

Patient participation disparities of direct-to-patient teledermatology: A retrospective observational study

Sara B. Peracca, Daniel J. Sturgeon, Rebecca P. Lamkin, E. David Zepeda, David C. Mohr, Olevie Lachica, Heather A. King, George L. Jackson, Isis J. Morris, Allen L. Gifford, John D. Whited, Martin A. Weinstock, Dennis H. Oh

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Patient participation disparities of direct-to-patient tele dermatology: A retrospective observational study

Sara B. Peracca^{1,2} PhD, MPH, MS; Daniel J. Sturgeon³ MS; Rebecca P. Lamkin³ MA; E. David Zepeda^{3,4} PhD; David C. Mohr^{5,6} PhD, MHA; Olevie Lachica^{7,1} MS; Heather A. King^{8,9,10} PhD; George L. Jackson^{8,11,12} PhD, MHA; Isis J. Morris¹³ LPN; Allen L. Gifford^{3,6,14}; John D. Whited¹⁵ MD, MHS; Martin A. Weinstock^{16,17} MD, PhD; Dennis H. Oh^{1,2,18} MD, PhD

¹ Center for Data to Discovery and Delivery Innovation (3DI) San Francisco VA Health Care System San Francisco US

² Dermatology Service (190) San Francisco VA Health Care System San Francisco US

³ Center for Health Optimization and Implementation Research (CHOIR) VA Boston Healthcare System Boston US

⁴ Gillings School of Global Public Health University of North Carolina Chapel Hill US

⁵ Veterans Health Administration National Center for Organization Development Mason US

⁶ Department of Health Law, Policy & Management Boston University School of Public Health Boston US

⁷ Dermatology Service San Francisco VA Health Care System San Francisco US

⁸ Center of Innovation to Accelerate Discovery and Practice Transformation Durham VA Health Care System Durham US

⁹ Department of Population Health Sciences Duke University Durham US

¹⁰ Division of General Internal Medicine Duke University School of Medicine Durham US

¹¹ Department of Health Economics, Systems, and Policy and Advancing Implementation & Improvement Science Program Peter O'Donnell Jr. School of Public Health The University of Texas Southwestern Medical Center Dallas US

¹² Division of General Internal Medicine The University of Texas Southwestern Medical Center Dallas US

¹³ Center of Innovation to Accelerate Discovery and Practice Transformation Durham VA Health Care System Durham US

¹⁴ Chobanian & Avedisian School of Medicine Boston University Boston US

¹⁵ retired Center of Innovation to Accelerate Discovery and Practice Transformation Durham VA Health Care System Durham US

¹⁶ Center for Dermatoepidemiology Providence VA Medical Center Providence US

¹⁷ Department of Dermatology and Epidemiology Brown University Providence US

¹⁸ Department of Dermatology University of California, San Francisco San Francisco US

Corresponding Author:

Dennis H. Oh MD, PhD

Dermatology Service (190)
San Francisco VA Health Care System
4150 Clement Street
San Francisco
US

Abstract

Background: While digital technologies have potential to enhance patients' access to health care, some patients may adopt them better than others.

Objective: We identified patient characteristics and usage patterns associated with My VA Images (<i>MVAI</i>), a clinician-gated, patient-facing asynchronous tele dermatology mobile application developed by the United States Department of Veterans Affairs (VA) to enable follow-up of established dermatology patients.

Methods: <i>MVAI</i> was initially piloted at 3 VA facilities, and then sequentially offered to groups of 7 facilities every 3 months for 1 year. We used VA's administrative and mobile health databases to examine MVAI usage over a 17-month period. We also collected qualitative data from field notes and interviews with staff.

Results: Including 2 pilot facilities, 11 facilities invited 494 dermatology patients to use <i>MVAI</i> during the study period. <i>MVAI</i> invitees were more likely than non-invitees to be White (72% vs. 66%, $P=.007$), to live in urban areas (30% vs. 25%, $P=.02$), and to have shorter mean drive times to specialty care (44 vs. 54 minutes, $P<.001$). <i>MVAI</i> invitees had more total outpatient and dermatology visits before and after <i>MVAI</i> use than the general dermatology outpatient population. 48% of invitees successfully used <i>MVAI</i>. Successful use was highest for follow-up intervals in the 8-30 day

range. The mean age of successful users (63) was younger than that of unsuccessful users (68, $P < .001$). Successful *MVAI* users were more likely than unsuccessful users to have a dermatology visit one year after *MVAI* use (median 3 vs. 1, $P < .001$). Patients requiring multiple attempts to successfully use *MVAI* were older than initially successful users though younger than unsuccessful users. Patients requiring multiple attempts also had slightly more post-*MVAI* dermatology visits than initially successful users.

Conclusions: Early *MVAI* usage data indicate that not all patients benefitted equally during the initial rollout of this technological innovation. Non-white and rural patients were under-represented as users, older patients were less successful in using *MVAI*, and patients who were already relatively high utilizers of health care services were over-represented in the *MVAI* invitee group. These disparities emphasize the continued need to optimize the equitable distribution of direct-to-patient telehealth's benefits and suggest specific target groups who may benefit from additional outreach or support. Clinical Trial: ClinicalTrials.gov NCT05128006

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Original Manuscript

Original Paper**Patient participation disparities of direct-to-patient teledermatology:****A retrospective observational study**

Sara B. Peracca, PhD, MPH, MS^{1,2}, Daniel J. Sturgeon, MS³, Rebecca P. Lamkin, MA³, E. David Zepeda, PhD^{3,4}, David C. Mohr, PhD, MHA^{5,6}, Olevie Lachica, MS^{1,2}, Heather A. King, PhD^{7, 8, 9}, George L. Jackson, PhD, MHA^{7,10,11}, Isis J. Morris LPN⁷, Allen L. Gifford, MD^{3,6,12}, John D. Whited, MD, MHS¹³, Martin A. Weinstock, MD, PhD^{14,15}, Dennis H. Oh, MD, PhD^{1,2,16}

¹Dermatology Service, San Francisco VA Health Care System, United States

²Center for Data to Discovery and Delivery Innovation (3DI), San Francisco VA Health Care System

³Center for Health Optimization and Implementation Research (CHOIR), VA Boston Healthcare System, United States

⁴Gillings School of Global Public Health, University of North Carolina, United States

⁵Veterans Health Administration National Center for Organization Development, Mason, Ohio, United States

⁶Boston University School of Public Health, Department of Health Law, Policy & Management, United States

⁷Center of Innovation to Accelerate Discovery and Practice Transformation, Durham VA Health Care System, United States

⁸Department of Population Health Sciences, Duke University, Durham, NC, United States

⁹Division of General Internal Medicine, Duke University School of Medicine, Durham, NC, United States

¹⁰Department of Health Economics, Systems, and Policy and Advancing Implementation & Improvement Science Program, Peter O'Donnell Jr. School of Public Health, University of Texas Southwestern Medical Center, Dallas, Texas, United States

¹¹Division of General Internal Medicine, University of Texas Southwestern Medical Center, Dallas, Texas, United States

¹²Chobanian & Avedisian School of Medicine, Boston University, United States

¹³Center of Innovation to Accelerate Discovery and Practice Transformation, Durham VA Health Care System, United States, retired

¹⁴Center for Dermatoepidemiology, Providence VA Medical Center, United States

¹⁵Department of Dermatology and Epidemiology, Brown University, United States

¹⁶Department of Dermatology, University of California San Francisco, United States

Corresponding Author: Dennis H. Oh, MD, PhD

Dermatology Service (190), San Francisco VA Health Care System, 4150 Clement Street, San Francisco, CA 94121; (415) 750-2091; Dennis.Oh@va.gov

ABSTRACT

Background: While digital technologies have potential to enhance patients' access to health care, some patients may adopt them better than others.

Objective: We identified patient characteristics and usage patterns associated with *My VA Images* (MVAI), a clinician-gated, patient-facing asynchronous teledermatology mobile application developed by the United States Department of Veterans Affairs (VA) to enable follow-up of established dermatology patients.

Methods: MVAI was initially piloted at 3 VA facilities, and then sequentially offered to groups of 7 facilities every 3 months for 1 year. We used VA's administrative and mobile health databases to examine MVAI usage over a 17-month period. We also collected qualitative data from field notes and interviews with staff.

Results: Including 2 pilot facilities, 11 facilities invited 494 dermatology patients to use MVAI during the study period. MVAI invitees were more likely than non-invitees to be White (72% vs. 66%, $P=.007$), to live in urban areas (30% vs. 25%, $P=.02$), and to have shorter mean drive times to specialty care (44 vs. 54 minutes, $P<.001$). MVAI invitees had more total outpatient and dermatology visits before and after MVAI use than the general dermatology outpatient population. 48% of invitees successfully used MVAI. Successful use was highest for follow-up intervals in the 8-30 day range. The mean age of successful users (63) was younger than that of unsuccessful users (68, $P<.001$). Successful MVAI users were more likely than unsuccessful users to have a dermatology visit one year after MVAI use (median 3 vs. 1, $P<.001$). Patients requiring multiple attempts to successfully use MVAI were older than initially successful users though younger than unsuccessful users. Patients requiring multiple attempts also had slightly more post-MVAI dermatology visits than initially successful users.

Conclusions: Early MVAI usage data indicate that not all patients benefitted equally during the initial rollout of this technological innovation. Non-white and rural patients were under-represented as

users, older patients were less successful in using *MVAI*, and patients who were already relatively high utilizers of health care services were over-represented in the *MVAI* invitee group. These disparities emphasize the continued need to optimize the equitable distribution of direct-to-patient telehealth's benefits and suggest specific target groups who may benefit from additional outreach or support.

Trial Registration: ClinicalTrials.gov NCT05128006

Keywords: health care disparity; telemedicine; asynchronous teledermatology; mobile health; Veterans

INTRODUCTION

Teledermatology has evolved from a collection of novelty demonstration projects to a relatively common and widely accepted method for providing skin evaluation and care to patients. Commonly used by non-dermatologist health care providers to consult with dermatologists, teledermatology can also be used by dermatologists to evaluate or follow-up with patients directly.[1, 2] In asynchronous teledermatology, patients are typically photographed at the clinic, and the digital skin images are electronically shared with the dermatologist who reads the case. Direct-to-patient teledermatology, where patients take their own digital photos and share them from home is another method with multiple potential patient benefits, including allowing flexibility in timing of the evaluations, eliminating the need to travel to the clinic for photography, and increasing patient self-efficacy.[3] Despite teledermatology's potential to reduce unequal access to dermatology, concerns have been raised that teledermatology may actually increase disparities.[4-8]

The Department of Veterans Affairs (VA) has long supported teledermatology as part of its broader telehealth vision. VA conducted over 128,000 asynchronous or store-and-forward teledermatology encounters in 2019, mostly consultations from primary care providers to dermatologists.[9] In an effort to increase Veterans' access to healthcare, including dermatology, VA developed a patient-facing asynchronous mobile web-based application (app) —*My VA Images (MVAI)*—to provide care to Veterans at home with no additional patient-incurred costs. After identifying willing patients who have a government-authenticated account and a mobile device or computer allowing them to receive email and share photos, a VA clinician or designee uses a clinician-facing portal named *Virtual Care Manager (VCM)* to order a *MVAI* request; patients must be invited by a clinician before using *MVAI*. [10] This request triggers an email containing a link to *MVAI* that is sent to the patient at the prescribed follow-up time, which may be days to months in the future; the patient is typically given one week to use *MVAI* and is sent multiple email reminders, each with a link to the web-based app. When used for teledermatology, *MVAI* prompts the patient to enter

their history since their last visit and medications used, and then to capture specific images requested by the clinician.[11] Upon the patient's successful completion of *MVAI* tasks, the dermatologist is notified by email or may monitor *VCM* for patient submissions and then uses *VCM* to review the patient-submitted data, write a note for the electronic health record, and write a message to the patient, which can include the assessment as well as any management or therapy instructions. Finally, the patient is notified by email to read the dermatologist's comment in *MVAI*. [10, 11]

The eligibility requirements as well as sequential steps—from receiving email notifications to reading the dermatologist's assessment and instructions—required to successfully use *MVAI* mean that some patients are good candidates for direct-to-patient teledermatology while others may be better suited to clinic-based teledermatology. Access to the internet, equipment and health literacy are important facilitators that can determine if a patient benefits from direct-to-patient teledermatology.[12, 13] More broadly, recent studies examining virtual dermatology care have found mixed results in reducing disparities in healthcare access in various populations.[14-22] A greater understanding of which patients adopt and successfully use different types of digital health technology may help to optimize its implementation.

Previously, we described implementation of *MVAI* from the perspectives of VA staff and of health care organizations as a whole.[10] Here we report demographic characteristics and actual usage data of established dermatology patients who were invited to use *MVAI* (invitees) and those who were not (non-invitees), and identify factors that were associated with successful utilization among different patient populations. We find disparities in patients who were offered to use *MVAI* as well as in those who successfully used it.[23]

METHODS

The study was approved by University of California at San Francisco Institutional Review Board (IRB) and by the VA Durham, Providence, and Boston Medical Center IRBs.

Patient sample: VA's Office of Connected Care introduced *MVAI* for dermatology at 3 pilot facilities

starting May 2019, and to 28 facilities in cohorts of 7 facilities every 3 months starting July 2019. [23] Facility assignment to a cohort was randomized. We examined data associated with patients invited to use *MVAI* for a dermatology visit at 2 of 3 pilot facilities and 9 of 28 subsequent facilities that ultimately adopted *MVAI*. 1 pilot site and 19 other facilities decided not to participate and did not contribute any data. Of the 9 subsequent facilities that decided to use *MVAI*, 2 were part of the 1st cohort, 3 were part of the 2nd cohort, 1 was part of the 3rd cohort, and 3 were part of the 4th cohort. A non-user control comparison group of 3,853 dermatology outpatients was a weighted sample matching the distribution of patients who had not been invited to use *MVAI* during the same time frame, referred to as non-invitees.

Quantitative data analysis: From May 2019 through September 2020, we collected data from VA's mobile health database to monitor *MVAI* usage and supplemented it with encounter and demographic data (age, sex, race, marital status, location, and VA facility). We compared demographic data of *MVAI* invitees (defined as patients who were requested to use *MVAI*, which included initially successful users, those requiring ≥ 2 attempts to succeed, and unsuccessful users) to non-invitees (patients with dermatology outpatient visits who were not invited to use *MVAI* at the same facilities while the facility was exposed to *MVAI*). We also recorded health care utilization as the number of outpatient care instances before and after a patient's *MVAI* visit or a visit chosen at random for non-users and the total number of dermatology encounters in the year before and following the *MVAI* encounter, excluding community care visits. We conducted bivariate analyses to examine the sociodemographic and health characteristics of our patient sample, stratified by the visit completion statuses. We used chi-square, Wilcoxon signed-rank, and analysis of variance (ANOVA) to detect differences among Veterans with specific characteristics and completion status.

Qualitative data analysis: We collected 26 qualitative reports of patient experience comprising field notes and interviews with clinical staff, clinical leads, and operational facilitators between June 2019-September 2020 at facilities adopting *MVAI*. Field notes were compiled by the research team

throughout the study. In-depth interviews followed a structured interview guide developed to elicit experiences during implementation, which included second-hand patient stories. Interviews were recorded, transcribed verbatim, and summarized. Qualitative data from interviews and field notes were analyzed together using open and focused coding combined with matrix techniques to identify themes associated with patient interactions.[24]

RESULTS

Characteristics of MVAI invitees and non-invitees

During May 2019-September 2020, a total of 494 Veteran patients at 11 facilities received requests to have at least one remote follow-up visit using *MVAI*. Contrary to our expectation that rural patients far from specialty health care would be over-represented as users of direct-to-patient teledermatology, *MVAI* invitees were slightly more urban and had a shorter drive time to specialty care than non-invitees (Table 1). *MVAI*-invitees were not significantly different in age or sex from non-invitees. Ethnicity also did not appear to be a factor, although the number of Hispanic individuals was too small to definitively state there was no difference.

MVAI invitees were more likely than non-invitees to be White as well as to have had more total outpatient visits and dermatology visits in the year before and after their remote *MVAI* visit. In a separate analysis, post-*MVAI* visits for *MVAI* invitees largely represented in-person encounters with a mean of 2 ± 2 in-person visits compared non-invitees with 1 ± 3 in-person visits ($P < .001$).

Table 1: MVAI invitees' and non-invitees' characteristics^a

	Invitees	Non-invitees	P-value	Test
N (% of total)	494 (11%)	3,853 (89%)		
Age				
Mean (S.D.)	66 (14)	67 (15)	0.06	t-test
<45	52 (10)	398 (10)	0.1	χ^2
45-64	152 (31)	1020 (26)		
65+	290 (59)	2,435 (63)		
Male Sex	422 (85)	3,393 (88)	0.09	χ^2
Ethnicity			0.97	χ^2
Hispanic/Latino	12 (2)	92 (2)		
Non-Hispanic/Latino	457 (93)	3,575 (93)		
Unknown	25 (5)	186 (5)		
Race				
White	358 (72)	2,560 (66)	0.007	χ^2
Non-White	136 (28)	1293 (34)		
Black	88 (18)	885 (23)		
Other	48 (10)	408 (66)		
Location				
Urban	373 (76)	2,718 (70)	0.02	χ^2
Rural	121 (24)	1,135 (30)		
Mean Drive Time, min. (S.D.)	44 (32)	54 (42)	<0.001	t-Test
Median number of total outpatient visits				
pre-MVAI (IQR)	25 (16, 45)	21 (11, 37)	<0.001	Wilcoxon
post-MVAI	32 (20, 53)	26 (15, 45)	<0.001	Wilcoxon
Number pre-MVAI dermatology visits				
Median (IQR)	1 (0.2)	1 (1,2)	0.04	Wilcoxon
0 visits	81 (16)	1043 (27)	<0.001	χ^2
1 visit	248 (50)	1388 (36)		
≥ 2 visits	165 (33)	1422 (37)		
Number post-MVAI dermatology visits				
Median (IQR)	2 (1, 4)	0 (0, 1)	<0.001	Wilcoxon
0 visits	81 (16)	1,935 (50)	<0.001	χ^2
1 visit	112 (23)	956 (25)		
≥ 2 visits	301 (61)	962 (25)		

^aUnless otherwise indicated, numbers in parentheses represent the percentage of each characteristic in the entire group of invited users or non-users

Characteristics of successful MVAI users

Successful completion of requested *MVAI* tasks varied with the time interval between the creation of the *MVAI* request during the face-to-face visit and the invited follow-up date. The success rate peaked for follow-up intervals of 8-30 days, then decreased, with follow-up intervals 60 days or longer having the least success (Figure 1).

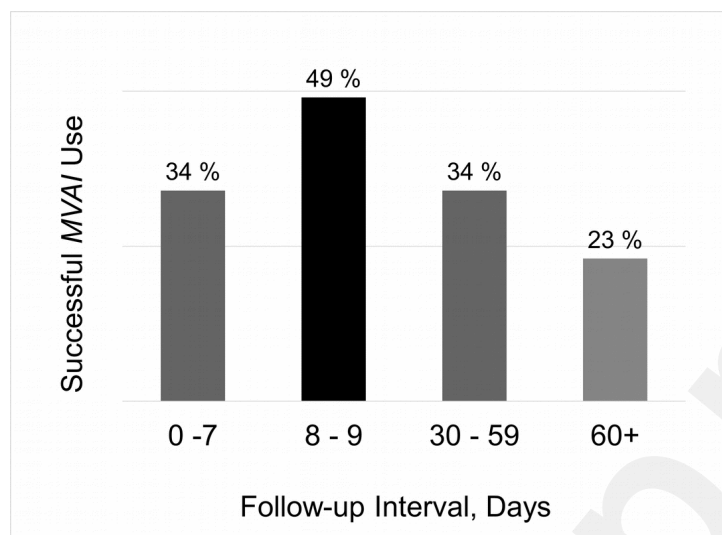


Figure 1. Time-dependence of MVAI follow-up. Successful follow-up using *MVAI* was monitored as a function of the invited follow-up time. Follow-up time was defined as the time in days from the day the *MVAI* request was created to the day the patient responded, which was defined by the requestor.

Of *MVAI* invitees, 48% successfully used *MVAI* to completion, allowing the dermatologist to review their cases (Table 2). Successful users were on average 5 years younger than those whose requests expired. Patients aged <45 and 45-64 had more success than failure, while the majority of those aged 65 and older were unsuccessful. There were no significant differences based on race or ethnicity or when these two characteristics were combined into one variable. Marital status, drive time, and rurality were also not associated with successful *MVAI* use.

Similar to *MVAI* invitees overall, successful *MVAI* use was associated with subsequent episodes of dermatologic care. In contrast to unsuccessful users, successful users had a higher median number of post-*MVAI* dermatology encounters. Successful users were more likely to have had at least one dermatology visit within 1 year after their *MVAI* use and were particularly more likely to have had 2 or more dermatology visits ($P<.001$). The number of prior dermatology visits, however, as well as the number of outpatient visits whether pre- or post-*MVAI* were not associated with successful usage (data not shown).

Table 2: MVAI users by completion status*

	Completion Status			
	Successful	Unsuccessful	P-value	Test
N (% of total)	239 (48)	255 (52)		
Age				
Mean (S.D.)	63 (15)	68 (13)	0.0008	t-test
Median (IQR)	66 (52, 76)	71 (60, 77)	0.0018	Wilcoxon
<45	21 (9)	8 (3)	0.003	χ^2
45-64	96 (40)	79 (31)		
65+	122 (51)	168 (66)		
Race				
White	166 (70)	192 (75)	0.15	χ^2
Non-White	73 (31)	63 (25)		
Mean Drive time, min. (S.D.)	45 (37)	43 (28)	0.5	t-Test
Location				
Urban	181 (76)	192 (75)	0.9	χ^2
Rural	58 (24)	63 (25)		
Number post-MVAI dermatology visits				
Median (IQR)	3 (1, 5)	1 (0, 3)	<0.001	Wilcoxon
0 Visits	6 (2)	75 (29)	<0.001	χ^2
1 Visit	59 (25)	53 (21)		
≥ 2 Visits	174 (73)	127 (50)		

*Unless otherwise indicated, numbers in parentheses represent the percentage of each characteristic in the entire group of Successful or Unsuccessful.

We also examined the relationship between the number of attempts needed to achieve a successful *MVAI* encounter and demographic characteristics. 10% of *MVAI* invitees required multiple requests before eventually succeeding (Table 3). On average, these Veterans were older (66 years) than those who needed only one attempt (63 years) but slightly younger than unsuccessful Veterans (68 years). Rurality, sex, race and ethnicity (data not shown) of invited users were not significantly related to the likelihood of requiring multiple attempts.

Requiring multiple attempts was associated with more subsequent episodes of dermatologic care. Veterans requiring multiple attempts before success had a mean of 4 dermatology visits after their *MVAI* visit compared to 3 visits for those initially successful or 2 for unsuccessful users (Table 3). The post-*MVAI* visits for *MVAI* invitees requiring multiple attempts largely represented in-person encounters with a mean of 2 ± 2.8 in-person visits compared to 0.1 ± 1 consultative asynchronous teledermatology visits and 1.5 ± 1 subsequent *MVAI* visits.

Table 3: Characteristics of *MVAI* invitees users requiring multiple attempts *

	Successful		Unsuccessful		
	1 attempt	≥ 2 attempts	All	P-value	Test
N (% of total)	187 (38)	52 (10)	255 (52)		
Age					
Mean (S.D.)	63 (15)	66 (14)	68 (13)	0.001	ANOVA
Median (IQR)	64 (51, 76)	69 (54, 76)	71 (60, 77)	0.002	Wilcoxon
<45	27 (14)	5 (4)	8 (3)	0.01	χ^2
45-64	68 (36)	20 (38)	79 (31)		
65+	92 (49)	30 (58)	168 (66)		
Sex - Male	151 (81)	47 (90)	224 (88)	0.06	χ^2
Race					
White	131 (70)	35 (67)	192 (75)	0.3	χ^2
Non-White	56 (30)	17 (33)	63 (25)		
Location					
Urban	147 (79)	34 (65)	192 (75)	0.15	χ^2
Rural	40 (21)	18 (35)	63 (25)		
Number pre-MVAI dermatology visits					
Median (IQR)	1 (1, 2)	1 (0, 2)	1 (1, 2)	0.5	Wilcoxon
0 visits	25 (13)	16 (31)	40 (16)	0.02	χ^2
1 visit	103 (55)	18 (35)	127 (50)		
≥ 2 visits	59 (32)	18 (35)	88 (35)		
Number post-MVAI dermatology visits					
Mean (S.D.)	3 (3)	4 (3)	2 (3)	<0.001	ANOVA
Median (IQR)	3 (1, 5)	3 (2, 5)	1 (0, 3)	<0.001	Wilcoxon
0 visits	5 (3)	1 (2)	75 (29)	<0.001	χ^2
1 visit	49 (26)	10 (19)	53 (21)		
≥ 2 visits	133 (71)	41 (79)	127 (50)		

*Unless otherwise indicated, numbers in parentheses represent the percentage of each characteristic in the identified group of *MVAI* invitees

Where patients received care was related to the likelihood of completing their *MVAI* visit. Patients at two facilities in particular were more likely to complete their *MVAI* visit (54% and 30%) than those at the 9 other facilities (16% $P<.001$). One of these facilities had the highest share of *MVAI*-invitees requiring multiple attempts (44%) while the other had more invitees successfully using *MVAI* on a first attempt (60% $P<.001$). Facility differences persisted in multivariate models examining usage.

Qualitative findings

Clinical staff reported that patients appreciated obtaining a new mode of receiving care and not having to travel for their appointments; a dermatologist who provided services where invitees were more likely to live in rural areas stated: “...*They’ve had good things to say about it, they enjoy not having to come in ...*”. On the other hand, clinical staff reported that some patients had difficulty navigating within the app itself such as uploading images, finding the request or finding the dermatologist’s response. Challenges extrinsic to the app included Veterans lacking adequate internet connectivity at home or lacking a proper VA mobile health account, either by failing to get it in time for the remote visit or forgetting/misplacing the login/password. A few VA staff members expressed concern that *MVAI* is “only...for a patient that is technology savvy enough...that is a smaller percentage of the population...”. Others reported that patients confused *MVAI* with another commonly used patient-facing VA app that shared the same authentication process and capability of securely sharing photos with VA clinicians. Additional barriers cited included emailed requests going to junk mail or the app being inaccessible during upgrades and maintenance.

Organizational barriers included limited access to technical help during the study period; clinicians heard from patients frustrated that some support representatives had no knowledge of the app. Veterans were also generally not able to get clinical staff assistance with creating a VA mobile health account or app education.

DISCUSSION

Direct-to-patient telehealth technologies offer patients the potential of enhanced access to health care with increased convenience, privacy and reduced or no cost; they also, however, place additional responsibility on patients to engage with and correctly use the technology. The most successful users of *MVAI* were those who were requested to follow up between 8 and 30 days. The reasons are unclear, but it is possible that Veterans did not have enough time to use the app in shorter time windows and the importance of using the app diminished with longer follow-up times. Our

qualitative data suggests that the added technical and procedural responsibilities, such as navigating VA's secure login process and the app itself, may have been barriers to successful use. Although subsequent changes have since improved *MVAI*'s usability, nonetheless not all individuals are optimal candidates for direct-to-patient care.[13, 25, 26] Importantly, while we did not find differences by sex or ethnicity for either being invited to use *MVAI* or for successful use, a concerning observation is that disparities in access existed between populations often challenged in accessing dermatologic care and populations with typically good access to dermatology care. We discuss four factors associated with the use of *MVAI*.

Race: White patients were over-represented among those invited to use *MVAI* relative to other dermatology patients, though race was not associated with successful use of *MVAI*. It's unclear whether non-White patients were less likely to be offered *MVAI* or to be eligible to use it or to accept the offer. Racial disparities have been previously observed in use of video teledermatology to the home during the COVID-19 pandemic, including when video and asynchronous teledermatology were used together.[15, 20, 21] Additional studies have also found racial disparities in usage of teledermatology during the pandemic but did not define the type of teledermatology used.[17, 27, 28] In contrast, two studies examining video teledermatology did not find increased disparities.[16, 22] Finally, in contrast to our results, usage of direct-to-patient asynchronous teledermatology has been reported to be most associated with Hispanic and African American users.[19] The variability in reported results likely reflects multiple factors, including the different teledermatology modalities studied as well as the particular health settings and populations studied.[29]

Rurality: We had originally anticipated that patients with longer drive times to VA specialty clinics (including dermatology), such as rural patients who are typically farther removed from dermatology clinics, would be motivated to use an app that helped with physical access to care; these were cited as factors in some of our qualitative data. Other studies have similarly mentioned the benefits of teledermatology for rural patients.[6, 30] Somewhat surprisingly, however, those invited to use

MVAI were overall more likely to live in urban areas and had shorter drive times to specialty care compared to other dermatology patients. Similarly, a study of video teledermatology visits found greater urban than rural usage.[31] A possible explanation is that urban patients may need to contend with traffic and thus may preferentially find substituting for an in-person visit desirable (our drive time data does not incorporate traffic estimates). Additionally, amongst the rural Veteran population, lower interest in mobile apps, financial limitations and connectivity issues have been reported.[32] Therefore rural Veterans may benefit from programs that increase access to tablets and broadband with added strategies for provider engagement to encourage interest.[33] We found no difference in successful completion, suggesting that rural patients have no additional barriers to actual app usage once they have agreed to do so.

Age: Our study found only a marginal difference in age between those invited to use *MVAI* compared to other dermatology patients, suggesting that older Veterans were willing to try the *MVAI* app to interact directly with a dermatologist. This finding corresponds to work showing use of digital health amongst seniors has been increasing and that they can be successful.[19, 34, 35] It differs from studies examining use of self-monitoring apps[36] or use of digital health in general with greater usage amongst younger age groups.[37] The absence of an age difference may reflect that *MVAI* is not an app that Veterans spontaneously choose to use but rather is assigned by VA clinicians who focus on eligibility criteria such as access to internet and possession of a mobile device.

Nevertheless, over half of our sample of patients invited to use *MVAI* were older than age 65, and older age was associated with a lack of successfully using *MVAI*. Similarly older age was associated with a lack of submission of photos to augment phone or video teledermatology visits.[21] Lack of technological expertise amongst older adults may explain some of this age difference in successful usage.[38-40] The user group that successfully used *MVAI* after 2 or more attempts was older than the initially successful group suggesting that older patients do have the potential to use

telehealth technology with persistence, and perhaps with additional assistance.[41, 42] Implementing strategies to increase digital literacy may increase technological expertise in older patients and enhance their ability to successfully complete their remote visits.[43-45]

Health system utilization: Direct-to-patient teledermatology may benefit health care system operations by freeing up in-person appointments.[46] However, we observed that *MVAI* invitees users actually utilized overall and dermatology-specific health services more than non-users after their *MVAI* usage. Additionally, successful *MVAI* users had more dermatology appointments than unsuccessful patients one year after *MVAI* usage. These findings along with the finding that *MVAI* invitees also utilized services more than non-users prior to *MVAI* usage ironically suggest that an app that promises increased dermatology access was used most by those with good access already. One possible explanation is that intrinsically high health care utilizers may seek to reduce travelling to clinic for at least one visit. Successful users may also be motivated by having greater skin concerns or more complex skin disease requiring more frequent dermatology visits than unsuccessful users or non-users. Previous studies have reported worse health associated with use of VA health-related apps or with teledermatology specifically.[5, 47] Distinguishing amongst these and other possibilities will require further direct interrogation of patients' motivations and circumstances.

Site-specific factors may play a role in successful usage; the facility where the invited user received care affected their success, with invited users at 2 facilities being more likely to complete their *MVAI* visit than patients at the 9 other facilities. Although patient characteristics at these facilities differed, facility differences persisted in multivariate models, suggesting organizational factors—such as provider influence, the presence of champions or the use of residents—may impact usage differences.[10, 41, 42, 47]

LIMITATIONS

Our findings based on the Veteran population at specific facilities may not be representative of the experiences of the general population. In addition, since invited patient users were initially

screened by clinicians, the potential for selection bias by clinicians also exists. Our sample was not randomized; we randomized at the facility level rather than the patient level. Finally, our reliance on second-hand accounts from VA staff regarding Veterans' experience likely missed barriers or facilitators that might have been identified by querying patients directly.

CONCLUSIONS

While direct-to-patient telehealth technologies have potential to increase health care access for all, we observed that an asynchronous teledermatology mobile app actually revealed some barriers in access for certain Veteran populations, and accentuated pre-existing gaps in others.[48] Understanding and addressing disparities among patient groups' access and usage of mobile teledermatology can help to assure the best strategy is employed to optimize dermatologic access. Improving digital health literacy and access to technology may help reduce disparities in opportunities for direct-to-patient teledermatology and in its successful use.

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Conflicts of Interest

None declared. The views expressed in this article are those of the authors and do not reflect the position or policy of the Department of Veterans Affairs, the United States government or other organizations with which authors may be affiliated.

Abbreviations

IRB, Institutional review board; VA, United States Department of Veterans Affairs; *MVAI*, *My VA Images*; VCM, Virtual Care Manager; S.D., standard deviation; I.Q.R., interquartile range



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Supplementary Files

Figures

Time-dependence of MVAI follow-up. Successful follow-up using MVAI was monitored as a function of the invited follow-up time. Follow-up time was defined as the time in days from the day the MVAI request was created to the day the patient responded, which was defined by the requestor.

