Exploration of Portal Activation by Patients in a Healthcare System

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A study of patient portal utilization was conducted at a not-for-profit healthcare system in Northern Virginia. The healthcare system serves more than 2 million people each year. The encounters with the portal included 461 700 different patients occurring between July 2014 and June 2015. Univariate analysis and multivariable logistic regression indicated associations between patient portal activation and predictive factors. Multiple findings emerged: patient portal activation was greater for English-speaking patients; differences in portal activation were observed by patient age; and patients who had an identified primary care provider were more likely to use the portal. The implications were that patients who have limited English skills and have economic challenges may be less engaged. This review demonstrates the importance of understanding the population using a patient portal and provides insight for future development on how to engage patients to interact with their providers through the portals.

KEY WORDS: Activation, MyChart, Patient engagement, Patient portals

I t is important to understand the patient population using a healthcare portal, both to engage patients so that they interact with their providers and to provide insight for the future development of portals. A study was conducted to assess activation of the patient portal MyChart (Epic Systems Corporation, Verona, WI), which is one application within the healthcare system's electronic health record. The research took place in a not-for-profit integrated healthcare system based in Northern Virginia. The system serves more than 2 million people yearly, extending to the Washington, DC, metropolitan area. The healthcare system is a comprehensive network of hospitals, outpatient facilities, primary and specialty care practices, and health and wellness initiatives. The system encompasses the full array of health services, including the area's only Level I trauma center, Level IV neonatal intensive care unit, Heart and Vascular Institute, Translational Medicine Institute, and The Cancer Institute.

The surrounding county is racially and ethnically diverse. In 2014, the population was 63% white, 10% African American, 19% Asian Pacific Islander, and 16% Hispanic. More than one in five residents (21%) are employed by federal, state, or local government. Median household income in 2014 was $110 674. Most residents 25 years or older (60%) have a bachelor's degree or higher education. Approximately 10% of county residents are without health insurance, and 38% speak a language other than English.[1]

In 2009, the American Recovery and Reinvestment Act was passed, giving healthcare providers a financial incentive to implement electronic health records and patient portals. Two stages of the "Meaningful Use" requirements have driven the current financial incentives. Stage 1 core requirements of data capture and sharing of information are met through the adoption of an electronic health record. Stage 2 is built on Stage 1 requirements and addresses the exchange of patient information and providing patients with access to their own medical records. To meet these requirements, eligible healthcare providers must demonstrate the use of information to engage patients and their families in their care.[2,3]

LITERATURE REVIEW

The Meaningful Use incentive program has accelerated implementation of health information technology, in particular, patient portals. To date, research on patient portals has focused on specific portal applications and their features. These features include secure messaging and user and nonuser characteristics,[4–6] such as age,[4,7,8] gender,[6] ethnicities,[4,8,9] computer literacy,[10] health literacy,[5]

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income,[9,11] education,[5] language,[9] insurance,[9] and attitudes.[12] Usage by those with chronic health conditions and barriers to portal use has also been examined.[13] Portal applications described in portal literature include EpicCare,[14] MyChart,[8] Health View,[7] KP Health Connect1,[15,16] MiCare,[17] MYMSKCC,[18] MyOscar,[19] PatientSite portal,[20] MyHealtheVet,[21,22] and MyHealthAtVanderbilt.[11] Common features found in patient portals comprise personal health information, results of medical tests, requests for medication refills, sending and receiving secure messages with providers, and scheduling appointments.[23,24] In addition, some systems include the ability to access billing and make payments. Patients can view and change personal information such as demographics and financial information. Systems allow for rapid check-in and discharge instructions. Patients have access to educational materials and general information about the healthcare system.[7,23]

Investigations of patient portals have included studies on many different aspects of use and user characteristics. Studies of veterans in clinics and patients in ambulatory practices found that portal users were younger.[14,22] Another study reported older patients with diabetes had greater trust in their providers and had increased portal usage.[5] A study of a disadvantaged population found that those who lacked insurance used the portal less.[9] It was found that women in ambulatory clinics used the portal more than did men.[14] Those with poor health literacy had lower portal usage among a diabetic population.[4,10] Health literacy was identified as a barrier to portal usage in patients with a chronic disease.[5] Patients with higher education had increased portal usage.[23] There were many studies that looked at chronic illness and the impact of portal usage, especially for patients with diabetes. Women with a chronic disease were more likely to use the portal than men with a chronic illness.[4] Portal users with diabetes were more likely to be younger and female and less likely to be African American.[7] A study that examined attitudes and experiences of patients with diabetes who did and did not use portals found that the barriers to lack of utilization included not being aware portals existed, inability to use the technology, and unwillingness to manage disease processes.[25]

A systematic review found that there were insufficient studies demonstrating improved outcomes in the quality of care, cost, and utilization as a result of patient use of portals.[24] A study of patients using secure messaging was linked with improvement in the effectiveness and quality of care.[26] Patient portal use is associated with increased self-management of chronic illnesses.[12]

In a systematic review of the effect of portals on managing chronic diseases, results included increased medication adherence, greater awareness of disease, improved disease self-management, fewer clinic visits, increased focus on illness prevention, and improved satisfaction with care.[27]

There was greater adherence to antihypertensive medication regimens among patients who could review their primary care providers' notes through a patient portal.[28] In a qualitative study, researchers reported five ways that a portal had affected delivery of care, including improved ease of access to services, transparency of patient information, and improved patient-provider relationship, which led to better management of care. Patient services were more personalized and provided more operational efficiency.[29] However, in Finland, a study examining cost-effectiveness was unable to demonstrate savings.[6]

Provider attitudes toward patient portals and technology are mixed.[12] Secure messaging saved time, made documentation easier, and improved patient care; however, providers had concerns about loss of revenue from potential heavy portal use, patient privacy, and increased workload.[12] Another important aspect of portal usage is creating a system that has a user-centered design. Web-based portals that provide patients with access to their medical records improve communication with providers and facilitate patients' role in their care.[12] A user-friendly design is an important factor in patient willingness to utilize portals.[5,10,11] Meeting patients' informational needs and functional requirements contributes to patient acceptance.[8] Portal utilization has been low; 46% of 104 healthcare organizations surveyed reported 5% or less use of their portals.[30] In summary, systematic reviews and qualitative and quantitative studies have examined specific applications, features and their use, user characteristics, cost, and secure messaging. Findings indicated that the most frequent setting for these studies was primary care and specialty clinics. There have been limited studies conducted from the perspective of an integrated healthcare delivery system. The purpose of this study was to explore user characteristics and portal activation by a diverse population of patients within a comprehensive health system.

METHODS
Design
An observational, retrospective design was used to examine user characteristics of patients who activated the MyChart portal. The research question was: What are the demographic characteristics of patients using the patient portal? The institutional review board (IRB) reviewed the protocol and approved the study (IRB 15.1805).

Sample
The sample consisted of all health system patient encounters captured between July 2014 and June 2015. This included all patients accessing the portal system at any point in the continuum of care. Patients younger than 18 years were excluded.

Activation codes for portals are generated at the end of each visit and provided to the patient. Providers in clinic and hospital settings are encouraged to activate patient portal accounts during visits. The health system also recommends that dedicated devices in clinical areas be made available for patients to activate their accounts. Patients also can request an activation code via the system Web site. After verification and processing, the activation code is e-mailed to the address provided. The use of the patient portal MyChart at this health system has evolved since 2012 (Figure 1). The MyChart patient portal was part of the initial Epic Ambulatory Go Live in April 2012 that included 14 sites. At the end of 2014, 16 Community Connect practices were participating in the use of MyChart. Inpatient Go Live for all five system hospitals took place in January 2014. The Epic upgrade from version 2010 to versions 2012 and 2014 took place in May 2015. Features of the software upgrade included a complete redesign of the patient portal Web site.

Data Collection

Patients' user data were obtained from the EpicCare database and included age, date of birth, gender, ethnicity, race, and zip code. Federal poverty levels (FPLs) by area (defined by US Postal Service zip code) were captured from the 2013 US census 5-year estimates. Patients' zip codes and corresponding percentage below FPL were derived from census data. The primary focus of the study was the "Activated" patient portal status. All other status indicators were combined to represent "Non-Activated" patients, including the subset of "Inactivated," "Activation Code Not Used," and "Patient Declined."

Definition of Terms

The research team used the following operational definitions to guide data collection and analysis.

Activation: Patient has an active portal account; utilization was initiated.

Inactivated: Portal accounts were active previously and then deactivated. Patient accounts are inactivated automatically after too many failed log-in attempts or by the portal administrator for inappropriate use of the system.

Activation Code Not Used: The patient was provided an access code but did not activate the portal.

Patient Declined: The patient was offered an access code but declined and never used the access code. When a patient declined to use the portal, status remained inactive for 60 days so that a new code was not generated during that time.

Statistical Analysis

Univariate analysis was conducted to evaluate associations between patient portal activation and predictive factors, using χ^2 tests. Patient age was converted to 10-year categories for analysis. Hispanic race and ethnicity were recorded as two separate variables in the medical record system and combined for analysis (ie, both Hispanic race and ethnicity were counted as Hispanic). Individual payers were categorized as Medicare, Medicaid, commercial managed care, military (Tricare, Veterans Affairs), self-pay, and charity. A multiple logistic regression model was calculated to determine independent predictors of patient portal activation (Table 1.) Factors were considered in the multiple regression model if univariate $P < .20$. Continuous predictive factors were converted to quartile categories for multiple regression analysis. Backward stepwise selection was used to exclude predictors from the multiple regression model until all remaining factors were statistically significant at the level of $P < .05$. Statistical analysis was conducted using Stata/SE version 12 (College Station, TX). To assess the extent of multicolinearity, variance inflation factors were evaluated for all independent variables in the final multiple regression model. All regression model
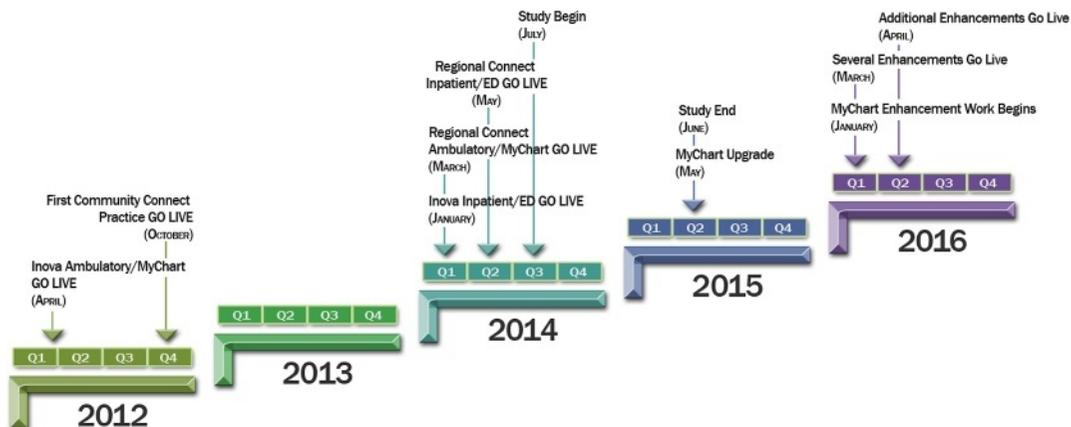

FIGURE 1. MyChart study timeline.

Table 1. Multiple Logistic Regression Model

	Odds Ratio	95% Confidence Interval		P
Age, y				
18–19	0.54	0.49	0.58	<.001
20–29	0.90	0.87	0.93	<.001
30–39	(Reference)			
40–49	0.90	0.88	0.93	<.001
50–59	0.86	0.84	0.88	<.001
60–69	0.81	0.78	0.83	<.001
70–79	0.54	0.52	0.57	<.001
80–89	0.32	0.30	0.34	<.001
≥90	0.21	0.19	0.23	<.001
Male	0.94	0.93	0.96	<.001
English primary language	1.63	1.59	1.67	<.001
Hispanic ethnicity	0.50	0.48	0.52	<.001
Race				
White	(Reference)			
African American	0.54	0.53	0.56	<.001
Asian	0.90	0.87	0.93	<.001
Middle Eastern	0.52	0.48	0.56	<.001
Other	0.81	0.79	0.83	<.001
Percentage below FPL				
<3.5%	(Reference)			
3.5%–5.59%	0.83	0.82	0.85	<.001
5.6%–8.69%	0.85	0.83	0.87	<.001
≥8.7%	0.89	0.87	0.92	<.001
Employment status				
Full time	(Reference)			
Disabled	0.47	0.44	0.50	<.001
Not employed	0.56	0.54	0.58	<.001
Active duty	0.47	0.35	0.63	<.001
Part time	0.69	0.66	0.72	<.001
Retired	0.92	0.89	0.95	<.001
Self-employed	0.75	0.71	0.78	<.001
Student	0.92	0.86	0.99	.020
Unknown	1.18	1.15	1.21	<.001
Named primary care provider	4.17	4.02	4.33	<.001
No. of encounters over 9 mo				
1	(Reference)			
2–3	1.84	1.81	1.88	<.001
≥4	3.27	3.20	3.34	<.001
Constant	0.0503	0.05	0.05	<.001

variables were found to have variance inflation factors of 6.04 or less, indicating multicolinearity was not problematic. All tests were two-sided, and statistical significance was assessed at the level of α = .05.

RESULTS

Between July 2014 and June 2015, 461 700 patients had encounters with the health system. A total of 387 198 patients met the study inclusion criteria; of those, 80 435 (20.8%) activated their MyChart accounts. Commercial insurance (66%) was the most common payer for the sampled population (Figure 2).

The demographic and clinical indicators that were associated with MyChart activation status were age, primary language, ethnicity, race, zip code FPL, employment status, known primary care provider, number of clinical encounters, and payer (Table 2).

MyChart activation was highest among English-speaking patients (23.4%) and lowest among Spanish-speaking patients (4.1%). In addition, Hispanic ethnicity had a low activation percentage (10%) compared with non-Hispanic (22%). White patients had the highest activation (25% of white patients activated), followed by Asian (21%), African American (16%), Middle Eastern (13%), and other (15%). Activation was lower among patients living in areas (categorized by zip code) where higher proportions of residents have incomes below the FPL. Additional findings, as outlined in Table 2, indicated that patients with full-time employment were most likely to have an activated MyChart account (24%), followed by retired (21%), self-employed (20%), and students (20%). Among patients with identified primary care providers, 23% activated their accounts versus 6% of patients with unknown primary care providers. Patients with more than four encounters with the healthcare provider over the 1-year study period were more likely to have activated their accounts (31%) versus those with a single encounter (13%). MyChart activation increased with age up to 70 years (Figure 3). Activation was highest among patients between
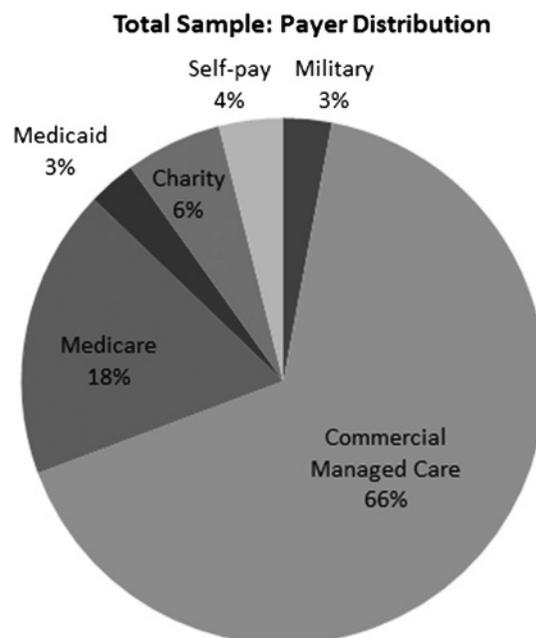
FIGURE 2. Payer distribution among study patients.

Table 2. Characteristics of Study Patients

Characteristics	Frequency, n (%)	Activated, n (%)	Nonactivated, n (%)	χ^2	P
Total	387 198 (100)	80 435 (20.8)	306 740 (79.2)		—
Sex				3.05	.081
Male	155 790 (40)	32 149 (20.6)	123 641 (79.4)		
Female	231 385 (60)	48 286 (20.9)	183 099 (79.1)		
Age, y				1.7×10^3	<.001
18–19	7728 (2)	913 (12)	6815 (88)		
20–29	54 652 (14)	10 223 (19)	44 429 (81)		
30–39	68 709 (18)	14 743 (22)	53 966 (79)		
40–49	69 041 (18)	14 770 (21)	54 271 (79)		
50–59	70 908 (18)	15 961 (23)	54 947 (78)		
60–69	58 692 (15)	13 858 (24)	44 834 (76)		
70–79	36 005 (9)	7071 (20)	28 934 (80)		
80–89	17 626 (5)	2494 (14)	15 132 (86)		
≥90	3837 (1)	402 (11)	3435 (90)		
Primary language				7.0×10^3	<.001
English	297 895 (77)	69 720 (23)	228 175 (77)		
Spanish	24 872 (6)	1023 (4)	23 849 (96)		
"Interpreter not required"	43 568 (11)	7271 (17)	36 297 (83)		
Other	20 863 (5)	2421 (12)	18 442 (88)		
Hispanic ethnicity/race				3.3×10^3	<.001
Hispanic	44 315 (11)	4586 (10)	39 729 (90)		
Non-Hispanic	342 883 (89)	75 849 (22)	267 034 (78)		
Race				4.8×10^3	<.001
White	216 457 (56)	53 094 (25)	163 363 (76)		
Black/African American	49 534 (13)	8052 (16)	41 482 (84)		
Asian	26 357 (7)	5644 (21)	20 713 (79)		
Middle Eastern	7129 (2)	926 (13)	6203 (87)		
Other	87 721 (23)	12 719 (15)	75 002 (86)		
FPL level by zip code				923.5	<.001
<3.5%	90 328 (23)	21 915 (24)	68 413 (76)		
3.5%–5.59%	103 948 (27)	21 336 (21)	82 612 (79)		
5.6%–8.69%	95 759 (25)	18 586 (19)	77 173 (81)		
≥8.7%	93 669 (24)	17 966 (19)	75 703 (81)		
Employment status				2.8×10^3	<.001
Full time	165 271 (43)	39 956 (24)	125 315 (76)		
Retired	73 491 (19)	15 469 (21)	58.022 (79)		
Not employed	47 953 (12)	7024 (15)	40 929 (85)		
Part time	16 789 (4)	2915 (17)	13 874 (83)		
Self-employed	12 900 (3)	2609 (20)	10 291 (80)		
Student	6875 (2)	1346 (20)	5529 (80)		
Disabled	5861 (2)	1015 (17)	4846 (83)		
Active duty	461 (0.1)	55 (12)	406 (88)		
Unknown	57 597 (15)	10 046 (17)	47 551 (83)		
Primary care provider				8.9×10^3	<.001
Named	327 468 (85)	76 615 (23)	250 853 (77)		
Unknown/none	59 730 (15)	3820 (6)	55 910 (94)		
No. of encounters (over 9 mo)				1.3×10^4	<.001
1	152 139 (39)	18 991 (13)	133 148 (88)		
2–3	115 489 (30)	24 871 (22)	90 618 (79)		
≥4	119 570 (31)	36 573 (31)	82 997 (69)		

(continues)

Table 2. Characteristics of Study Patients *(Continued)*

Characteristics	Frequency, n (%)	Activated, n (%)	Nonactivated, n (%)	χ^2	P
Payer				7.8×10^3	<.001
Medicare	68 600 (18)	13 874 (20)	54 726 (80)		
Medicaid	11 137 (3)	1159 (10)	9978 (90)		
Commercial managed care	259 388 (67)	60 778 (23)	198 610 (77)		
Military	11 109 (3)	2888 (26)	8221 (74)		
Self-pay	14 528 (4)	583 (4)	13 945 (96)		
Charity	22 436 (6)	1153 (5)	21 283 (95)		

the ages of 60 and 69 years (24%), followed by those 50 to 59 years of age (23%). Activation rates diminished with increasing age beyond 70 years. Although patients with military payers represented only 3% of the study sample, those patients had the highest MyChart activation percentage at 26% (Figure 4).

The multiple regression analysis revealed patterns similar to the univariate analysis. Independent predictors of portal activation were age, sex, language, race, ethnicity, zip code, poverty level, employment status, known primary care provider, and number of encounters (all $P < .001$). McFadden's pseudo-R^2 for the final model (0.094) suggested a moderate level of variation in the outcome (portal activation status) and was explained by the multiple regression variables.

LIMITATIONS

There are several limitations to this study. The research was conducted in one healthcare system, and the demographics of this population may not be reflective of other regions in the nation. The study was conducted and data retrieved from the period July 2014 to June 2015 and provided a one-time view of portal activation. Since that period, multiple updates and revisions have been made to the portal system. Education levels were not available for the population studied, so inferences cannot be made about education as a predictor. The socioeconomic data were obtained per proxy using the FPL by zip code. It was assumed that the person

activating the MyChart account was the patient. Portal activation was not explored based on patient diagnosis. The researchers could not ascertain whether the patient was ambulatory versus inpatient status at the time of activation, because patients can activate at any point in the process of care. The patient could have activated the portal after being hospitalized or after being seen in a clinic. The activation process could occur at any point in the care continuum, and activation was not coded to an episode of care.

DISCUSSION

In the current study, the overall activation rate was 21%, which was lower than the organizational goal of 40%. This was still higher than the 10% activation rate reported by 63% of healthcare organizations surveyed in a 2015 report.[30] Many of the study's findings are congruent with previously published studies investigating portal use. Whereas other studies looked at portal utilization, this study focused on portal activation. For example, MyChart activation was greater for English-speaking patients. There is limited literature that examined the language aspect of portal usage. The demographics in the current study included a high percentage of Spanish-speaking individuals. At the time this study

FIGURE 3. Portal activation by patient age.
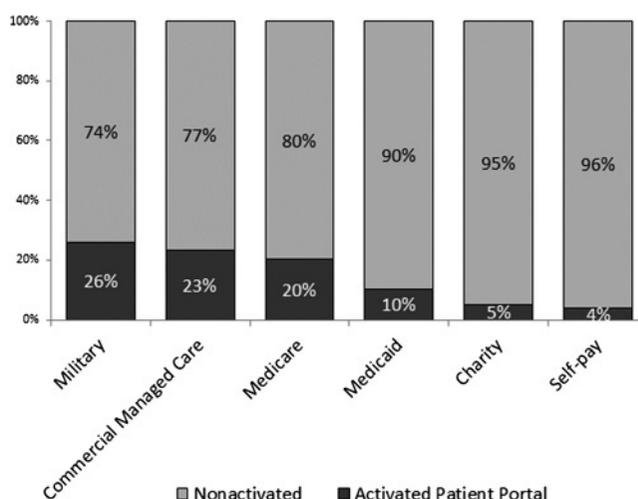
FIGURE 4. Activation by payer.

was conducted, the health system's portal was available only in English, which may be a reason for the greater activation among the English-speaking population. The results of this study were consistent with previous studies that revealed differences in portal use by age.[4,7] What was unique about this study was the higher activation rater for older adults (60–69 years of age). Although the activation age was higher than expected, it is unclear whether the patient or a caregiver activated portal use. These results may not be representative of other regions because of the unique demographics of this region, including a 60% college completion rate and higher than average family income.

Patients with access to private insurance had higher rates of activation. Particularly noteworthy in this study was the finding that patients who identified a primary care provider were more likely to activate MyChart. This study provided information that can be used to enhance MyChart activation and engage patients who are not currently using the portal system. This study suggests that patients may be more likely to activate a patient portal if they have reported an identified provider. The findings of this study on portal use are congruent with previous studies for income[9,11] and insurance.[9] This study found that minorities were less likely to use the portal, which was also reported in other studies.[9,24] In contrast to previous studies, this study revealed that male and female activation was almost equal.[4,14]

IMPLICATIONS AND RECOMMENDATIONS

The low activation rate has prompted the exploration of opportunities to increase patient engagement through portal activation. It was observed that the Spanish-speaking population had the lowest rates of activation. Since the study, this health system implemented both the Spanish patient portal and mobile application. The team created an innovative solution for messages received via the portal in Spanish that needed to be translated for response. The team continues to assess ways to increase portal activations and to make it most useful to patients who have activated and use MyChart. To reach a broader group of patients and meet Meaningful Use goals, it is necessary to provide a Spanish portal. It provides a reliable way to communicate with patients. Many healthcare systems have faced challenges with a patient portal available only in English. Patient portal promotional materials should also be produced in Spanish to explain the benefits of the portal and encourage its use. Methods that support certain patients to activate the portal may not work for all patients.

This health system is in the process of making changes to include adult proxy and to create a process for the caregiver to activate accounts. The enhanced system would give the caregiver access to the portal and differentiate among who uses it. The assignment of a navigator or a patient advocate may help with activation. During each patient encounter,

staff and care providers must involve the patient in activating the portal. This should be a team effort to include front-desk staff, registrars, patient care navigators, and others who can facilitate this process. It has been proposed at discharge that the healthcare provider or nurse document in the electronic healthcare record the patient's portal activation status and education. This would create a method of postdischarge communication and provide a means for further planning and education. Portal utilization starts with activation. It is an evolving communication tool to connect patients with the healthcare team. Patient care can be safer, more efficient, and patient centered when there is consistent communication between patients and their providers. The Institute of Medicine as early as 2001 recommended "the healthcare system should be responsive at all times (24 hours a day, every day) and that access to care should be provided over the Internet, by telephone, and by other means in addition to face-to-face visits."[31(p8)] MyChart and other patient portals continue to provide opportunities to build on the Institute of Medicine's recommendations to enhance communication and shared information.

FUTURE STUDIES

Recommendations for future studies include examining factors that enhance activation for those who are underserved or non–English speaking. In addition, questions could be added to the Hospital Consumer Assessment of Healthcare Providers and Systems survey that relates to patient portal utilization and satisfaction with care. It has been proposed to implement patient portal activation and education at discharge with appropriate documentation in the healthcare record. This would create a method of patient engagement beyond discharge and provide a means to continue patient care and improve patient outcomes.

Other areas for future research may be the examination of diagnostic predictors and matching patterns of activation and utilization with demographics. Future research questions include the following: Is there is a higher activation rate from clinics or hospitals? If a portal is offered in additional languages, would it increase activation and utilization?

CONCLUSION

The research in the use of patient portals is evolving. This study has contributed to the current knowledge on patient portals by identifying predictors of portal activation from the perspective of an integrated healthcare delivery system and examining portal activation among a large diverse urban population. Findings from this study can inform researchers planning future patient portal studies and assist providers in identifying strategies for increasing the activation among diverse populations. Many healthcare systems have faced challenges with a patient portal available only

in English. As a result of the findings from the study, this health system implemented a Spanish patient portal and mobile application. The portal promotional video, brochures, and instructions on the mobile application were translated into Spanish for patient use. In addition, solutions were developed to translate messages from healthcare providers into Spanish. This study highlights some of the challenges of patient activation. It demonstrated that those without insurance or a primary care provider may have been at a disadvantage for portal activation. This presents a compelling case for future research and efforts to engage all health consumers in their healthcare.

Acknowledgments

References

1. Fairfax County Government. Fairfax County general overview: additional demographic indicators. http://www.fairfaxcounty.gov/demogrph/gendemo.htm. Accessed March 9, 2017.

2. HealthIT.gov. EHR Incentives and Certification. 2015. https://www.healthit.gov/providers-professionals/meaningful-use-definition-objectives. Accessed March 9, 2017.

3. CMS.gov Centers for Medicare and Medicaid. Health Records (EHR) incentive Programs. https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/ehrincentiveprograms/. Accessed March 9, 2017.

4. Fleming NL, Cullen D, Luna G. An evaluation of patient web portal engagement: an exploratory study of patients with hypertension and diabetes. *Online Journal of Nursing Informatics*. 2015;19(3): 1–8.

5. Lyles CR, Sarkar U, Ralston JD, et al. Patient-provider communication and trust in relation to use of an online patient portal among diabetes patients: the Diabetes and Aging Study. *Journal of the American Medical Informatics Association*. 2013;20(6): 1128–1131.

6. Riippa I, Linna M, Ronkko I. A patient portal with electronic messaging: controlled before-and-after study. *Journal of Medical Internet Research*. 2015;17(11): e250.

7. Shaw RJ, Ferranti J. Patient-provider Internet portals—patient outcomes and use. *CIN: Computers, Informatics, Nursing*. 2011;29(12): 714–718.

8. Irizarry T, DeVito Dabbs A, Curran CR. Patient portals and patient engagement: a state of the science review. *Journal of Medical Internet Research*. 2015;17(6): e148.

9. Ancker JS, Barron Y, Rockoff ML, et al. Use of an electronic patient portal among disadvantaged populations. *Journal of General Internal Medicine*. 2011;26(10): 1117–1123.

10. Sarkar U, Karter AJ, Liu JY, et al. The literacy divide: health literacy and the use of an Internet-based patient portal in an integrated health system—results from the Diabetes Study of Northern California (DISTANCE). *Journal of Healthcare Communications*. 2010;15(suppl 2): 183–196.

11. Osborn CY, Mayberry LS, Wallston KA, Johnson KB, Elasy TA. Understanding patient portal use: implications for medication management. *Journal of Medical Internet Research*. 2013;15(7): e133.

12. Kruse CS, Argueta DA, Lopez L, Nair A. Patient and provider attitudes toward the use of patient portals for the management of chronic disease: a systematic review. *Journal of Medical Internet Research*. 2015;17(2): e40.

13. Tieu L, Sarkar U, Schillinger D, et al. Barriers and facilitators to online portal use among patients and caregivers in a safety net health care system: a qualitative study. *Journal of Medical Internet Research*. 2015;17(12): e275.

14. Jung C, Padman R, Shevchik G, Paone S. Who are portal users vs. early e-Visit adopters? A preliminary analysis. *AMIA Annual Symposium Proceedings* [serial online]. 2011;2011: 1070–1079.

15. Chen C, Garrido T, Chock D, Okawa G, Liang L. The Kaiser Permanente electronic health record: transforming and streamlining modalities of care. *Health Affairs*. 2009;28(2): 323–333.

16. Gray P, El Sawy OA, Asper G, Thordarson M. Realizing strategic value through center-edge digital transformation in consumer-centric industries. *MIS Quarterly Executive*. 2013;12(1).

17. Do NV, Barnhill R, Heermann-Do KA, Salzman KL, Gimbel RW. The military health system's personal health record pilot with Microsoft HealthVault and Google health. *Journal of the American Medical Informatics Association*. 2011;18(2): 118–124.

18. Rodriguez ES. Using a patient portal for electronic communication with patients with cancer: implications for nurses. *Oncology Nursing Forum*. 2010;37(6): 667–671.

19. Chan D, Howard M, Dolovich L, Bartlett G, Price D. Revolutionizing patient control of health information. *Canadian Family Physician* [serial online]. 2013;59(8): 823–824.

20. Weingart SN, Carbo A, Tess A, et al. Using a patient Internet portal to prevent adverse drug events: a randomized, controlled trial. *Journal of Patient Safety*. 2013;9(3): 169–175.

21. Haun JN, Lind JD, Shimada SL, et al. Evaluating user experiences of the secure messaging tool on the Veterans Affairs' patient portal system. *Journal of Medical Internet Research*. 2014;16(3): e75.

22. Tsai J, Rosenheck RA. Use of the Internet and an online personal health record system by US veterans: comparison of Veterans Affairs mental health service users and other veterans nationally. *Journal of the American Medical Informatics Association*. 2012;19(6): 1089–1094.

23. Ancker JS, Osorio SN, Cheriff C, et al. Patient activation and use of electronic patient portal. *Informatics for Health & Social Care*. 2015;40(3): 254–266.

24. Goldzweig CL, Orshansky G, Paige NM, et al. Electronic patient portals: evidence on health outcomes, satisfaction, efficiency, and attitudes: a systematic review. *Annals of Internal Medicine*. 2013;159(10): 677–687.

25. Ronda MC, Dijkhorst-Oei L, Rutten GE. Reasons and barriers for using a patient portal: survey among patients with diabetes mellitus. *Journal of Medical Internet Research*. 2014;16(11): e263.

26. Wade-Vutero A, Mayberry L, Osborn C. Secure messaging and diabetes management: experiences and perspectives of patient portal users. *Journal of the American Medical Informatics Association*. 2013;20: 519–525.

27. Kruse CS, Bolton K, Freriks G. The effect of patient portals on quality outcomes and its implications to meaningful use. A systematic review. *Journal of Medical Internet Research*. 2015;17(2): e44.

28. Wright E, Darer J, Tang X, et al. Sharing physician notes through an electronic portal is associated with improved medication adherence: quasi-experimental study. *Journal of Medical Internet Research*. 2015;17(10): e226.

29. Otte-Trojel T, Rundall TG, de Bont A, van de Klundert J, Reed ME. The organizational dynamics enabling patient portal impacts upon organizational performance and patient health: a qualitative study of Kaiser Permanente. *BMC Health Services Research*. 2015;15: 559.

30. Murphy-Abdouch K. Patient access to personal health information: regulation vs. reality. *Perspectives in Health Information Management*. 2015;12: 1–10.

31. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, DC: National Academy Press; 2001.

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