Veteran Preferences for Technology-Assisted Patient Reported Outcomes Measurement of Mental Health Symptoms

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Abstract

Background: The Veterans Health Administration (VHA) is promoting patient-reported outcome measures (PROMs) collection for measurement-based mental healthcare. Understanding Veteran preferences about how and when to complete PROMs is critical to support their implementation.

Objective: We examined Veteran preferences for timing and use of different technology platforms to complete mental health-related PROMs.

Methods: We invited a national sample of 1,373 Veterans to complete a survey; 858 (63%) responded. Surveys asked about Veteran preferences for how and when to complete mental health-related PROMs. We characterized responses using descriptive statistics, and estimated multiple logistic regression models to examine associations between Veteran demographic and health characteristics and preferences for completing PROMS.

Results: Most Veterans preferred completing PROMs between appointments (76%) using features of a patient portal (51%), during appointments (74%) verbally (52%), and while at the medical center (60%) on paper (24%) or a tablet computer (23%). Hispanic (vs. non-Hispanic) Veterans had 3.32 times higher odds of preferring to complete PROMs at the medical center (95%CI:1.04-10.58), and Veterans with lower (vs. higher) socioeconomic status had lower odds (OR:0.61, 95%CI:0.40-0.93) of preferring to complete PROMs in between appointments, but 1.97 times higher odds (95%CI:1.23-3.16) of preferring to complete PROMs during appointments.

Conclusions: As VHA and other healthcare systems seek to expand the integration of PROM data into healthcare services, adaptive and flexible approaches to PROM administration that align with patient preferences, including those that leverage

technology platforms in the remote collection of these data, may bolster implementation. Our results indicate that such implementation efforts should consider patient ethnicity and socioeconomic status. Our findings further suggest that these efforts could benefit from incorporating PROM administration into online patient portals, developing mobile health apps that support PROMs completion through patient's personal devices in between clinical encounters, and engaging care team members in PROM administration during appointments. Clinical Trial: N/A

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clinical encounters, and engaging care team members in PROM administration during appointments.

Trial Registration: N/A

Keywords: Measurement-Based Care; Patient Preferences; Patient-Reported Outcomes; Technology-Based Assessment; Veterans

Introduction

Despite encouraging evidence of their clinical utility, the integration of patient-reported outcome measure (PROM) data into healthcare practice – also referred to as measurement-based care (MBC) – remains limited.[1-5] A recent Cochrane review of 116 randomized studies concluded that using PROM data in healthcare has a moderate effect on improving important aspects of clinical care, including accuracy of diagnoses, disease management, and patient-provider communication.[4] Nevertheless, only 60% of a recent sample of 600 hospital/clinic administrators reported wanting to implement routine PROM collection within their organization to improve patient experiences, and only 38% of the total sample indicated that they had done so.[6]

There is recognition that PROM collection in the context of clinical care may be bolstered by leveraging technology platforms to collect PROMs from patients[7], either in between clinical encounters or before an encounter, while they are waiting to see their care team members. In fact, several professional organizations have suggested that one strategy for bolstering implementation of MBC practices is to improve engagement by aligning PROM administration with patient needs and preferences.[8,9] However, additional information is needed regarding patient preferences for timing and use of different technology platforms to complete PROMs, particularly those related to potentially sensitive topics such as mental health-related symptoms.

To date, research regarding such patient preferences is mixed, largely relying on qualitative data or focused narrowly on specific contexts of care.[10-12] For example, one recent systematic review of 14 qualitative studies reported mixed findings among patients regarding preferred modality (pencil-and-paper vs. electronic), timing (at home vs. in clinic), and frequency of completing PROMs as part of their healthcare.[13] This review further noted a range of reasons for patient preferences, including that patients who preferred to complete PROMs at home felt they would be more likely to respond honestly, while patients who preferred to complete PROMs at the clinic liked that it gave them something to do while they waited for their appointment.[13] Other literature

suggests that preferences may be influenced by demographic characteristics;[14] however, little research has been conducted regarding preferences for completing PROMs among diverse populations. Taken together, the existing literature-base indicates that additional work focused on patient preferences for using technology platforms to complete PROMs is warranted.

The Veterans Health Administration (VHA), the largest integrated healthcare system in the United States (US), is currently working to further the integration of patient-generated health data (PGHD) – including PROMs – into practice; this is evidenced in part by national calls to incorporate MBC practices across mental health services and by the development of policies to guide Veteran PGHD collection and use.[15-17] Tailoring the timing and mode of PROM administration, including through the use of relevant technology platforms, may increase the likelihood that Veterans will share such data with their care team members. The objective of this analysis was to characterize Veteran preferences for timing and use of different technology platforms to complete mental health-related PROMs, and to assess factors associated with preferences regarding when (e.g., in between, during, or just before clinical encounters) to complete mental health-related PROMs.

Methods

Design: These data were collected as part of a longitudinal survey effort, initiated in 2017 and referred to as the Veterans Engagement with Technology Collaborative (VET-C) cohort. The overall goal of the VET-C cohort was to collect Veteran feedback on VHA patient-facing technologies intended to improve access to and delivery of care and to support Veteran self-management.[18] The VET-C cohort was initiated by VHA's Office of Connected Care, in partnership with investigators from the VHA's Quality Enhancement Research Initiative (QUERI) Program, to collect survey data from a nationwide sample of Veterans at three time points. Survey data were combined with additional demographic and health information from VHA administrative data.

Sample: A set of 14 geographically dispersed VHA facilities were identified as VET-C recruitment sites. We identified Veterans who were users of VHA patient-facing technologies (i.e., secure

messaging) to be included in the cohort. Secure messaging use was defined as sending a minimum of five messages through VHA's online patient portal in the year prior to cohort recruitment. Further details related to sampling for the VET-C cohort can be found in previous publications.[18,19]

Procedures: Survey data were collected from members of the VET-C cohort at three time points: 2017-2018, 2019-2020, and 2021-2022. Data collection procedures for the first two rounds of surveys are described in previous publications.[18,19] Veterans who responded to the first two surveys were invited to complete the third survey, which was administered by mail. Non-responders to the initial mailing were mailed a follow-up survey approximately 4 weeks later to enhance response rates. Veterans were also provided the option to complete the survey by phone with a member of our evaluation team; two Veterans chose to do so. Survey data were entered into VHA's secure electronic data capture platform, REDCap.[20]

Measures: The survey collected data on Veteran demographic characteristics, health and healthcare use, technology ownership and use, and preferences for completing PROMs. Demographic characteristics included Veteran age, sex, race, ethnicity, source of healthcare (i.e., within or outside VHA), level of difficulty paying for basics like food and heating/cooling, and current housing situation. We asked Veterans to rate their physical and mental health on a five-point Likert scale ranging from excellent to poor. Veteran health conditions were obtained from diagnosis codes in the VHA Corporate Data Warehouse (CDW). We also used CDW data to fill in any missing survey data on key demographic variables.

To assess Veteran preferences for completing mental health-related PROMs, we asked Veterans to report both when and how they preferred to complete such PROMs. Regarding preferences related to "when," response options included "in between my appointment when I am not at the VHA," "when I am at the VHA," and "during my appointments with my VHA provider(s)." We also asked Veterans to indicate "how" they prefer to complete PROMs at these particular times, including through the use of different technology platforms: (1) in between

appointments: using secure messaging, using a mobile health app, and/or mailed paper-and-pencil assessments; (2) when at the VHA (in the waiting room before an appointment): on a kiosk, on paper-and-pencil, and/or on a tablet computer; and (3) during appointments: on a tablet computer, on a kiosk, on paper-and-pencil, and/or verbally with their provider(s). Veterans were allowed to select more than one response per question.

Analyses: We characterized Veteran survey responses using descriptive statistics. We then used multiple logistic regression models to examine factors associated with Veteran preferences regarding when to complete mental health-related PROMs, controlling for key demographic characteristics and health conditions. All statistical analyses were performed with STATA MP Version 17 software (StataCorp, College Station, TX).

Ethical considerations: This work was reviewed by the Institutional Review Boards at the VA Hospital in Hines, IL, and the VA Bedford Healthcare System in Bedford, MA, and designated as program evaluation for quality improvement purposes, exempting it from further oversight (VA Handbook 1058.05).

Results

We mailed surveys to 1,373 Veterans who completed round one and two surveys for the VET-C cohort and asked them to complete a third-round survey. Ten of the third-round survey invitations were returned due to bad addresses and an additional five were returned because the Veteran was deceased. From the sample of 1,358 Veterans who were thus eligible to complete a round three survey, we received responses from 858 (response rate=63%). We included Veterans with complete data on model covariates in our analyses (n=801).

Sample characteristics: A majority of survey respondents were 65 years of age or older (70%), male (87%), White (89%), were married or in a civil union (70%) and received their healthcare mostly from VHA (72%) (Table 1). Nearly half (49%) reported having obtained a master's degree or higher professional degree. Most reported being in excellent/very good/good physical (70%) and mental

(81%) health. A vast majority (96%) lived in their own house or apartment. About a quarter (24%) of the sample reported low socioeconomic status (SES) (i.e., difficulties paying for basics such as food and heating/cooling). Nearly half (47%) had a diagnosis consistent with an anxiety disorder, 38% had a diagnosis consistent with a depressive disorder, and 29% had a posttraumatic stress disorder (PTSD) diagnosis.

Table 1. Veteran Characteristics

Variable		%	(n)
Age (n=858)			
	Over 65 years old		
		70%	(n=603)
	65 or younger		
		30%	(n=255)
Sex (n=858)			
	Male		
		87%	(n=751)
	Female		
		13%	(n=107)
Race (n=858)			
	White		
		89%	(n=763)
	Black or African American/Other		
		11%	(n=95)
Ethnicity (n=858)			
	No, Hispanic or Latino		
		97%	(n=831)
	Yes, Hispanic or Latino		
		3%	(n=27)
Relationship Status (n=827)			
	Married or in a civil union		
		70%	(n=582)
	Neither married nor in a civil union		
		30%	(n=245)
Education status (n=852)			
	High school graduate or less		
		12%	(n=106)
	At least some college or vocational school [1-4 years]		
		39%	(n=333)
	Master’s, professional, or doctoral degree		
		49%	(n=413)
Receives medical care (n=857)			
	Mostly at the VA		
		72%	(n=617)
	Other		
		28%	(n=240)

Physical health (n=854)			
	Excellent/very good/good health		
		70%	(n=596)
	Fair/poor health		
		30%	(n=258)
Mental health (n=856)			
	Excellent/very good/good health		
		81%	(n=695)
	Fair/poor health		
		19%	(n=161)
Housing (n=837)			
	Own apartment or house		
		96%	(n=807)
	Friend or relative's apartment or house		
		4%	(n=30)
Financial Difficulties (n=776)			
	No		
		76%	(n=587)
	Yes		
		24%	(n=189)
Mental Health Conditions (n=858)			
	Anxiety Disorders		
		47%	(n=404)
	Depression		
		38%	(n=327)
	Post-Traumatic Stress Disorder		
		29%	(n=251)

Veteran preferences for PROM completion: Most Veterans in our sample preferred completing mental health-related PROMs in between appointments when not at VHA (76%) and/or during appointments with their VHA provider(s) (74%) (Table 2). Respondents endorsed to a lesser degree the option to complete PROMs when at the VHA before an appointment (60%). Regarding preferences for how to complete PROMs, most Veterans reported similar preferences for completing mental health-related PROMs: 1) using a secure messaging feature through a patient portal when completing these PROMs in between appointments when not at VHA (51%), 2) on paper-and-pencil (24%) or on a tablet computer (23%) when completing PROMs at the VHA before an appointment, and 3) verbally (52%) when completing PROMs during appointments with their VHA provider(s).

Table 2. Veteran Preferences for Completing Patient-Reported Outcomes Measures About Mental Health Symptoms

Variable		**%**	**(n)**

In between my appointments when I am not at the VA (n=801)			
		76%	(n=607)
	Using secure messaging through a patient portal		
		51%	(n=410)
	Using a mobile health app on a smartphone, tablet, or other computer		
		19%	(n=155)
	By completing paper-and-pencil assessments mailed to me		
		17%	(n=132)
During my appointments with my VA provider(s) (n=801)			
		74%	(n=589)
	Verbally		
		52%	(n=413)
	On a tablet computer		
		15%	(n=119)
	On paper-and-pencil		
		13%	(n=104)
	On a kiosk		
		6%	(n=48)
When I am at the VA (n=801)			
		60%	(n=480)
	On paper-and-pencil in the waiting room before my appointment		
		24%	(n=189)
	On a tablet computer in the waiting room before my appointment		
		23%	(n=180)
	On a kiosk in the waiting room before my appointment		
		19%	(n=152)

Factors associated with Veteran preferences for when to complete PROMS: When controlling for demographic and health-related variables, Veterans of Hispanic (vs. non-Hispanic) ethnicity had greater odds of preferring to complete mental health-related PROMs (OR: 3.32, 95%CI: 1.04-10.58) when at the VHA, before an appointment (Table 3). Veterans reporting having (vs. not having) financial difficulties had lower odds of preferring to complete mental health-related PROMs in between appointments, when not at VHA (OR: 0.61, 95%CI: 0.40-0.93) but greater odds of preferring to complete such PROMs during a visit with their VHA provider(s) (OR: 1.97, 95%CI: 1.23-3.16).

Table 3. Factors Associated with Preferences for When to Complete Patient-Reported Outcomes Measures About Mental Health Symptoms

Variable		In between appointments, when not at the VA	At the VA	During appointments
		Odds Ratio (95% Confidence Interval)		
Age				
	>65 (REF: <=65)			
		1.35	1.09	1.21
		(0.88, 2.06)	(0.75, 1.58)	(0.80, 1.80)
Sex				
	Female (REF: Male)			
		1.35	1.28	1.05
		(0.74, 2.48)	(0.76, 2.15)	(0.60, 1.85)
Race				
	Black/Other (REF: White)			
		0.69	0.87	0.69
		(0.37, 1.29)	(0.50, 1.51)	(0.38, 1.25)
Ethnicity				
	Hispanic (REF: non-Hispanic)			
		1.36	**3.32***	3.27
		(0.45, 4.13)	**(1.04, 10.58)**	(0.88, 12.21)
Marital Status				
	Married (REF: Not Married/In A Civil Union)			
		0.77	0.93	0.91
		(0.50, 1.20)	(0.64, 1.34)	(0.60, 1.39)
Education Level				
	At Least Some College or Vocational School (REF: High School or Less)			
		0.83	0.87	0.61
		(0.47, 1.49)	(0.53, 1.44)	(0.33, 1.13)
Where Care is Received				
	Mostly at VA (REF: Other)			
		0.96	0.86	0.97
		(0.65, 1.43)	(0.61, 1.21)	(0.65, 1.42)
Physical Health				
	Excellent/Very Good/Good (REF: Fair/Poor)			
		0.79	0.96	0.96
		(0.51, 1.21)	(0.67, 1.38)	(0.63, 1.45)
Mental Health				

	Excellent/Very Good/Good (REF: Fair/Poor)			
		0.62	1.10	1.46
		(0.36, 1.07)	(0.70, 1.72)	(0.88, 2.41)
Housing Status				
	Own/Rent (REF: Other)			
		0.95	1.22	1.74
		(0.32, 2.80)	(0.50, 2.96)	(0.67, 4.53)
Financial Difficulties				
	Yes (REF: No)			
		0.61*	1.34	**1.97****
		(0.40, 0.93)	(0.91, 1.97)	**(1.23, 3.16)**
Depression				
	Yes (REF: No)			
		1.46	1.23	1.14
Anxiety		(0.92, 2.30)	(0.83, 1.83)	(0.73, 1.78)
	Yes (REF: No)			
		1.37	0.81	0.97
PTSD		(0.84, 2.24)	(0.53, 1.23)	(0.61, 1.55)
	Yes (REF: No)			
		0.67	1.25	1.32
		(0.41, 1.11)	(0.82, 1.91)	(0.81, 2.14)

Discussion

Overall, Veterans indicated a preference for completing mental health-related PROMs either in between or during appointments with their VHA provider(s), as opposed to before appointments in clinic waiting rooms, and preferred to do so using secure messaging via a patient portal or verbally with their provider, respectively. Yet, our results suggested differences in preferences based on demographic characteristics including ethnicity and SES. These findings suggest that technology platforms, including secure messaging features of online patient portals, may bolster implementation of remote MBC practices, although rollout of such remote MBC practices may benefit from targeted improvement efforts among certain segments of the patient population, including those patients experiencing financial stressors. Our findings further suggest that care team members should elicit preferences for how and when to complete PROMs from each Veteran, and administer PROMs in accordance with those preferences, to optimize the likelihood that Veterans will provide PROM data as part of their healthcare. These results present a foundation from which VHA, as well as other

healthcare systems, can support patient-centered implementation of MBC practices and use of PGHD in clinical care.

Patient-facing technologies such as patient portals may facilitate completion of PROMs for MBC; however, more research is needed to understand when patients are willing to use technologies to complete PROMs and when they are not. Our findings suggest a high degree of comfort with completing PROMs through secure messaging via a patient portal among our cohort, which may be due, in part, to the fact that all of our survey respondents had used secure messaging at some point. However, there is high engagement overall among Veterans with VHA's online patient portal.[21,22] Since secure messaging was first implemented in VHA nationwide in 2010, its use has continued to grow.[21] In April 2025 alone, the number of secure messages sent by Veterans exceeded 1.7 million.[23] Literature also suggests that secure messaging has been used in VHA to support MBC for behavioral health.[22] As such, facilitating PROM completion via secure messaging may bolster Veteran engagement in MBC practices among some Veterans.

In addition, literature has reported that older Veterans are less likely than younger Veterans to prefer using smartphone/tablet technologies.[24,25] Thus, the average age of our overall sample may be one reason for the low rate in reported preferences for using smartphone/tablet technologies to complete PROMs.[26] Alternatively, the low preferences for use of smartphone/tablet technologies, even in a sample of individuals who are known technology users, may suggest that Veterans are more trusting of the security and privacy associated with using other methods for completing PROMs, such as secure messaging through a patient portal. Several studies in the context of cancer care, however, have found that integration of smartphone applications (apps) with tethered patient portals increases patient engagement in completing PROMs.[27] As the use of health-related mobile apps increases, the ability to synchronize mobile app data with patient portals may facilitate Veteran use of apps to collect and share data with VHA.[28,29]

Our findings further highlight the need to be sensitive towards differences across

demographic characteristics (e.g., ethnicity, SES) of patients to ensure equity in completion of PROMs. In line with previous research, we observed differences in preferences among certain segments of the Veteran population that could contribute to the ongoing “digital divide” in healthcare access and outcomes.[14, 30-32] While we are still unsure of the extent, there seems to be a strong preference among Hispanic Veterans to complete assessments while present at the VHA. This is aligned with prior research suggesting that portal users of Hispanic ethnicity were less likely than users of White race to use secure messaging.[33] Similarly, in a 2007 nationwide survey on health information technology use, respondents of Hispanic ethnicity were less likely to access technologies between appointments with providers.[34] This could be due, in part, to reduced access to technology at home, lower health or computer literacy, or other health management and health communication preferences.[35,36]

In addition, Veterans in our sample who reported experiencing financial difficulties were less likely to prefer completing PROMs in between appointments. This may be due, in part to lack of access to technology with which to complete PROMs remotely, lower technological literacy, or lower health literacy.[37,38] Studies have shown that patients with lower SES are more likely to have privacy concerns or report not trusting remote measurement options.[30] This is supported, in part, by the preferences reported by the Veterans in our sample for completing assessments verbally with their provider(s).

Taken together, our findings can serve as a foundation for healthcare systems to design and implement patient-centered procedures to collect PROMs, including through the use of technology platforms to assist with remote PROM collection. As seen, methods of administering a PROM cannot assume a one-size-fits-all approach. Adaptations to how PROMs are collected may depend on preferences in different contexts such as using technologies at the VHA and not between appointments.[39] Alternately, older Veterans may not use smartphones or tablets, but may be more amenable to secure messaging as a work around. Although we cannot assume that changing the way

in which a validated PROM is administered will retain its psychometric properties (e.g., if a measure is validated to be administered on paper-and-pencil, having a healthcare team member verbally ask the questions may impact the psychometric properties of the measure), several reviews of the literature have concluded that different methods (i.e., electronic vs paper-pencil) and even modest adaptations to collection procedures (i.e., interactive voice response systems) do not reduce the validity of results.[40-42] Thus, the ability to meet Veteran preferences does not seem to reduce data quality, and in fact, may potentially improve PROM data by facilitating more genuine responses. Future research may examine more fully the extent to which the psychometric properties of PROMs are impacted based on the mode of administration used.

Limitations: Several limitations need to be considered when interpreting our results. First, our sample was comprised of Veterans who were known users of patient-facing technologies, which may impact generalizability. Second, the homogeneity of our sample demographics (i.e., mostly White, male, and over 65 years) may limit the generalizability of our findings. Third, our relatively small sample size may have limited the statistical power of our analyses. Fourth, when completing surveys, there is the risk of recall and response biases. Finally, due to the nature of the cross-sectional design of the data collection, we cannot make any inferences about the causality between Veteran characteristics and preferences for completing PROMs. Despite these limitations, these findings add important insights to our understanding of patient preferences for completing PROMs in different contexts and using different technology platforms.

Conclusions: As the VHA seeks to expand initiatives related to use of MBC practices and PGHD as part of healthcare services, adaptive and flexible approaches to PROM administration that align with Veteran preferences[43] and leverage technology platforms to collect PROMs remotely[7] may be beneficial. Our findings provide foundational insights into Veteran preferences for completing PROMs and can be used to design patient-centered PROM data collection procedures. Further, our findings suggest that initiatives focused on promoting the administration of PROMs as part of

clinical care could incorporate administering PROMs using VHA's online patient portal, developing mobile health apps that support Veteran completion of PROMs using their personal devices in between VHA clinical encounters and building Veteran trust in the privacy and security of those apps, and engaging care team members in the administration of PROMs during appointments.

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Conflicts of Interest

None of the authors declare a conflict of interest, financial or otherwise.

Data Availability

The data used for this analysis are not permitted to leave the VHA firewall without a data use agreement. This limitation is consistent with other work based on VHA data. However, VHA data are made freely available to investigators behind the Department of Veterans Affairs' firewall with appropriate documentation.

Abbreviations

CDW: Corporate data warehouse

MBC: Measurement-based care

PGHD: Patient-generated health data

PROMS: Patient-reported outcome measures

QUERI: Quality Enhancement Research Initiative

NIMH: National Institute of Mental Health

REDCap: Research Electronic Data Capture

SES: Socioeconomic Status

STATA MP: Stata multiprocessing

VET-C: Veterans Engagement with Technology Collaborative

VHA: Veterans Health Administration

Multimedia Appendix

Not applicable.

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Supplementary Files