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Factors affecting the use of patient portals among chronically ill patients in an outpatient hospital setting, kingdom of Saudi Arabia

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Abstract

Background: In the light of the major healthcare transformations taking place in the Kingdom of Saudi Arabia (KSA), more focus is placed on promoting patient engagement to improve the quality of healthcare services provided. There is limited research that explores the factors related to the use of patient portals in KSA, which support patient engagement. We aimed to investigate factors that contribute to the use of a specific patient portal system, implemented at Prince Sultan Military Medical City, Riyadh, KSA among chronically ill patients in an outpatient setting.

Method: A cross-sectional study was performed in the adult outpatient clinics. We included five main outcomes: self-reported portal use, participant characteristics, patient activation levels, e-Health literacy scores, and the availability of internet access at home. We used descriptive analyses, univariate and multivariate logistic regression to analyze the data.

Results: A total of 403 patients (81% response rate) participated in our study. More than 50% of the participants were female, younger than 55 years, educated, with monthly family income less than 10,000 SR. Most of the participants reported at least one form of internet connection. A total of 212 (52.6%) participants were users of the portal. Patient activation measure scores were at level 3 or below for the majority of participants (66%) and e-Health literacy scores were at a moderate to a high level for 276 (69%) of participants. Portal use was more likely among males (OR = 2.182, $p = 0.00$), with two or more forms of internet connections (OR = 5.586, $p = 0.037$), and with moderate to high levels of e-Health literacy (OR = 2.028, $p = 0.003$) (OR = 2.309, $p = 0.022$). There was a positive correlation between e-Health literacy scores and patient activation levels ($R = 0.321$, $p = 0.000$).

Conclusion: Patient portal use was significantly influenced by certain factors, including gender, level of e-Health literacy and availability of internet. There is a tremendous opportunity to improve the use of patient portal by focusing on methods to increase the level of patient activation and e-Health literacy scores.

Keywords: Patient portal, e-Health literacy, patient activation, patient engagement

Introduction

In the light of the major national transformations taking place in the Kingdom of Saudi Arabia (KSA), with the announcement of the country's 2030 vision, healthcare organizations are more focused on providing tools to support patient engagement and self-health management^[1]. Promoting patient engagement^[2], can potentially improve the quality of healthcare services and lower healthcare costs^[3] allow patients to monitor the decision-making of their health care^[4], and improve health-related outcomes^[5].

The introduction of patient portals known as "secure online website that gives patients convenient, 24-hour access to personal health information -stored in EHR - from anywhere with an Internet connection"^[6] has been visibly increasing in many hospitals^[2, 7-9]. Patients can access their health records to view prescriptions, immunizations, allergies, lab results, recent medical appointments, and discharge summaries. Some patient portals have additional features that allow patients to request prescription refills, schedule non-urgent appointments, display educational materials, update contact details, and make payments^[6].

Despite the many advantages of using patient portals, their use among patients and consumers is considered to be low^[10], with global average adoption rates as 52%^[7]. According to the social cognitive theory of patient's behaviors^[11, 12], the ability to

adapt and use patient portals is highly affected by internal factors related to the patient, such as age, race, level of education, health literacy, health status, and the role as a caregiver. External environmental factors also play a role in the use of patient portals, which include social support, health care delivery factors, availability, and accessibility of internet connections [11, 12].

In an attempt to explore the reasons contributing to the low patient portal usage rates, several studies have linked their findings to many factors such as racial and ethnical minorities, low income, low literacy, the lack of knowledge, elderly, and disabled persons [13-17]. Fisher, Clayton & O'Donnell *et al.* suggested that lack of knowledge related to confidentiality and privacy issues may reduce the adoption of patient portals by patients and consumers [18, 19]. Other researchers investigated the relationship between portal use and e-Health literacy [20, 21] between portal use and the level of patient activation [22-25] and between portal use and the availability of internet at home and overall online behavior [13-17].

Results from studies exploring the relationship between portal use and e-Health literacy known as "the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem" [21, 26] were varying. Price-Haywood *et al.* found e-Health literacy positively correlated with portal use [21], while Khan *et al.* found that while participants' e-Health literacy skills were high, their actual use of the portal remained limited [20].

The Patient Activation Measure (PAM)©, a measure usually linked with patient engagement, which describes the "knowledge, skills, and confidence a person has in managing their own health and care" [22, 24, 27], has also been examined by researchers in relation to portal use. While Norman & Skinner, and Woods *et al.*, found no significant relationship between PAM and portal use [17, 26], others reported that patients with high levels of activation were more likely to actually use the portal [23, 25] Grossman *et al.* specifically used PAM as one of the measurement tools to evaluate technology access, technical assistance, and disparities in inpatient portal use [28].

Based on our knowledge, many studies have been conducted to explore several aspects of patient portals and their role in enhancing health outcomes; however in KSA we only found one study, which discussed the idea of the patient portal concept through examining Saudi diabetic patients' attitudes towards patient portal use and their perceived e-Health literacy [29]. Given the scarcity of research in this area, our aim was to investigate factors that may be correlated with the use of a specific patient portal system, implemented at Prince Sultan Military Medical City (PSMMC) hospital, Riyadh, KSA. Our objective was to specifically identify the role of patient demographic factors, level of patient activation, and e-Health literacy on the use of patient portals among chronically ill patients in a primary care setting. By identifying factors associated with the use of patient portals, it may inform others on the best approaches to follow to improve user utilization, experience and engagement.

Method

Study setting and the patient portal system (PATTAL)

The PSMMC was formerly known as the Riyadh Military Hospital, one of the largest and oldest hospitals in KSA located in the capital city Riyadh. It was formally

inaugurated in December 1978 to serve all the workers of the ministry of defense and their families. It has 16 primary health centers situated in various regions of the city of Riyadh. More than 700, 000 patients are eligible to receive healthcare at the hospital. The PSMMC's primary care centers include four outpatient clinics; Wazarat clinic, Moroj clinic, Manar clinic, and Senior officer clinics. The PSMMC established a patient portal named PATTAL, which was derived from the first three letters of the word patient (PAT-) combined with the last three letters of the word portal (-TAL). The portal was introduced in 2014 to support hospital patients. It contains several features that allow patients to access information including medical history, lab results, radiological reports, future appointments, and prescriptions. It also offers a range of services, such as scheduling appointments in general and dental clinics, requesting medication refills, access to health calculators and health education services, sending complaints, and requesting for sick leave reports. The majority of PATTAL's features can be displayed to the patient in Arabic or English languages, with the exception of laboratory results and radiological reports, which only are displayed in English.

Study design

This is a prospective descriptive cross-sectional study conducted at the four adult outpatient clinics at the PSMMC. We developed a paper-based questionnaire and incorporated standardized measurement tools [13, 16, 29]. Data collection lasted for three months starting on 1/8/2019 and ending on 30/10/2019.

Study instrument

The developed questionnaire included a total of 42 closed-ended questions divided into four sections: PAM measurement tool, Saudi e-Health Literacy (SeHL), PATTAL use, and socio-demographic data.

The first section focused on assessing the level of patient activation using the PAM 13-questions measurement tool [13, 16]. The questions measure self-reported health and disease knowledge, perceptions of one's position in the health, and self-efficacy for a variety of health-related activities. Based on participants' answers, one of four levels of activation were assigned to participants; level 1 is believing that their role in their health is important, level 2 is learning and building confidence to act, level 3 is taking action to support health, and level 4 is maintaining health activities, even under stress. PAM license (Arabic version) was obtained from insignia company [30] (license number: 1561635664-1593258064).

The second section focused on assessing the level of participants' e-Health literacy using the SeHL scale [29]. SeHL has four evaluation dimensions, which include: usefulness and understanding decision making, confidence and need for assistance, health information seeking, and using technology and use of media. The SeHL scale consists of 19 questions with total scores ranging from 0 to 64. The categorization was based on the 60-80% cut-off point of the bloom, with high level e-Health literacy assigned to participants with scores between 51 to 64, moderate level assigned to participants with scores between 38 to 50, and low level assigned to participants with scores between 0 to 37 [29]. Permission to use the tool was obtained.

The third section focused on measuring PATTAL use

among participants. This section consisted of three questions related to internet connection, registration to use PATTAL, and the extent of use. We defined PATTAL users as patients who registered and used the account at least once during the last 12 months. While nonuser were patients who did not register for a PATTAL account, or did not know about the availability of PATTAL, or registered for a PATTAL account and did not use it during the last 12 months. The fourth and last section of the questionnaire covered socio-demographic questions, which included age, gender, marital status, employment status, income, educational level, and health status.

The study was approved by the PSMCM Institutional Review Board (IRB approval number: 1209).

Eligibility and sampling technique

The required sample size was calculated by using Yamane method [31], resulting in a sample size of 400 participants. We used a convenience sampling technique by including the PSMCM’s four primary health centers (Wazarat, Moroj, Manar, and senior officers) in this study. Patients were eligible if they were 18 years of age or older, able to write, read and communicate in Arabic, and had one or more of the following chronic diseases: diabetes mellitus, hypertension, dyslipidemia, or asthma.

Survey administration

The survey was randomly distributed to patients by researcher (JS) with the assistance of the clinics’ nursing team, consisting of seven nurses. To ensure ethical and standard procedures were followed, researcher (JS) explained to the nursing team the goals of the study and how to interact with potential participants when distributing the questionnaires. The team then approached patients waiting to be seen by their providers in the clinics’ waiting rooms to explain the aims of this study and obtain written consents of all patients willing to participate. A total of 500 paper-based questionnaires were distributed randomly to patients, who met the inclusion criteria. The questionnaire took 10 to 20 minutes to be completed.

Data and statistical analysis

Participants’ paper-based responses were transferred to an electronic Microsoft excel sheet for coding and analysis using SPSS software [version 22]. Descriptive statistics were reported for the following variables: (1) level of patient activation, (2) e-Health literacy (3) access to internet at home, (4) PATTAL use, and (5) socio-demographic data. These variables were classified as categorical data and summarized in proportions. Participant responses to the 13 PAM questions were uploaded to the insignia researcher account to calculate patient scores. PAM measures were categorized into two levels; Low/moderate level of activation (included level 1, 2, and 3) and high level of activation (included level 4). Univariable logistic regression was used to calculate correlations between the use of PATTAL as a binary variable and the four predictors (participants’ demographics, internet access, patient

activation, and e-Health literacy). A multivariate model was developed to evaluate the relationship between patient activation and the odds of PATTAL use, and between e-Health literacy and the odds of PATTAL use. The Chi-square statistical test was performed to compare the factors that were found to be statistically influenced by the use of PATTAL (results from the univariable logistic regression). Findings were considered statistically significant at p<0.05.

Results

Out of the 500 questionnaires distributed to patients, a total of 97 (19%) were not returned or omitted due to incompleteness, resulting in a total number of 403 questionnaires included in our study (81% response rate). More than 50% of the participants were female, younger than 55 years, educated, and their monthly family income was less than 10, 000 SR (Table 1). Most of the participants reported at least one form of internet connection, with only 3% reporting no internet connection at home (Table 2). When participants were asked about PATTAL registration and use, 225 (56%) of participants indicated having a PATTAL account and 212 (52.6%) of participants were users of PATTAL (patients who registered and used the account at least once during the last 12 months). Results from PAM measure indicated the majority 265 (66%) of the participants scored a level of activation at 3 or below. While the e-Health literacy indicated the majority of participants 276 (69%) had a moderate to a high level of e-Health literacy score (Table 3).

Table 1: Participants’ demographic and health characteristics (N = 403)

Characteristic	N (%)
Age (years)	
<55	240 (59.5)
>= 55	163 (40.5)
Gender	
Male	194 (48)
Female	209 (52)
Educational level	
Elementary	81 (20.1)
Intermediate	82 (20.3)
Secondary*	134 (33.3)
Higher Education**	106 (26.3)
Employment status	
Employed	130 (32)
Unemployed	152 (38)
Retired	121 (30)
Marital status	
Married	339 (84)
Unmarried	64 (16)
Income per month	
<10000SR	206 (51)
>= 10000 SR	197 (49)
Health condition	
1 disease	111 (27.5)
2 diseases	141 (35)
3 = < diseases	151 (37.5)

* Equivalent to a high school diploma.

** Any professional degree higher than a high school diploma.

Table 2: Internet connection and PATTAL usage among participants (N = 403)

Characteristic	N (%)
Availability of home internet connection	
Not available	11 (3)

Available by one type of internet connection	255 (63)
Available of two types or more of internet connection *	137 (34)
Registered PATTAL account	
Yes	225 (55.8)
No	178 (44.1)
Users of PATTAL account	
Yes	212 (52.6)
No**	191 (47.3)

*Includes DSL modem, WIFI, and mobile phone connections. ** Non user are patients who did not register for a PPATTAL account, or did not know about the availability of PPATTAL, or registered for a PPATTAL account and did not use it during the last 12 months.

Table 3: Patient activation and e-Health literacy among participants (N = 403)

Characteristic	N (%)
Patient activation	
Low/moderate (levels 1, 2 & 3)	265 (66)
High (level 4)	138 (34)
E-Health literacy	
Low	127 (31)
Moderate	225 (56)
High	51 (13)

Table 4 illustrates the participants' characteristics and their association with odds of PATTAL use using univariable logistic models. The use of PATTAL was more likely among males (OR = 1.681, p = 0.010), participants who were younger than 55 years (OR = 1.627, p = 0.017), those with ≥ 10000 SR income per month (OR = 1.641, p = 0.014), those with secondary and higher education (OR = 2.296, p = 0.004) (OR = 3.449, p = 0.000), and those who

were unemployed (OR = 0.604, p = 0.040). In addition, PATTAL usage was more likely among participants who had more than two types of internet connections in their homes (OR = 7.356, p = 0.013). The number of reported diseases (health conditions) and marital status were not correlated with PATTAL use among participants. (Table 4). Univariable logistic models (Table 5) shows the odds of PATTAL use and the level of patient activation and e-Health literacy. PATTAL use was significantly higher among patients with patient activation level 4 (OR = 1.499, p 0.049).

The resulting multivariate model showed that PATTAL use was not significantly correlated with patient activation. PATTAL use was more likely among males (OR = 2.182, p = 0.00), with two or more forms of internet connections at home (OR = 5.586, p = 0.037), and with moderate to high levels of e-Health literacy (OR = 2.028, p = 0.003) (OR = 2.309, p = 0.022), respectively.

Table 4: Participants' characteristics and association with odds of using PATTAL

Characteristic	N (%)			Unadjusted OR for use of PATTAL (95% CI)	p-value	Adjusted OR for use of PATTAL (95% CI)	p-value
	Total sample (N = 403)	Pattal Users (N = 212)	Pattal nonusers (N = 191)				
Age (years)							
<55	240 (59.6)	138 (65)	102 (53)	1.627 (1.090 - 2.429)	0.017		
≥ 55	163 (40.4)	74 (35)	89 (47)	reference	-		
Gender							
Male	194 (48)	115 (54)	79 (41)	1.681 (1.132 - 2.495)	0.010	2.182 (1.415-3.365)	0.000
Female	209 (52)	97 (46)	112 (59)	reference	-	reference	-
Educational level							
Elementary	81 (20.1)	30 (14)	51 (27)	reference	-		
Intermediate	82 (20.3)	34 (16)	48 (25)	1.204 (.642 - 2.260)	0.563		
Secondary	134 (33.3)	77 (36)	57 (30)	2.296 (1.304 - 4.046)	0.004		
Higher Education	106 (26.3)	71 (33)	35 (18)	3.449 (1.881 - 6.322)	0.000		
Employment status							
Employed	128 (32)	79 (37)	49 (26)	1.299 (.784 - 2.154)	0.310		
Unemployed	154 (38)	66 (31)	88 (46)	0.604 (0.374 - 0.977)	0.040		
Retired	121 (30)	67 (32)	54 (28)	reference	-		
Marital status							
Married	339 (84)	182 (86)	157 (82)	.761 (0.446- 1.300)	0.318		
Unmarried	64 (16)	30 (14)	34 (18)	reference	-		
Income per month							
<10000SR	206 (51)	96 (45)	110 (58)	reference	-		
≥ 10000 SR	197 (49)	116 (55)	81 (42)	1.641 (1.106 - 2.434)	0.014		
Health condition							
1 disease	111 (27.5)	60 (28)	51 (27)	1.161 (0.711 - 1.897)	0.551		
2 diseases	141 (35)	76 (36)	65 (34)	1.154 (0.729 - 1.827)	0.542		
3 = < diseases	151 (37.5)	76 (36)	75 (39)	reference	-		
Availability of home internet connection							
Not available	11 (3)	2 (1)	9 (5)	reference	-	reference	-
Available by one type of internet connection	255 (63)	125 (59)	130 (68)	4.327 (.917 - 20.421)	0.064	3.486 (0.713 - 17.053)	0.123

Available by two types or more of internet connection	137 (34)	85 (40)	52 (27)	7.356 (1.529 - 35.376)	0.013	5.586 (1.113 -28.024)	0.037
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Table 5: Patient activation and E-Health literacy and association with odds of using PATTAL

Characteristic	N (%)			Unadjusted OR for use of PATTAL (95% CI)	p-value	Adjusted OR for use of PATTAL (95% CI)	p-value
	Total sample (N = 403)	PATTAL users (N = 212)	PATTAL nonusers (N = 191)				
Patient activation							
Low/moderate (levels 1-3)	265 (66)	130 (61)	135 (71)	reference	-	reference	-
High (Level 4)	138 (34)	82 (39)	56 (29)	1.521 (1.003- 2.306)	0.049	1.527 (0.957-2.435)	0.076
E-health literacy							
Low	127 (31)	49 (23)	78 (41)	reference	-	reference	-
Moderate	225 (56)	131 (62)	94 (49)	2.218 (1.422 -3.461)	0.000	2.028 (1.269 - 3.240)	0.003
High	51 (13)	32 (15)	19 (10)	2.681 (1.371 -5.243)	0.004	2.309 (1.126- 4.733)	0.022

Finally, we assessed the impact of the e-Health literacy score on the patient activation score among the entire sample by using the simple linear regression test (Figure 1). Table 6 illustrates a positive correlation between e-Health

literacy and the patient activation score (R = 0.321, p = 0.000). On average, with every one-degree rise in the patient's e-Health literacy score, the patient's activation scores would rise by 0.61 degrees.

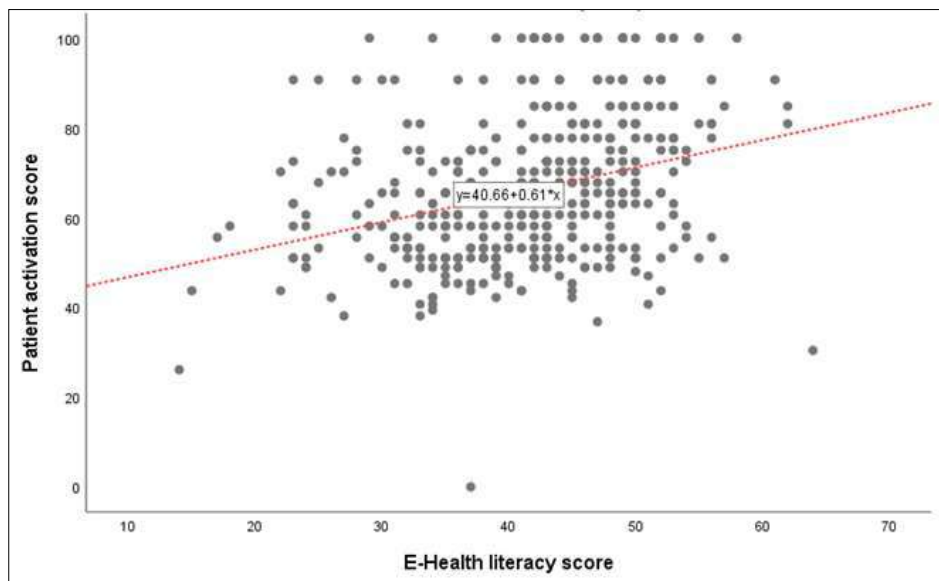


Fig 1: Correlation between e-health literacy and patient activation scores

Table 6: Correlation between e-health literacy and patient activation score

Model	Unstandardized coefficients		Standardized coefficients		t	Sig.
	B	Std. Error	Beta			
E-Health literacy score	0.610	0.090	0.321	6.796	0.000	

a. Dependent variable: Patient activation score.

Discussion

The use of patient portals provides an opportunity for patients to better manage their health and increase their level of engagement. We explored factors that may contribute to the use of PATTAL, a patient portal offered to patients eligible for healthcare services at PSMCC, among chronically ill patients in an outpatient setting. While our participants had reported having one or more chronic diseases, our analysis found that most of the participants scored a low/moderate level of activation using PAM. This indicated that participants were beginning to believe their role in their health and were beginning to develop knowledge and trust in their self-management [32]. This may serve as a barrier to fully engaging in managing

their health condition. Chronically ill patients are required to reach the highest level of activation in order to maintain their health behaviour and achieve self-management [25]. For patients to reach the highest level of patient activation, more focus should be on increasing patient engagement [33]. Increasing the utilization of PATTAL may help in enhancing the activation level among patients, which in turn may improve their knowledge and understanding about their health conditions and increase their level of confidence. Unlike what has been reported by al Othman *et al.* in similar studies [29], the majority of our participants had a moderate to a high level of e-Health literacy score. These participants used PATTAL more frequently compared with participants who had a low e-Health literacy score, similar what has

been reported by Sarkar *et al.* [10]. The association between e-Health literacy and patient activation was an interesting finding. While it showed a weak correlation, the relationship offered an additional indicator that increasing e-Health literacy among patients might potentially have an effect on engaging more patients in their healthcare. Designing specific educational programs for potential non-users may be beneficial in improving e-Health literacy skills and promoting the use of PATTAL.

Gender differences have also been studied as an influencer in technology adoption since men were found to be more adapters of technology compared to women [34]. This was similar to our finding, which reported men using PATTAL more than women. Our study setting at the PSMCMC, may have indirectly influenced this finding as these clinics are established to serve ministry of defence employees and their dependents, with most of the military employees being men in KSA. Another factor might be related to the social norms in the country. Men are generally considered as the responsible individual for their families, including providing access to healthcare. Given this norm, men might consider themselves responsible for registering and using PATTAL for themselves as well as their dependents.

Although PATTAL was introduced in 2014, almost half of the participants did not register and use PATTAL. This finding seemed to be close to the adoption rates reported by other studies, such as [7, 10]. We found that more than one type of internet connection at participants' homes had related to the use PATTAL. This may indicate that internet access might not be as one of the main reasons for the portal's low utilization among our participants. The primary reasons, which may have potentially contributing to the low utilization among our participants could be related to three main factors. First, the PATTAL system may be difficult to use by patients due to language barriers. Given the fact that almost all PSMCMC patients are native Arabic speakers, laboratory and radiological reports are only displayed in English. Being able to produce reports for Arabic speaking patients could in turn increase the utilization of the system. Second, although PATTAL provides much functionality, it does not provide the ability for patients to communicate directly with healthcare providers, which is an important feature of patient portals [35, 36]. Adding this functionality to PATTAL may potentially help in increasing the utilization among patients. Third, announcements about PATTAL, as a patient portal system available to patients at PSMCMC, was done using one method of communication. Administrative staff distributed paper leaflets, posters, and displayed information on the hospital website. While this announcement may reach some patients, many were unaware of existence of the system. Healthcare professionals also have a key role in promoting the use of the portal by communicating with their patients about PATTAL features, how to register and access the system, and when to use it [8]. Integrating the use of PATTAL during patient care may serve as an important factor in increasing the understanding of the effectiveness and positive outcomes related to the use of the portal.

While these factors may have been significant in understanding the reasons behind the low utilization of PATTAL among PSMCMC patients, further research is required to understand patient preferences when using the portal features and possible barriers that led to low utilization.

There were several limitations in our study worthy of notice. First, data collection timing was not well planned. During the time we collected data at the clinics, there was another survey being distributed to patients. This situation was frustrating for some patients, which resulted in them declining to participate. Second, data related to PATTAL use was based on self-reported data rather than extracting usage statistics from PATTAL system. Third, this study was limited to adult chronically ill patients in an outpatient setting. Parents of children visiting the clinics and inpatients were not included in our study. These groups may have shown different results regarding the use of the patient portal. Finally, the generalizability of this study may be limited due to the use of a convenient sample of patients in waiting rooms.

Future research will focus on determining user preferences, usability and satisfaction with PATTAL system to better understand the low utilization rates among patients. Other areas of research will include extracting usage statistics from the system to better inform decision makers about the most and least used features of the system. We also plan on studying the effects of using the portal on healthcare outcomes, and measure the changes in patients' level of activation before and after using the portal, especially among chronically ill patients.

Conclusion

Our study reported factors that had an impact on the use of the patient portal, which included gender, availability of two or more internet connections at home, and e-Health literacy scores. Factors that had no effect were the level of patient activation, and the patients' reported health condition. E-Health literacy was correlated with the patients' level of activation providing a tremendous opportunity to improve the use of the patient portal by increasing levels of e-Health literacy scores. Further educational efforts need to target patients with low e-Health literacy scores and low activation levels to create more engaged patients and empowered consumers responsible for their own personal health.

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