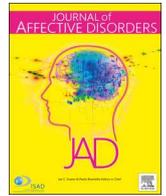




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Short communication

## Patient portal use among veterans with depression: Associations with symptom severity and demographic characteristics

Samantha L. Connolly<sup>a,b,\*</sup>, Bella Etingen<sup>c</sup>, Stephanie L. Shimada<sup>d,e,f</sup>, Timothy P. Hogan<sup>d,g</sup>, Kim Nazi<sup>h</sup>, Kevin Stroupe<sup>c</sup>, Bridget M. Smith<sup>c,i</sup><sup>a</sup> Center for Healthcare Organization and Implementation Research, VA Boston Healthcare System, Boston, MA, United States<sup>b</sup> Department of Psychiatry, Harvard Medical School, Boston, MA, United States<sup>c</sup> Center of Innovation for Complex Chronic Healthcare, Edward Hines Jr. VA Hospital, Hines, IL, United States<sup>d</sup> Center for Healthcare Organization and Implementation Research, Edith Nourse Rogers Memorial Veterans Hospital, Bedford, MA, United States<sup>e</sup> Division of Health Informatics and Implementation Science, Department of Population and Quantitative Health Sciences, University of Massachusetts Medical School, Worcester, MA, United States<sup>f</sup> Department of Health Law, Policy, and Management, Boston University School of Public Health, Boston, MA, United States<sup>g</sup> Department of Population and Data Sciences, University of Texas Southwestern Medical Center, Dallas, TX, United States<sup>h</sup> Independent Consultant, Coxsackie, NY, United States<sup>i</sup> Center for Healthcare Studies, Institute of Public Health and Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL, United States

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## ABSTRACT

**Background:** Patient portals can support self-management behaviors and increase continuity of care. It is therefore important to understand how individuals with depression are interacting with patient portals, to ensure that they have access to tools that can improve outcomes. The purpose of the current retrospective analysis was to examine associations between symptom severity, demographic characteristics and patient portal adoption and use among Veterans with depression diagnoses.

**Methods:** Data were collected within a larger retrospective analysis of use of the Veterans Health Administration patient portal, My HealthVet (MHV). The final sample included 3053 Veterans with diagnoses of depression and at least two measures of depressive symptoms. Regressions tested whether depressive symptoms and demographic variables were associated with MHV registration and feature use.

**Results:** Veterans with more severe depression were more likely to have registered for MHV and downloaded medical record content compared to those with milder symptoms. Male and older Veterans had lower rates of portal registration, and African American Veterans had lower rates of portal feature use.

**Limitations:** Limitations include restriction to a Veteran population who first used MHV in FY2013 as opposed to prior or subsequent years.

**Conclusions:** Patients with more severe depression may have increased interest in and use of patient portals. Demographic differences in portal use continue to be observed; barriers to uptake must be identified so disparities can be addressed.

Online patient portals, which allow patients to view portions of their medical record and communicate with providers, can improve patients' access to and quality of medical care (Kruse et al., 2015). They may be especially useful for patients with chronic conditions that require steady monitoring over time, including psychiatric disorders such as depression. Depression is the leading cause of disability worldwide, further emphasizing the need to identify strategies to best manage this disorder and improve patient functioning (World Health Organization, 2017). Individuals with depression can use patient

portals to complete tasks such as reviewing medications, refilling prescriptions, downloading content from their medical record, communicating with providers via secure messaging, and managing appointments. As such, patient portals can support self-management behaviors and increase continuity of care (Zhou et al., 2010). It is therefore important to understand how individuals with depression are interacting with patient portals, to ensure that they have access to tools that can improve outcomes.

Introduced in 2003, the US Veterans Health Administration (VA) My

\* Corresponding author at: Center for Healthcare Organization and Implementation Research, VA Boston Healthcare System, Boston, MA, United States.

E-mail address: [samantha.connolly@va.gov](mailto:samantha.connolly@va.gov) (S.L. Connolly).

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HealthVet (MHV) patient portal includes data from VA's electronic medical record, health information self-entered by Veterans, and health education resources (Nazi et al., 2010). Large-scale studies of MHV have reported greater use among patients with depression, as compared to those with chronic medical conditions such as diabetes and hypertension (Shimada et al., 2014) or other psychiatric disorders including bipolar disorder and schizophrenia (Etingen et al., 2019). Although it is established that patients with depression have higher rates of portal use, little is known regarding the relationship between symptom severity and usage rates. Depression can range from having mild effects on daily functioning to severe impairment in which individuals have difficulty maintaining employment or personal hygiene. It is possible that individuals with more severe depression may have increased patient portal utilization in an attempt to manage their symptoms. Conversely, the greater functional impairments associated with severe depression could impede portal use. Indeed, previous work has reported low levels of portal engagement among patients with psychotic and bipolar disorders, which are considered to have high levels of impairment (Etingen et al., 2019). Demographic factors may also influence portal engagement among patients with depression. Patients who are younger, female, and white may be more likely to use patient portals (Ancker et al., 2011; Grossman et al., 2019); however, it is unclear whether these demographic differences persist within depressed samples.

To our knowledge, only one study has examined the relationship between depressive symptoms and portal usage, finding no association (Bauer et al., 2017); however, this study employed a sample of primary care patients, as opposed to those with preexisting depression diagnoses, and used a two-item symptom measure, both of which may have limited the ability to observe meaningful differences. Therefore, the purpose of the current retrospective analysis was to examine associations between symptom severity, demographic characteristics and patient portal adoption and use among Veterans with depression diagnoses.

## 1. Methods

### 1.1. Sample

Data were collected as part of a larger retrospective database analysis of MHV use among approximately 3.5 million Veterans. To determine the sample, we first selected two groups: a MHV group, comprised of Veterans who had used MHV at least once in FY2013, but had no use prior to FY2013, and a randomly-sampled comparison group of Veterans with no history of MHV use (see Etingen et al., 2019 for further detail). For the current analysis, we refined that sample such that it only included Veterans with depression diagnoses, defined as having an ICD-9 code for depression documented at least twice in the Veteran's outpatient medical records, or documented at least once during an inpatient encounter in the year prior to their index date (defined as the date of first MHV use for the MHV users group and October 1, 2012 for the comparison group; ICD-9 codes: 296.20–296.36, 296.50–296.55, 296.90, 300.4, 311 (Carlson et al., 2010)). Veterans also had to have completed at least one assessment of depressive symptoms via the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) both before and after their index date. Veterans were excluded from the sample if they were deceased, younger than 18 or older than 104, had less than two encounters before or after their index date, and/or had missing data on any study covariates. Our final sample included 3053 Veterans.

### 1.2. Measures and data sources

#### 1.2.1. MHV use

Among those in the MHV group, number of uses for each portal feature (appointment views, prescription refills, secure messages read,

secure messages sent, and medical record downloads) was calculated for the twelve-month period following the Veteran's first use of MHV.

#### 1.2.2. Depressive symptoms

Symptoms of depression were measured via the PHQ-9 (Kroenke et al., 2001), a widely-used measure with strong psychometric properties that can be completed via patient self-report or administered verbally by a clinician. PHQ-9 scores were averaged for each Veteran; those with an average score of 14 or less were deemed to have mild/moderate depression, while those with an average score of 15 or more had moderately severe/severe depression, based on established thresholds (Kroenke et al., 2001).

#### 1.2.3. Demographics, health status, and healthcare utilization

Demographic information was obtained from the VA Medical SAS administrative databases and included gender, age, race, ethnicity, and region of residence (Midwest, Northeast, South, West, other). Age was dichotomized as being younger than 50 or 50+, as cognitive and physical changes after age 50 may affect technology use and attitudes (Connolly et al., 2018; Kuerbis et al., 2017). Race was dichotomized as African American/all other races, and ethnicity was dichotomized as Hispanic/non-Hispanic. Income was determined via the median household income for the Veteran's zip code. Rural/urban status was determined via the Rural Urban Commuting Area codes (RUCA; WWAMI Rural Health Research Center 2020) which classify census tracts based on population and commuting flows to urbanized areas. Health status was assessed using Hierarchical Condition Category (HCC) risk scores, determined by considering a combination of demographic and diagnostic data using a hierarchical method in which more severe medical conditions within each condition category are weighted more heavily in contributing to a patient's health risk (Hynes et al., 2007). The following variables were also obtained from VA administrative databases: history of diabetes, chronic kidney disease, heart failure, ischemic heart disease, and stroke, and the number of VA primary care, specialty care, and mental health visits in the year prior to the index date.

### 1.3. Data analysis

To account for the random sampling of the comparison group, all data for the Veterans comprising this group were weighted. We first ran a logistic regression model to examine factors associated with Veterans having registered for MHV. Among Veterans who had registered, we ran five negative binomial regressions to examine factors associated with use of: appointment views, prescription refills, secure messages read, secure messages sent, and medical record content downloads. Covariates included depressive symptom severity, age, sex, race, and ethnicity. Analyses also controlled for income, region of residence, urbanicity, healthcare utilization (number of VA primary care, specialty care, and mental health appointments), health status, chronic health conditions (history of diabetes, chronic kidney disease, heart failure, ischemic heart disease, and stroke), and mental health conditions (diagnosis of PTSD, substance use disorder, bipolar disorder, and/or psychotic disorder). Covariates were included for the following reasons: income, region, and urbanicity could impact technological literacy and access to technologies necessary to use a patient portal, and health status and comorbidities could 1) impact overall functioning and self-management abilities, and 2) influence the number of interactions individuals have with the healthcare system, which could in turn affect portal usage. Analyses were performed using STATA MP Version 14.2 software. This study was approved by the Edward Hines Jr. VA Hospital and Edith Nourse Rogers Memorial Veterans Hospital Institutional Review Boards.

## 2. Results

### 2.1. Sample description

Within this sample of 3053 Veterans, 61.4% had mild/moderate depressive symptoms and 38.6% had moderately severe/severe symptoms. Veterans were 55.4 years old on average (29.6% < 50, 70.4% 50+), 9.7% female, 27.3% African American, and 8.9% Hispanic. 21.9% of the sample was registered for MHV. Of those who were registered, 33.6% had used the appointment view feature, 44.7% had refilled at least one prescription, 20.4% had read at least one secure message, 24.9% had sent at least one secure message, and 15.9% had downloaded content from their medical record at least once. See [Table 1](#) for descriptive statistics of all study covariates.

### 2.2. Odds of MHV use by depression severity and demographic characteristics

Among this sample of Veterans with depressive disorders, those with moderately severe/severe symptoms had higher odds of registering for MHV as compared to those with mild/moderate symptoms (OR = 1.41,  $p < 0.01$ ; [Table 2](#)). Women also had higher odds of registering as compared to men (OR = 1.98,  $p < 0.001$ ) and Veterans who were 50+ (versus less than 50; OR = 0.50,  $p < .001$ ) had significantly lower odds of registering. Veterans who were Hispanic (versus non-Hispanic; OR = 0.62,  $p < .05$ ) or African American (versus other race; OR = 0.73,  $p < .05$ ) had significantly lower odds of registering when adjusting for additional covariates ([Table 2](#)), but the unadjusted odds were nonsignificant ([Supplementary Table 1](#)).

Among those who were registered, Veterans with moderately severe/severe depressive symptoms had a higher likelihood of downloading medical record content compared to those with milder symptoms (PRR = 1.37,  $p < .05$ ). African-American Veterans were less likely to view appointments, refill medications, read or send secure

**Table 1**  
Descriptive statistics of study sample ( $N = 3053$ ).

Variable Name	Mean or percentage
Depressive symptoms	
Mild/moderate symptoms	61.4%
Moderately severe/severe symptoms	38.6%
Age	55.4
Female	9.7%
African American	27.3%
Hispanic	8.9%
Registered for MyHealtheVet	21.9%
Number of primary care appointments	3.24
Number of specialty care appointments	5.49
Number of mental health appointments	6.69
Income	\$49,798
Region of residence	
Midwest	24.9%
Northeast	10.7%
South	47.4%
West	16.2%
Urban	62.0%
HCC score	.94
Diabetes	25.3%
Chronic kidney disease	9.6%
Heart failure	4.8%
Ischemic heart disease	16.3%
Stroke	3.3%
PTSD	41.2%
Substance use disorder	31.2%
Bipolar disorder	5.2%
Psychotic disorder	5.7%

Note. Depressive symptoms measured via PHQ-9 score. Number of primary care, specialty care, and mental health appointments refer to those occurring in the year prior to the index date.

messages, and download medical record content via MHV (all PRRs < 0.66,  $ps < 0.05$ ), as compared to Veterans of all other races. Female veterans were less likely to use the medication refill feature (PRR = 0.64,  $p < .05$ ) and older Veterans were less likely to read or send secure messages (PRRs < 0.67,  $ps < 0.01$ ) than younger Veterans. Hispanic (versus non-Hispanic) and older Veterans (50+ versus under 50) were less likely to use the medication refill feature (PRRs < 0.78,  $ps < 0.05$ ) and older Veterans were more likely to have downloaded content from their medical record (PRR = 1.34,  $p < .05$ ); however these odds were not significant in unadjusted models ([Supplementary Table 1](#)).

## 3. Discussion

The current study found that among Veterans with a depression diagnosis, those with more severe symptoms were more likely to register for a patient portal and download content from their medical record compared to those with milder symptoms. These findings emphasize that certain patient portal features may be of particular interest and use to patients with more severe depression. Results serve as a reminder to providers that patients with depression, including those with more severe symptomatology, should be offered these resources to help promote self-management abilities. Regarding demographic differences, we found that Veterans who were male and 50+ demonstrated lower rates of portal registration; African American Veterans also had lower portal feature use. African American and Hispanic Veterans had lower rates of portal registration when adjusting for other variables, but these results should be interpreted with caution as the unadjusted models were not significant. Overall, findings complement existing studies examining both Veteran ([Shimada et al., 2014](#)) and non-Veteran ([Ancker et al., 2011](#); [Grossman et al., 2019](#)) populations, which report lower portal use among older, male, and racial and ethnic minority patients, irrespective of depression diagnosis. These results further emphasize the need to identify and address barriers to portal use among older, male, and minority populations and to develop strategies to increase use. For example, providing training in navigating computers, the internet, and patient portals can increase portal usage among vulnerable populations ([Grossman et al., 2018](#); [Hilton et al., 2012](#); [McInnes et al., 2013](#)). Such efforts can help to increase the number of patients able to benefit from these tools ([Grossman et al., 2019](#); [Irizary et al., 2015](#)). Of note, findings remained significant when controlling for variables that could influence rates of portal registration and use, including medical comorbidities, income, region of residence, and urbanicity. However, future work should assess additional factors that may influence portal adoption, such as access to technology, computer literacy, and patient preference.

To our knowledge, this is the first study to examine the relationship between symptom severity, demographics, and patient portal usage among a large sample of patients with depression diagnoses. A prior study that used a two-item depression measure to quantify symptom severity within a primary care population had null results ([Bauer et al., 2017](#)); the current study's use of depression diagnoses documented in the medical record and a nine-item symptom inventory likely increased our ability to detect meaningful differences in portal use among depressed patients. Limitations of this work include restriction to a Veteran population who first used the patient portal in FY2013 as opposed to prior or subsequent years; portal use was only assessed in the twelve months following first use. It will be important for future research to track changes in patient portal use over time, as these platforms incorporate new and increasingly dynamic features and as technological literacy continues to increase. It will also be critical to seek feedback from portal users to ensure that these tools best serve patients' healthcare needs. Such user-centered design practices have been successfully employed by VA throughout the development and ongoing refinement of the My HealtheVet patient portal ([Nazi et al., 2018](#)).

**Table 2**  
Adjusted odds of MHV adoption and use by depression severity and demographic characteristics.

Independent variable	Registered OR <sup>a</sup> 95% CI SE	Appointment view <sup>a</sup> PRR95% CI SE	Used medication refill <sup>a</sup> PRR95% CI SE	Read ≥ 1 secure message <sup>a</sup> PRR95% CI SE	Sent ≥ 1 secure message <sup>a</sup> PRR95% CI SE	Medical record content download <sup>a</sup> PRR95% CI SE
Moderately severe to severe depression <sup>b</sup>	1.41** 1.14–1.74 .15	1.08 .85–1.38 .14	1.02 .88–1.19 .08	.84 .64–1.11 .12	.94 .73–1.20 .12	1.37* 1.08–1.75 .17
African American	.73* .56–0.96 .10	.54*** .41–0.73 .08	.54*** .44–0.67 .06	.58** .41–0.82 .10	.63** .47–0.86 .10	.66* .47–0.92 .11
Hispanic	.62* .42–0.92 .12	1.13 .70–1.82 .27	.69* .52–0.92 .10	.75 .46–1.22 .19	.74 .48–1.16 .17	.81 .52–1.26 .18
Female	1.98*** 1.39–2.81 .35	.77 .70–1.82 .27	.77** .63–0.94 .08	1.10 .77–1.58 .20	1.14 .81–1.61 .20	1.16 .80–1.68 .22
50 +	.50*** .39–0.64 .06	1.04 .81–1.34 .14	.78** .66–0.93 .07	.64** .48–0.86 .10	.67** .51–0.87 .09	1.34* 1.01–1.76 .19

Note. OR = Odds ratio. CI = Confidence interval. SE = standard error. PRR = Prevalence rate ratio. All analyses control for number of primary care, specialty care, and mental health appointments, Veterans' income, region of residence, urbanicity, health status (HCC score), chronic conditions (history of diabetes, chronic kidney disease, heart failure, ischemic heart disease, and stroke), and comorbid psychiatric disorders (PTSD, substance use disorders, bipolar disorder, and psychotic disorders).

<sup>a</sup> Values represent calculations for registered Veterans.

<sup>b</sup> As compared to those with mild to moderate depressive symptoms on the PHQ-9.

\*\*\*  $p < 0.001$ .

\*\*  $p < 0.01$ .

\*  $p < 0.05$ .

#### 4. Conclusions

This analysis aimed to broaden our understanding of how patients with depression interact with patient portals, in order to ultimately inform strategies to best engage this patient population in effective self-management. Findings suggest that patients with more severe depression may be more likely to register for a patient portal and download content from their medical record, emphasizing that those with chronic and impairing conditions may be an important population to target for portal adoption. Across healthcare systems, demographic differences in portal use continue to be observed, as was found in the current study: older and male Veterans demonstrated lower rates of portal registration, and African American Veterans also had lower portal feature use. Future efforts to increase patients' engagement with portals should target those who can most benefit from portal usage, as well as patients who may be experiencing barriers to adoption, to ultimately improve uptake and encourage self-management of depression.

#### Contributors

BMS designed the overall study and SLC developed the current manuscript aims. BMS conducted the statistical analysis. SLC wrote the first draft of the manuscript. BMS, BE, SLS, TPH, KN, and KS all provided critical feedback and edits. All authors contributed to and have approved the final manuscript.

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#### Author Disclosure

The authors declare no conflicts of interest.

The content is solely the responsibility of the authors and does not necessarily represent the official views of the US Department of Veterans Affairs or the US Government.

#### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jad.2020.06.073](https://doi.org/10.1016/j.jad.2020.06.073).

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