









ORIGINAL RESEARCH

Patient Portal Perceptions in an Urban Community Health Center Setting: Insights for Telehealth

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Abstract

Introduction: Patient portals can be the “front door” to telehealth—secure clinician messaging, video visit links, and digital after visit summaries are accessed via the patient portal. Patient portal tools often require similar patient skills and attitudes as telehealth adoption. Analyzing patients’ perceptions and beliefs around this digital patient engagement tool may lead to insights regarding telehealth, particularly in historically underrepresented patient populations.

Methods: Participants from a Federally Qualified Health Center (FQHC) in Chicago were surveyed on general technology use, healthcare-specific technology use, and barriers and facilitators to patient portal use.

Results: The 149 respondents (81% response rate) represented a unique population base with 96% African American, 74% with the educational attainment of some college or less, and 48% with at least one chronic medical condition. Technology access and use were high with 78% computer ownership and 98% mobile phone ownership (with 75% smartphone ownership). In terms of patient portal perception, 75% rated perceived usefulness (U) as high. Perceived ease of use (E) domains similarly had 70% or higher agreement from patients, and potential barriers and facilitators in the attitudes toward use (A) section included a preference to calling their doctor, and the minority of patients viewing the portal as an unsafe way to communicate, too complicated to use, or taking too much time. Additional stratification analysis by demographic variables (age, gender, educational attainment, and number of chronic conditions) revealed differences in portal perception across the usefulness, ease of use, and attitude domains.

Discussion: Insights from barriers, attitudes, and capacity to use patient portal tools deliver important insight into the overall adoption of other digital health modalities, including telehealth. In an urban historically underserved patient population, technology access and use are quite high, and mobile phone access was nearly ubiquitous with a large majority using the internet function on their mobile device. Different age groups, genders, levels of educational attainment, or degrees of comorbidity have different values and needs. Therefore, each subpopulation needs targeted messaging of different portal benefits.

Conclusions: Our research provides initial insights into patient-level factors influencing patient portal attitudes, with implications toward telehealth adoption. Demographic differences have a significant impact on attitudes toward technology adoption. Equitable uptake of portal and telehealth services will require tailored messaging, training, and multiple modes of communication, including web based and mobile.

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Patient portals are the “front door” to telehealth. Telehealth encompasses more than video visits, and patient portal adoption is a necessary first step

toward telehealth adoption. Telehealth, broadly defined as “the remote provision of healthcare via telecommunications technology” such as secure clinician messaging,

video visit links, and digital after-visit summaries are all accessed via the patient portal. Patient portal tools often require similar patient skills and attitudes as telehealth adoption. Analyzing patients' perceptions and beliefs around this digital patient engagement tool may lead to insights regarding telehealth.¹ The digital divide is also a concern, as patients have different levels of trust and ability to access new modalities of care. Overall, these barriers to digital health access manifest as low uptake of digital health interventions among underserved populations.²⁻⁵

It is important to represent diverse patient populations when analyzing patient portal uptake trends. Adoption and use of portals by patients have been variable and high use has been difficult to achieve, particularly among patient populations that already experience healthcare disparities.^{6,7} Given the central focus on patient portals to connect patients with their healthcare information and care teams, there is a significant concern that low usage by safety net patient populations will lead to increased healthcare disparities, particularly among African American populations, who already experience disparities in access to care.⁸⁻¹⁰

Conceptual Framework

The Technology Acceptance Model (TAM) is a commonly used theory that postulates that an individual's attitude toward and behavioral intention to use a technology is influenced predominantly by the perceived usefulness (U) of and perceived ease of use (E) of the technology in the context of key external factors such as primary demographics and general technology use.¹¹⁻¹³ The TAM has been used extensively to explain the adoption of technology in other fields, including internet use, internet banking, and physician acceptance of telemedicine.¹⁴⁻¹⁷ Prior studies show that the TAM has also been shown to be useful in predicting care team adoption of health information technology.¹⁸ Thus far, the literature is scant with the TAM framework and the patient as the end-user, with only one qualitative study of patient adoption of patient portals,¹⁹ and quantitative analysis remains incomplete.

To determine whether the TAM could be used to understand portal use and to better understand how patients in community health center settings could be encouraged to use patient portals, we performed a pre-portal implementation study to assess key TAM components (technology access, perceived usefulness, perceived ease of use, and attitudes toward using the portal) among a predominantly African-American patient population at an urban Federally Qualified Health Center (FQHC) and determined variations in subpopulations of patients based on age, gender, educational attainment, and chronic conditions.

Methods

Study Population

We recruited 150 participants from the adult internal medicine clinic, women's clinic and pharmacy and laboratory services for waiting areas at a Federally Qualified Health Center (FQHC) in Chicago. Data were collected between July and August, 2014 before the deployment of their electronic health record-tethered patient portal. Eligible participants were English-speaking, 18 years of age or older and receiving care at the FQHC. One participant completed the survey twice, and their second set of survey results was removed, so the final study population was 149 participants.

Study Procedures

Research assistants (authors MS and RK) approached potential participants in the waiting areas of the adult internal medicine clinic, the women's clinic, and pharmacy and laboratory services. Research assistants confirmed eligibility and obtained informed consent that included participation in the survey and permission to extract clinical conditions (including chronic conditions) and administrative data (demographics) from their electronic health records. We used a nonprobability sampling method based on convenience and availability. Those who completed the survey received a \$25 pharmacy gift card.

Survey Design and Administration

The technology acceptance model has been successfully used in business environments to model technology uptake.¹²⁻¹⁴ The TAM posits that in combination with key external variables (such as demographics), perceived usefulness (U) and perceived ease of use (E) of a technology impact attitudes toward using (A) and behavioral intention to use the technology, which ultimately determines whether a given individual will use the technology. We developed a 20-min survey, by adapting the validated TAM instrument¹³ and Pew Internet and American Life Surveys on mobile technology use and use of the Internet for healthcare information.^{20,21} The survey included five core domains: demographic information (age, gender, race/ethnicity, and education level), general use of technology, access to technology, perceptions of technology for communicating about health care, and preferences for how to communicate about healthcare. We also included a modified version of the survey performed by Goel et al. to assess barriers and facilitators of patient portal use.²² The entire survey is provided in Supplemental Section A. The survey was administered, either on paper or through the use of a tablet computer, using SNAP survey software (SnapSurveys, Bristol, United Kingdom).

Electronic Health Record Data Collection

Survey data were supplemented with health information from the electronic medical records of the survey

participants to assess the number of chronic conditions each participant experienced. Chronic conditions considered were those described in the Dartmouth Atlas of Chronic Disease,²³ which were mapped to appropriate International Classification of Disease 9th Edition (ICD-9) codes for identification in the medical record.²⁴ The chronic disease categories assessed included: malignant cancer, chronic pulmonary disease, coronary artery disease, congestive heart failure, peripheral vascular disease, severe chronic liver disease, diabetes with end organ damage, renal failure, and dementia. Data were extracted for all participants from the AllianceChicago electronic data warehouse where the FQHC EHR data are housed, following the completion of the survey data collection. AllianceChicago is a Health Center Controlled Network that provides central EHR and data warehousing infrastructure for a national network of FQHCs.

Analysis

We generated descriptive statistics for all demographic variables. Categorical variables are reported as counts or proportions as appropriate. Patient responses were coded and reported as frequencies based on demographic variables. Given the non-normal distribution, we performed Pearson chi-square tests to compare group differences. All statistical analyses were two-sided and performed using STATA, version 15 (StataCorp, LLC, College Station, TX) and R, version 3.44 (R Foundation, Vienna, Austria). Statistical significance was defined at $p < 0.05$.

Human Subjects and Ethical Review

This study was reviewed and approved by the Northwestern University Institutional Review Board (STU00068642) and the Near North Health Service Corporation Scientific Review Committee.

Results

Demographics of study participants are detailed in Table 1. A total of 183 eligible participants were approached to participate in the study, and 149 met our eligibility criteria and completed the survey (response rate: 81.4%). The primary demographics of the participants are described in Table 1. Of the 149 respondents, 143 (96%) identified as African American, 2 (1%) as Hispanic or Latinx, 1 (1%) as Caucasian, and 3 (2%) did not identify in any of these categories and were grouped as “Other”. The mean age of the participants was 46 years, and 92 (62%) were women. We also assessed education levels: 41 (28%) had achieved a GED/completed high school or less, 68 (46%) reported some collegiate-level education and 40 (27%) were college graduates. Finally, the number of chronic conditions our study participants experienced

Table 1. Participant demographics (N = 149)

Demographics	n (%)
Mean age, in years (SD)	45 (15)
18–34	40 (27%)
35–49	43 (29%)
50–64	51 (34%)
≥ 65	15 (10%)
Race/ethnicity	
African American	143 (96%)
Hispanic or Latino	2 (1%)
Caucasian	1 (1%)
Other	3 (2%)
Gender	
Female	92 (62%)
Male	57 (38%)
Educational attainment	
GED or less	41 (28%)
Some college	68 (46%)
College graduates or more	40 (27%)
Chronic conditions (n)	
0	77 (52%)
1	37 (25%)
2	20 (14%)
3 or more	13 (9%)

Table 2. Technology access and use for healthcare

Elements	n (%)
Own a computer	116 (78%)
Use computer	107 (92%)
Do not use computer	9 (8%)
Computer use rate	
Once a day	103 (69%)
Once a week or less	46 (31%)
Use of internet	138 (93%)
Look for medical information for self	95 (64%)
Look for medical information for others	57 (38%)
Have Email address	131 (88%)
Own mobile phone and activities performed on mobile phone	146 (98%)
Telephone	144 (97%)
Text messaging	127 (85%)
Voicemail	113 (76%)
Internet access	109 (75%)
Email	99 (68%)
Aware of patient portal technology	54 (34%)

was determined from their medical records: 77 (52%) had no documented conditions, 37 (25%) had one chronic condition, 20 (14%) had two and 13 (9%) had three or more chronic conditions.

Table 3. Overall perceived usefulness (U), perceived ease of use (E), and attitudes toward use (A) of patient portals

Perceived usefulness (U)	Perceived ease of use (E)		Attitudes toward use (A)			
	% Agree	% Very important	% Agree	% Agree		
View lab results	90%	74%	Can get help if having difficulty	90%	Prefer to call my doctor	66%
Request refills	93%	73%	Compatible with other technology I use	88%	Unsafe way to communicate	35%
Manage medical issues	83%	68%	Learning to operate will be easy for me	85%	Too complicated to use	20%
Schedule appointments	90%	68%	Easy to use	84%	Take too much time	14%
Review current meds	94%	66%	Using Internet fits into my life	79%	Not useful	11%
Ask questions re medical issues	89%	61%	Will be clear and understandable	78%		
View screening tests	93%	56%	Predict that I will use portal	74%		
Get alerts/reminders	93%	54%	Easy to have it do my task	73%		
Provide doctor with home blood pressure or glucose reading	84%	53%	Not require a lot of mental effort	57%		
View clinic notes	89%	49%				
Email doctor with regard to medical issues	82%	42%				
Communicate after hours	79%	40%				
Preappointment preparation	86%	38%				
Share medical records with other doctors	88%	38%				
Do office tasks online	83%	31%				
Share medical records with family	44%	15%				

To better understand how our participants used technology and the Internet, participants were asked to describe access to technology, frequency of technology use, and use of technology for healthcare. These results are described in Table 2. Overall, we observed a high rate of technology access among our participants: 78% owned a computer, 88% had an email address, 93% used the Internet, and 98% owned a mobile phone, which could be a standard mobile phone or smartphone. For those that owned a computer, 69% used it daily or more frequently. For those that owned a mobile phone, 97% used it to make phone calls, 85% to send text messages, 76% used voicemail functions, 75% used the Internet from their phone, and 68% sent email. While Internet use was high, only 38% of participants had looked for medical information for themselves or others in the past 12 months and only 34% were aware of patient portal technology.

Survey Results by TAM Domain

Patient responses to survey questions across the TAM domains are detailed in Table 3. TAM domains include perceived usefulness (U), perceived ease of use (E), and attitudes toward use (A). Overall, the portal had high perceived usefulness with all portal features rated as being “important” or “very important” by 75% or more of patients. These categories were combined since both

connote positive perceived usefulness on our five-point Likert scale. For examination of individual portal features, only “very important” ratings were used to provide more granular differentiation and stratification. The top five “very important” rated functions were viewing test results (75%), requesting medication refills (73%), managing medical issues (68%), scheduling appointments (68%), and reviewing current medications (66%). Portal functions related to communication or coordination were slightly lower with “Very Important” ratings for the following functions: provide doctor with home blood pressure or glucose readings (53%), email doctor regarding medical issues (42%), communicate after hours (40%), and share medical records with other doctors (38%). A notable outlier is a low desire to share medical records with family (15% rated “very important”). All questions in the Perceived Ease of Use domain had 70% or higher agreement from patients, with the exception of the portal would “not require a lot of mental effort” (57%). Lastly, the Attitudes Toward Use section highlighted a main reason for not using the portal was a preference to calling their doctor (66%). An additional set of reasons for not using the portal included: viewing the portal as unsafe way to communicate (35%), too complicated to use (20%), taking too much time (14%), or not useful (11%).

Table 4. Technology acceptance model elements stratified by age

Elements	Age (in years)				p-value*
	18–34 (n = 40)	35–49 (n = 43)	50–64 (n = 51)	≥ 65 (n = 15)	
Usefulness					
Request refills	95%	95%	92%	73%	0.04
Email doctor with regard to medical issues	90%	91%	71%	67%	0.02
Ask questions re medical issues	95%	93%	86%	67%	0.02
Do office tasks online	95%	84%	76%	60%	0.01
View lab results	95%	88%	86%	87%	0.58
Manage medical issues	88%	88%	80%	67%	0.21
Schedule appointments	93%	98%	84%	80%	0.09
Ease of use					
Easy to use	93%	81%	82%	80%	0.44
Predict that I will use portal	70%	84%	75%	53%	0.012
Using Internet fits into my life	90%	93%	67%	53%	<0.001
Compatible with other technology I use	95%	98%	80%	73%	0.01
Not require a lot of mental effort	58%	65%	53%	53%	0.67
Attitudes					
Prefer to call my doctor	55%	58%	73%	93%	0.03
Take too much time	5%	5%	24%	27%	0.01
Unsafe way to communicate	30%	28%	45%	40%	0.29

*Values in bold face are statistically significant.

Stratification Analysis

In addition to overall trends, we investigated whether key demographic variables (age, gender, educational attainment, and number of chronic conditions) were associated with differences in TAM domains.

Trends by Age

Overall, as shown in Table 4, there was a trend toward lower perceived usefulness ratings, with a drop off at age ≥ 65. Statistically significant differences in levels of agreement were noted for requesting refills, emailing doctors regarding medical issues, asking questions regarding medical issues, and doing office tasks online. Similar decreases by age were noted in ease of use domains with lower levels of agreement for age ≥ 65 in predicting portal use (53%), personal life/Internet compatibility (53%), and compatibility with other technology in use (73%). Finally, there was a trend toward more negative attitudes toward the portal with both 50 – 64 and 65+ age groups preferring to call their doctor (73% and 93%, respectively), and the patient portal taking too much time (24% and 27%, respectively).

Trends by Gender

When there were gender differences in perception of the usefulness of portal features, women tended to rate features as important more frequently than men, especially viewing screening tests (97% vs 88%), viewing clinic notes (93% vs 82%), and communicating after hours (86% vs 67%). However, men

rated sharing medical records with family as important more frequently than women (54% vs 37%). Women also generally viewed ease of use domains more favorably, agreeing that they would use the portal (82%), and that using the Internet fits into their life (86%). Finally, when there were differences in attitudes toward portal use, men tended to have more negative views of patient portals, noting them to be not useful (19% vs 5%) and too complicated (30% vs 14%) (Table 5).

Trends by Educational Attainment

Overall perceived usefulness of portal features was similar across education levels. However, for scheduling appointments, 100% of patients with GED or less rated it as important compared with those with some college (84%) and college or greater (90%). Those with higher education attainment such as college or greater had the lowest level of agreement on select perceived ease of use questions. For example, only 68% agreed that “learning to operate [the portal] will be easy for me” and 73% agreed that the portal would be “easy to use.” Finally, those with a college degree or greater had a higher frequency of negative attitudes toward portals rating them as “too complicated to use” (35%) and “taking too much time” (25%) (Table 6).

Trends by Number of Chronic Conditions

Perceived usefulness of portal features and perception of ease of use remained similar across the number of chronic conditions. However, there was a trend toward patients

Table 5. Technology acceptance model elements stratified by gender

Elements	Men (n = 57)	Women (n = 92)	p-value*
Usefulness			
Schedule appointments	86%	92%	0.21
Request refills	91%	92%	0.8
View lab results	91%	88%	0.54
Review current meds	91%	93%	0.61
Manage medical issues	77%	87%	0.12
View screening tests	88%	97%	0.03
View clinic notes	82%	93%	0.04
Communicate after hours	67%	86%	0.01
Share medical records with family	54%	37%	0.04
Ease of use			
Predict that I will use portal	61%	82%	0.01
Using Internet fits into my life	68%	86%	0.01
Not require a lot of mental effort	58%	58%	0.97
Easy to use	86%	84%	0.71
Attitudes			
Not useful	19%	5%	0.01
Prefer to call my doctor	70%	63%	0.37
Too complicated to use	30%	14%	0.02
Unsafe way to communicate	42%	32%	0.19

*Boldface values: statistically significant finding.

with two chronic conditions having the highest frequency of negative attitudes toward patient portals. For example, 40% of patients with two chronic conditions thought that the portal was “not useful,” compared with those with 0–1 (6%) or 3+ conditions (7%). Similarly, 35% of patients with two chronic conditions thought the portal would “take too much time,” compared with those with 0–1 (11%) or 3+ conditions (0%) (Table 7).

Discussion

Insights from barriers, attitudes, and capacity to use patient portal tools to deliver important insight into the overall adoption of other digital health modalities, including telehealth. Our results suggest that among an urban historically underserved patient population, technology access, and use are quite high and comparable to overall trends in mobile technology ownership.²⁵ In fact, access to mobile phones was nearly ubiquitous with a large majority using the Internet function on their mobile device.

Perceived usefulness of various portal features was overall high, with the most useful features being viewing test results, requesting medication refills, reviewing current medications, scheduling appointments, and managing medical issues. Many of these patient-perceived top

Table 6. Technology acceptance model elements stratified by educational attainment

Elements	≤ GED (n = 41)	Some college (n = 68)	College + (n = 40)	p-value*
Usefulness				
Schedule appointments	100%	84%	90%	0.03
Request refills	93%	93%	90%	0.87
View lab results	93%	87%	90%	0.62
Manage medical issues	88%	84%	78%	0.46
Ease of use				
Predict that I will use portal	80%	76%	63%	0.15
Not require a lot of mental effort	61%	60%	50%	0.51
Easy to use	85%	91%	73%	0.03
Learning to operate will be easy for me	95%	90%	68%	0.001
Attitudes				
Not useful	7%	10%	15%	0.53
Too complicated to use	7%	19%	35%	0.01
Take too much time	7%	10%	25%	0.04
Unsafe way to communicate	29%	31%	50%	0.08

*Boldface values: statistically significant finding.

features are more administrative (appointment scheduling and medication refills), so additional effort may be needed to demonstrate the value of other communication options such as clinician messaging or telehealth via the portal.^{26,27} It is also important to note the effect of external factors (demographic variables) on technology adoption. Different age groups, genders, levels of educational attainment, or degree of comorbidity have different values and needs. Therefore, each subpopulation needs targeted messaging concerning different portal benefits.

In patients aged 65 years or older, perceived usefulness and perceived ease of use of portal tools were lower than in other age groups. Particular attention should be paid to this group, as this older population tends to have the most complex medical needs and could potentially benefit most from communication and care coordination via the patient portal.²⁸ Our findings that women viewed patient portals more favorably than men are consistent with prior research associating women with more health-seeking behaviors overall.^{29,30} There were some surprising trends by education attainment. Most notably, those with a college education or greater had more negative associations on the perceived ease of use and attitudes toward use. We posit that those with a college education or greater have had

Table 7. Technology acceptance model elements stratified by the number of chronic illnesses

Elements	0–1 (n = 114)	2 (n = 20)	3+ (n = 15)	p-value*
Usefulness				
Schedule appointments	92%	80%	87%	0.34
Request refills	93%	95%	80%	0.34
View lab results	91%	85%	80%	0.53
Review current meds	95%	95%	73%	0.75
Manage medical issues	86%	70%	80%	0.33
Ask questions re-medical issues	92%	85%	67%	0.89
Ease of use				
Predict that I will use portal	75%	75%	60%	0.81
Using Internet fits into my life	84%	60%	67%	0.46
Compatible with other technology I use	92%	80%	73%	0.68
Not require a lot of mental effort	55%	75%	53%	0.53
Easy to use	86%	95%	60%	0.5
Easy to have it do my task	74%	85%	53%	0.54
Learning to operate will be easy for me	86%	95%	67%	0.66
Attitudes				
Not useful	6%	40%	7%	<0.001
Prefer to call my doctor	64%	80%	60%	0.53
Too complicated to use	17%	35%	20%	0.19
Take too much time	11%	35%	0%	0.01
Unsafe way to communicate	31%	65%	27%	0.05

*Boldface values: statistically significant finding.

more experience with different technologies and are more wary of the pitfalls of technology. Finally, there was an interesting signal toward an upside-down U-shaped curve of those with a moderate amount of comorbidity (exactly two chronic conditions) having the most negative attitudes toward portals. It is possible that patients with 0-1 chronic conditions interact infrequently with the health care system, so the portal provides added convenience on the few occasions they would need to schedule an appointment or refill. For patients with 3+ chronic conditions, they see their health care team very frequently, so a single portal access point would be useful. Patients in the two chronic condition groups may interact with the system just infrequently enough that another portal login and password would be perceived as too much of a burden or barrier.

Limitations

This was a single-site study; however, it does provide insights into a historically marginalized African American patient population in a general internal medicine setting.

Prior research has focused on disparities in subspecialty clinics.^{31–33} There is also the potential that the results are biased toward the perspective of those who opted in; however, the survey response rate was over 80%. An additional limitation is that data were collected in 2014. However, the challenges of the digital divide and disparities in access and attitudes remain pertinent today.

Conclusions

Our research provides initial insights into patient-level factors influencing patient portal attitudes, with implications toward telehealth adoption. Demographic differences have a significant impact on attitudes toward technology adoption. Equitable uptake of portal and telehealth services will require tailored messaging, training, and multiple modes of communication, including web based and mobile.

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Financial and non-Financial Relationship and Activities

Dr. Sakumoto is a Review Board Member for *Telehealth and Medicine Today*. All other authors declare no potential conflicts of interest.

Contributors

Drs. Sakumoto and Walunas wrote the manuscript. Drs. Sakumoto and Kalu conducted the patient surveys. Ms. Ye and Ms. Yee conducted all statistical analyses. Drs. Walunas and Goel designed the study. Ms. Rittner and Mr. Long provided system partnership, advocacy, and support. Drs. Goel and Walunas contributed equally. All authors reviewed the final manuscript.

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