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Antidepressant Adherence across Diverse Populations and Healthcare Settings

Rebecca C Rossom, MD MS[1], **Susan Shortreed, PhD**[2], **Karen J Coleman, PhD**[3], **Arne Beck, PhD**[4], **Beth E Waitzfelder, PhD**[5], **Christine Stewart, PhD**[2], **Brian K Ahmedani, PhD**[6], **John E Zeber, PhD**[7], and **Greg E Simon, MD MPH**[2]

[1]HealthPartners Institute, Minneapolis, MN

[2]Group Health Research Institute, Seattle, WA

[3]Kaiser Permanente Southern California, Department of Research and Evaluation, Pasadena, CA

[4]Kaiser Permanente Colorado, Institute for Health Research, Denver, CO

[5]Kaiser Permanente Center for Health Research – Honolulu, HI

[6]Henry Ford Health System, Behavioral Health Services and Center for Health Policy and Health Services Research, Detroit, MI

[7]Baylor Scott & White Health, Center for Applied Health Research; Central Texas Veterans Health Care System; Temple, TX

Abstract

Background—Early adherence is key to successful depression treatment, but nearly 60% of patients discontinue antidepressants within three months. Our study aimed to determine factors associated with poor early adherence to antidepressants in a large diverse sample of patients.

Methods—Six Mental Health Research Network healthcare systems contributed data for adults with depression and a new antidepressant start, defined by a washout period of at least 270 days, between 1/1/2010 and 12/31/2012. Pharmacy fill and self-reported race/ethnicity data were obtained from the electronic medical record. Patients had early adherence if they had a second antidepressant fill within 180 days of the first. We used logistic regression to investigate the relationship between early adherence and patient characteristics.

Results—177,469 adult patients had 184,967 new episodes of depression with a filled antidepressant prescription. Patients refilled their antidepressants within 180 days in 71% of episodes. Race/ethnicity was a strong predictor of early adherence, with patients from racial/ethnic minorities less likely (adjusted odd ratios 0.50–0.59) to refill their antidepressants than were non-Hispanic whites or Native Americans/Alaskan Natives. Other apparent predictors of early adherence, including neighborhood income, gender and prior mental health hospitalizations, were no longer significant in the fully adjusted model.

Corresponding author address: Rebecca C Rossom, HealthPartners Institute for Education and Research, P.O. Box 1524, Mail Stop: 23301A, Minneapolis, MN 55440-1524, Rebecca.C.Rossom@HealthPartners.com, 952-883-5466.

Conclusions—Race/ethnicity was a robust predictor of early antidepressant adherence, with minority groups other than Native Americans/Alaskan Natives less likely to be adherent. Further research is needed to determine whether early nonadherence in specific minority populations is intentional, due to side effects or patient preference, or unintentional and appropriate for targeted interventions to improve adherence.

Keywords

Antidepressants; medication adherence; patient adherence

INTRODUCTION

Depression results in significant burden for individuals, families and communities.[1,2] Despite consistent evidence of the effectiveness of antidepressants for many with depression,[3] particularly those with more severe depression,[4] remission rates are disappointingly low. An AHRQ-sponsored report found that only 46% of patients experienced remission from depression during 6 to 12 weeks of treatment with second-generation antidepressants.[5]

One reason for low remission rates is nonadherence, with early adherence, also called early persistence, key to the successful treatment of depression.[6] Early discontinuation of antidepressants is common – approximately 30% of patients discontinue antidepressants within one month, and up to 60% discontinue them within 3 months – and is associated with poor depression outcomes.[6] Conversely, 85% of patients who satisfy Health Effectiveness Data and Information Set (HEDIS) criteria for adequate acute-phase antidepressant treatment by taking antidepressants for at least 12 weeks go on to complete continuation phase treatment.[7–9] Therefore, early adherence to an antidepressant is critical for depression remission.

While interventions to improve antidepressant adherence can be effective,[10,11] they are often resource-intensive and may be best targeted towards patients at greatest risk of nonadherence. Previous studies and a recent systematic review have found age and race/ethnicity to be most consistently associated with adherence as opposed to other socioeconomic and clinical predictors.[12–15] However, work in this area suffers from two main limitations: studies using survey data have good race/ethnicity data but poor self-reported adherence data, while studies using health system data have good adherence data but poor data on race/ethnicity. The aim of our study is to address these gaps by determining factors associated with poor early adherence to antidepressants, assessed via pharmacy refill records, in a large, well-documented, and racially and ethnically diverse group of patients.

METHODS

Data Sources

Data were obtained from six partners in the Mental Health Research Network (MHRN), a consortium of public-domain research centers affiliated with 13 large not-for-profit healthcare systems that each provide comprehensive care to a defined population of

members and/or patients.[16] All MHRN healthcare systems organize EMR data, insurance claims and other administrative data into a Virtual Data Warehouse (VDW) to facilitate population-based research.[17] Each healthcare system's Institutional Review Board and privacy board approved all study procedures and granted waivers of consent to use this de-identified data for research.

Group Health Cooperative, HealthPartners, Henry Ford Health System, Kaiser Permanente Colorado, Kaiser Permanente Hawaii, and Kaiser Permanente Southern California contributed data to this study. Combined, these systems provide care to approximately 4.7 million members and/or patients. Members are enrolled through employer-sponsored insurance plans, individual insurance plans, and capitated Medicaid and Medicare programs, and are generally representative of each system's regional population. Group Health, HealthPartners and Henry Ford are mixed-model healthcare systems that provide care through both internal and external providers, so at these sites analytic samples were limited to patients who were also health plan members.

Study Population

The study sample consisted of patients 18 and older who filled a new outpatient antidepressant prescription between 1/1/2010 and 12/31/2012. Patients were included if they had a recorded diagnosis of depression (ICD9 diagnoses 296.2, 296.3, 300.4 or 311) in the period starting 90 days before the index medication dispensing and ending 15 days after. In prior work, we found that about 60% of adults receiving an antidepressant had a diagnosis of depression; most others had diagnoses of anxiety or attention deficit disorders.[18] Patients were excluded if they had a diagnosis of schizophrenia or bipolar disorder. A new episode of antidepressant treatment was defined by using a washout period of at least 270 days without any antidepressants dispensed. To ensure the availability of data needed to assess inclusion and exclusion criteria, the sample was limited to those who were continuously enrolled in the healthcare systems for at least 270 days prior to the index antidepressant dispensing. Patients could be included in the analysis more than once if they had more than one episode of antidepressant treatment over the course of the study.

Measures

Patient Demographics—Each healthcare system implemented meaningful use requirements[19] to collect self-reported gender and race/ethnicity data, which was recorded in the health system's EMR and incorporated into the VDW. Education and income are not commonly collected at the individual level; we used information about the 2010 census block of a patient's home address for these demographic variables.

We followed national recommendations to create mutually exclusive race and ethnicity categories.[20,21] Patients self-reporting Hispanic ethnicity were considered Hispanic regardless of the race category they endorsed, following recommendations from a U.S. survey that found that Hispanics consider themselves a race of people and not an ethnicity.[21] If a patient's records contained two or more race categories (rather than a single category of "mixed race"), they were assigned the least prevalent race category in the U.S. population to maximize the ability to understand differences in diagnoses and treatment for the least

represented racial groups. We also conducted sensitivity analyses maximizing classification into the “mixed race” group. For both models, patients for whom race/ethnicity data were missing were classified in the unknown or missing group.

Mental Health Treatment—All medications approved by the US Food and Drug Administration for treatment of major depression were included, with the exception of trazodone, which is used much more often for insomnia than depression (Appendix Table 1). Locations of encounters for depression and details of previous mental health treatment up to five years prior to the index antidepressant dispensing, including pharmacotherapy, psychotherapy, and provider type, were abstracted from the VDW. We defined psychotherapy treatment using standardized procedural terminology codes for diagnostic interviews and assessments and individual psychotherapy. We did not consider appointments that were less than 30 minutes and/or clearly designated as only medication management to be psychotherapy.

Comorbidity Burden—Disease burden was assessed by calculating a modified Charlson Comorbidity Index for each patient, using diagnosis codes assessed in the three years before enrollment to provide a summary score assessing a patient’s risk for 10-year mortality based upon 22 different health conditions.[22]

Adherence—We defined early adherence as any antidepressant prescription fill (either refill of the initial medication or new fill for an alternative antidepressant) within 180 days of the first prescription fill. While some measures of early adherence (such as HEDIS metrics for adequate acute-phase treatment) are based on number of days dispensed, increasing use of 90- or 100-day initial prescriptions undermines the validity of those measures based on “days’ supply”.[23] Because those longer initial prescriptions might not be refilled for 100 days or more, we considered any second fill within 180 days to indicate continued treatment. We repeated the analysis using a HEDIS-like measure of depression, considering patients adherent if there were at least 90 pills dispensed in the 120 days after the initial fill, presented both with and without episodes starting with a 90-day fill.

Analysis

Percentages and unadjusted logistic regression models were used to describe the unadjusted relationship between each covariate and early adherence. We then fit a multivariable logistic regression model using generalized estimating equations that included all covariates as well as the health system to identify which associations persisted when accounting for all covariates. Individuals who disenrolled from the health care system less than 180 days following their antidepressant fill were censored at their month of disenrollment.

Wald tests[24] were used to calculate p-values for the association between each covariate and early persistence in multivariable models.[25] We estimated all logistic regression models using generalized estimating equations and calculated standard errors using the robust sandwich estimator to account for any within-person correlations resulting from the inclusion of multiple episodes from the same patient in the analyses.[26] We repeated the

analyses including only patient's first episode of depression in the time frame. All analyses were performed using Stata version 12.1.[27]

RESULTS

Patient Characteristics

A total of 177,469 adult patients had 184,967 new episodes of depression associated with a filled antidepressant prescription in 2010 through 2012 (Table 1). Most patients had one new episode of depression during this period; 4.2% of patients had two episodes. Sixty-nine percent of episodes occurred in women. The sample was diverse in age, with 18% of episodes occurring in those 18–29 years-old, 27% in those 30–44, 30% in those 45–59, 17% in those 60–74, and 9% in those 75 and older. The sample was also diverse in race/ethnicity, with 50% of episodes involving patients who self-identified as non-Hispanic white, 25% Hispanic, 8% non-Hispanic black, 5% Asian, 1% Native Hawaiian/Pacific Islander, and 0.6% Native American/Alaskan Native. The majority of episodes occurred in patients who lived in neighborhoods where household incomes averaged over $25,000/year and where college graduates comprised less than 25% of the population. Most episodes (73%) involved patients with commercial health insurance, while 19% involved patients with Medicare, 3% involved patients with Medicaid, and 4% involved patients with another insurance type. Most episodes (81%) involved patients with a Charlson Comorbidity score of 0.

Mental Healthcare

The most commonly filled antidepressants were fluoxetine (30%) and citalopram (29%), followed by sertraline (15%) and bupropion (10%). Other antidepressants accounted for 17% of antidepressant fills, with no single remaining antidepressant accounting for greater than 5% of the total. Most antidepressant prescriptions were written by primary care providers (123,933 episodes, accounting for 67%), with mental health providers accounting for 22% and other providers for 11%. Thirty-nine percent of episodes occurred among patients who had used an antidepressant in the past, and 47% involved patients who had a history of specialty mental health use. Twenty-six percent of treatment episodes involved patients who used psychotherapy in addition to antidepressants to treat their depression, and approximately 3% of episodes involved patients who had prior psychiatric hospitalizations.

Early Adherence

Overall, patients refilled their antidepressants within 180 days of the first dispensing in 71% of treatment episodes. One of the strongest predictors of early adherence was race/ethnicity. In the fully-adjusted model, patients who self-identified as Asian, non-Hispanic black, Hispanic, or Native Hawaiian/Pacific Islander were significantly less likely to refill their antidepressant prescriptions than were non-Hispanic whites or Native Americans/Alaskan Natives (adjusted odds ratios (aORs) ranged from 0.50 to 0.67; $p<0.0001$). Unique among minority racial/ethnic groups, adherence rates for Native Americans/Alaskan Natives were similar to non-Hispanic whites. The unadjusted and adjusted models were very similar for most racial/ethnic groups, with the exception of those for whom race was mixed/other/unknown, as this group's adherence rates seemed similar to non-Hispanic whites and Native Americans and Alaskan Natives in the unadjusted model but were lower after adjustment

(aOR=0.90, 95% CI 0.82 to 0.88). The association between race/ethnicity on early adherence was similar for patients seen in primary care, behavioral health or other clinics (analysis not shown). All analyses in Table 1 were repeated using a more expansive definition of mixed race to maximize this racial/ethnic group (Appendix Table 2), and all associations were essentially unchanged. Patients who self-identified as being of mixed race were less likely to be adherent to their antidepressant medications, similar to most other racial/ethnic minorities (aOR=.68, 95% CI .63 to .73). Analyses were also repeated including only the first observed episode of depression for the 7648 patients who experienced more than one episode of depression in the study time frame; results were unchanged (analysis not shown).

Age also predicted adherence. Older age groups were more likely than 18–29 year-olds to refill their antidepressants, and these associations were strengthened after adjustment for other covariates (aORs ranged from 1.18 to 1.23; $p<0.0001$). Lower neighborhood income appeared to be a significant predictor of poorer adherence in the unadjusted model, but this association essentially disappeared after adjustment. The effect of neighborhood education was also greatly reduced after adjustment, although it still remained a significant predictor, with patients from neighborhoods with fewer college graduates less likely to be adherent to their antidepressants (aOR=.94, 95% CI .91 to .96, $p<.0001$). Patients with greater medical burden, those who received prescriptions from mental health providers, and those who were active in psychotherapy or used specialty mental health care in the past were more likely to refill their antidepressants. There were no significant associations between early adherence and gender, prior mental health hospitalizations, or insurance type. There were small apparent differences in adherence to specific antidepressant medications that disappeared after adjustment, with the exception of “other” antidepressants, for which adherence was lower (aOR=0.89, 95% CI 0.86 to 0.92).

HEDIS-like Measure of Early Adherence

In addition to our primary measure of early adherence (any antidepressant fill within 180 days of the first prescription fill), we repeated our analyses using a HEDIS-like measure of early adherence (90 pills dispensed in the 120 days after the initial fill; Appendix Table 3). Our primary definition of early adherence found that patients were adherent to their antidepressants in 71% of treatment episodes. Using the HEDIS-like measure of early adherence, patients were adherent to their antidepressants in 64% of treatment episodes; when we excluded episodes with an initial dispensing of a 90-day or more supply, primary adherence decreased further, as expected, to 56%.

DISCUSSION

Race/ethnicity was one of the largest predictors of early adherence to antidepressant medications, with lower early adherence rates for most racial/ethnicity minority groups. The effects of neighborhood income and neighborhood educational attainment were both markedly attenuated after adjustment, suggesting these apparent associations were due to confounding with other factors instead, most likely race/ethnicity. Similarly, other apparent predictors of adherence, such as gender, insurance type or prior mental health

hospitalizations, were no longer significant after adjustment. Significant predictors of poorer adherence in our population included being from a racial/ethnic minority group other than Native American/Alaskan Native, being a young adult, living in a neighborhood with fewer college graduates or having a lower medical comorbidity burden. Additional predictors included receiving the prescription from a non-mental health provider, not engaging in psychotherapy, not having a history of mental healthcare or an antidepressant prescription, or being prescribed an antidepressant other than citalopram, fluoxetine, sertraline or bupropion. HEDIS-like measures of early adherence were lower than our primary definition of adherence (71% vs. 64%) but showed similar associations with patient and encounter characteristics.

Patients who self-identified as Native American/Alaskan Native or non-Hispanic white had higher adherence rates than other groups. Other studies have also found race and ethnicity to be significant predictors of adherence, with minority populations generally found to be less adherent than non-Hispanic whites. A recent systematic review of 32 observational studies of antidepressant adherence found associations between adherence and race, with whites more likely to be adherent to antidepressants than others.[12] However, only four of the 32 studies analyzed the effects of race on adherence, and three of these were fairly small, with sample sizes between 390 and 403, and reliant on self-reports of adherence.[28–30] Two studies found no differences between racial/ethnic groups, but their minority patient samples were fairly small, at 134 and 143 patients each.[29,30] The third study found that Hispanic patients were less adherent than non-Hispanic white patients (OR=0.58, 95% CI: 0.36 to 0.94), while adherence rates for blacks and an “other” racial/ethnic group were similar to non-Hispanic whites.[28] The fourth and final study had a larger sample size (N=3083) and used prescription records to assess adherence, a more reliable indicator of prescription refills.[13] This study found that black patients were less likely to be adherent to antidepressants than white patients (HR 0.60, 95% CI: 0.51 to 0.72). No other racial/ethnic groups were represented in this study.

None of the above studies had representation of Asian, Native Hawaiians/Pacific Islanders or Native Americans/Alaskan Natives. Our study found that antidepressant adherence for Asian and Native Hawaiian/Pacific Islander patients was lower than adherence for non-Hispanic white patients. Unlike other ethnic and racial minority groups, there was no difference in adherence between Native Americans/Alaskan Natives and non-Hispanic whites. To our knowledge, our study is one of the first with a large enough sample of Native Americans/Alaskan Natives to examine this outcome, and the first to find their adherence rates were higher than most other racial/ethnic groups. Our findings are consistent with national reports on depression, which found that Native Americans and non-Hispanic whites preferred medications over counseling for depression treatment.[31] This was in contrast to non-Hispanic blacks, Asians, Pacific Islanders and Hispanics, who preferred counseling. Additionally, in contrast to other ethnic minority groups, Native Americans did not believe antidepressants are usually addictive.[31] These preferences and beliefs may explain why Native Americans tended to be more adherent to antidepressants in our study.

Similar to previous studies, we found that the youngest adult patients were least likely to adhere to their antidepressants.[12,32–34] We also found that patients living in neighborhoods

with lower levels of education had lower rates of antidepressant adherence, and although some studies found similar results,[28,34] others did not find education to have an effect.[29,30,35] In our population, patients with higher comorbidity burden were more likely to adhere to their antidepressant medications, perhaps due to a learning effect, having a routine for consistently taking medications, or having a better understanding of the negative effects of stopping chronic disease medications. Other studies have found mixed effects for the impact of disease burden on medication adherence, with some finding improved adherence in patients with greater comorbidity,[36,37] and others finding no effect or decreased adherence.[33,38–40]

There was a strong association between provider type and early adherence to antidepressants. Patients who received their antidepressants from psychiatrists were more likely to refill their antidepressants than those treated in primary care. This may be because depression severity may have been greater in patients referred to a psychiatrist, perhaps providing greater motivation for antidepressant adherence, but this is speculative as these data did not provide information on depression severity. Similarly, patients receiving psychiatric care may have had previous episodes of depression or a history of treatment-resistant depression, perhaps giving them better insight into the benefits of antidepressant adherence. Another possible factor may be rapport between provider and patient, as other studies have shown that the quality of the provider-patient relationship, particularly surrounding communication and empathy, are positive predictors of medication adherence.[41–43] Psychiatrists often receive more training in patient engagement and motivational interviewing, and perhaps were able to develop better rapport with patients with depression.

Patients who engaged in new or ongoing psychotherapy were more likely to refill their antidepressants. This finding has been supported in other studies, including one conducted in Amsterdam that found that 22% of patients receiving antidepressants and psychotherapy discontinued their medications by 24 weeks, compared to 40% of patients receiving only antidepressants.[44] It may be that patients with more severe depression were more likely to engage in therapy and adhere to their medications, but as noted above, we do not have measures of depression severity in this sample. In our population, we also found smaller positive effects for early adherence in patients who had previous antidepressant treatment or specialty mental healthcare. All of these findings support the importance of engagement with specialty mental health providers for antidepressant adherence.

There were no differences in adherence between antidepressant medications, with the exception of lower adherence rates for those prescribed “other” antidepressants. While the literature comparing tolerability between antidepressants has been mixed, and often limited to comparing two antidepressants at a time, a multiple-treatments meta-analysis of 117 randomized controlled trials found that bupropion, citalopram, escitalopram, and sertraline had better adherence rates than did fluoxetine, duloxetine, fluvoxamine, mirtazapine, paroxetine or venlafaxine.[45] Our results generally fit with the findings of this meta-analysis, as in our study, bupropion, citalopram, fluoxetine and sertraline all had better adherence rates than other antidepressants.

Our study has several limitations and strengths. As this study used observational data from administrative databases, we were reliant on clinician diagnoses of depression. Further, we were unable to distinguish between planned (e.g. cessation due to side effects or lack of benefit or, alternatively, remission of depression) and unplanned discontinuation of antidepressants, an important distinction.[46] There is growing evidence in the field of ethnic psychopharmacology that variations in genetic and non-genetic mechanisms that alter pharmacokinetics and pharmacodynamics of antidepressants may also affect tolerability and effectiveness.[47] Therefore it may be possible that some racial/ethnic groups were intentionally discontinuing their antidepressants at higher rates because of tolerability issues. We did not have direct measures of income or education, but used census data estimates of mean neighborhood income and education levels. A strength of our study is our very large and diverse sample, including a relatively large population of Native Americans/Alaskan Natives, Asians, and Native Hawaiian/Pacific Islanders, groups that have not been well-represented in previous antidepressant adherence studies. Another strength is the assessment of antidepressant adherence using prescription fill records, a less subjective method than self-report.

Our work presents population-based findings of early adherence to antidepressants in a large diverse sample of patients, including the largest sample of Asian, Native Hawaiian/Pacific Islander, and Native American/Alaskan Native patients to date. Race/ethnicity was a robust predictor of antidepressant adherence, with racial/ethnic minority groups other than Native Americans/Alaskan Natives more likely to discontinue their antidepressants within 180 days. Further research is needed to determine whether early nonadherence in specific minority populations is intentional, due, for example, to side effects or patient preference, or unintentional and appropriate for targeted interventions to improve adherence.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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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(23):3095–3105. [PubMed: 12813115]
2. Satcher DS. Executive summary: a report of the Surgeon General on mental health. Public Health Rep. 2000; 115(1):89–101. [PubMed: 10968589]
3. Geddes JR, Carney SM, Davies C, et al. Relapse prevention with antidepressant drug treatment in depressive disorders: a systematic review. Lancet. 2003; 361(9358):653–661. [PubMed: 12606176]
4. Fournier JC, DeRubeis RJ, Hollon SD, et al. Antidepressant drug effects and depression severity: a patient-level meta-analysis. JAMA. 2010; 303(1):47–53. [PubMed: 20051569]
5. Gartlehner, G., Hansen, RA., Thieda, P., et al. Comparative Effectiveness of Second-Generation Antidepressants in the Pharmacologic Treatment of Adult Depression. Rockville (MD): 2007.
6. Lingam R, Scott J. Treatment non-adherence in affective disorders. Acta Psychiatr Scand. 2002; 105(3):164–172. [PubMed: 11939969]

7. Aikens JE, Nease DE Jr, Nau DP, Klinkman MS, Schwenk TL. Adherence to maintenance-phase antidepressant medication as a function of patient beliefs about medication. Ann Fam Med. 2005; 3(1):23–30. [PubMed: 15671187]
8. Simon GE. Evidence review: efficacy and effectiveness of antidepressant treatment in primary care. Gen Hosp Psychiatry. 2002; 24(4):213–224. [PubMed: 12100832]
9. Lewis E, Marcus SC, Olfson M, Druss BG, Pincus HA. Patients' early discontinuation of antidepressant prescriptions. Psychiatr Serv. 2004; 55(5):494. [PubMed: 15128956]
10. McDonald HP, Garg AX, Haynes RB. Interventions to enhance patient adherence to medication prescriptions: scientific review. JAMA. 2002; 288(22):2868–2879. [PubMed: 12472329]
11. Nieuwlaat R, Wilczynski N, Navarro T, et al. Interventions for enhancing medication adherence. Cochrane Database Syst Rev. 2014; 11 CD000011.
12. Rivero-Santana A, Perestelo-Perez L, Perez-Ramos J, Serrano-Aguilar P, De Las Cuevas C. Sociodemographic and clinical predictors of compliance with antidepressants for depressive disorders: systematic review of observational studies. Patient preference and adherence. 2013; 7:151–169. [PubMed: 23487319]
13. Wu CH, Erickson SR, Piette JD, Balkrishnan R. The association of race, comorbid anxiety, and antidepressant adherence among Medicaid enrollees with major depressive disorder. Research in social & administrative pharmacy : RSAP. 2012; 8(3):193–205. [PubMed: 21955808]
14. Zivin K, Ganoczy D, Pfeiffer PN, Miller EM, Valenstein M. Antidepressant adherence after psychiatric hospitalization among VA patients with depression. Adm Policy Ment Health. 2009; 36(6):406–415. [PubMed: 19609666]
15. Busch SH, Leslie D, Rosenheck R. Measuring quality of pharmacotherapy for depression in a national health care system. Med Care. 2004; 42(6):532–542. [PubMed: 15167321]
16. Mental Health Research Network. [Accessed November 25, 2015] http://hcsrn.org/mhrn/en/
17. Ross TRND, Brown JS, Pardee R, Hornbrook MC, Hart G, Steiner JF. The HMO Research Network Virtual Data Warehouse: A Public Data Model to Support Collaboration. eGEMs (Generating Evidence & Methods to Improve Patient Outcomes). 2014; 2(1)
18. Simon GE, Stewart C, Beck A, et al. National Prevalence of Receipt of Antidepressant Prescriptions by Persons Without a Psychiatric Diagnosis. Psychiatr Serv. 2014
19. Blumenthal D, Tavenner M. The "meaningful use" regulation for electronic health records. N Engl J Med. 2010; 363(6):501–504. [PubMed: 20647183]
20. IOM. Ethnicity, and Language Data: Standardization for Health Care Quality Improvement. Washington, DC: The National Academies Press; 2009. IoM.
21. Taylor, PLMH., Martinez, JH., Velasco, G. When labels don't fit: Hispanics and their views of identity. Pew Research Center, Pew Hispanic Center; 2012. Published April 4, 2012
22. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987; 40(5):373–383. [PubMed: 3558716]
23. Pfeiffer PN, Szymanski BR, Valenstein M, McCarthy JF, Zivin K. Trends in antidepressant prescribing for new episodes of depression and implications for health system quality measures. Med Care. 2012; 50(1):86–90. [PubMed: 22182925]
24. Wald A. Sequential Tests of Statistical Hypotheses. : 117–186. The Annals of Mathematical Statistics. 1945:117–186.
25. Rotnitzky AJ, N P. Hypothesis testing of regression parameters in semiparametric generalized linear models for cluster correlated data. Biometrika. 1990; 77(3):485–497.
26. Zeger SL, Liang KY. Longitudinal data analysis for discrete and continuous outcomes. Biometrics. 1986; 42(1):121–130. [PubMed: 3719049]
27. Stata Statistical Software: Release 12.1. [computer program]. College Station, TX: Stat Corp.: StataPress; 2011.
28. Olfson M, Marcus SC, Tedeschi M, Wan GJ. Continuity of antidepressant treatment for adults with depression in the United States. Am J Psychiatry. 2006; 163(1):101–108. [PubMed: 16390896]

29. Bull SA, Hu XH, Hunkeler EM, et al. Discontinuation of use and switching of antidepressants: influence of patient-physician communication. JAMA. 2002; 288(11):1403–1409. [PubMed: 12234237]
30. Woolley SB, Fredman L, Goethe JW, Lincoln AK, Heeren T. Hospital patients' perceptions during treatment and early discontinuation of serotonin selective reuptake inhibitor antidepressants. J Clin Psychopharmacol. 2010; 30(6):716–719. [PubMed: 21105288]
31. Givens JL, Houston TK, Van Voorhees BW, Ford DE, Cooper LA. Ethnicity and preferences for depression treatment. Gen Hosp Psychiatry. 2007; 29(3):182–191. [PubMed: 17484934]
32. Burton C, Anderson N, Wilde K, Simpson CR. Factors associated with duration of new antidepressant treatment: analysis of a large primary care database. Br J Gen Pract. 2012; 62(595):e104–112. [PubMed: 22520784]
33. Cui Z, Faries DE, Gelwicks S, Novick D, Liu X. Early discontinuation and suboptimal dosing of duloxetine treatment in patients with major depressive disorder: analysis from a US third-party payer perspective. Journal of medical economics. 2012; 15(1):134–144. [PubMed: 22014076]
34. Warden D, Trivedi MH, Wisniewski SR, et al. Predictors of attrition during initial (citalopram) treatment for depression: a STAR*D report. Am J Psychiatry. 2007; 164(8):1189–1197. [PubMed: 17671281]
35. Hung CI, Wang SJ, Liu CY, Hsu SC, Yang CH. Comorbidities and factors related to discontinuation of pharmacotherapy among outpatients with major depressive disorder. Compr Psychiatry. 2011; 52(4):370–377. [PubMed: 21683174]
36. Akerblad AC, Bengtsson F, Holgersson M, von Knorring L, Ekselius L. Identification of primary care patients at risk of nonadherence to antidepressant treatment. Patient preference and adherence. 2008; 2:379–386. [PubMed: 19920985]
37. Poluzzi E, Piccinni C, Sangiorgi E, et al. Trend in SSRI-SNRI antidepressants prescription over a 6-year period and predictors of poor adherence. European journal of clinical pharmacology. 2013; 69(12):2095–2101. [PubMed: 23904053]
38. Vik SA, Maxwell CJ, Hogan DB. Measurement, correlates, and health outcomes of medication adherence among seniors. Ann Pharmacother. 2004; 38(2):303–312. [PubMed: 14742770]
39. Akincigil A, Bowblis JR, Levin C, Walkup JT, Jan S, Crystal S. Adherence to antidepressant treatment among privately insured patients diagnosed with depression. Med Care. 2007; 45(4): 363–369. [PubMed: 17496721]
40. Lu CY, Roughead E. New users of antidepressant medications: first episode duration and predictors of discontinuation. European journal of clinical pharmacology. 2012; 68(1):65–71. [PubMed: 21713518]
41. Anderson C, Roy T. Patient experiences of taking antidepressants for depression: a secondary qualitative analysis. Research in social & administrative pharmacy : RSAP. 2013; 9(6):884–902. [PubMed: 23219056]
42. van Geffen EC, Hermsen JH, Heerdink ER, Egberts AC, Verbeek-Heida PM, van Hulten R. The decision to continue or discontinue treatment: experiences and beliefs of users of selective serotonin-reuptake inhibitors in the initial months--a qualitative study. Research in social & administrative pharmacy : RSAP. 2011; 7(2):134–150. [PubMed: 21272543]
43. Thompson L, McCabe R. The effect of clinician-patient alliance and communication on treatment adherence in mental health care: a systematic review. BMC Psychiatry. 2012; 12:87. [PubMed: 22828119]
44. de Jonghe F, Kool S, van Aalst G, Dekker J, Peen J. Combining psychotherapy and antidepressants in the treatment of depression. J Affect Disord. 2001; 64(2–3):217–229. [PubMed: 11313088]
45. Cipriani A, Furukawa TA, Salanti G, et al. Comparative efficacy and acceptability of 12 new-generation antidepressants: a multiple-treatments meta-analysis. Lancet. 2009; 373(9665):746–758. [PubMed: 19185342]
46. Samples H, Mojtabai R. Antidepressant self-discontinuation: results from the collaborative psychiatric epidemiology surveys. Psychiatr Serv. 2015; 66(5):455–462. [PubMed: 25930223]
47. Chaudhry I, Neelam K, Duddu V, Husain N. Ethnicity and psychopharmacology. J Psychopharmacol. 2008; 22(6):673–680. [PubMed: 18308818]

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Table 1

Patient characteristics and the association with primary adherence

A total of 177,469 patients had 184,967 new episodes of depression and were included in these analyses. Overall, patients had primary adherence to their depression medications in 71% (n = 131,431) of episodes.

	N (%)[a]	Adherent (n; %)[b]	Test Statistic (Wald / adj)	Unadjusted OR (95% CI)	Adjusted OR (95% CI) [c]
Age			129 (<.0001)		
18–29	32282 (17.5%)	22767 (70.5%)		1	1
30–44	49724 (26.9%)	35602 (71.6%)		1.05 (1.02–1.09)	1.18 (1.14–1.22)
45–59	54743 (29.6%)	38951 (71.2%)		1.03 (1.00–1.06)	1.18 (1.14–1.22)
60–74	31253 (16.9%)	22008 (70.4%)		1.00 (0.96–1.03)	1.18 (1.13–1.23)
75+	16965 (9.2%)	12103 (71.3%)		1.04 (1.00–1.08)	1.23 (1.16–1.30)
Gender			0.64 (0.42)		
Female	127935 (69.2%)	90121 (70.4%)		1	1
Male	57030 (30.8%)	41309 (72.4%)		1.10 (1.08–1.13)	0.99 (0.97–1.01)
Race/Ethnicity [d]			2732(<.0001)		
Non-Hispanic white	92439 (50.0%)	71217 (77.0%)		1	1
Asian	8614 (4.7%)	5612 (65.2%)		0.56 (0.53–0.58)	0.58 (0.55–0.61)
Non-Hispanic black	14081 (7.6%)	8698 (61.8%)		0.48 (0.46–0.50)	0.50 (0.48–0.52)
Hispanic	46469 (25.1%)	27910 (60.1%)		0.45 (0.44–0.46)	0.54 (0.53–0.56)
Native Hawaiian/Pacific Islander	2015 (1.1%)	1345 (66.8%)		0.60 (0.55–0.66)	0.67 (0.58–0.77)
Native American/ Alaskan Native	1179 (0.6%)	925 (78.5%)		1.09 (0.95–1.25)	0.96 (0.79–1.18)
Mixed Race, Other or Unknown [e]	20170 (10.9%)	15724 (78.0%)		1.05 (1.02–1.09)	0.85 (0.82–0.88)
Neighborhood Annual Income			3.22 (0.07)		
≥ $25,000	135379 (73.2%)	98687 (72.7%)		1	1
< $25,000	49228 (26.6%)	32744 (66.5%)		0.75 (0.73–0.76)	1.03 (1.00–1.06)
Neighborhood Education			26.4 (<.0001)		
≥ 25% College Grad	65730 (35.5%)	49934 (76.0%)		1	1
< 25% College Grad	119237 (64.5%)	81497 (68.4%)		0.68 (0.67–0.70)	0.94 (0.91–0.96)
Insurance Type			4.33 (0.23)		

	N (%)[a]	Adherent (n; %)[b]	Test Statistic (Wald / adj)	Unadjusted OR (95% CI)	Adjusted OR (95% CI) [c]
Commercial	135576 (73.3%)	96436 (71.1%)		1	1
Medicare	35661 (19.3%)	25182 (70.6%)		0.98 (0.95–1.00)	0.98 (0.94–1.03)
Medicaid	6069 (3.3%)	4144 (68.3%)		0.87 (0.83–0.92)	0.94 (0.88–1.00)
Other	7661 (4.1%)	5669 (74.0%)		1.16 (1.10–1.22)	1.03 (0.98–1.09)
Charlson Comorbidity Index			164 (<.0001)		
0	149458 (80.8%)	105643 (70.7%)		1	1
1	18403 (9.9%)	13316 (72.4%)		1.09 (1.05–1.12)	1.14 (1.10–1.18)
≥ 2	17106 (0.9%)	12472 (72.9%)		1.12 (1.08–1.16)	1.25 (1.21–1.30)
Prior Antidepressant Use			84.3 (<.0001)		
No	113452 (61.3%)	79974 (70.4%)		1	1
Yes	71425 (38.6%)	51457 (72.0%)		1.08 (1.06–1.10)	1.11 (1.09–1.14)
Prior Specialty MH Care Use			25.7 (<.0001)		
None	98000 (53.0%)	67343 (68.7%)		1	1
Prior	86967 (47.0%)	64088 (73.7%)		1.28 (1.25–1.30)	1.06 (1.04–1.09)
Also Receiving Psychotherapy			1153 (<.0001)		
No	136207 (73.6%)	93076 (68.3%)		1	1
Yes	48760 (26.4%)	38355 (78.7%)		1.71 (1.67–1.75)	1.62 (1.58–1.67)
Prior MH Hospitalization			2.35 (0.13)		
No	179738 (97.2%)	127531 (71.0%)		1	1
Yes	5229 (2.8%)	3900 (74.6%)		1.20 (1.13–1.28)	1.05 (0.99–1.12)
Initial Antidepressant Prescribed			75.1 (<.0001)		
Citalopram	52868 (28.6%)	38250 (72.4%)		1	1
Fluoxetine	55047 (29.8%)	38119 (69.3%)		0.86 (0.84–0.88)	1.01 (0.98–1.03)
Sertraline	27876 (15.0%)	20305 (72.8%)		1.03 (0.99–1.06)	1.00 (0.96–1.03)
Bupropion	17796 (9.6%)	13226 (74.3%)		1.11 (1.06–1.15)	1.00 (0.96–1.04)
Other	31380 (16.9%)	21531(68.6%)		0.84 (0.81–0.86)	0.89 (0.86–0.92)
Prescribing Provider			336 (<.0001)		
Mental Health Specialty	39997 (21.6%)	30587 (76.5%)		1	1
Primary Care	123933 (67.0%)	86029 (69.4%)		0.70 (0.68–0.72)	0.74 (0.72–0.77)

	N (%)[a]	Adherent (n; %)[b]	Test Statistic (Wald / adj)	Unadjusted OR (95% CI)	Adjusted OR (95% CI) [c]
Other or Unknown	21037 (11.4%)	14815 (70.4%)		0.73 (0.71–0.76)	0.73 (0.70–0.77)

[a] Percentages by column

[b] Percentages by row

[c] Adjusted for all other covariates in Table 1 and for site.

[d] Uses "plus Hispanic" classification for race/ethnicity (minimizes mixed race group)

[e] Includes 163 "mixed race" patients