

Nonadherence to Depression Treatment Guidelines Among Veterans With Diabetes Mellitus

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Objective: To assess the adequacy of antidepressant dosage and duration among veterans with and without diabetes mellitus (DM), as well as provider-level and patient-level predictors of depression care quality, based on Veterans Health Administration (VHA) evidence-based clinical practice guidelines.

Study Design: Retrospective (1997-2005) cohort study of administrative, clinical, and pharmacy data from a midwestern VHA facility.

Methods: The sample included 2332 subjects (773 with DM) who had a new episode of depression, received antidepressant therapy, and had neither schizophrenia nor bipolar disorder. Antidepressant dosage and duration were evaluated in the acute and continuation phases. Dosage was adequate if the treatment dosage met the minimum therapeutic dosage specified in VHA guidelines. Treatment duration was adequate if the medication possession ratio was at least 80%. Multivariate logistic regression analysis was used to calculate odds ratios (ORs), adjusted for demographic, clinical, and healthcare utilization characteristics.

Results: Most subjects received an adequate dosage during the acute (88%) and continuation (58%) phases. Subjects with DM were 1.51-fold more likely to receive adequate dosage during the acute phase but were similarly likely (OR, 1.15) to receive adequate dosage during the continuation phase. Few subjects (<10%) received adequate treatment duration. Diabetes mellitus was not associated with less adequate duration during the acute phase (OR, 1.14). Few factors were identified as significant predictors of both antidepressant dosage and duration.

Conclusions: Diabetes mellitus did not adversely affect depression care quality. Adequate antidepressant dosages were prescribed, but treatment duration fell short of guideline recommendations. Strategies to more effectively manage depression treatment are needed.

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Depression is a serious debilitating illness with high prevalence among the general population and among Veterans Health Administration (VHA) patients.^{1,2} Depression disproportionately affects those with chronic medical comorbidity, such as diabetes mellitus (DM).³ Unfortunately, depression recognition and treatment are poor. Only 46% to 51% of patients with depression are detected in primary care, and only half of those receive treatment.⁴

Major national organizations have endorsed clinical practice guidelines (CPGs) outlining minimum effective antidepressant dosage and duration,^{5,6} yet undertreat-

ment of depression is common, although wide variation (11%-90%) is reported.⁷⁻¹⁸ However, depression care adequacy may be lower than is reported. For example, prior studies^{9,11,15,19-21} have based duration adequacy on medication refills (which are problematic given the variation in days' supply) or on medication possession ratios (MPRs) less than the standard 80%. Dosage adequacy has not always been based on guideline-recommended dosages.^{13,17} Inadequate depression treatment is clinically significant for several reasons, including poor quality of life, economic burden, increased healthcare utilization, and poor medical and psychiatric outcomes.²²⁻²⁵

Patients with DM may be at greater risk for lower-quality depression care because of competing clinical demands (eg, a focus on DM aspects of care), or they may conversely receive better depression care because of increased provider contact and more opportunities to receive optimal treatment.^{4,26,27} We are aware of only 2 studies^{14,15} that provide information regarding depression care quality among the population with DM. The findings of the first study,¹⁴ using computerized pharmacy records, suggested that 31% received adequate antidepressant dosage. The second study¹⁵ reported that 46% of older persons with DM received adequate depression care (based on ≥ 4 antidepressant prescriptions at adequate dosage or ≥ 8 psychotherapy visits) but that they were 77% more likely to receive adequate depression care than adults without DM.

We are unaware of any studies that have assessed the longitudinal nature of depression care quality among

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persons with DM. This is an important issue from a clinical perspective and from a policy perspective because it may highlight provider awareness of treatment guidelines and factors that may contribute to adequate or inadequate depression care among a high-risk population. The objectives of this research were to assess (1) the quality of antidepressant dosage and the duration during the acute and continuation phases of treatment and (2) the predictors of depression care quality among depressed veterans. We hypothesized that veterans with DM were less likely to receive adequate depression care compared with those without DM.

METHODS

Study Data

The data included 8.33 years (from January 1, 1997, to April 30, 2005) of administrative, clinical, and pharmacy data from a midwestern Veterans Affairs medical center. The data comprised inpatient encounters and outpatient encounters (primary care, specialty medicine, and mental health). Pharmacy data included the name and National Drug Code of outpatient drugs, fill date, quantity, dosage, and days' supply.

Study Population

Subjects with an *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnosis of DM or depression were initially selected for inclusion. Further inclusion criteria required that subjects (1) were diagnosed as having a new episode of depression, (2) were followed up for at least 180 days before the diagnosis and for the 264-day treatment duration, and (3) received antidepressant therapy within 84 days following the depression diagnosis (Figure). Subjects with comorbid schizophrenia or bipolar disorder were excluded because of the focus on unipolar depression.

Cases. The case population included depressed subjects with DM. Identification of DM was based on validated criteria for VHA data, which specify indication of at least 2 *ICD-9-CM* codes for DM (250.xx) in inpatient or outpatient data during a 24-month period or receipt of a DM prescription medication.²⁸ All cases were diagnosed as having DM before follow-up for depression or treatment.

Control Subjects. Controls included all subjects at this facility with an *ICD-9-CM* diagnosis of depression who received antidepressant therapy and who had no indication of DM, based on *ICD-9-CM* codes, DM medications, glycosylated hemoglobin testing results, or impaired glucose tolerance.

Identification of a New Episode of Depression

Depression was identified via a single *ICD-9-CM* code

for major depressive disorder (MDD) (code 296.2 or 296.3), dysthymia (code 300.4), or depressive disorder not otherwise specified (code 311). A single *ICD-9-CM* code was used for identification because depression is undercoded in administrative and clinical data.^{7,17,18} We did not specifically focus on MDD because many patients with depression seek care solely in primary care, and depression not otherwise specified is the most common diagnosis in primary care.^{9,29} The follow-up period for identification of a new episode of depression began on or after June 30, 1997, to allow for a 180-day pretreatment period. Standardized diagnostic interview data to confirm the diagnoses were unavailable.

Prescription data were used to identify new episodes of depression, defined by an *ICD-9-CM* diagnosis of depression that was not preceded by a 180-day period (an accepted minimum standard in the literature) with indication of antidepressant use or an *ICD-9-CM* depression diagnosis.^{7,9,13,30} Symptoms of depression may have existed, but there was neither a record of diagnosis nor treatment. If pretreatment-phase requirements were not met for the first-recorded *ICD-9-CM* depression diagnosis, then subsequent periods were analyzed to determine the next earliest start of a new episode of depression. Otherwise, subjects were excluded if these criteria were not satisfied.

Depression Treatment Phases

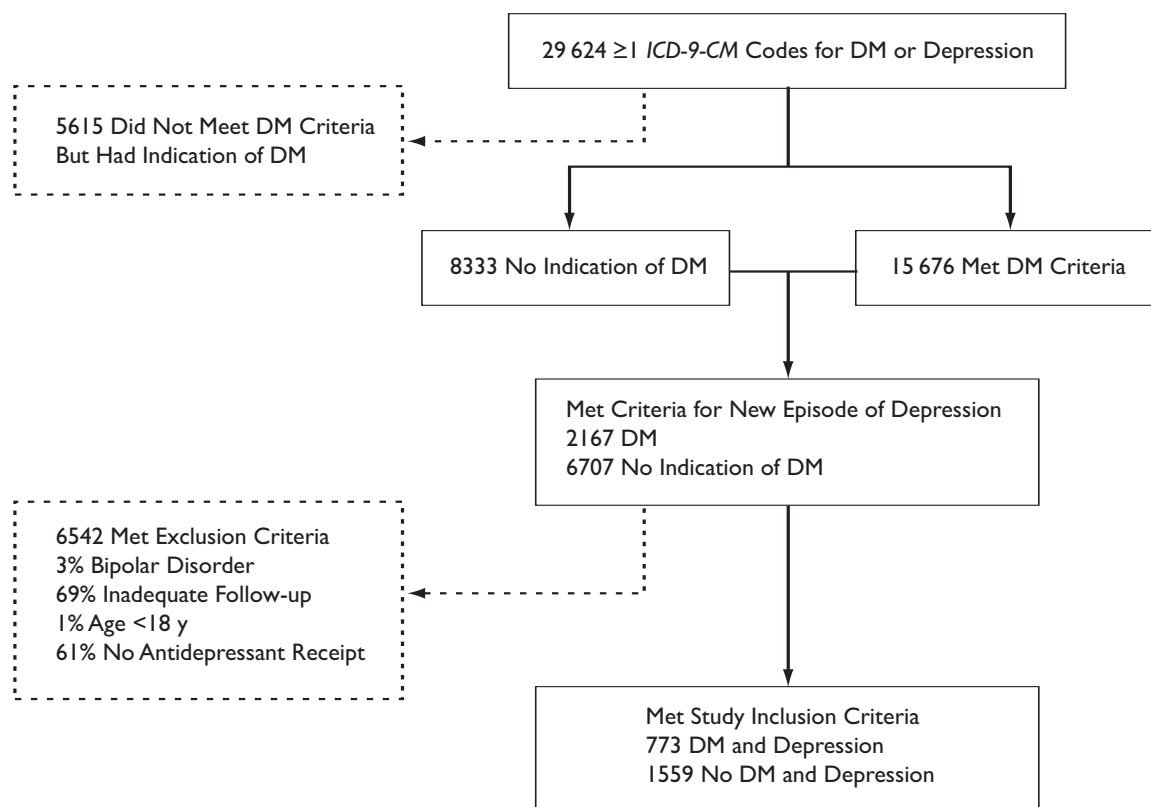
The acute phase of treatment was the 84-day period following the depression diagnosis. The continuation phase was the 180-day period thereafter.

Guideline-Concordant Treatment of Depression

The 2000 VHA CPGs for depression were used to evaluate depression care quality.⁶ We focused on antidepressant dosage and duration during the 84-day acute and 180-day continuation phases. Other forms of therapy (eg, psychotherapy) were not addressed because they are not included in VHA CPGs.

Antidepressant Duration. We first analyzed the quantity and days' supply of antidepressants that were dispensed. The end date was calculated by adding the days' supply to the fill date. If a prescription was refilled before the end date, an oversupply of medication was noted, which was added to the days' supply of subsequent prescriptions. This made it possible to develop a person-time calendar to indicate on which days a subject was exposed to antidepressant medication. Among the 23% of patients who were exposed to multiple antidepressants on the same day (eg, because of drug switching or augmentation), the prescription with the longest days' supply was counted. The MPR, defined as the sum of the days' supply divided by the number of

Figure. Derivation of the Study Sample



ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification*; DM, diabetes mellitus.

days in the treatment phase, was used to assess duration adequacy. The literature suggests that an 80% cutoff is reasonable.^{20,21} Duration adequacy was defined as a dichotomy, with an MPR of at least 80% representing an adequate duration and an MPR of less than 80% representing inadequate duration.

Antidepressant Dosage. Dosage adequacy refers to the mean treatment-phase dosage and whether the treatment dosage met minimum therapeutic dosages specified in VHA guidelines.⁶ First, the mean daily dosage was calculated by multiplying the drug strength (in milligrams) by the quantity of drug dispensed divided by the days' supply and then converted to fluoxetine hydrochloride equivalents (Table 1). If multiple prescriptions for the same agent were filled on the same day, the dosages were combined if the days' supply was the same for each prescription. Otherwise, the antidepressant with the highest fluoxetine-equivalent daily dosage was chosen. Second, the mean treatment-phase dosage was calculated by summing the mean daily doses and dividing by the number of prescription days in the period. An adequate treatment

dosage was achieved if the mean fluoxetine-equivalent dosage was at least 20 mg/d for younger subjects (<65 years) or at least 10 mg/d for older subjects (≥65 years). Otherwise, the treatment dosage was considered inadequate.

General Considerations. Subjects who did not receive antidepressant therapy during the continuation phase were considered to have received inadequate dosage and duration given that VHA guidelines explicitly state that pharmacologic treatment should be continued if provided during the acute phase. All subjects were followed up during the entire acute and continuation phases of treatment, as stated in the inclusion criteria.

Potential Confounders

Demographic, clinical, and healthcare utilization characteristics were examined as possible correlates of depression care quality. These characteristics were chosen a priori based on information in the literature.^{1,3,8,9,14-18} Demographic characteristics included age, sex, race/ethnicity, marital status, educational attainment, and service-connected disability percentage. Age

was included as a dichotomous variable (≥ 65 vs < 65 years) in multivariate analyses because antidepressant dosage differs for these age cutoffs. Service-connected disability percentage is used to determine the level of VHA access to healthcare and the amount of copayment for prescription medications. Medical comorbidity was based on a count of 29 conditions included in the comorbidity index by Elixhauser et al³¹ and other conditions prevalent among the VHA population² using the method by Klabunde et al.³² Psychiatric comorbidity was based on a count of 14 *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* conditions. Prior indication of depression was based on whether *ICD-9-CM* codes for depression were present before the diagnosis of a new episode of depression. A categorical variable was created to indicate the type of depression.

Healthcare utilization included the location of the diagnosis and the number of outpatient visits to primary care and mental health during each treatment phase. Clinic stop codes, which identify the type of ambulatory encounter in the VHA, were used to determine provider specialty given that specific provider codes were unavailable in these data.

Statistical Analysis

Demographic, clinical, and healthcare utilization characteristics were compared using χ^2 tests for categorical variables and *t* tests for continuous variables. Multivariate logistic regression models were developed to calculate adjusted odds ratios (OR) and 95% confidence intervals (CIs) to determine if DM status predicted depression care quality during the acute and continuation phases of treatment.³³ Univariate logistic regression analysis results are available from the author. All variables included in the multivariate models were identified a priori based on salient variables noted in the literature.^{1,3,8,9,14-18} A multivariate analysis was not conducted for continuation-phase duration adequacy because so few patients received adequate treatment. All analyses were conducted using SAS 9.1 (SAS Institute Inc, Cary, NC). Two-tailed tests were used to determine statistical significance, with α set at .05. The institutional review boards at Roudebush Veterans Affairs Medical Center, Indiana University, and the University of Iowa approved this study.

Table 1. Veterans Health Administration Recommended Minimum Therapeutic Antidepressant Dosage

Antidepressant	Minimum Therapeutic Dosage (mg/day)	
	<65 years	≥ 65 years
Amitriptyline	50	50
Amoxapine	100	50
Bupropion	150	50
Citalopram	20	20
Clomipramine	75	75
Desipramine	75	25
Doxepin	75	30
Duloxetine	40	40
Escitalopram	10	10
Fluoxetine	20	10
Fluvoxamine	100	100
Imipramine	75	30
Maprotiline	75	25
Mirtazapine	15	15
Nefazodone	200	100
Nortriptyline	75	30
Paroxetine	20	10
Phenelzine	45	45
Protriptyline	15	15
Sertraline	50	25
Tranlycypromine	20	10
Trazodone	150	25
Trimipramine	75	50
Venlafaxine	75	50

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RESULTS

Sample Description

A total of 2332 subjects with depression (773 [33%] with DM) met the study inclusion criteria. Subjects were commonly excluded because of insufficient follow-up or nonreceipt of antidepressant therapy (Figure).

The subjects with DM were more likely to be male, married, older, and less educated and have more medical comorbidity but less psychiatric comorbidity than the subjects without DM. They were also less likely to have been diagnosed as having depression in a mental health clinic. Subjects with DM had less healthcare utilization during the acute phase than subjects without DM but had more visits during the continuation phase, although the differences were not clinically significant. Serotonergic agents were most commonly prescribed (Table 2).

Duration of Antidepressant Therapy

Few subjects (<10%) received adequate antidepressant treatment duration in the acute or continuation

Table 2. Demographic and Clinical Characteristics for Depressed Veterans With and Without Diabetes Mellitus (DM), 1997-2005*

Characteristic	Total Study Population (N = 2332)	With DM (n = 773)	Without DM (n = 1559)	P	
Gender					
Male	2078 (89.1)	736 (95.2)	1342 (86.1)	<.001	
Female	254 (10.9)	37 (4.8)	217 (13.9)		
Race/ethnicity					
White	1678 (85.1)	578 (87.2)	1100 (84.0)	.06	
Nonwhite	294 (14.9)	85 (12.8)	209 (16.0)		
Unknown†	360	110	250		
Marital status					
Married	1116 (47.9)	430 (55.6)	686 (44.1)	<.001	
Nonmarried	1213 (52.1)	343 (44.4)	870 (55.9)		
Unknown†	3	0	3		
Service-connected disability percentage					
≥50	443 (19.0)	164 (21.2)	279 (17.9)	.05	
<50	1889 (81.0)	609 (78.8)	1280 (82.1)		
Education					
<High school	316 (22.5)	123 (26.1)	193 (20.8)	.02	
≥High school	1086 (77.5)	349 (73.9)	737 (79.2)		
Unknown†	930	301	629		
Older person, ≥65 y					
Yes	672 (28.8)	324 (41.9)	348 (22.3)	<.001	
No	1660 (71.2)	449 (58.1)	1211 (77.7)		
Location of depression diagnosis					
Inpatient	99 (4.2)	51 (6.6)	48 (3.1)	<.001	
Mental health outpatient clinic	520 (22.3)	130 (16.8)	390 (25.0)		
Primary care outpatient clinic	1463 (62.7)	506 (65.5)	957 (61.4)		
Other outpatient clinic	250 (10.7)	86 (11.1)	164 (10.5)		
Depression diagnosis					
Major depressive disorder	527 (22.6)	128 (16.6)	399 (25.6)	<.001	
Dysthymia	161 (6.9)	54 (7.0)	107 (6.9)		
Depression not otherwise specified	1644 (70.5)	591 (76.5)	1053 (67.5)		
Prior indication of depression‡					
Yes	594 (25.5)	251 (32.5)	343 (22.0)	<.001	
No	1738 (74.5)	522 (67.5)	1216 (78.0)		
Initial antidepressant agent prescribed					
Amitriptyline hydrochloride	64 (2.7)	23 (3.0)	41 (2.6)	.03	
Bupropion hydrochloride	121 (5.2)	31 (4.0)	90 (5.8)		
Citalopram hydrobromide	181 (7.8)	67 (8.7)	114 (7.3)		
Desipramine hydrochloride	5 (0.2)	2 (0.3)	3 (0.2)		
Doxepin hydrochloride	8 (0.3)	2 (0.3)	6 (0.4)		
Escitalopram oxalate	1 (0.04)	0	1 (0.1)		
Fluoxetine hydrochloride	474 (20.3)	160 (20.7)	314 (20.1)		
Fluvoxamine maleate	1 (0.04)	0	1 (0.1)		
Imipramine hydrochloride	6 (0.3)	2 (0.3)	4 (0.3)		
Mirtazapine	69 (3.0)	21 (2.7)	48 (3.1)		
Nefazodone hydrochloride	52 (2.2)	11 (1.4)	41 (2.6)		
Nortriptyline hydrochloride	25 (1.1)	8 (1.0)	17 (1.1)		
Paroxetine hydrochloride	314 (13.5)	105 (13.6)	209 (13.4)		
Sertraline hydrochloride	651 (27.9)	245 (31.7)	406 (26.0)		
Tranlycypromine sulfate	1 (0.04)	1 (0.1)	0		
Trazodone hydrochloride	102 (4.4)	19 (2.5)	83 (5.3)		
Venlafaxine hydrochloride	75 (3.2)	25 (3.2)	50 (3.2)		
Multiple initial agents	182 (7.8)	51 (6.6)	131 (8.4)		
Age, mean ± SD, y	55.6 ± 14.3	61.7 ± 11.5	52.6 ± 14.6		<.001
No. of medical comorbidities, mean ± SD	1.84 ± 1.91	2.81 ± 2.19	1.36 ± 1.54		<.001
No. of psychiatric comorbidities, mean ± SD	1.17 ± 1.23	0.96 ± 1.12	1.28 ± 1.27	<.001	
No. of outpatient visits, mean ± SD§					
Acute phase	3.42 ± 4.29	3.18 ± 3.30	3.54 ± 4.70	.03	
Continuation phase	4.04 ± 5.57	4.44 ± 5.45	3.84 ± 5.62	.01	

*Data are given as number (percentage) unless otherwise indicated.

†Not included in percentage or statistical analysis.

‡International Classification of Diseases, Ninth Revision, Clinical Modification code for depression present before the diagnosis of a new episode of depression.

§Includes outpatient primary care and mental health visits; only 1 visit per day was counted.

Table 3. Adequacy of Antidepressant Duration and Dosage for Depressed Veterans With and Without Diabetes Mellitus (DM), 1997-2005*

Variable	Total Study Population (N = 2332)	With DM (n = 773)	Without DM (n = 1559)	P
Adequate duration				
Acute phase	207 (8.9)	69 (8.9)	138 (8.9)	.95
Continuation phase	31 (1.3)	11 (1.4)	20 (1.3)	.78
Treatment phase	14 (0.6)	4 (0.5)	10 (0.6)	>.99
Adequate dosage				
Acute phase	2044 (87.7)	705 (91.2)	1339 (85.9)	<.001
Continuation phase	1359 (58.3)	491 (63.5)	868 (55.7)	<.001
Treatment phase	1271 (54.5)	475 (61.4)	796 (51.1)	<.001
Treatment duration (MPR), mean ± SD				
Acute phase	47.0 ± 21.1	47.3 ± 21.1	46.9 ± 21.0	.60
Continuation phase	17.8 ± 19.9	19.1 ± 20.2	17.1 ± 19.7	.02
Treatment phase	27.1 ± 16.9	28.1 ± 17.1	26.6 ± 16.7	.04

*Data are given as number (percentage) unless otherwise indicated. Adequacy of antidepressant duration was based on a medication possession ratio (MPR) of at least 80%. Treatment phase refers to a combination of the acute and continuation phases.

phase. Overall, the mean MPR during the 264-day treatment period for all subjects was 27%, corresponding to possession of antidepressant medication for only 71 days. The presence of DM did not affect the mean treatment duration in the acute phase ($P > .05$) but was statistically associated with an increased treatment duration (albeit a nonclinically significant association) in the continuation phase ($P = .02$) (Table 3). The overall low MPR in the continuation phase is attributed to the 35% of subjects who did not receive antidepressant therapy at any time during this 180-day period and, by definition, were considered to have an MPR of 0%. Even among the 1525 subjects who received antidepressant therapy during the continuation phase, only 2% had an MPR of at least 80%. Adequacy of treatment duration was not associated with the presence of DM in the acute phase (OR, 1.14; 95% CI, 0.81-1.61) (Table 4). Multivariate analysis identified increased odds for receipt of adequate treatment duration among men, unmarried persons, and those with at least a high school education, increased medical and psychiatric comorbidities, and higher healthcare utilization rates.

Antidepressant Dosage

Most subjects received an antidepressant dosage that was consistent with guideline-recommended minimum therapeutic dosages during the acute phase (88%)

and the continuation phase (58%), regardless of DM status. Thirty-five percent of subjects did not continue to receive antidepressant therapy during the continuation phase of treatment and, by definition, were considered to have received an inadequate dosage (Table 3). However, among the 1525 subjects who received antidepressant therapy during the continuation phase, adequacy rates in the continuation phase were similar to those in the acute phase (89% vs 88%), and subjects with DM were still significantly more likely to have received a therapeutic dosage (92% vs 88%, $P = .01$). In multi-

variate analyses, subjects with DM were statistically more likely to have received an adequate dosage during the acute phase (OR, 1.51; 95% CI, 1.10-2.08) but not during the continuation phase (OR, 1.15; 95% CI, 0.94-1.41) compared with subjects without DM (Table 3). In the acute phase, older persons, those with at least a high school education, and veterans with prior indication of depression were more likely to receive an adequate dosage. In contrast, medical comorbidity, depression not otherwise specified, and diagnosis in a mental health clinic were negatively associated with dosage adequacy. Continuation-phase analyses indicated that increased medical comorbidity and healthcare utilization were associated with higher odds of dosage adequacy but that nonwhite race/ethnicity was associated with lower odds of dosage adequacy.

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DISCUSSION

The following 2 major findings result from this research: (1) most (>85%) depressed veterans received adequate antidepressant dosage, yet many (>90%) did not receive the minimum guideline-recommended treatment duration, and (2) the presence of DM did not result in less adequate depression care. The VHA guidelines explicitly state that a minimum of 4 to 9 months of

Table 4. Odds Ratios for Receipt of Adequate Antidepressant Treatment Duration and Dosage for Depressed Veterans With and Without Diabetes Mellitus (DM), 1997-2005*

Variable	Acute-phase Antidepressant Duration	Antidepressant Dosage	
		Acute Phase	Continuation Phase
Age, y			
<65	1.00	1.00	1.00
≥65	0.93 (0.63-1.37)	4.67 (3.01-7.25)	1.09 (0.87-1.35)
Gender			
Female	1.00	1.00	1.00
Male	1.97 (1.28-3.04)	0.98 (0.66-1.44)	1.19 (0.90-1.58)
Race/ethnicity			
White	1.00	1.00	1.00
Nonwhite	0.80 (0.50-1.28)	0.80 (0.55-1.16)	0.61 (0.47-0.80)
Unknown	1.65 (1.08-2.52)	0.81 (0.56-1.18)	1.24 (0.95-1.62)
Marital status			
Nonmarried	1.00	1.00	1.00
Married	0.68 (0.50-0.93)	1.14 (0.87-1.49)	1.19 (0.99-1.42)
Service-connected disability percentage			
<50	1.00	1.00	1.00
≥50	0.76 (0.50-1.15)	0.85 (0.62-1.17)	1.08 (0.85-1.35)
Education level			
<High school	1.00	1.00	1.00
≥High school	0.62 (0.40-0.97)	1.62 (1.08-2.44)	0.93 (0.71-1.23)
Unknown	0.81 (0.51-1.29)	1.14 (0.74-1.74)	0.93 (0.70-1.25)
No. of medical comorbidities	1.10 (1.01-1.20)	0.90 (0.83-0.97)	1.10 (1.04-1.16)
No. of psychiatric comorbidities	1.16 (1.03-1.32)	0.90 (0.81-1.02)	1.02 (0.94-1.11)
Depression diagnosis			
Major depressive disorder	1.00	1.00	1.00
Depression not otherwise specified	0.71 (0.46-1.10)	0.64 (0.43-0.95)	0.83 (0.62-1.11)
Dysthymia	0.90 (0.48-1.67)	1.21 (0.65-2.26)	1.22 (0.82-1.82)
Prior indication of depression			
No	1.00	1.00	1.00
Yes	0.90 (0.63-1.28)	1.46 (1.06-2.02)	1.12 (0.92-1.37)
Location of depression diagnosis			
Primary care outpatient clinic	1.00	1.00	1.00
Inpatient	0.96 (0.47-1.97)	1.04 (0.51-2.11)	1.06 (0.68-1.66)
Mental health outpatient clinic	0.82 (0.52-1.29)	0.65 (0.44-0.98)	1.20 (0.89-1.61)
Other outpatient clinic	0.97 (0.59-1.59)	0.77 (0.51-1.18)	1.02 (0.76-1.37)
No. of outpatient visits[†]	1.06 (1.03-1.09)	1.01 (0.98-1.04)	1.13 (1.10-1.16)
No DM	1.00	1.00	1.00
DM	1.14 (0.81-1.61)	1.51 (1.10-2.08)	1.15 (0.94-1.41)

*Data are given as odds ratio (95% confidence interval), adjusted for all covariates. Significant associations shown in bold.

[†]Includes outpatient primary care and mental health visits.

treatment should be provided after acute-phase treatment. In this sample, however, the mean treatment duration was only 2 to 3 months following depression diagnosis. This research uniquely contributes to the literature by describing the longitudinal nature of depression treatment, the use of evidence-based depression treatment guidelines in day-to-day practice among patients with DM, and the finding that treatment is poor, regardless of DM status.

Our results are similar and dissimilar to results reported previously. The literature reports wide variation (11%-90%) regarding adequacy of dosage and duration.⁷⁻¹⁸ Differences in patient (eg, demographics), provider (eg, guideline awareness), and organizational (eg, resource availability) characteristics in this study may partially explain the variation. The observed 88% rate of dosage adequacy in this study is comparable to the 80% to 91% adequacy rates reported in at least 3

prior VHA studies^{9,10,12} but was significantly higher than the 29% adequacy rate reported among another VHA sample.⁷ The observed less than 10% adequacy of treatment duration in our study is lower than previously reported rates (11%-85%)^{9,16,18} and may be related to the more stringent criteria we used to categorize treatment adequacy (ie, an MPR of $\geq 80\%$), which we believed to better represent treatment guidelines.

Important methodological differences among our study and others bear mention. First, our longitudinal study assessed treatment adequacy during both the acute and continuation phases. A previous study⁹ assessed treatment quality during a single treatment phase and may have identified subjects with depression as early as 19 months before antidepressants were prescribed. In contrast, subjects in our study received antidepressants within 12 weeks of the depression diagnosis, with most (80%) within 1 week of the depression diagnosis. Second, inclusion of patients with any unipolar depression diagnosis in this study, rather than inclusion of patients with only MDD, may also account for discrepancies. Treatment initiation and maintenance rates may be higher in studies that focus solely on MDD because of disease severity. Certain patient characteristics may be associated with the severity of the depression, which may also bias the results if they affect dosage or duration. The VHA CPGs for depression are for major depression. An assumption of this work is that dosing and duration are based on the physician's decision to pharmacologically treat the depression, irrespective of the particular depression diagnosis.

Our findings support prior work that DM is not a risk factor for inadequate depression treatment compared with controls.¹⁵ In fact, persons with DM had 14% to 51% higher odds for receipt of adequate treatment in our study. Contrary to our hypothesis, competing clinical demands may not result in lower-quality depression care among the population with DM. Subjects with DM may be more likely to receive adequate depression care because of their healthcare-seeking behavior. Prior research shows that depressed persons with DM use more ambulatory care than non-depressed persons with DM.^{27,34} Increased healthcare utilization was a significant predictor of several of the outcome measures in this study. Increased provider contact corresponds to more opportunities to promote patient compliance with treatment, while allowing providers the opportunity to adjust treatment. Adequate follow-up care for depression was the most significant predictor of antidepressant treatment duration in another study.³⁵ In addition, a higher burden of comorbidity may result in providers taking a proactive approach in treating depression among patients with

DM, which may correspond to a greater likelihood for adequate depression care.

These results suggest that factors other than DM are responsible for inadequate treatment of depression, although few predictors were uniformly identified. Factors associated with adequate depression care in this study (eg, older age and MDD) mirror those reported in other VHA depression studies^{9,16} and add credibility to the reported results. Younger adults were less likely to receive an adequate dosage, but this may be partially explained by the fact that VHA guidelines⁶ recommend lower starting dosages for older patients. This likely explains why age was associated with dosage but not with duration. The finding that increased medical and psychiatric comorbidities were associated with lower odds of dosage adequacy but with higher odds of duration adequacy is unclear, although we speculate that providers may be hesitant to initially prescribe higher dosages because of concern for adverse effects or drug interactions. Treatment duration was likely higher for those with more comorbidity because of increased provider contact, resulting in more opportunities to prescribe medications or to educate patients regarding treatment. We did not address other salient predictors of depression care quality, including patient beliefs, provider knowledge, and organizational resources. Inadequate depression treatment does not necessarily reflect deficiencies in clinician provision of treatment but may also reflect patient rejection or underappreciation of the need for long-term treatment. Prior work suggests that it is difficult to separate patient and provider adherence, highlighting the importance of promoting patient and provider partnerships.³⁶

Study Limitations

The results of this study should be interpreted with several limitations in mind. First, restricting depression care profiling to a single VHA facility may limit generalizability to other VHA facilities and to the general public. The veteran population is a predominately older male population with significant medical and psychiatric comorbidities, further limiting generalizability to the general public. The methods for identification of a new episode of depression may have resulted in an underestimation of the true treatment rates if the specificity of the diagnosis is low, although treatment rates were not significantly associated with the number of *ICD-9-CM* depression diagnoses (data not shown) or the type of depression. Furthermore, missing information (eg, race/ethnicity), misclassification of known variables, and unmeasured characteristics (eg, access to non-VHA care) may have affected the observed findings. The use of the MPR to assess treatment duration

may provide spurious results, although recent work suggests that other metrics available to assess duration adequacy provide results similar to those obtained using the MPR.²¹ Finally, these data do not indicate the clinical necessity of care and treatment for depression. Clinical practice guidelines were derived to represent what is best for most patients and should not be construed as a standard of medical care for all patients.

Study Strengths

We believe that this is the first study among the veteran population with DM to describe adherence to depression guidelines. The use of rigorous and validated methods helped to ensure the reliability and accuracy of the reported findings and allowed the results to be extrapolated to other VHA populations. The inclusion criteria were less stringent, and all pharmacologic therapies were evaluated. The agreement between the VHA's electronic medical record database and medical record review with respect to treatment of depression is high, supporting the use of VHA administrative, clinical, and pharmacy data to assess depression care quality.⁷ To our knowledge, our study is the first to conduct a longitudinal assessment of treatment adequacy during both the acute and continuation phases.

Clinical Implications

The low rates of adequate depression care in this study, despite recognition by providers and treatment (typically within 7 days of the ICD-9-CM diagnosis), suggest an opportunity for substantial practice improvement. These findings should motivate physicians' heightened awareness of CPG treatment specifications. Because adequate depression care follow-up has been shown to be the most effective predictor of treatment duration,³⁵ clinicians and quality managers in the VHA may wish to implement changes to the current organizational structure to ensure that depressed veterans have timely follow-up care, that they have access to the most appropriate resources (eg, mental health), and that strategies are in place to continually monitor treatment quality and outcomes. Although this study was not powered to specifically examine the clinical effects of guideline-concordant depression treatment, the clinical implications of inadequate treatment are profound. Inadequate treatment may result in poor patient outcomes (eg, psychiatric hospitalization) and may negatively affect the healthcare system as a result of costs.²⁵ Because current dosing regimens for selective serotonin reuptake inhibitors make adequate treatment dosage less confusing for providers, issues contributing to adherence and treatment duration are paramount for further

research. Finally, these data elucidate that deficiencies in depression treatment exist but do not pinpoint specific driving factors for inadequate treatment duration. Further work is required to elucidate why depression treatment is not congruent with evidence-based practices and to formulate strategies to help align current practice with evidence-based practices.

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REFERENCES

1. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA*. 2003;289:3095-3105.
2. Selim AJ, Fincke G, Ren XS, et al. Comorbidity assessments based on patient report: results from the Veterans Health Study. *J Ambul Care Manage*. 2004;27:281-295.
3. Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. *Diabetes Care*. 2001;24:1069-1078.
4. Goldman LS, Nielsen NH, Champion HC. Awareness, diagnosis, and treatment of depression. *J Gen Intern Med*. 1999;14:569-580.
5. American Psychiatric Association. Practice guideline for the treatment of patients with major depressive disorder (revision). *Am J Psychiatry*. 2000;157(suppl):1-45.
6. Management of Major Depressive Disorder Working Group. *VHA/DoD Clinical Practice Guideline for Management of Major Depressive Disorder in Adults*. Washington, DC: Dept of Veterans Affairs; 2000.
7. Kramer TL, Owen RR, Cannon D, et al. How well do automated performance measures assess guideline implementation for new-onset depression in the Veterans Health Administration? *Jt Comm J Qual Saf*. 2003;29:479-489.
8. Weiburg JB, O'Leary KM, Meigs JB, Hennen J, Stafford RS. Evaluation of the adequacy of outpatient antidepressant treatment. *Psychiatr Serv*. 2003;54:1233-1239.
9. Charbonneau A, Rosen AK, Ash AS, et al. Measuring the quality of depression care in a large integrated health system. *Med Care*. 2003;41:669-680.
10. Dobscha SK, Gerrity MS, Corson K, Bahr A, Cuiwik NM. Measuring adherence to depression treatment guidelines in a VA primary care clinic. *Gen Hosp Psychiatry*. 2003;25:230-237.
11. Katon W, von Korff M, Lin E, Bush T, Ormel J. Adequacy and duration of antidepressant treatment in primary care. *Med Care*. 1992;30:67-76.
12. Chen RS, Rosenheck R. Using a computerized patient database to evaluate guideline adherence and measure patterns of care for major depression. *J Behav Health Serv Res*. 2001;28:466-474.
13. McCombs JS, Shi L, Stimmel GL, Croghan TW. A retrospective analysis of the revocation of prior authorization restrictions and the use of antidepressant medications for treating major depressive disorder. *Clin Ther*. 2002;24:1938-1959.
14. Katon WJ, Simon G, Russo J, et al. Quality of depression care in a population-based sample of patients with diabetes and major depression. *Med Care*. 2004;42:1222-1229.
15. Harman JS, Edlund MJ, Fortney JC, Kallas H. The influence of comorbid chronic medical conditions on the adequacy of depression care for older Americans. *J Am Geriatr Soc*. 2005;53:2178-2183.
16. Busch SH, Leslie D, Rosenheck R. Measuring quality of pharmacotherapy for depression in a national health care system. *Med Care*. 2004;42:532-542.
17. Kerr EA, McGlynn EA, Van Vorst KA, Wickstrom SL. Measuring antidepressant prescribing practice in a health care system using administrative data: implications for quality measurement and improvement. *Jt Comm J Qual Improv*. 2000;26:203-216.
18. Young AS, Klap R, Sherbourne CD, Wells KB. The quality of care for depressive and anxiety disorders in the United States. *Arch Gen Psychiatry*. 2001;58:55-61.
19. White T, Vanderplas A, Ory C, Dezi C, Chang E. Economic impact of patient adherence with antidepressant therapy within a managed care organization. *Dis Manag Health Outcomes*. 2003;11:817-822.
20. Sikka R, Xia F, Aubert RE. Estimating medication persistency using administrative claims data. *Am J Manag Care*. 2005;11:449-457.
21. Cantrell CR, Eaddy MT, Shah MB, Regan TS, Sokol MC. Methods for evaluating patient adherence to antidepressant therapy: a real-world comparison of adherence and economic outcomes. *Med Care*. 2006;44:300-303.
22. Sood N, Treglia M, Obenchain RL, Dulisse B, Melfi CA, Croghan TW. Determinants of antidepressant treatment outcome. *Am J Manag Care*. 2000;6:1327-1336.

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23. **Katon W, Cantrell CR, Sokol MC, Chiao E, Gdovin JM.** Impact of antidepressant drug adherence on comorbid medication use and resource utilization. *Arch Intern Med.* 2005;165:2497-2503.
24. **Weilburg JB, Stafford RS, O'Leary KM, Meigs JB, Finkelstein SN.** Costs of antidepressant medications associated with inadequate treatment. *Am J Manag Care.* 2004;10:357-365.
25. **Charbonneau A, Rosen AK, Owen RR, et al.** Monitoring depression care: in search of an accurate quality indicator. *Med Care.* 2004;42:522-531.
26. **Klinkman MS.** Competing demands in psychosocial care: a model for the identification and treatment of depressive disorders in primary care. *Gen Hosp Psychiatry.* 1997;19:98-111.
27. **Kalsekar ID, Madhavan SM, Amonkar MM, Scott V, Douglas SM, Makela E.** The effect of depression on health care utilization and costs in patients with type 2 diabetes. *Manag Care Interface.* 2006;19:39-46.
28. **Miller DR, Safford MM, Pogach LM.** Who has diabetes? best estimates of diabetes prevalence in the Department of Veterans Affairs based on computerized patient data. *Diabetes Care.* 2004;27(suppl 2):B10-B21.
29. **Croghan TW, Melfi CA, Dobrez DG, Kniesner TJ.** Effect of mental health specialty care on antidepressant length of therapy. *Med Care.* 1999;37(suppl Lilly):AS20-AS23.
30. **Melfi CA, Croghan TW.** Use of claims data for research on treatment and outcomes of depression care. *Med Care.* 1999;37(suppl Lilly):AS77-AS80.
31. **Elixhauser A, Steiner C, Harris DR, Coffey RM.** Comorbidity measures for use with administrative data. *Med Care.* 1998;36:8-27.
32. **Klabunde CN, Potosky AL, Legler JM, Warren JL.** Development of a comorbidity index using physician claims data. *J Clin Epidemiol.* 2000;53:1258-1267.
33. **Hosmer DW, Lemeshow S.** *Applied Logistic Regression.* 2nd ed. New York, NY: John Wiley & Sons Inc; 2000.
34. **Egede LE, Zheng D, Simpson K.** Comorbid depression is associated with increased health care use and expenditures in individuals with diabetes. *Diabetes Care.* 2002;25:464-470.
35. **Jones LE, Turvey C, Carney Doebbeling C.** Inadequate follow-up care for depression and its impact on antidepressant treatment duration among veterans with and without diabetes mellitus in the Veterans Health Administration. *Gen Hosp Psychiatry.* In Press.
36. **McCombs JS, Nichol MB, Stimmel GL, Sclar DA, Beasley CM Jr, Gross LS.** The cost of antidepressant drug therapy failure: a study of antidepressant use patterns in a Medicaid population. *J Clin Psychiatry.* 1990;51(suppl):60-71.