.2)
Non-Hispanic Black	48 (10.8)	27 (8.3)	248 (8.0)
Asian	28 (6.3)	34 (10.5)	247 (8.0)
Other	23 (5.2)	22 (6.8)	118 (3.8)
Married	243 (55.0)	198 (61.7)	2,012 (65.4)
Education beyond high school	322 (72.9)	219 (68.2)	2,373 (77.3)
Salary ≥$20,000/year	200 (53.1)	129 (50.4)	1,464 (59.0)
Smoker	65 (14.5)	33 (10.1)	226 (7.3)
BMI (kg/m^2)	35.1 ± 9.2	32.1 ± 7.1	31.0 ± 6.8
Hypertension	202 (45.2)	158 (48.5)	1,328 (42.8)
LDL (mg/dL)	114.5 ± 36.4	107.8 ± 32.0	111.7 ± 34.7
Type 1 diabetes	13 (2.9)	8 (2.5)	130 (4.2)
Duration of diabetes (years)	9.2 ± 7.8	10.6 ± 9.9	9.3 ± 9.3
Hemoglobin A1c (%)	8.1 ± 1.6	7.9 ± 1.6	7.7 ± 1.5
Creatinine (mg/dL)	1.0 ± 0.4	1.1 ± 0.4	1.0 ± 0.4
eGFR (mL/min/1.73 m^2)	77.3 ± 23.5	71.6 ± 24.8	73.6 ± 21.7
Microalbuminuria (UACR ≥30 mg/g)	133 (39.5)	82 (36.1)	682 (30.3)
Summary of Diabetes Self-Care Activities score[2]			
General diet	3.7 ± 2.2	4.3 ± 2.3	4.9 ± 2.0
Special diet	3.4 ± 1.6	3.6 ± 1.7	4.0 ± 1.6
Exercise	2.0 ± 1.9	2.1 ± 2.0	2.9 ± 2.2
Blood glucose testing	4.3 ± 2.7	4.1 ± 2.8	4.2 ± 2.8
Foot care	3.2 ± 2.3	3.4 ± 2.2	3.3 ± 2.4

Data are mean ± standard deviation or N (%).

Abbreviations: PHQ-9 = Patient Health Questionnaire-9; BMI = body mass index; LDL = low-density lipoprotein; eGFR = estimated glomerular filtration rate; UACR = urine albumin to creatinine ratio

SI Conversion Factors: To convert LDL to mmol/L, multiply by 0.0259; creatinine to μmol/L, multiply by 88.4.

[1]Data are missing in less than 1% of subjects for race/ethnicity, marital status, BMI, type 1 diabetes, and duration of diabetes; 1-3% for education and hemoglobin A1c; 4-10% for creatinine and eGFR: and >10% for salary (19%), LDL (28%) and microalbuminuria (27%),

[2]Self-care scores correspond with how many days per week that the self-care activity was performed.

Table 2. Incidence Rates of End-Stage Renal Disease by Depression Status

	Events	Patient-Years (Median, IQR)	Incidence Rate/ 1,000 Patient-Years
Total	78	26,361 (8.87, 3.89-9.50)	2.96
Major depressive symptoms	17	2,705 (6.48, 2.80-9.50)	6.28
Minor depressive symptoms	8	2,089 (7.76, 3.27-9.50)	3.83
No depression	53	21,567 (9.25, 4.25-9.50)	2.46

Abbreviations: IQR = interquartile range

Table 3. Cox Proportional Hazards Models for Time to Dialysis in the Pathways Study

Variable	Unadjusted HR (95% CI)	Model 1 Adjusted HR (95% CI)[1]	Model 2 Adjusted HR (95% CI)[2]
Major depressive symptoms	2.47 (1.43-4.27)	1.92 (1.07-3.43)	1.87 (1.02-3.44)
Minor depressive symptoms	1.44 (0.69-3.04)	1.10 (0.51-2.37)	1.11 (0.53-2.48)
Age (year)	1.00 (0.98-1.01)	0.95 (0.93-0.97)	0.95 (0.93-0.97)
Male	0.98 (0.63-1.53)	0.97 (0.60-1.56)	0.96 (0.58-1.59)
Race/Ethnicity			
Non-Hispanic White	Reference	Reference	Reference
Non-Hispanic Black	1.89 (0.96-3.70)	1.57 (0.76-3.27)	1.63 (0.79-3.37)
Asian	1.66 (0.82-3.36)	1.76 (0.87-3.57)	1.68 (0.82-3.44)
Other	0.73 (0.18-3.00)	0.79 (0.18-3.37)	0.81 (0.19-3.53)
Married	1.12 (0.69-1.81)	1.37 (0.80-2.36)	1.38 (0.80-2.37)
Education beyond high school	0.67 (0.42-1.08)	0.67 (0.40-1.13)	0.67 (0.40-1.14)
Smoker	0.48 (0.15-1.52)	0.53 (0.16-1.77)	0.52 (0.16-1.76)
BMI (kg/m^2)	1.03 (1.00-1.06)	1.01 (0.97-1.05)	1.01 (0.97-1.05)
Duration of diabetes (year)	1.04 (1.02-1.05)	1.02 (1.00-1.04)	1.02 (1.00-1.04)
Hemoglobin A1c (%)	1.22 (1.09-1.38)	1.18 (1.04-1.34)	1.19 (1.04-1.36)
eGFR ($mL/min/1.73\ m^2$)	0.97 (0.97-0.98)	0.96 (0.94-0.97)	0.96 (0.94-0.97)
Microalbuminuria	3.95 (2.29-6.81)	2.27 (1.18-4.38)	2.28 (1.18-4.39)
General diet (day/week)	0.95 (0.87-1.04)		0.98 (0.87-1.11)
Special diet (day/week)	0.97 (0.85-1.11)		1.02 (0.88-1.19)
Exercise (day/week)	0.93 (0.85-1.02)		1.00 (0.90-1.11)
Blood glucose testing (day/week)	1.03 (0.95-1.12)		0.96 (0.87-1.05)
Foot care (day/week)	0.99 (0.89-1.09)		0.95 (0.85-1.06)

Survival models for continuous variables are hazard ratios for an increase by one unit.

Abbreviations: BMI = body mass index; eGFR = estimated glomerular filtration rate.

[1]Adjusted for age, sex, race/ethnicity, marital status, education level, smoking status, BMI, duration of diabetes, hemoglobin A1c, eGFR, and presence of baseline microalbuminuria.

[2]Additionally adjusted for Summary of Diabetes Self-Care Activities scores for general diet, special diet, exercise, blood glucose testing, and foot care.

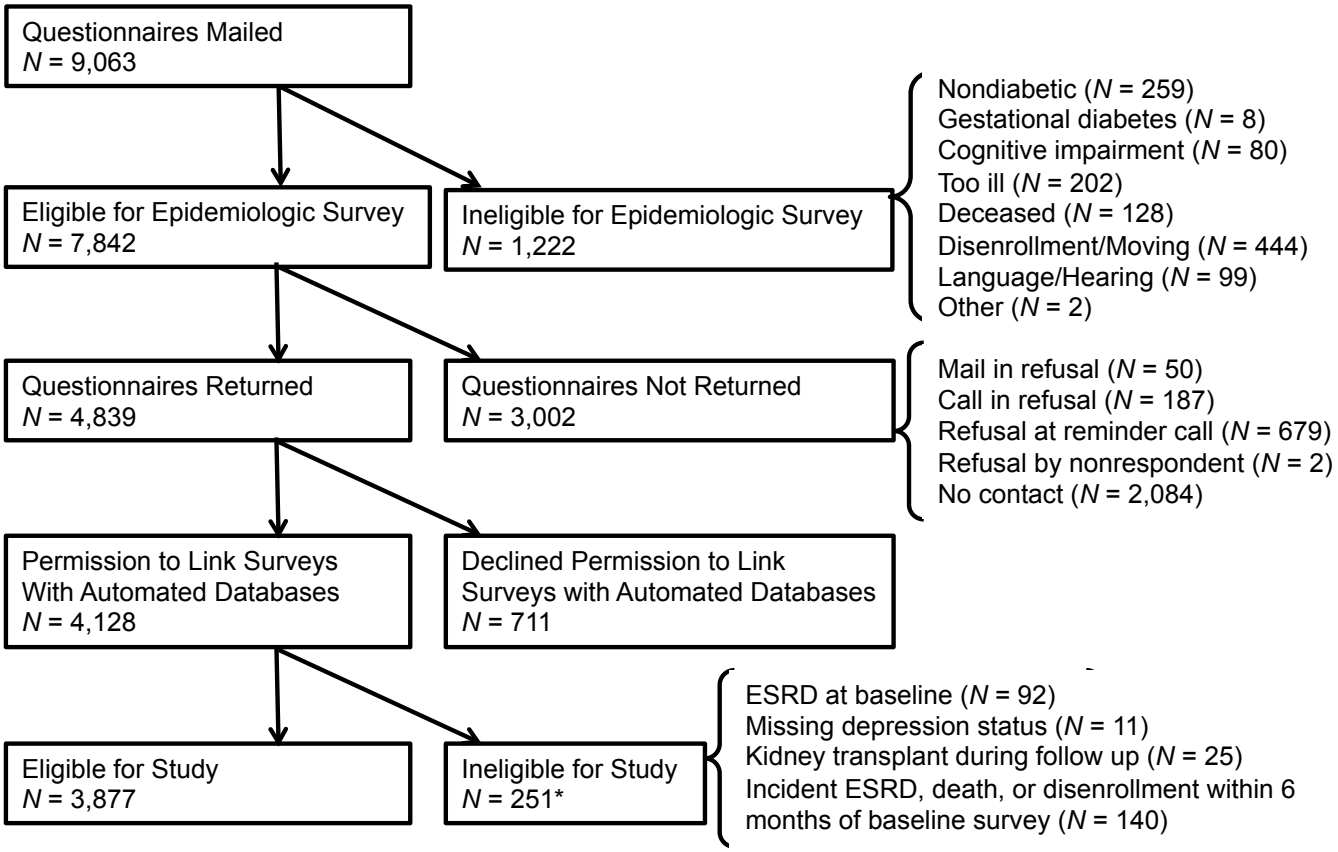

Figure 1. Pathways Study subject recruitment. *Components add up to more than the total *N* due to overlap.

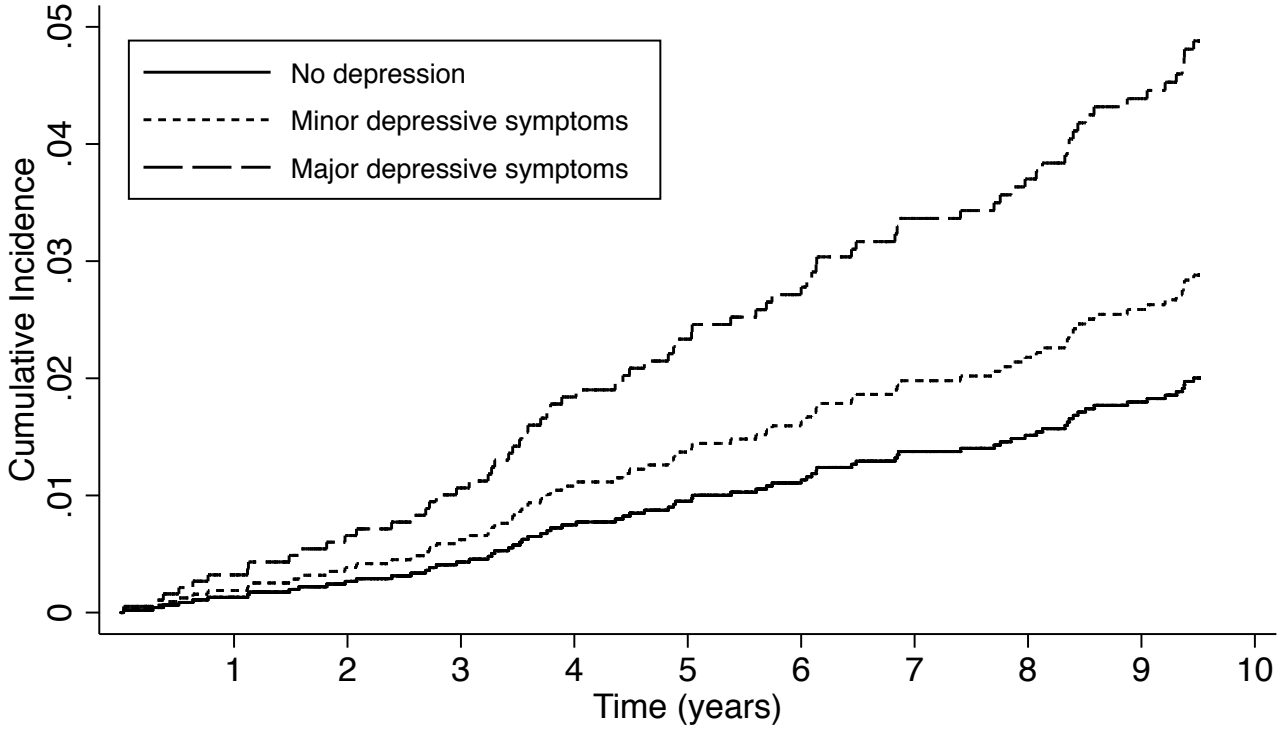

Figure 2. Cumulative incidence of end-stage renal disease by depression status.

Appendix A. Selected questions from the Summary of Diabetes Self-Care Activities (SDSCA)

Self-care Domain	SDSCA Question
General diet	On how many of the last SEVEN DAYS have you followed a healthful eating plan? Think about the PAST MONTH. How may days PER WEEK, ON AVERAGE, have you followed your eating plan?
Special diet	On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables? On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or whole-fat dairy products?
Exercise	On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (This means 30 minutes of continuous activity, including walking). On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?
Blood glucose testing	On how many of the last SEVEN DAYS did you test your blood sugar? On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?
Foot care	On how many of the last SEVEN DAYS did you check your feet? On how many of the last SEVEN DAYS did you inspect the inside of your shoes?