

# Patients' Adoption of and Feature Access Within Electronic Patient Portals

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Since 2011, CMS has provided financial incentives to healthcare providers who implement and “meaningfully use” certified health information technology. Incentives to date have focused on providing patients the ability to view, download, and transfer data electronically. Although the incentives do not specify how organizations are to meet these criteria, most primary care practices and other healthcare delivery organizations have chosen to purchase electronic health records (EHRs) and accompanying patient portal software to meet these requirements.<sup>1,2</sup> Neither how these online portals are being adopted nor their potential influence on known health disparities has been fully explored.

In most primary care practices, patient portals enable users to view personal health information, such as laboratory test results, discharge summaries, and notes from recent visits, thus fulfilling the CMS requirement to view, download, and transfer data electronically.<sup>3,4</sup> In some practices, portal users can also schedule appointments and refill prescriptions or send other secure, unstructured messages to providers. Other practices enable users to record personal health information, such as allergies or preventive service use. Despite the array of functionalities that currently exist within commercially available patient portals, we know of just 2 studies that have examined which features adopters access once they have an activated portal account.<sup>5,6</sup> Thus, although studies repeatedly have found traditionally vulnerable populations less likely to be portal adopters as defined by account activation,<sup>7-24</sup> to our knowledge, just 1 prior study has reported findings specific to whether disparities exist in how those adopting portal technology engage with available health-related portal features once they have an activated account.<sup>8</sup> It is important to understand whether disparities in health-related portal feature access exist among those who have an account, because portal technology is increasingly being used to target care delivery to those with specific chronic diseases.<sup>21,25,26</sup>

We describe how a patient portal was initially used among an insured, sociodemographically diverse population receiving primary care within an integrated health system. This system was selected for its relatively early adoption of patient portal technology and for the comprehensiveness of portal features initially made available to

## ABSTRACT

**OBJECTIVES:** We describe online portal account adoption and feature access among subgroups of patients who traditionally have been disadvantaged or represent those with high healthcare needs.

**STUDY DESIGN:** Retrospective cohort study of insured primary care patients 18 years and older (N = 20,282) receiving care from an integrated health system.

**METHODS:** Using data from an electronic health record repository, portal adoption was defined by 1 or more online sessions. Feature access (ie, messaging, appointment management, visit/admission summaries, and medical record access and management) was defined by user-initiated “clicks.” Multivariable regression methods were used to identify patient factors associated with portal adoption and feature access among adopters.

**RESULTS:** One-third of patients were portal adopters, with African Americans (odds ratio [OR], 0.50; 95% CI, 0.46-0.56), Hispanics (OR, 0.63; 95% CI, 0.47-0.84), those 70 years and older (OR, 0.48; 95% CI, 0.44-0.52), and those preferring a language other than English (OR, 0.43; 95% CI, 0.31-0.59) less likely to be adopters. On the other hand, the likelihood of portal adoption increased with a higher number of comorbidities (OR, 1.04; 95% CI, 1.02-1.07). Among adopters, record access and management features (95.9%) were accessed most commonly. The majority of adopters also accessed appointment management (76.6%) and messaging (59.1%) features. Similar race and age disparities were found in feature access among adopters.

**CONCLUSIONS:** The diversity of portal features accessed may bode well for the ability of portals to engage some patients, but without purposeful intervention, reliance on portals alone for patient engagement may exacerbate known social disparities—even among those with an activated portal account.

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patients. We report the extent to which members of traditionally disadvantaged subgroups of the population (ie, those from minority races, those for whom English is not a first language, and those of Hispanic ethnicity) and those known to have disproportionate health needs (ie, older patients and those with more comorbidities) had activated portal accounts (ie, were portal adopters). Among adopters, we further evaluate which health-related portal features were accessed. Of particular interest was the extent to which adopters accessed features that enable viewing test results and health history information versus accessing the more interactive features that allow adopters to manage and exchange health-related information. In doing so, we provide important information regarding the patient portal foundation upon which subsequent patient engagement capabilities are being built, and we identify subgroups at risk of being left behind as healthcare organizations increasingly rely on portal technology to enable patients to electronically view, download, and transmit their health information to a third party.

## METHODS

### Setting

The study was conducted in an integrated health system serving metropolitan Detroit, Michigan. The health system's institutional review board approved all aspects of the study protocol. In 2012, the health system purchased an enterprise license for EpicCare EMR, a commercial medical record software program, and its accompanying patient portal, MyChart.<sup>27</sup> As originally implemented, patients seen in any of the health system's 26 primary care clinics were able to use MyChart via a desktop computer, tablet, or mobile device to securely schedule appointments, receive appointment reminders, view test results, request prescription refills, view and manage information about their health, and send secure messages to care teams.

Portal implementation was a systemwide initiative, with patient- and clinician-targeted campaigns. Screen savers introducing MyChart were launched on examination room computers and other workstations. Posters were placed in clinic elevators, clinician work areas, examination rooms, and waiting rooms. Informational brochures were available in all clinics. Each component of the campaign instructed patients on how to request a MyChart activation code via the health system's website or call center. Activation codes were also included on patient discharge summaries. All clinical staff received MyChart training, and front desk staff were instructed to inquire about patients' account activation status. Work processes were adjusted to prioritize answering patient portal messages over telephone messages.

### Study Population

We identified patients 18 years or older enrolled in the health system's affiliated health plan with at least 1 visit to their primary

## TAKEAWAY POINTS

Healthcare organizations are increasingly using online portals to engage patients and enhance access to health information. Our findings illustrate that focusing on improving the diversity of the population that has an activated portal account alone may not be enough to prevent disparities. We found disparities not only in who adopted portal technology but also in which features were accessed by those with an activated portal account.

- ▶ African Americans, Hispanics, those 70 years and older, and those preferring a non-English language were significantly less likely to be portal adopters.
- ▶ Compared with white portal adopters, African American portal adopters were less likely to access each of the portal features evaluated.
- ▶ Portal adopters who were 70 years and older were less likely to access most portal features, including those that were more interactive.

care physician between April 1, 2013, and March 31, 2014. Patients younger than 18 years, those without a primary care visit, and those with indeterminate portal activation status (eg, those with account information but no evidence of a session) were excluded.

### Data Sources

Patient sociodemographic information, comorbidities, primary care visits, and portal activation information were obtained from the health system's EHR data repository. These patient-level data were joined with clinic-level information available from health system administrative files.

### Analytical Variables

"Portal adopters" activated their portal account and initiated at least 1 online session between December 1, 2012, and March 31, 2014. Among portal adopters, we examined which health-related portal features were accessed (ie, "clicked on") between April 1, 2013, and March 31, 2014, in 4 categories: (1) messaging, (2) appointment management, (3) visit/admission summaries, and (4) medical record access and management. Adopters were considered to be users of the messaging feature if they (1) viewed electronic test result letters or other personal communications from their physician, (2) sent a message or viewed a response related to prescription refills, or (3) sent a message or viewed a response related to general medical advice. Those who reviewed their upcoming appointment information or accessed the appointment scheduling feature were considered to be users of the appointment management feature. Adopters who viewed outpatient visit summaries and/or inpatient admission summaries were deemed users of the visit/admission summaries feature. Finally, adopters who accessed the following features were considered to be users of the medical record access and management feature: test results, health summary, current health issues, medications, allergies, preventive care, medical history, immunizations, and/or home monitoring reports. We also constructed a binary variable ("interactive feature use") that indicated whether the adopter had ever (vs never) clicked on a feature that enabled them to input information (eg, update health issues, update medications, update allergies, send a secure message to their doctor, or request a prescription renewal).

**TABLE 1.** Overall Sample Characteristics, Portal Adopter Characteristics, and Adjusted Logistical Regression Results: Portal Adopters Versus Nonadopters

	Overall Sample (N = 20,282)		Portal Adopters (n = 6621)		Adjusted Logistical Regression Results <sup>a</sup> (n = 15,735)	
	n	%	n	%	Estimated β	95% CI
Race						
White or other	12,198	70.0	4555	78.4	1.00	Reference
African American	5218	30.0	1258	21.6	0.50	0.45-0.56
Ethnicity						
Non-Hispanic	16,551	98.3	5552	98.6	1.00	Reference
Hispanic	289	1.7	77	1.4	0.63	0.47-0.84
Language preference						
English	18,230	98.3	6067	98.9	1.00	Reference
Non-English	306	1.7	68	1.1	0.43	0.31-0.58
Age, years						
<50	2293	11.3	903	13.6	1.20	1.06-1.35
50-69	6757	33.3	2811	42.5	1.00	Reference
≥70	11,232	55.4	2907	43.9	0.48	0.44-0.52
CCI score	20,282	1.3 (1.8) <sup>b</sup>	6621	1.3 (1.8) <sup>b</sup>	1.04	1.02-1.07

CCI indicates Charlson Comorbidity Index.

<sup>a</sup>Hierarchical random-effects logistical model. In addition to variables listed above, model controls for patient gender, marital status, health maintenance visit use, and number of primary care office visits, as well as clinic location (urban vs suburban), size, and medical teaching status.

<sup>b</sup>Mean (SD); estimated betas represent a 1-unit increase (ie, a change of 1 CCI score point).

Of particular interest was whether portal adoption and feature access differed by patient race (African American vs white or other), ethnicity (Hispanic ethnicity vs not of Hispanic origin), or language preference (English vs other), or by health needs as defined by patient age or comorbidities. The latter was measured via the Deyo adaption of the Charlson Comorbidity Index (CCI), a diagnosis-based measure of a patient’s case mix that has been shown to be associated with subsequent mortality and resource use.<sup>28</sup>

We also obtained information on patient gender (female/male), marital status (currently married vs other), and patients’ realized access to office-based primary care. The last was measured by whether the patient had a health maintenance exam visit (ie, “checkup”) and by the total number of primary care office visits within the 12-month study period. In addition to the patient-level variables, we controlled for 3 clinic-level factors that may affect portal adoption and feature use: the number of primary care physicians practicing at the clinic (a proxy for clinic size), whether medical students and/or residents saw patients at the clinic (ie, designated teaching facility), and whether the clinic was located within the city of Detroit (urban) or a surrounding area (suburb).

### Statistical Analyses

A multivariable logistic regression model with random effects was fit using the PROC GLIMMIX procedure (SAS software, version 9.4 [SAS Institute Inc; Cary, North Carolina]) to test the role of the patient-level factors of interest in portal adoption status, controlling for other patient- and clinic-level factors. Patients were blocked

by physician and nested within clinic, and the Laplace method was used for likelihood approximation. Among portal adopters, we report the percentage of patients accessing each of the 4 categories of portal features (messaging, appointment management, visit/admission summaries, and medical record access and management) as well as by whether or not an interactive feature was accessed. We used multivariable logistic regression to test the role of the same patient-level factors of interest in feature access, again controlling for other patient- and clinic-level factors. Because adopters’ feature access was not influenced by the clinic from which or physician from whom care was received (ie, interclass correlation coefficients <0.01), models were fit using PROC LOGISTIC (SAS version 9.4).

## RESULTS

### Portal Adoption

Table 1 describes the sociodemographic and other characteristics of the study population (N = 20,282). About one-third of study-eligible patients (32.6%) were portal adopters (n = 6621). The majority (92%) of adopters had at least 2 online sessions, and 86% had 3 or more sessions. Reflecting the relative newness of the portal’s availability, patients who were adopters had been using the portal for a mean (SD) of 8.9 (4.5) months, with 95% using their account for at least 1 month. Across the health system, patients’ portal adoption rates ranged from 6.8% to 64.9% among primary care clinics (interclass correlation, 0.067) with a mean (SD) of 32.7% (12.4%), and from 0% to 100% among primary care physicians (interclass correlation, 0.060) with a mean (SD) of 31.1% (20.2%). Prior to controlling for other factors, African Americans, those of Hispanic ethnicity, those preferring to use a non-English language, and those 70 years and older were substantially less likely to have an activated portal account (Table 1). It should be noted, however, that portal adoption among these vulnerable and relatively high-health-need populations varied substantially across physician panels and primary care clinics. For example, on some physician panels, as few as none (0.0%) of the African American patients had an activated portal account, whereas on others, all (100.0%) African American patients had a portal account. Similarly, at some clinics, as few as 4.5% of the African American patients receiving primary care from the clinic had an activated portal account, whereas at others, the percentage was as high as 52.9%. Similar variability at the physician panel and primary care clinic levels was seen for the other subgroups of interest.

Multivariable logistic regression model results comparing portal adopters with nonadopters are also presented in Table 1. After controlling for other factors, African American patients were half

**TABLE 2.** Percentage of Portal Adopters by Portal Feature Accessed (n = 6621)

Portal Feature	% (n) of Adopters Accessing <sup>a</sup>
Record access and management	95.9 (6351)
Laboratory test results	91.7 (6073)
Current health issue	87.8 (5810)
Medications	87.5 (5791)
Immunizations	86.1 (5701)
Allergies	86.0 (5692)
Health summary	84.7 (5608)
Medical history	47.0 (3112)
Preventive care	7.4 (487)
Appointment management	76.6 (5074)
Messaging	59.1 (3914)
Visit/admission summaries	41.0 (2717)
Any health-related feature	97.0 (6423)
Potentially interactive feature	68.8 (4556)

<sup>a</sup>Percentage of patients who ever clicked on feature component.

as likely as patients of other races to be portal adopters. Similarly, compared with patients aged 50 to 69 years, those 70 years and older were approximately half as likely to be portal adopters. Those of Hispanic ethnicity and with a preference for a non-English language were also significantly less likely to be portal adopters, whereas portal adoption was more likely among patients with higher CCI scores.

### Portal Feature Access

Most adopters accessed portal features related to medical record access and management (95.9%) (Table 2), most often to obtain laboratory test results (91.7%). As depicted in Table 2, adopters also frequently accessed information on their current health issues (87.8%), medications (87.5%), immunizations (86.1%), allergies

(86.0%), and health summaries (84.7%). The majority of adopters also accessed the appointment management features (76.6%), more frequently to review information on upcoming appointments (73.1%) than to schedule appointments (58.5%). Relatively fewer patients accessed the messaging features (59.1%), and within this category, access was evenly distributed across letters (35.5%), medical advice requests (31.7%), and medication renewal requests (31.3%). Fewer patients had accessed the visit/admission summary component (41.0%). Overall, 97.0% of portal adopters accessed at least 1 of the health-related features available within the portal, with 68.8% accessing at least 1 interactive feature.

Table 3 presents results from the 5 multivariable logistic regression models testing the association of the patient-level factors of interest with feature access. With the exception of accessing visit/admission summaries, patients of African American race were significantly and substantively less likely to have accessed each of the portal features. Similarly, with the exception of record access and management (which virtually all [95.9%] patients accessed), patients 70 years and older were also significantly and substantively less likely to have accessed each of the portal features. On the other hand, as a patient's CCI score or number of primary care visits increased, so too did their likelihood of accessing the different portal features.

## DISCUSSION

We found that approximately one-third of patients with a primary care visit were portal adopters, as defined by their having an activated portal account. Furthermore, the majority of portal adopters logged into their account multiple times and accessed a variety of features related to both viewing and inputting information. Together, these results illustrate the ability of patient portals to reach a large number of patients, particularly those who are already actively connected with a primary care provider.

**TABLE 3.** Logistic Regression Results: Type of Portal Feature Accessed Among Portal Adopters (n = 5146)<sup>a</sup>

Parameter	Record Access and Management		Appointment Management		Messaging		Visit/Admission Summaries		Any Interactive Feature	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Race										
White/other		Reference		Reference		Reference		Reference		Reference
African American	0.57	0.39-0.84	0.70	0.59-0.84	0.78	0.67-0.91	0.91	0.78-1.06	0.83	0.71-0.99
Hispanic ethnicity	2.15	0.29-15.63	0.71	0.41-1.23	0.95	0.58-1.56	1.04	0.64-1.67	0.85	0.51-1.42
Non-English language preference	0.35	0.12-0.98	0.53	0.29-0.96	0.64	0.37-1.11	0.74	0.42-1.30	0.73	0.41-1.30
Age, years										
<50	0.68	0.44-1.07	0.86	0.70-1.06	1.12	0.93-1.35	1.34	1.12-1.60	0.82	0.68-1.00
50-69		Reference		Reference		Reference		Reference		Reference
≥70	0.78	0.55-1.12	0.82	0.70-0.95	0.63	0.56-0.72	0.79	0.70-0.89	0.75	0.65-0.86
CCI score <sup>b</sup>	1.03	0.93-1.13	1.09	1.04-1.14	1.08	1.04-1.12	1.06	1.03-1.10	1.06	1.02-1.10

CCI indicates Charlson Comorbidity Index; OR, odds ratio.

<sup>a</sup>In addition to variables listed above, models control for patient gender, marital status, health maintenance visit use, and number of primary care office visits, as well as clinic location (urban vs suburban), size, and medical teaching status.

<sup>b</sup>Estimates represent a 1-point increase in CCI score.

Importantly, however, our results also underscore why efforts to enhance and ensure portal adoption as defined by account activation are likely to be insufficient: Our analyses point to disparities not only between those who activate and do not activate a portal account but also in how those with an active account access the features available within portals. Particularly concerning was the finding that African American and older patients were consistently least likely to have an activated portal account, and when they did, they were also least likely to access most portal features. The latter included being least likely to access the appointment management and messaging features—2 functionalities that are arguably critical to care access. The disparities in portal account activation that we observed are consistent with those now repeatedly found by others.<sup>7-24</sup> The findings of disparities in portal adoption, combined with the additional disparities in feature access among portal adopters that we and another study have shown,<sup>8</sup> highlight the importance of providing alternative channels for vulnerable and traditionally less engaged patient populations to view and share their health information. Such a need is echoed by findings from a recent qualitative study that highlight the basic computer-related and other barriers that vulnerable populations experience once logged into a portal<sup>29</sup> and by a recent systematic review that highlights the role of health literacy in patients' ability to accurately input and interpret information contained within portals.<sup>19</sup>

We identified wide variability in portal account activation by primary care physician panel and clinic—both overall and among traditionally high-need and vulnerable populations. Understanding the factors that underlie such variability was beyond the scope of the present study, but evidence from elsewhere would point to a diverse array of multilevel factors that may include everything from patients' health and technological literacy and internet access to the characteristics and supportiveness of physicians and other care team members to the programs and support offered within the broader community.<sup>19,30</sup> Future studies should specifically explore the provider-, clinic-, system-, and community-level factors underlying this variability in portal use, as such studies may hold clues to innovative solutions for engaging and enabling the viewing and sharing of health information among hard-to-reach populations.<sup>31</sup> What is clear is that there is likely not a universal patient portal solution for electronically capturing and sharing health information if the goal is the inclusion and engagement of all members of diverse primary care populations. Moving beyond this one-size-fits-all mentality is important in light of mounting evidence that patient adoption of and engagement with EHR-integrated portals can lead to improved outcomes among some patients, including treatment adherence and clinical outcomes among patients with diabetes and HIV.<sup>21,25,26,32-34</sup>

### Limitations

Our results should be interpreted with a number of study limitations in mind. First, to determine the types of portal features used by patients, we measured user clicks on the links to access

specific portal features. Thus, our results are based on the links that patients activated and not time spent per se. Capturing use in this way is consistent with other studies<sup>9</sup> but may nonetheless result in overestimates of patient feature use because some clicks may have been due to curious exploration and not actual engaged use. Second, although we were able to control for some clinic-level factors, because of the nature of our study methods and data, we were unable to control for some potentially important patient-level factors, such as education and income. We were also unable to determine the reasons behind patients' adoption or nonadoption of the portal and specific portal features accessed. Understanding the multilevel and modifiable factors that contribute to observed patterns of portal adoption and feature access is a fruitful avenue for future research. In addition, the context for this research was 1 integrated health system that serves an urban/suburban Midwestern locale. As such, findings may not reflect patterns of portal adoption and feature access that are faced over the long term or by health systems serving other types of populations or based in other locations.

## CONCLUSIONS

Our results underscore the opportunities and challenges that patient portals present. On the one hand, when integrated within EHRs, portals represent an exciting new frontier for information exchange between healthcare organizations and patients. As such, portal technology may be able to support patients' health-related decision making and adherence to evidence-based care (and thereby health outcomes) beyond what traditional office visits alone can accomplish. On the other hand, our findings caution that without purposeful planning and integration, reliance on patient portals alone for engaging patients outside of office visits could inadvertently serve to exacerbate existing racial and other social disparities. Our findings therefore highlight not only the need to continually assess the reach and impact of patient portals on diverse populations but also a need to consider alternative channels and mechanisms for sharing health information and engaging patients beyond the walls of traditional office visits. ■

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