Time to Depression Treatment in Primary Care Among HIV-infected and Uninfected Veterans

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BACKGROUND: Multiple factors, including patient characteristics, competing demands, and clinic type, impact delivery of depression treatment in primary care.

OBJECTIVE: Assess whether depression severity and HIV serostatus have a differential effect on time to depression treatment among depressed patients receiving primary care at Infectious Disease or General Medicine clinics.

DESIGN: Multicenter prospective cohort, (Veterans Aging Cohort Study), comparing HIV-infected to uninfected patients.

PARTICIPANTS AND MEASURES: The total cohort consisted of 3,239 HIV-infected and 3,227 uninfected patients. Study inclusion criteria were untreated depressive symptoms, based on a Patient Health Questionnaire (PHQ-9) score of greater than 9, and no antidepressants or mental health visits in the 90 days prior to PHQ-9 assessment. Treatment was defined as antidepressant receipt or mental health visit within 90 days following PHQ-9 assessment. Depression severity based on PHQ-9 scores was defined as mild-moderate (greater than 9 to 19) and severe (20 or greater). Kaplan-Meier curves were used to estimate time to treatment by depression severity and HIV serostatus. Cox proportional hazards methods adjusted for covariates were used.

KEY RESULTS: Overall, 718 (11%) of the cohort met inclusion criteria, 258 (36%) of whom received treatment. Median time to treatment was 7 days [95% confidence interval (CI) = 4, 13] and was shortest for severely depressed HIV-infected patients (0.5 days; 95% CI=0.5, 6, $p=0.04$). Compared to mildly-moderately depressed uninfected patients, severely depressed HIV-

infected patients were significantly more likely to receive treatment [adjusted hazard ratio (HR) 1.67, 95% CI=1.07, 2.60], whereas mildly-moderately depressed HIV-infected patients (adjusted HR 1.10, 95% CI=0.79, 1.52) and severely depressed uninfected patients (adjusted HR 0.93, 95% CI=0.60, 1.44) were not.

CONCLUSIONS: In this large cohort, time to primary care treatment of depression was shortest among severely depressed HIV-infected patients. Regardless of HIV serostatus, if depression was not treated on the assessment day, then it was unlikely to be treated within a 90-day period, leading to the majority of depression being untreated.

KEY WORDS: AIDS; antidepressant drugs; HIV; major depression; psychotherapy.

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INTRODUCTION

Depression is associated with increased health care utilization¹, decreased quality of life², and suicides among patients in primary care³. Among people living with HIV/AIDS, depression increases the likelihood of HIV transmission⁴, is associated with poor adherence to antiretroviral therapy (ART)⁵ leading to virologic failure⁶, and may independently increase HIV progression⁷. These adverse effects of depression are especially concerning given its high prevalence: in a nationally representative probability sample of adult HIV-infected patients in primary care, the 1-year prevalence of major depressive disorder was 36% compared to 7.6% among the general population⁸.

Both antidepressants and psychotherapy have demonstrated effectiveness in treating depression, including among HIV-infected patients^{9,10}. Despite the profound consequences of depression and the existence of effective treatments, providers under-diagnose and under-treat major depressive disorder^{11,12}. Somatic symptom overlap between depression and chronic medical illnesses¹³ and competing demands of primary care visits¹⁴ contribute to this under-treatment. To improve

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depression treatment quality, it is critical to understand the timing of treatment and to identify factors associated with the delay of treatment. Patient race and clinical characteristics affect the likelihood of depression treatment: depressed African-American HIV-infected patients are less likely to receive antidepressants compared to depressed white or Hispanic HIV-infected patients¹²; patients are more likely to receive treatment in clinics that have on-site mental health providers¹⁵.

To our knowledge, there have been no studies evaluating the time to depression treatment among depressed primary care patients. The primary aim of this study was to determine whether time to depression treatment differed between HIV-infected patients who receive primary care through infectious disease (ID) clinics and uninfected patients who receive primary care through general medicine (GM) clinics among patients in a large national Veteran Affairs (VA) sample. The secondary aim was to evaluate correlates of untreated depression, specifically depression severity and HIV serostatus. We hypothesized that time to depression treatment would be shorter among HIV-infected patients because ID providers have smaller patient panels, can schedule earlier return appointments, and have longer appointment times compared to GM providers. Also, we hypothesized that the time to depression treatment would be shortest among patients with severe depressive symptoms¹⁶.

METHODS

Patient Population

Veterans Aging Cohort Study (VACS) is a prospective cohort study of HIV-infected patients and an age-, race-, and site-frequency matched comparison group of uninfected patients receiving care in eight VA centers¹⁷. Between June 2002 and September 2006, patients were asked to complete a self-administered survey. Overall, 58% of HIV-infected patients seen during this interval were enrolled¹⁷. As of September 2006, 6,466 patients had enrolled (3,239 HIV-infected and 3,227 uninfected). VACS data were linked to the VA's administrative data, pharmacy records, and electronic medical record system to obtain information on medical, psychiatric, and substance abuse diagnoses based on *International Classification of Diseases, Ninth Revision* (ICD-9) codes, filled prescriptions, and laboratory data. VACS survey and ICD-9 coding categories are available at www.vacohort.org. The VACS study has been IRB-approved at the coordinating center at the VA Connecticut Healthcare System, at Yale University, and at each of the sites. All patients gave written informed consent.

VACS Survey

The survey included patient characteristics and screening instruments for alcohol use [Alcohol Use Disorders Identification Test (AUDIT-C)]¹⁸ and depressive symptoms [Patient Health Questionnaire (PHQ-9)]¹⁹ but is not part of the VA clinical reminder system. VACS staff coordinate administration of a baseline survey, which occurred either before or after a clinical encounter, independent of the patient's HIV serostatus.

VACS staff informed providers of PHQ-9 scores only in the case of patient endorsed suicidality.

Providers

All VACS patients had one identified primary care provider: ID providers for HIV-infected patients and GM providers for uninfected patients. Patients are not co-managed by ID and GM providers. Providers included attending physicians, residents, fellows, physician assistants, and nurse practitioners; ID clinics have no residents. All non-attending physicians and mid-level providers are supervised by attending physicians, who do not differ by sex, race, or duration of practice; however, ID-certified physicians are older than GM-certified physicians²⁰. Some ID and GM providers were also VACS investigators, but this study evaluated the standard clinical care provided at participating VA centers. ID and GM providers initiate and provide mental health care until referral is made to mental health provider. Although this study occurred before VA's initiative to base mental health providers in primary care clinics, three ID and four GM clinics had on-site mental health providers. ID and GM providers can be aware of their patient's VACS participation.

Measures

Screen for Depressive Symptoms. Depressive symptoms were assessed using the PHQ-9, a validated screening tool for major depressive disorder as defined by the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* (DSM-IV) criteria²¹. Depressive severity based on PHQ-9 scores has been defined as minimal (score of 0 to 9), mild (score of 10 to 14), moderate (score of 15 to 19), and severe (score of 20 to 27)²². A PHQ-9 score of greater than 9 has both a sensitivity and specificity of 88% for major depressive disorder diagnosis made by a provider¹⁹. In this study, a positive depression screen was defined as PHQ-9 score greater than nine²³; mild-moderate depressive symptoms were defined as PHQ-9 scores greater than 9 to 19; scores greater than 20 were considered severe depressive symptoms²². Baseline PHQ-9 was defined as the first PHQ-9 the patient completed between June 2002 and September 2006.

Depression Treatment. Depression treatment was defined as either a receipt of antidepressant or at least one VA mental health visit(s) within the 90-day period following the baseline PHQ-9,²⁴ as treatment after 90 days may reflect treatment of a recurrent rather than the index episode. Treatment status was dichotomized as yes-no variable. Prescribed antidepressant medications included selective serotonin reuptake inhibitor, serotonin and norepinephrine reuptake inhibitor, mirtazapine, monoamine oxidase inhibitor, bupropion, or tricyclic antidepressant.

Comorbid Conditions. Psychiatric and medical comorbid conditions associated with increased depression risk were identified from VA administrative data and hepatitis C laboratory results and included illicit drug abuse, alcohol abuse, post-traumatic stress disorder, schizophrenia/schizoaffective, bipolar, anxiety disorder, diabetes, coronary

artery disease, hypertension, hepatitis C, hepatitis B, stroke, pulmonary disease, and renal disease.

Study Inclusion Criteria. As this study aimed to evaluate the incidence of treatment of depressive symptoms, patients with PHQ-9 scores greater than 9 were included only if they had no VA mental health visit and did not fill an antidepressant prescription in the 90 days preceding baseline PHQ-9 assessment. That is, depressive symptoms among patients who had received depression treatment in the 90 days prior to their baseline PHQ-9 assessment would reflect partial or inadequate response to treatment, not a “new” depressive episode²⁵. Patients who did not live at least 1 year after PHQ-9 assessment were also excluded, given the complexities associated with recognition and treatment of depression in terminally ill patients²⁶.

Data Analyses

Baseline demographic and clinical characteristics were compared by HIV serostatus using Pearson χ^2 for categorical variables and Student's *t* test for continuous variables. Kaplan-Meier survival curves were used to analyze differences in time to depression treatment by HIV serostatus and depression severity; the comparison group was uninfected patients with mild-moderate depression. Time was calculated as duration in days between baseline PHQ-9 administration and first event: received antidepressant, had VA mental health visit, or end of 90-day observation. Patients untreated for depression by end of 90-day follow-up were considered censored. Wilcoxon test was used to test for differences by HIV serostatus and depression severity. Multivariable models were fit using proportional hazards regression to assess whether HIV serostatus was associated with time to depression treatment. Potential confounding was controlled by adjusting for variables associated with HIV serostatus in bivariate analyses and for models of HIV-infected patient CD4 count, HIV viral load, and ART adherence (percentage of ART prescriptions filled within 1-year period). Statistical analyses were performed using SAS version 9.1.3 (SAS, Inc., Cary, NC).

RESULTS

Patient Characteristics

Of 6,466 patients enrolled in VACS, 6,326 (98%) were alive 1 year post assessment. Of these, 1,348 had a baseline PHQ-9 score of greater than 9, and 718 of these had not received any depression treatment in the preceding 90 days. The majority of these patients were male (95%), African American (61%), unemployed (81%), and did not have a partner (72%). Median age was 48 years. Patients had a median of two comorbid conditions and a median PHQ-9 score of 14. Fifty-six percent were HIV-infected. Among HIV-infected patients, median CD4 count and HIV viral load were 336 cells/ μ l [interquartile range (IQR) 335] and 3.6 log₁₀ copies/ml (IQR 2.74), respectively. Seventy-two percent were on ART at time of depression assessment. More uninfected patients had severe depression (25%) compared to HIV-infected patients (17%). Patient

characteristics that were statistically significantly different by HIV serostatus and depression severity were gender, partner status, income, employment status, number of GM or ID visits in the year prior to assessment, and having comorbid illicit drug use, post-traumatic stress disorder, coronary artery disease, hypertension, hepatitis C, hepatitis B, and diabetes (Table 1).

Depression Treatment

In the 90-day period after baseline PHQ-9 assessment, 20% of patients with depressive symptoms received at least one mental health visit, 27% received an antidepressant, and 36% received either a mental health visit or antidepressant (Table 2). Among those treated with either antidepressant or mental health visit(s), overall median time to depression treatment was 7 days (range 0.5–89 days). Median time to any depression treatment was shortest among HIV-infected patients with severe depression (0.5 days, range 0.5–83 days) compared to uninfected patients with severe depression (7 days, range 0.5–54 days), HIV-infected patients with mild-moderate depression (5.5 days, range 0.5–84 days), and uninfected patients with mild-moderate depression (13 days, range 0.5–88 days), (*p*=0.04), (See Fig. 1). Median time to antidepressant treatment alone was also shortest among HIV-infected patients with severe depression (0.5 days, range 0.5–83 days) compared to uninfected patients with severe depression (20.5 days, range 0.5–84 days), HIV-infected patients with mild-moderate depression (2.5 days, range 0.5–84 days), and uninfected patients with mild-moderate depression (13.5 days, range 0.5–84 days), (*p*=0.004). There was no statistically significant difference with respect to time to mental health visit: HIV-infected patients with severe depression (17.5 days, range 0.5–81 days), uninfected patients with severe depression (19 days, range 0.5–52 days), HIV-infected patients with mild-moderate depression (23.5 days, range 0.5–84 days), and uninfected patients with mild-moderate depression (20 days, range 0.5–88 days) (*p*=0.92). Value of 0.5 days indicates that patient was treated on PHQ-9 administration day.

Depression Treatment Correlates

In unadjusted Cox regression models, HIV-infected patients with severe depression were significantly more likely to receive depression treatment [hazard ratio (HR) 1.55, 95% confidence interval (CI) = 1.03, 2.33] compared to uninfected patients with mild-moderate depression. There was no significant difference in treatment rate for HIV-infected patients with mild-moderate depression (HR 1.01, 95% CI=0.76, 1.34) and uninfected patients with severe depression (HR 1.09, 95% CI=0.72, 1.67) compared to uninfected patients with mild-moderate depression (Table 3).

After adjusting for patient demographic and clinical characteristics, treatment rate for HIV-infected patients with severe depression (HR 1.67, 95% CI=1.07, 2.60) continued to be significantly higher (*p*=0.03) compared to uninfected patients with mild-moderate depression. In this adjusted model that included all the study patients, patients who were African American (HR 0.61, 95% CI=0.45, 0.82), were Hispanic (HR 0.51, 95% CI=0.31, 0.84), had coronary artery disease (HR 0.57, 95% CI=0.34, 0.95), or had hepatitis C (HR 0.49, 95% CI=0.35,

Table 1. Demographic and Clinical Characteristics of Patients with Untreated Depressive Symptoms (PHQ-9>9), Stratified by HIV Serostatus and Depression Severity

Characteristics	Uninfected patients		HIV-infected patients		P-Value
	Mild-moderate depression ^a (no. (%))	Severe depression ^a (no. (%))	Mild-moderate depression ^a (no. (%))	Severe depression ^a (no. (%))	
Patients (no.)	239	79	331	69	–
Median age (years)	48	50	48	48	0.06
Comorbid conditions (median no.)	2	3	2	2	0.05
Median PHQ-9 score	13	23	13	23	<0.001
Median AUDIT-C (4 items)	5	5	5	4	0.88
Female	27 (11.3)	3 (3.8)	5 (1.5)	4 (5.8)	<0.001
Race/ethnicity	–	–	–	–	0.47
White	57 (23.9)	24 (30.4)	64 (19.3)	11 (15.9)	–
African American	147 (61.5)	43 (54.4)	203 (61.3)	43 (62.3)	–
Hispanic	25 (10.5)	8 (10.1)	45 (13.6)	10 (14.5)	–
Other	10 (4.2)	4 (5.1)	19 (5.7)	5 (7.3)	–
Partnered	83 (34.7)	30 (38.0)	73 (22.1)	13 (18.8)	<0.001
High school graduate	168 (70.3)	49 (62.0)	235 (71.0)	43 (62.3)	0.26
Income <12 K per year	122 (51.1)	50 (63.3)	212 (64.1)	53 (76.8)	<0.001
Employed	59 (24.7)	13 (16.5)	55 (16.6)	8 (11.6)	0.03
Homeless (past 4 weeks)	42 (17.6)	24 (30.4)	66 (19.9)	17 (24.6)	0.08
Current smoker	135 (56.5)	50 (63.3)	213 (64.4)	46 (66.7)	0.21
Illicit drug use ^b	66 (27.6)	32 (40.5)	100 (30.2)	30 (43.5)	0.02
Alcohol abuse ^b	62 (25.9)	19 (24.1)	74 (22.4)	21 (30.4)	0.49
Post-traumatic stress disorder ^b	34 (14.2)	22 (27.9)	29 (8.8)	10 (14.5)	<0.001
Schizophrenia/schizoaffective ^b	10 (4.2)	1 (1.3)	11 (3.3)	1 (1.5)	0.49
Bipolar disorder ^b	14 (5.9)	8 (10.1)	17 (5.1)	7 (10.1)	0.22
Anxiety disorder ^b	19 (8.0)	9 (11.4)	31 (9.4)	6 (8.7)	0.82
Coronary artery disease ^b	22 (9.2)	14 (17.7)	13 (3.9)	3 (4.4)	<0.001
Hypertension ^b	124 (51.9)	42 (53.2)	86 (26.0)	15 (21.7)	<0.001
Hepatitis C ^b	52 (21.8)	11 (13.9)	125 (37.8)	23 (33.3)	<0.001
Hepatitis B ^b	4 (1.7)	2 (2.5)	17 (5.1)	6 (8.7)	0.03
Diabetes ^b	65 (27.2)	18 (22.8)	35 (10.6)	5 (7.3)	<0.001
Stroke ^b	8 (3.4)	5 (6.3)	7 (2.1)	1 (1.5)	0.20
Pulmonary disease ^b	25 (10.5)	11 (13.9)	39 (11.8)	1 (1.5)	0.06
Renal disease ^b	7 (2.9)	2 (2.5)	11 (3.3)	2 (2.9)	0.98
Visits to GM/ID clinic ^c (median no.)	3	3	5	5	<0.001
Median CD4 count (cells/ μ l)	–	–	345	303.5	0.27
Median HIV viral load (log ₁₀ copies/ml)	–	–	3.5	3.9	0.34
Antiretroviral therapy ^c	–	–	238 (71.9)	50 (72.5)	0.92
ART adherence $\geq$ 95% ^c	–	–	67 (20.2)	12 (17.4)	0.55

Abbreviations: PHQ-9 = Patient Health Questionnaire-9; AUDIT-C = Alcohol Use Disorders Identification Test; GM/ID = general medicine/infectious disease; ART = antiretroviral therapy

^aDepression severity: mild-moderate (PHQ-9 score >9 to 19) and severe (PHQ-9 score $\geq$ 20)

^bDiagnoses from Veterans Affairs administrative data using International Classification of Diseases, Ninth Revision codes and laboratory results for hepatitis C

^cTime period is year prior to assessment

0.68) were less likely to receive treatment, while having more comorbidities (HR 1.43, 95% CI=1.25, 1.64) or GM/ID visits in the year prior to assessment (HR 1.03, 95% CI=1.00, 1.06) was associated with greater treatment likelihood. In adjusted analysis among only uninfected patients, having more GM visits in the year prior to assessment (HR 1.07, 95% CI=1.03, 1.12) or more comorbidities (HR 1.49, 95% CI=1.21, 1.83) was

associated with greater treatment likelihood, while being African American (HR 0.60, 95% CI=0.37, 0.97) or having hepatitis C (HR 0.47, 95% CI=0.27, 0.81) was associated with lower treatment likelihood. In adjusted analysis among only HIV-infected patients, no analyzed factor was associated with greater treatment likelihood, while being African American (HR 0.59, 95% CI=0.37, 0.95), being Hispanic (HR 0.37, 95%

Table 2. Treatment of Depressive Symptoms, Stratified by HIV Serostatus and Depression Severity

Depression treatment	Uninfected patients		HIV-infected patients		P-Value
	Mild-moderate depression ^a (no. (%))	Severe depression ^a (no. (%))	Mild-moderate depression ^a (no. (%))	Severe depression ^a (no. (%))	
Any antidepressant	60 (25.1)	22 (27.9)	84 (25.4)	27 (39.1)	0.11
Any mental health visit	49 (20.5)	15 (19.0)	64 (19.3)	14 (20.3)	0.98
Any depression treatment	83 (34.7)	29 (36.7)	114 (34.4)	32 (46.4)	0.29

^aDepression severity: mild-moderate (Patient Health Questionnaire-9 score >9 to 19) and severe (Patient Health Questionnaire-9 score $\geq$ 20)

Figure 1. Time to treatment of depressive symptoms, stratified by HIV serostatus and depression severity.

CI=0.17, 0.79), or having hepatitis C (HR 0.51, 95% CI=0.30, 0.86) was associated with lower treatment likelihood. No analyzed HIV specific factor was associated with time to depression treatment (Table 3).

DISCUSSION

Our findings provide further evidence of the under-treatment of depression in primary care settings, including by general

medical providers and medical specialists (infectious disease providers). However, among both HIV-infected and uninfected patients in whom depression is detected, depression treatment is initiated quickly and typically at the assessment visit for HIV-infected patients with severe depression. The finding that ID providers treat severe depression more quickly may reflect either biological differences among patients by HIV serostatus or practice characteristic differences between ID and GM clinics. For example, ID providers have more time with patients as they have longer visit durations and smaller patient panels. In this study, uninfected patients in care at GM clinics were no less clinically complex than HIV-infected patients in care at ID clinics. Compared to HIV-infected patients, more uninfected patients had severe depression, characteristics that are usually associated with depression treatment (being female, having higher income, employed, and having a partner),²⁷ and conditions common in depressed patients that could serve as depression screening indicators (post-traumatic stress disorder²⁸, diabetes²⁹, hypertension³⁰, and coronary artery disease³⁰). Despite these potential depression treatment correlates among uninfected patients, time to depression treatment was significantly shorter in HIV-infected patients with severe depression.

In this study, African Americans and Hispanics received delayed depression treatment, consistent with previous reports of under-detection and under-treatment of depression among non-white patients^{31,32}. This disparity occurring in the VA (an integrated system) suggests that this difference is not entirely due to barriers to access to care. Both psychiatric and medical comorbidity also appear to have a significant impact

Table 3. Unadjusted and Adjusted Hazard Ratios for Treatment of Depressive Symptoms, Stratified by HIV Serostatus

Patient characteristics	All patients	All patients, adjusted	Uninfected patients	HIV-infected patients
	Hazard ratio (95% CI)	Hazard ratio (95% CI)	Hazard ratio (95% CI)	Hazard ratio (95% CI)
HIV-infected, severe depression ^a	1.55 (1.03, 2.33)	1.67 (1.07, 2.60)	N/A	1.64 (1.02, 2.65)
HIV-infected, mild-moderate depression ^a	1.01 (0.76, 1.34)	1.10 (0.79, 1.52)	N/A	Reference
Uninfected, severe depression ^a	1.09 (0.72, 1.67)	0.93 (0.60, 1.44)	0.86 (0.54, 1.37)	N/A
Uninfected, mild-moderate depression ^a	Reference	Reference	Reference	N/A
Age	—	0.99 (0.98, 1.01)	1.00 (0.97, 1.03)	1.01 (0.98, 1.04)
African American	—	0.61 (0.45, 0.82)	0.60 (0.37, 0.97)	0.59 (0.37, 0.95)
Hispanic	—	0.51 (0.31, 0.84)	0.67 (0.33, 1.39)	0.37 (0.17, 0.79)
Other	—	0.62 (0.34, 1.13)	0.80 (0.28, 2.28)	0.56 (0.22, 1.39)
Female	—	1.23 (0.72, 2.11)	1.60 (0.80, 3.20)	1.75 (0.52, 5.91)
Partnered	—	1.11 (0.83, 1.48)	1.25 (0.81, 1.94)	0.85 (0.52, 1.39)
Income <12 k	—	0.96 (0.72, 1.27)	1.07 (0.69, 1.67)	1.04 (0.66, 1.65)
Employed	—	0.88 (0.62, 1.26)	0.59 (0.33, 1.07)	1.55 (0.91, 2.64)
Illicit drug use ^b	—	0.90 (0.59, 1.35)	0.94 (0.47, 1.88)	1.22 (0.65, 2.30)
Post-traumatic stress disorder ^b	—	1.17 (0.82, 1.68)	1.43 (0.88, 2.34)	1.67 (0.85, 3.27)
Diabetes ^b	—	0.87 (0.60, 1.26)	0.63 (0.37, 1.08)	1.16 (0.63, 2.15)
Coronary artery disease ^b	—	0.57 (0.34, 0.95)	0.58 (0.29, 1.14)	0.78 (0.30, 2.00)
Hypertension ^b	—	0.72 (0.52, 1.00)	0.82 (0.51, 1.33)	0.79 (0.45, 1.39)
Hepatitis C ^b	—	0.49 (0.35, 0.68)	0.47 (0.27, 0.81)	0.51 (0.30, 0.86)
Hepatitis B ^b	—	0.61 (0.33, 1.13)	1.26 (0.45, 3.58)	0.61 (0.27, 1.37)
Number of comorbidities	—	1.43 (1.25, 1.64)	1.49 (1.21, 1.83)	1.25 (1.00, 1.56)
Visits to GM/ID clinic ^c	—	1.03 (1.00, 1.06)	1.07 (1.03, 1.12)	1.03 (0.99, 1.07)
CD4 count (cells/ μ l)	—	—	—	1.02 (0.99, 1.05)
HIV viral load (log ₁₀ copies/ml)	—	—	—	1.09 (0.91, 1.32)
Antiretroviral therapy ^c	—	—	—	1.05 (0.61, 1.80)

Abbreviations: CI=confidence interval; GM/ID=general medicine/infectious disease

^aDepression severity: mild-moderate (Patient Health Questionnaire-9 score >9 to 19) and severe (Patient Health Questionnaire-9 score $\geq$ 20)

^bDiagnoses from Veterans Affairs administrative data using International Classification of Diseases, Ninth Revision codes and laboratory results for hepatitis C

^cTime period is year prior to assessment

on time to depression treatment. For example, hepatitis C infection complicates depression treatment³³ and in this study was associated with delay in depression treatment initiation regardless of HIV serostatus. Similarly, coronary artery disease was also associated with delay in depression treatment, perhaps suggesting the impact of competing demands on primary care providers³⁴. Neither a history of alcohol abuse nor baseline AUDIT scores were associated with a delay in depression treatment; while, history of illicit drug use was more common among HIV-infected patients, it did not significantly affect time to depression treatment. Surprisingly, among depressed HIV-infected patients, well-controlled HIV infection (i.e., higher CD4 counts, lower HIV viral loads, being prescribed ART, or being adherent to ART) was not associated with shorter time to depression treatment.

Competing demands impact detection and treatment of depression in primary care³⁵. Among patients with untreated depressive symptoms in this study, uninfected compared to HIV-infected patients had more comorbidities (although did not achieve a statistically significant difference) but had half as many primary care visits in the year prior to assessment. The likelihood of depression treatment might increase if these patients had more frequent visits. Indeed, in this study, we found that more GM visits in the year prior to assessment was associated with a greater likelihood of depression treatment among depressed uninfected patients. Our finding that having more comorbidities was associated with a greater likelihood of depression treatment among depressed uninfected patients was inconsistent with some previous literature suggesting that depression treatment occurs less frequently among depressed patients with comorbid conditions¹⁴; however, patients with multiple comorbidities typically have more frequent visits with medical providers, offering more encounters for depression to be diagnosed and treated. Furthermore, the HIV-infected group in this study had well-controlled HIV, potentially allowing ID providers more time to address other conditions, such as depression. These factors could have accentuated the effects of competing demands on detection and treatment of depression more among uninfected compared to HIV-infected patients. Consequently, compared to ID providers, GM providers may have less time to nurture a working alliance with patients that fosters an environment conducive not only to detecting depression, but also formulating depression treatment plans acceptable to patients. If these conditions are fulfilled, time to depression treatment could improve, as suggested by our study's median time to depression treatment being 7 days.

We have previously shown that ID and GM providers are equally likely to under-diagnosis and under-treat depression¹⁵, and ID compared to GM providers are less comfortable in treating depression²⁰. Despite these provider characteristics, time to depression treatment was shortest among HIV-infected patients; however, percentage of patients treated for depression and type of depression treatment (antidepressant or referral to mental health clinic) was not significantly different by HIV serostatus and depression severity.

Our findings should be interpreted in the context of our study's limitations. First, generalizability may be limited since patients who obtain care through the VA are not representative of all patients in care; however, only 9% of approached patients, regardless of HIV serostatus, refused participation in VACS¹⁷. Second, depression classification

was based on a screening instrument rather than diagnostic interview; however, patients with major depressive disorder are six times more likely to score 9 or higher on PHQ-9 testing than patients without major depressive disorder¹⁹. Third, detection of comorbid conditions was based on ICD-9 codes, and a count of comorbid conditions may not adequately capture clinical complexity. Fourth, providers were not aware of their patients' PHQ-9 scores; however, baseline PHQ-9 was administered during either GM or ID visit. Finally, our treatment definition does not adequately capture treatment complexity. Identification of treatment was based on VA utilization; patients may have obtained mental health treatment outside the VA. Also, referred patients could have cancelled or not attended their mental health visit. Furthermore, antidepressant prescription receipt does not indicate medication adherence. Moreover, patients could have declined depression treatment.

In conclusion, the majority of depressed patients in primary care do not receive treatment for depression. This study demonstrates that if depressed patients are not treated for depression on the day that they have symptoms severe enough to screen positive for depression, then ID and GM providers are unlikely to initiate depression treatment in the subsequent 90-day period. Difference between time to depression treatment among HIV-infected and uninfected patients may reflect differences in delivery of clinical care and suggests a need to evaluate the negative consequences of increasing demands on primary care providers.

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