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Concordance between Clinical Diagnosis and Medicare Claims of Depression among Older Primary Care Patients

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Abstract

Objective—To identify patient characteristics associated with concordance of Medicare claims with clinically identified depression.

Design—Cohort of 742 older primary care patients linked to Medicare claims data.

Measurements—Structured Clinical Interview for DSM-IV major depressive disorder (MDD) and clinically-significant minor depression.

Results—Among 474 patients with depression, 198 patients had a Medicare claim for depression (sensitivity: 42%, 95% confidence interval (CI) 37% to 46%). Among 268 patients who did not meet criteria for depression, 235 patients did not have a Medicare claim for depression (specificity: 88%, 95% CI 83% to 91%). After adjustment for demographic and clinical characteristics, non-white participants were nearly twice as likely not to have Medicare claims for depression among patients who met criteria for depression (“false negatives”). Smoking status, depression severity (HDRS), cardiovascular disease, and more primary care physician office visits were also significantly associated with decreased odds to be false negatives. In contrast, after covariate adjustment, white race and chronic pulmonary disease were associated with increased odds of a Medicare claim for depression among patients who did not meet criteria for depression (“false positives”). Using weights based on the screened sample, the positive predictive value of a Medicare claim for depression was 66% (95% CI [63%, 69%]), while the negative predictive value was 77% (95% CI [76%, 78%]).

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Conclusion—Investigators using Medicare data to study depression must recognize that diagnoses of depression from Medicare data may be biased by patient ethnicity and the presence of medical comorbidity.

Keywords

claims analysis; depression; Medicare; primary health care

INTRODUCTION

Administrative claims data are important tools for health services research and policy. These data capture the billable interactions between patients and healthcare providers, maintained and collected during the course of medical care by the federal government, state governments, or private health care insurers. With the ability to link to other public data (e.g., National Death Index, Veterans Affairs data), administrative data provide person-level data on insurance enrollment status, demographic characteristics, medical diagnoses, procedures, sources of care, and reimbursement. Studies employing medical records to validate administrative data find generally good agreement for medical conditions (e.g., myocardial infarction,¹ diabetes,² osteoarthritis,³ Parkinson's disease,⁴ cancer,⁵ medical comorbidity⁶) and for procedures (e.g., colonoscopy,⁷ mammography⁸). Despite the potential of administrative data to contribute to our understanding of medical-psychiatric comorbidity, use of health and mental health services, and the consequences of health policies, few investigators have examined how well administrative data for depression agree with clinical assessments.

Given the significant disease burden and costs associated with depression,⁹ investigators have sought to validate algorithms for identifying cases of depression in administrative data. Studies have shown a poor or modest concordance of a depression diagnosis on an in-person assessment with administrative data.¹⁰ Despite the use of Medicare claims data to study depression and its consequences (e.g., to study depression in prostate cancer¹¹), only two studies have compared Medicare claims data directly to personal assessments.^{12,13} No study has reported what patient characteristics are associated with concordance of Medicare claims with a clinically-based research interview to determine depression status.

Our objective was to compare how well Medicare claims for depression map to clinical assessments of depression in a sample of primary care patients. Based on prior findings and clinical experience,^{14–16} we hypothesized that patient characteristics such as age, gender, ethnicity, level of educational attainment, cognitive function, severity of depressive symptoms, and medical conditions would be associated with accuracy of Medicare claims. We calculated sensitivity and specificity with the clinical assessment as the 'gold standard.' In so doing, we used the terms "false negative" (no claim in the face of a clinical diagnosis of depression) and "false positive" (a claim when the patient did not meet criteria for depression) as shorthand. Since the sample was representative of patients obtaining treatment in primary care settings,¹⁷ we were able to use associated weights to derive population estimates of the positive and negative predictive values of a depression diagnosis in Medicare claims against a standardized clinical interview for depression.

METHODS

Study sample

The Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT) was a cluster-randomized controlled trial comparing a primary care-based intervention with usual care to improve outcomes of depression.^{17,18} The study was conducted in 20 primary care practices from May 1999 to August 2001, with individual patients followed clinically for two years. Patients over age 60 years who gave oral consent were screened for enrollment using the Centers for Epidemiologic Studies Depression scale (CES-D¹⁹). All patients who scored higher than 20 on the CES-D were invited into the study, as well as a 5% random sample of patients with lower scores. Approximately half of the final PROSPECT sample consisted of persons who met criteria for depression. Study procedures were implemented with written informed consent. The research protocols received full review and approval from the Institutional Review Board of all participating universities.

Clinical assessment of depression

Trained research assistants used the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) to diagnose major depressive disorder (MDD).²⁰ Clinically-significant minor depression was defined as meeting DSM-IV criteria for minor depression with four depressive symptoms, Hamilton Depression Rating Scale (HDRS) score 10 or higher, and duration of symptoms four weeks or more.²¹ Structured Clinical Interview for Axis I DSM-IV Disorders (SCID) was obtained for all participants.²² Physicians received written notification of the depression status of patients based on the SCID assessment. For the purposes of comparing clinical diagnoses from SCID with Medicare claims, we combined any depression (major or minor) over the two-year study period.

Depression in Medicare claims data

We linked PROSPECT participants to Medicare data and used *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes to be inclusive of depression, consistent with other studies.^{11,23,24} Our goal in being inclusive in the Medicare claims for a diagnosis of depression was to give the benefit of the doubt to the physicians. In other words, we did not think it was reasonable to require or expect them to make distinctions within depression diagnostic categories. The appearance of an ICD-9-CM code of 296.2 (MDD, single episode), 296.3 (MDD, recurrent episode), 298.0 (Depressive type psychosis), 300.4 (Dysthymic disorder), 309.0 (Adjustment disorder with depressed mood), 309.1 (Prolonged depressive reaction), or 311 (Depressive disorder, not elsewhere classified) in any Medicare claims data files over the two-year period counted as depression.

Covariates under study

Sociodemographic characteristics were assessed with standard questions regarding age, gender, self-identified ethnicity, level of education attainment, and marital status. Smoking status was based on report of smoking within six months of the interview. The Mini-Mental State Examination (MMSE) was used to assess cognition.²⁵ The range of scores for the MMSE is 0 to 30, with lower scores indicating cognitive impairment. Severity of depression

was assessed using the 24-item Hamilton Depression Rating Scale (HDRS) ranging 0 to 76 with higher scores indicating greater depressive symptoms.²¹ The presence of suicidal ideation was assessed using the 21-item Scale for Suicidal Ideation (SSI) dichotomized to indicate the presence of any suicidal ideation.²⁶ Additional potentially influential covariates included in multivariable models were cardiovascular disease, diabetes, cancer, and chronic pulmonary disease based on diagnostic information from the entire observation interval using Medicare inpatient and outpatient claims data.²⁷ Primary care physician office visits over the two-year period were calculated using Medicare physician office claims data.²⁸

Analytic strategy

The analysis considered the SCID diagnosis as the criterion standard to which Medicare claims data would be compared. First, we used a simple 2 by 2 table to compare Medicare claims from the same two-year window when clinical diagnoses were made with the SCID. Measures of agreement (sensitivity, specificity, Cohen's κ) were calculated with 95% confidence intervals.^{29,30}

Second, we sorted participants into four groups based on the 2 by 2 table of depression diagnosis by SCID versus depression diagnosis in Medicare claims data: (1) depression diagnosis in both SCID and claims data ("true positives": TP); (2) no depression in both ("true negatives": TN); (3) depression only in SCID but not in claims data ("false negatives": FN); and, (4) depression only in Medicare claims data but not in SCID ("false positives": FP). We compared the characteristics of FNs (coded 1) to those of TPs (coded 0), and, in separate models, we compared the characteristics of FPs (coded 1) to those of TNs (coded 0). We carried out logistic regressions with random effects to account for within-practice clustering and adjust the measures of association between the claims data and SCID diagnoses for influential patient characteristics such as demographic factors and medical comorbidity. We carried out analyses with two models, one in which we only used data that would be available with Medicare claims data, and one in which we additionally adjusted for education, marital status, smoking, cognitive impairment, depression severity, and suicidal ideation (which would not be available in Medicare data). Intervention condition was not significantly associated with concordance and was not further considered.

Third, we repeated all analyses applying weights so that the study sample for which we had both SCID and Medicare claims data represented the entire sample screened with the CES-D. Using weights allowed us to calculate the positive and negative predictive value of a Medicare claim of depression for a clinically-derived SCID diagnosis of depression in the screened, representative sample of older primary care patients. For all analyses we used a level of significance set at $\alpha = 0.05$. SAS version 9.3 was used to carry out analyses (SAS Institute Inc., Cary, North Carolina).

RESULTS

Sample characteristics

The CONSORT (Consolidated Standards for Reporting of Trials) flow diagram for PROSPECT has previously been published.¹⁷ In brief, the study screened 9,072 patients

aged 60 years and older, of whom 1,888 were invited to participate, and 1,238 (65.8%) agreed to a baseline interview. Among them, we excluded persons in a Medicare health maintenance organization who did not have claims data, leaving 770 persons. We excluded 28 persons who did not meet standard criteria for depression but who reported a history of depression, since they might be expected to have claims for depression despite not meeting criteria. Our study sample comprised 742 persons who had a clinical interview and were eligible for Medicare.

Baseline characteristics

Baseline patient characteristics are shown in Table 1. The study sample consisted of 742 persons with a mean age of 72.8 years (standard deviation 7.4) ranging from 60 to 95 years. Table 1 shows that the most were women (71.2%) and had a Medicare claim of cardiovascular disease (67.1%). Furthermore, 34.2% were non-white, 35.4% were married, and 13.3% reported smoking cigarettes in the past 6 months. The mean MMSE score was 27.1 (standard deviation 3.2) and mean HDRS score was 11.7 (standard deviation 8.1).

Concordance of Medicare claims with SCID diagnosis of depression

Table 2 presents the cross-classification between depression on clinical assessment with the SCID and a claim of depression in Medicare data during the same 2-year period for the entire sample. Concordance between the two methods was low, but statistically significant ($\chi^2_{[df=1, n=742]}=69.3, P < 0.0001, \kappa = 0.25$). Specificity was high (point estimate 87.7%, 95% confidence interval (CI) [83.1, 91.4]), but sensitivity was substantially lower (point estimate 41.8%, 95% CI [37.3, 46.4]). Stated differently, 88% of those who did not meet criteria for depression had no Medicare claim for depression, while 42% of those who met criteria for depression had a corresponding Medicare claim.

Characteristics associated with “false negatives”

Among those who met criteria for depression by SCID interview, we compared those who had no Medicare claims of depression (“false negatives”) with those who had a Medicare claim of depression in the initial two-year period (“true positives”). Unadjusted estimates show that persons over 70 years of age, women, several medical conditions, and more primary care physician visits in the two-year interval were less likely to be classified as “false negative” (“Model 1” in Table 3). With adjustment for characteristics that would be available with only Medicare claims data, persons of an ethnic minority were significantly more likely to be “false negative,” while persons with cardiovascular disease and more PCP office visits were less likely to be “false negative” (“Model 2” in Table 3). After additional adjustment for education, marital status, smoking, cognitive impairment, depression severity, and suicidal ideation, persons of an ethnic minority were about twice as likely as non-minority to be “false negative,” while smokers and persons with higher HDRS scores, cardiovascular disease, and more PCP office visits were less likely to be classified as “false negative” (“Model 3” in Table 3)."

Characteristics associated with “false positives”

Among those who did not meet criteria for major or minor depression by SCID interview, we compared those who had a Medicare claim of depression (“false positives”) with those who had no Medicare claim of depression during the two-year period (“true negatives”). Unadjusted estimates show (“Model 1” in Table 4) that persons over 70 years of age and more PCP office visits were more likely to have a claim for depression without meeting criteria for major or minor depression according to the SCID. Similarly, most medical conditions were significantly associated with having a claim when they did not meet criteria by the SCID. After adjustment for variables that would be available with only Medicare data, persons of an ethnic minority were less likely to be identified as depressed, but persons with chronic pulmonary disease were more likely to be identified with claims data as depressed when they did not meet criteria by the SCID (“Model 2” in Table 4). After additional adjustment for education, marital status, smoking, cognitive impairment, depression severity, and suicidal ideation, the association of ethnicity and chronic pulmonary disease with a claim despite not meeting criteria by the SCID was unchanged (“Model 3” in Table 4).

Positive and negative predictive value

The population estimate for the positive predictive value of a Medicare claim for depression was 66% (95% CI [63%, 69%]). The population estimate for the negative predictive value of not having a Medicare claim for depression was 77% (95% CI [76%, 78%]). Stated differently, the results indicate that, after accounting for the prevalence of depression in the sampled population, 66% of persons with a Medicare claim of depression would meet criteria for depression by SCID interview. In contrast, 77% of those without a Medicare claim of depression did not meet criteria for depression in the SCID clinical interview.

DISCUSSION

Using the standard clinical assessment as the ‘gold standard,’ Medicare claims data showed poor sensitivity but good specificity for a clinical diagnosis of depression. Medical conditions, derived from Medicare data, were associated with increased likelihood that a depressed patient would be identified in the Medicare claims as depressed. On the other hand, older patients in an ethnic minority who did meet criteria for depression were less likely than non-minority who met criteria to have a Medicare claim for depression. Because our sample was representative of the population of older primary care patients, we were able to calculate positive (66%) and negative (77%) predictive values that reflect the prevalence of depression in the population.

We recognize our methods have limitations to acknowledge before any discussion of results. Participating primary care practices may not reflect all primary care practices in the United States, as the study was carried out at sites in the greater metropolitan areas of New York City, Philadelphia, and Pittsburgh. While awareness of depression has increased over the past decade, our findings are relevant to use of Medicare data in research because diagnosis in primary care remains challenging, particularly among older persons. In any case, as part of the protocol of PROSPECT, the doctors received the diagnostic information derived from

the SCID and if anything we would expect the disclosure to increase concordance with claims data. We do not have medication data from Medicare Part D that might make the diagnosis from claims more specific; nevertheless, requiring antidepressant medicines be present with a claim of depression would only reduce the number of depression cases from Medicare claims data and would be unlikely to improve sensitivity. Our study has important strengths in that trained research associates conducted a thorough evaluation of depression diagnosis and severity using sensitive clinical rating instruments (i.e., SCID and HDRS). Research associates were expected to respond to visual cues (e.g., tearfulness, appearance, and demeanor), to challenge inconsistencies (e.g., patients who report no activities yet deny anhedonia), and to request clarification (e.g., whether sleep disturbance was due to frequent awakening to use the bathroom or to rumination that disturbs the ability to fall asleep). This approach contrasts sharply with other studies that used survey instruments or non-standardized assessments.^{12,13} We adjusted our estimates of association for the number of visits with the primary care physician, since patients with more visits may have more opportunity to be diagnosed than patients with fewer visits to the doctor.

Investigators have proposed algorithms to identify depression from claims data employing a number of selected diagnostic codes, treatment settings, study populations, and time periods. Claims represent a physician recognizing depression and providing a depression diagnosis code for billing purposes. An older person might meet criteria for depression but there may not be a depression diagnosis in Medicare data (“false negative”) for several reasons. Older patients may attribute symptoms of depression (e.g., fatigue) to physical illnesses or medical comorbidities.^{31,32} Depressed persons from minority groups may not be recognized as depressed by physicians.³³ In some cases, primary care providers may intentionally substitute another diagnostic code for major depression (such as fatigue) to circumvent problems with third-party reimbursement for services and to avoid jeopardizing the patient’s ability to obtain health insurance.³¹ Health plans that subcontract depression care to behavioral health organizations do not provide primary care physicians with compensation for diagnosing or treating depression, a disincentive for depression care.³⁴ Conversely, persons who do not meet criteria for depression might have a Medicare claim for depression (“false positives”) because physicians might have a low threshold for depression diagnosis reflected in global awareness of depression and its public health importance.³⁵ Patients may have depression “carried forward” in a patient’s medical record as a diagnosis even when they no longer are depressed. Comorbidity of depression symptoms with physical illness may play a role in whether physicians diagnose depression.¹⁴

Based on a 2012 systematic review,¹⁰ using at least two first-listed ICD-9 codes for 296.2 (major depressive episode, single episode), 296.3 (major depressive episode, recurrent episode), 300.4 (dysthymic disorder), or 311 (depression not elsewhere classified) and a filled prescription for an antidepressant medication resulted in the highest agreement with clinically diagnosed depression.³⁶ Other studies employing Medicare data have reported only modest agreement of claims data with depression diagnoses.^{12,13} Frayne and colleagues tested eight algorithms in a national sample of 133,068 older veterans who were treated for diabetes, finding that a claim of depression was associated with 82% positive predictive value and 68% negative predictive value.¹² Their in-person assessment was limited to a single question, “Has a doctor ever told you that you have any of the following: depression,

PTSD, schizophrenia?” Assessment with a single question may account for an optimistic positive predictive value since a respondent might only answer in the affirmative if the disorder was severe enough to have come to medical attention (e.g., high level of depressive symptoms).

Noyes et al. compared self-reported data from the Medicare Primary and Consumer Directed Care Demonstration to Medicare claims data (n = 1551) in a sample with mean age 77 years.¹³ Two measures were assessed against the Medicare claims: the Mini-International Neuropsychiatric Interview-Major Depressive Episode Module (MINI-MDE³⁷) and the 15-item version of the Geriatric Depression Scale (GDS³⁸). Both scales had poor positive predictive values when compared to the Medicare claims data (37% for the MINI and 51% for the GDS, based on unweighted data). The MINI consists of a series of yes-no questions that do not require interviewer judgment, and does not line up perfectly with the SCID (κ of 0.55, sensitivity 77%, specificity 79% for major depression³⁹).

We extended observations to analyze what characteristics influenced concordance. Minority groups were more likely than whites to be “false negative,” that is, after adjustment for influential characteristics such as age, depression severity, and medical comorbidity, minority older patients who met criteria for depression were about twice as likely not to have a Medicare claim for depression (odds ratio 2.11, 95% confidence interval 1.17 to 3.80). Reflecting the other side of the coin, non-minority patients were more likely than minorities to be classified as “false positive.” After adjustment, non-minority older patients who did not meet criteria for depression nevertheless were more likely than minorities to have a Medicare claim for depression (odds ratio 3.96, 1.12 to 14.04). In the Spectrum study, older African American primary care patients were less likely to be identified as depressed or managed for depression than whites.³³ Minority older adults were more likely than whites to be misclassified by Medicare claims based on the clinical assessment as the ‘gold standard.’

Patients with medical comorbidity were more likely to have a Medicare claim for depression, whether or not the patient met clinical criteria for depression. Among patients who met criteria for depression, the presence of medical comorbidity signaled that the patient was less likely to be “false negative.” In multivariable models, only smokers and patients with cardiovascular disease were significantly less likely to be a “false negative,” consistent with work suggesting that physicians are more likely to identify depression in the presence of cardiovascular disease.¹⁴ The presence of medical comorbidity was associated with higher odds of having Medicare claims for depression, even when the patient did not meet criteria for depression. In multivariable models, only patients with chronic pulmonary disease were significantly more likely to be a “false positive.” Our findings on the concordance between claims for depression and clinical assessment are consistent with evidence that doctors tend to rate patients higher on depression when medical comorbidity is present.¹⁴

In summary, when Medicare claims are used to study depression, investigators should be aware that minority older adults who meet criteria for depression may be less likely, and persons with medical comorbidity who do not meet criteria for depression more likely, to

have a Medicare claim for depression. Given the generally good agreement between claims and clinical assessment for medical conditions^{1–6} or procedures,^{7,8} analysis of Medicare claims provides a useful tool for the study of population health. Nevertheless, the opportunity to study depression care at the population level employing Medicare claims must be tempered by findings on how well claims correspond to clinical diagnostic criteria for depression.

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TABLE 1

Description of the Sample. Data Gathered from the Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT) and Medicare Claims, 1999–2003, (n=742)

Characteristics	Mean \pm SD or n (%)
Sociodemographic characteristics	
Age, years	72.8 \pm 7.4
Women	528 (71.2)
Ethnic minority	254 (34.2)
Education, years	12.8 \pm 3.6
Married	263 (35.4)
Habits	
Current smoker	99 (13.3)
Cognition and depression	
MMSE score	27.1 \pm 3.2
HDRS score	11.7 \pm 8.1
Suicidal ideation (SSI > 0)	120 (16.2)
Medical conditions	
Cardiovascular disease	498 (67.1)
Diabetes	190 (25.6)
Cancer	96 (12.9)
Chronic pulmonary disease	158 (21.3)
Medical services	
PCP office visits, counts	7.7 \pm 7.6
Depression status by SCID	
Major depression	321 (43.3)
Minor depression	153 (20.6)
No depression	268 (36.1)

Notes: Minority defined as ethnicity other than non-Hispanic white.

SD, Standard Deviation; MMSE, Mini-Mental State Examination; HDRS, Hamilton Depression Rating Scale; SSI, Scale for Suicidal ideation; PCP, Primary Care Physician.

TABLE 2
 Relationship between Depression based on SCID Interview and Claim of Depression in CMS Data. Data Gathered from the Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT) and Medicare Claims, 1999–2003.

	Any depression based on SCID interview	Does not meet criteria based on SCID interview	Totals
Any depression	198	33	
Based on Medicare claims data	(True Positives)	(False Positives)	
No Medicare claims	276	235	
For depression	(False Negatives)	(True Negatives)	
Totals	474	268	742
	Sensitivity = 41.8% 95% CI, (37.3, 46.4)		
	Specificity = 87.7% 95% CI, (83.1, 91.4)		

Medicare Claims among Persons who Met Criteria for Depression according to the SCID, Comparing Characteristics of Persons who Had No Medicare Claim for Depression (“False Negatives”) to Persons who Had a Medicare Claim for Depression (Reference Group). Data Gathered from the Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT) and Medicare Claims, 1999–2003.

TABLE 3

Characteristic	Unadjusted OR (95% CI) (Model 1)	Adjusted OR (95% CI) (Model 2)	Adjusted OR (95% CI) (Model 3)
Sociodemographic characteristics			
Age > 70 years	0.61 (0.41 – 0.89)**	0.86 (0.55 – 1.33)	0.79 (0.50 – 1.25)
Women	0.64 (0.42 – 0.97)*	0.67 (0.41 – 1.10)	0.69 (0.40 – 1.18)
Ethnic minority	1.16 (0.75 – 1.81)	1.75 (1.02 – 3.01)*	2.11 (1.17 – 3.80)*
Education (at least 12 years)	1.27 (0.84 – 1.94)	—	1.24 (0.73 – 2.10)
Married	1.45 (0.96 – 2.20)	—	1.16 (0.68 – 1.96)
Habits			
Current smoker	0.79 (0.48 – 1.29)	—	0.55 (0.30 – 0.99)*
Cognition and depression			
MMSE score (< 23)	0.60 (0.29 – 1.25)	—	0.57 (0.22 – 1.46)
HDRS score (> 10)	0.65 (0.40 – 1.04)	—	0.47 (0.26 – 0.84)*
Suicidal ideation (SSI > 0)	0.95 (0.61 – 1.50)	—	0.90 (0.53 – 1.54)
Medical conditions			
Cardiovascular disease	0.18 (0.11 – 0.29)***	0.30 (0.17 – 0.52)***	0.28 (0.16 – 0.50)***
Diabetes	0.78 (0.51 – 1.20)	1.62 (0.96 – 2.73)	1.70 (0.98 – 2.93)
Cancer	0.45 (0.26 – 0.78)**	0.62 (0.33 – 1.16)	0.66 (0.35 – 1.28)
Chronic pulmonary disease	0.38 (0.24 – 0.60)***	0.64 (0.38 – 1.07)	0.70 (0.41 – 1.19)
Medical services			
PCP office visits	0.88 (0.85 – 0.91)**	0.91 (0.88 – 0.94)***	0.90 (0.87 – 0.94)***

Notes: All coefficients based on logistic regression models with random effects to account for clustering of patients by practice. The statistical significance of individual variables was assessed with t tests; Model 1, *df* = 454; Model 2, *df* = 447; Model 3, *df* = 430.

OR, Odds Ratio; CI, Confidence interval; MMSE, Mini-Mental State Examination; HDRS, Hamilton Depression Rating Scale; SSI, Scale for Suicidal Ideation; PCP, Primary Care Physician.

$P < 0.001$.

$P < 0.01$.
**

$P < 0.05$.
*

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Medicare Claims among Persons who Did Not Meet Criteria for Depression according to the SCID, Comparing Characteristics of Persons who Had a Medicare Claim for Depression (“False Positives”) to Persons Who Had No Medicare Claim for Depression (Reference Group). Data Gathered from the Prevention of Suicide in Primary Care Elderly: Collaborative Trial (PROSPECT) and Medicare Claims, 1999–2003.

TABLE 4

Characteristic	Unadjusted OR (95% CI) (Model 1)	Adjusted OR (95% CI) (Model 2)	Adjusted OR (95% CI) (Model 3)
Sociodemographic characteristics			
Age > 70 years	2.84 (1.05 – 7.66)*	1.47 (0.49 – 4.45)	1.46 (0.44 – 4.85)
Women	0.80 (0.37 – 1.74)	1.10 (0.44 – 2.76)	1.05 (0.36 – 3.06)
Ethnic minority	0.40 (0.16 – 1.01)	0.27 (0.09 – 0.81)*	0.25 (0.07 – 0.90)*
Education (at least 12 years)	0.99 (0.43 – 2.25)	—	0.99 (0.31 – 3.12)
Married	1.36 (0.65 – 2.84)	—	1.13 (0.41 – 3.08)
Habits			
Current smoker	1.61 (0.43 – 5.98)	—	2.55 (0.48 – 13.66)
Cognition and depression			
MMSE score (< 23)	1.77 (0.55 – 5.65)	—	2.28 (0.50 – 10.37)
HDRS score (> 10)	4.48 (1.40 – 14.41)*	—	4.97 (0.91 – 27.15)
Suicidal ideation (SSI > 0)	2.25 (0.58 – 8.70)	—	0.70 (0.07 – 7.18)
Medical conditions			
Cardiovascular disease	8.15 (1.89 – 35.18)**	3.17 (0.64 – 15.77)	2.78 (0.55 – 13.95)
Diabetes	2.87 (1.36 – 6.07)**	2.33 (0.99 – 5.52)	1.89 (0.74 – 4.85)
Cancer	3.46 (1.43 – 8.36)**	1.84 (0.67 – 5.10)	1.96 (0.67 – 5.77)
Chronic pulmonary disease	6.50 (2.98 – 14.18)***	4.45 (1.90 – 10.45)***	3.84 (1.55 – 9.51)**
Medical services			
PCP office visits	1.09 (1.04 – 1.14)***	1.04 (0.98 – 1.10)	1.05 (0.99 – 1.12)

Notes: All coefficients based on logistic regression models with random effects to account for clustering of patients by practice. The statistical significance of individual variables was assessed with t tests: Model 1, *df* = 248; Model 2, *df* = 241; Model 3, *df* = 230.

OR, Odds Ratio; CI, Confidence interval; MMSE, Mini-Mental State Examination; HDRS, Hamilton Depression Rating Scale; SSI, Scale for Suicidal Ideation; PCP, Primary Care Physician.

* *P* < 0.05;

$P < 0.0001$

 $P < 0.01$
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