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Predictors affecting personal health information management skills

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Abstract

Objectives—This study investigated major factors affecting personal health records (PHRs) management skills associated with survey respondents' health information management related activities.

Methods—A self-report survey was used to assess individuals' personal characteristics, health knowledge, PHR skills, and activities. Factors underlying respondents current PHR-related activities were derived using Principle Component Analysis (PCA). Scale scores were calculated based on the results of the PCA, and hierarchical linear regression analyses were used to identify respondent characteristics associated with the scale scores. Internal consistency of the derived scale scores was assessed with Cronbach's alpha.

Results—Among personal health information activities surveyed (N=578 respondents), the four extracted factors were subsequently grouped and labeled as: *Collecting Skills* (Cronbach's α = .906), *Searching skills* (Cronbach's α = .837), *Sharing skills* (Cronbach's α = .763), and *Implementing skills* (Cronbach's α = .908). In the hierarchical regression analyses, education and computer knowledge significantly increased the explanatory power of the models. Health knowledge (β = 0.25, $P < 0.001$) emerged as a positive predictor of PHR *Collecting skills*.

Conclusions—This study confirmed that PHR training and learning should consider a full spectrum of information management skills including collection, utilization, and distribution to support patients' care and prevention continua.

Keywords

Personal Health Records; Personal Information Management; Principal Component Analysis; Hierarchical Regression Analysis

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DECLARATION OF INTEREST

The author reports no conflicts of interest.

OBJECTIVES

Patient-centered care is a focal point of modern healthcare in that patient participation takes many forms, including shared decision-making, care partnership, and evidence-based preventive care and wellness management. Documenting and managing care-related data for use in medical decisions has not been a conventional role for patients. Rather, it has been handled by healthcare providers as a crucial communication tool for patient care, fiscal matters, and population health reporting within healthcare provider networks. A collaborative partnership in health promotion and disease management puts greater pressure on consumers to seek out health information and manage their own health records. Consequently, the role of the consumer is moving toward being a full partner in the care continuum, and not just a passive recipient of health information. Most importantly, patients are expected to play an active role in care planning and managing their own health data, especially within a managed care setting [1, 2].

In the patient-centric care context, personal health records (PHRs) have emerged as a mechanism to empower consumers to store, organize, find, understand, and share their own health information. Ideally, PHRs serve as a central hub of individual health records maintained and controlled by patients, and PHRs are highly encouraged by several federal agencies including the Department of Veteran Affairs, the Department of Defense, and the Centers for Medicare & Medicaid Services (CMS). Despite widespread interest, and the promotional adoption of government-fostered or provider-driven PHR systems, little research has been done to understand how well people are prepared to manage their own health records. Understanding individuals' information management skills with relevance to literacy levels has been a historically important component of technology adoption in health IT literature. Therefore, the main objective of this study was to investigate major factors affecting personal health information management skills related to the understanding of health information as well as technology and computer knowledge and skills. The following literature review focuses on research findings that describe the impact of health literacy on managing individual's health information and provides general descriptions of PHR users and the opportunities and barriers they face.

BACKGROUND

Demographic profile of PHR users

Substantial evidence supports the pivotal role of individuals in controlling and managing their own health information [3, 4]. The development of PHR tools and services was triggered a decade ago by President Bush in his 2004 State of the Union Address, but is still in its infancy in terms of understanding the full spectrum of patient engagement. Limited findings on early PHR adopters highlight some demographic characteristics that are in many ways consistent with typical technology adopters. In studies of PHR use, PHR users tend to be younger than non-users [5, 6], have higher socioeconomic status [5, 7], higher levels of education [5, 8, 9, 10], and tend to be sicker (i.e., more severe disease or heavier medication use) than non-users [6-9]. These findings are consistent with theories of self-management behaviors and reviews of motivators of PHR use, which find that chronic disease self-efficacy facilitates self-management behavior adoption [11].

PHR opportunities and barriers

PHRs offer a multitude of opportunities and challenges for individuals to enhance their ability to engage in their care continuum. The vast majority of current studies have shown the benefits of health information technologies with positive overall conclusions [12]. However, few research findings have been published on the value of PHRs with relevance to clinical outcomes. Studies that report improvements in clinical outcomes deliver more persuasive messages to adopt PHR tools and services. In particular, medication management -- medication reconciliation, adherence, and side effect alerts has been found to be the most beneficial PHR feature. For example, in the early adopters' survey on the MyHealthVet PHR portal, veterans (the intended users of the system) voiced the importance of pharmacy-related features [13]. In a recent randomized clinical intervention study, Chrischilles and her colleagues (2013) reported that participants randomized to the PHR group "were significantly less likely [than the non-PHR group] to use multiple non-steroidal anti-inflammatory drugs" after receiving warnings about such use through the PHR system [6].

Related findings from chronic disease management studies also offer some evidence supporting the use of PHRs. Tenforde and his colleagues (2011) confirmed the benefits of PHRs in the management of type 2 diabetes mellitus, where PHR users had more favorable diabetes quality measures compared to non-users [5]. Conversely, no impact of PHR use was observed in a hypertension control study [14]. These clinical outcome studies emphasized that longer-term research with representative users is required to investigate effective and efficient delivery of PHRs across the care continuum.

Noticeable barriers related to integration, fragmentation, and management of PHRs have been noted [15]. The most pressing is the need to integrate and synthesize multiple types of information from multiple sources (e.g., hospitals, pharmacies, insurance companies, etc.), delivered on devices (e.g., servers, PCs, mobiles, etc.) in different formats (e.g., print-outs, handwritten notes, downloaded webpages) [16]. Synthesizing this information places patients in a shared decision-making role with providers. Consequently, shared decision-making demands that patients understand the course of a disease, treatment options, and preventive care for optimal health. Within this context, health literacy research must assess whether people are ready to accomplish PHR-related tasks.

Health literacy and information management skills

The focus of patient engagement using PHRs reinforces the importance of health literacy education and training. Undoubtedly, enhancing health literacy has been identified as an enabler of successful information sharing and collaborative decision-making. In particular, the decision-making process through information sharing "may be warranted in cases where literacy concerns indicate that the patient may be incapable of maintaining the personal record" [17]. Yet, as Tenforde et al. note, little attention has been paid to potential or actual PHR users who have limited health knowledge and training [5]. Considering the strong influence on providers' practices and patients' self-care, the information management issues regarding influential health literacy factors become important in the implementation of PHR systems [18]. In a recent paper by Agarwal and colleagues (2013), multiple factors affecting PHR use intentions were tested using social cognitive theory [7]. The study emphasizes that

respondents' intention to use the PHR tool is affected by a number of interactions involving environment, patient, and tool factors [7]. Other case reports about the implementation of provider-driven PHRs highlight the importance of communication tactics and technology characteristics in the context of intention to use PHRs but have yet to investigate which specific skills have any influence on PHR management [7].

As such, PHRs require multiple health literacy skills, which could become a composite measure of individuals' capabilities of health knowledge [19]. Health literacy, as a discrete form of general literacy, has been focused on a limited scope of medical knowledge. Beyond the scope of limited care instruction, individuals are to expand their understanding of various types of PHRs and data management issues. At the least, individuals who wish to manage their own PHRs should be able to identify which information should be retained. Once all records are stored, finding the right information in an efficient way may be challenging. Moreover, even if the records are retrieved, individuals may not understand how to use the information for their care decisions [20].

Personal Information Management (PIM) and Computer Literacy

Research on personal information management (PIM) has noted several factors that could be adopted in PHR environments [21]. In his series of works on PIM, Jones and his colleagues emphasized that PIM refers to "the practice and study of the activities people perform to acquire, organize, maintain, retrieve, use and control the distribution of information items such as documents (paper-based and digital), web pages and email messages for everyday use." [22-25]. This PIM definition indicates diverse information management activities that individuals should perform to manage their PHRs effectively. Findings from the PIM literature can inform the development of a PHR training strategy. For instance, an individual should be able to identify diverse locations, devices, forms, and organizations where his or her care has been involved. Next, an individual should understand how to identify useful information to keep while discarding irrelevant information.

Computer or technology literacy plays a major role in managing personal health records. Whether provider-sponsored or freely available via Web portals, managing electronic PHRs requires computer and technology skills. Literature linking health literacy and technology skills to ability to manage PHRs also warrant that specific computer or technology skills are necessarily to adopt the electronic PHRs by diverse literacy groups [26]. In their recent work, Sharit and his colleagues noted that participants with low computer and Internet proficiency skills may not fully receive benefits of the PHRs offered through *My HealthVet* [27, 28]. For instances, specific PHR-related activities such as downloading, saving, or sharing their medication data, laboratory results, or health/wellness data are highly related to varying degree of computer or Internet literacy.

In summary, low health literacy is associated with the digital divide. PHR literacy studies would be useful to revisit findings from digital divide studies reporting on low literacy groups including older adults, economically and culturally disadvantaged populations, [technologically illiterate], and populations with chronic disease [15]. Most important, health and information management skills will be critical for PHR adoption by diverse populations and necessary to facilitate information retrieval and online communication.

METHODS

The current study was designed to describe a demographic profile of survey respondents and understand its relevance to their PHR management status. In addition to the demographic description, self-reported health and computer knowledge responses measured along with PHR-related activities were used to identify major factors underlying information management skills.

Participants

In December 2013, participants were recruited from Amazon's *mTurk* service. Participants had to be at least 20 years old. Other inclusion criteria required U.S. residency (based on ownership of a U.S. bank account) and at least a 95% task approval rate for their previous *mTurk* assignments. Non-U.S. residents were excluded because the measures that we used in this study may not be valid for non-English speaking, non-American samples. Participants were paid $1.50 to complete approximately 25 minutes of survey questions. Each IP address was restricted to respond the survey only once. Of the original 627 survey responders, those who did not answer more than 25% of questions were excluded. A total of 578 participants were included in this study. The University of Kentucky's Institutional Review Board (IRB) approval was received before the study was conducted.

Measures

Variables measuring demographics (age, gender, race, and education), PHR characteristics (health status, PHR management status, health knowledge, and technology knowledge), and 25 items on PHR-related activities were collected. All variables were collected as categorical or ordinal measures. Health status was measured using a 5-point scale ranging from *Poor* (0) to *Excellent* (4). PHR management status referred to likelihood of completing four PHR activities (*Strongly Disagree* (0) to *Strongly Agree* (4)): putting PHR documents in files, scanning and saving documents to a computer or USB drive, emailing documents to self, and using web-based PHR services. PHR-related activities were measured on a 5-point Likert-type scale (*Never* (0) to *Always* (4)) to ascertain the frequency with which respondents performed the activity. Examples of PHR-related activities included *I keep my personal health records* and *I share my health information to support care for family.* Barriers that limit personal health–related activities were also surveyed. The surveyed items and accompanying results are reported in Tables 1 and 2.

RESULTS

Sample characteristics

The first research question sought to profile demographic characteristics of the survey respondents (N=578) (Table 1). The majority of participants were male (52.3%), and the age distribution of this population included adequate representation of adults of all ages, except for adults aged 66 or over (N=8). This population lacked racial and ethnic diversity in that 84.6% of the sample was White, with African Americans representing the next most sampled population (5.7%). The respondents were highly educated, with a majority of the sample reporting an associate degree or more advanced degree (69.7%). Participants with

higher education tended to report better health status and higher computer/technology skills and knowledge (Table 1). These findings are consistent with other skills and knowledge measures in health content and information management studies. Interestingly, those in the adults in the oldest age group were more likely to report they had a confirmed diagnosis for which they would like to have further information about treatment options, while the younger groups reported general health-related information needs (Table 1).

Concerning management of personal health records, a paper file folder option was found to be most popular, followed by emailing documents to self and scanning and saving documents to computer or USB. The 66 and older age group favored web archiving, while it was the least likely option to be selected overall. The younger groups were more active in managing PHRs using diverse options than other groups. Men reported higher computer/technology skills and knowledge compared to women. In addition, race was not important in distinguishing of health and computer skills and knowledge, as well as PHR management status.

Characteristics of PHR-related activities and barriers

The second research question sought to examine the frequency with which the survey respondents participated in various PHR-related activities. On a scale of 0 representing *Never* to 4 representing *Always*, the respondents were asked to answer how often they perform the listed PHR activities (Table 2). The activities reported as most frequently done include: *understanding my health information when discussing with my care providers* (Avg. = 2.87), *articulating my health issues when I visit my doctors* (Avg. = 2.78), *identifying high quality information* (Avg. = 2.72), and *identifying highly credible resources (Avg. = 2.68)*. The respondents answered that they rarely *share their health information with others through a network drive (e.g., cloud storage or dropbox)* (Avg. = 0.78) and seldom *share their clinical schedule* (Avg. = 0.96). This is potentially indicative of low prevalence of networked PHR systems in this study sample. Interestingly, this study sample indicates that they do not actively participate in organizing activities such as *using Web applications to organize my health info* (Avg. = 0.98), *attempting to establish the mapping between information needs and information items* (Avg. = 1.34), *assigning keywords* (Avg. = 1.49), and *organizing information by a classification scheme* (Avg. = 1.54). These findings suggest that the respondents were more likely to participate in the activities requiring understanding information and interacting with providers, while some activities that require organizing and sharing were less often performed in this study sample.

The study also asked responders to identify barriers to managing health information on a scale of 0 representing *Strongly Disagree* to 4 representing *Strongly Agree*. As shown in Table 2, the respondents indicated environmental barriers that most frequently interfere with management of PHRs. These include: *high volumes of information to keep* (Avg. = 2.07), *scattered information at distant, multiple sites* (Avg. = 2.06), and *language used is not understandable* (Avg. = 1.89). These barriers are more related to the complicated nature of PHRs and inchoate status of PHR system features and services. Inversely, individual factors were least often noted as barriers managing PHR-related information. These include: *lack of searching skills to locate information* (Avg. = 1.08), *lack of memory to locate information*

(Avg. = 1.12), *lack of skills to organize information* (Avg. = 1.24), *lack of knowledge to understand information* (Avg. = 1.32), and *lack of knowledge to identify valuable information* (Avg. = 1.34). This result implies that consumers are not aware of individual knowledge and skills as being important barriers for them to overcome when using of PHR-related services and systems.

Primary factors of PHR Skills

The third question sought to identify major factors that are important for participating in managing PHR-related activities. Principal components analysis was used to identify the underlying domains of PHR-related activities. Varimax rotation was applied to the initial factor pattern, and items with factor loadings lower than 0.65 were eliminated, resulting in a four-factor solution. These factors were subsequently labeled *Collecting, Searching, Sharing,* and *Implementing*. As shown in Table 3, the four factors represent major groups of PHR-related activities. These factors accounted for about 67% of the total variance. The scores for the scales were summed and divided by the number of items in the scale to produce variables ranging from 0-4, with smaller values indicating lower frequency of activities for that scale. The consistency of the four factors was also assessed to measure strengths of the scales: *Collecting* (Cronbach's α = .906), *Searching* (Cronbach's α = .837), *Sharing* (Cronbach's α = .763), and *Implementing* (Cronbach's α = .908).

Predictors of PHR Skills

The fourth research question sought to describe the relationships between PHR-related activities and health and knowledge status. Five independent hierarchical linear regression analyses were performed with demographic variables (gender, age, race, and education) entered in the first block, self-rated health status (rated as *Poor* (0) to *Excellent* (4)) entered in the second block, and two self-rated knowledge variables—health knowledge and computer knowledge (both rated as *Poor* (0) to *Excellent* (4))—in the third block. The first analysis was performed on self-rated overall PHR skills (rated as *Poor* (0) to *Excellent* (4)) as an independent variable and then four PHR skills factors extracted—*Collecting*, *Searching*, *Sharing*, and *Implementing* were performed independently. Prior to the hierarchical regression analyses, the independent variables were examined for collinearity; no problems were detected (i.e., all variance inflation factors < 2.0). Overall, education and self-rated computer knowledge significantly increased the explanatory power of the regression models. Detailed results appear below.

Predictors of overall self-rated PHR skills

Demographic characteristics were significantly but very weakly associated with self-rated PHR skills. The variance accounted for (R^2) with the first block of predictors (gender, age, race, and education) equaled .02 (adjusted R^2 = .02), which was significantly different from zero (ΔF (4, 567) = 2.41, $P < .05$). Next, self-rated health status scores were entered into the regression equation, and total variance accounted for was .11, which represented a statistically significant increase in variance accounted for over the step one model (ΔF (1, 566) = 59.31, $P < .001$). In step three, self-rated knowledge status variables (health knowledge and computer knowledge) were entered into the model. Total variance accounted for was .48, which was a statistically significant increase above the variables entered in step

two (ΔF (2, 564) = 336.03, $P < .001$). Significant predictors in the final model included education, health status, and computer knowledge (Table 4).

Predictors of PHR Collecting skills

No variables entered in the first block surfaced as significant predictors of PHR collection skills. The model was slightly but not significantly improved by the addition of health status in step two. In step three, health knowledge ($\beta = 0.25$, $P < 0.001$) emerged as a positive predictor of PHR collection skills such that those who reported a higher understanding of health knowledge were more likely to report PHR collection skills (Table 5).

Predictors of PHR Searching skills

Here, demographic characteristics entered in the first block revealed significant predictors of PHR finding skills. Age category was found to be a strong predictor of the second regression model ($\beta = 0.13$, $P < 0.001$). When the health status variable was added in step two, the model was significantly improved ($R^2 = 0.10$, $\Delta R^2 = 0.08$, $P < 0.001$). Further, the results show that both age and computer knowledge ($\beta = 0.134$, $P < 0.002$; $\beta = 0.18$, $P < 0.001$) were significantly positive predictors of PHR searching skills (Table 6).

Predictors of PHR Sharing skills

Among the variables entered in the first block, age and race were significantly negative predictors of PHR implementation skills such that younger and non-white people were more likely to share PHRs. When the health status variable was added in the second block, the model was not improved. In the step three, the self-rated computer and health knowledge variables significantly improved the model ($\beta = 0.14$, $P < 0.001$; $\beta = 0.17$, $P < 0.001$). The results indicate that those who reported that they knew more about their health and possessed computer/technology knowledge and skills were more likely to share PHRs (Table 7).

Predictors of PHR Implementing skills

Age, race, and education significantly predicted PHR implementation skills. Older and more educated respondents were more likely to implement PHR skills. When the health status variable was added in step two, the model did not improve. When the two knowledge variables were added in the last block, the model was significantly improved ($R^2 = 0.14$, $\Delta R^2 = 0.07$, $P < 0.001$), and both knowledge variables positively and significantly predicted PHR implementing skills (Table 8). The results indicate that those who reported that they knew more about health and computers were more likely to implement PHRs in their care.

DISCUSSION

The major findings from this study indicate the following four aspects of personal health record management. First, the demographic characteristics of those respondents who perceived themselves to be highly competent in computer and technology knowledge are consistent with previous literature describing PHR users as male, younger, and educated people, especially for computer and technology-related knowledge [21, 29,30]. Yet, the self-reported health knowledge in this survey did not vary by demographic characteristics. No

demographic differences, except for education, were found to be significant in regards to self-rated PHR skills. As shown, management of PHRs not only requires advanced health literacy but also accompanying skills in information management.

Second, there were clear differences in PHR skills and activities by age group. Although limited in number, adults over age 65 in this survey indicated a strong desire for personal treatment-related information. In comparison, the younger groups identified a need for more general health-related information. Age-specific differences also occurred in the current status of PHR management activities, suggesting the youngest group (between age 20 – 25) more often utilized diverse PHR tools including file folders, scanning and saving to computer or USB drive, emailing, and Web archiving. Web-archiving was least favorite PHR option overall. Inconsistent with results from previous studies, this study's findings suggest the oldest group (≥66 years) favored using electronic PHR options such as emailing, scanning, and Web-archiving. In previous studies, older adults tended to be more hesitant to adopt PHR technologies [11, 31-33]. We note that the older adults in this sample may be more highly motivate than the average senior to use Internet services (such as Amazon's *mTurk* system, from which the participants were recruited) so the results could be biased.

Third, the respondents were most actively engaged in PHR activities involving understanding and evaluating their health information when discussing with care providers. The least favorite PHR activities identified in this survey indicated that respondents were less likely to share and organize their PHRs. Again, this result suggests which information management skills should be targeted through PHR training. Information management skills, especially organizing and sharing information, are not a conventional focus of health literacy education targeted at the general public level. Considering the wider expectation of PHR adoption by the general public, better education in skills such as developing a personal classification scheme and information sharing strategy would appear beneficial [34].

In social media studies, research suggests that introduction to folksonomy may improve individuals' information organization and searching skills [35, 36]. Folksonomy is the use of social tags that individuals use to assign their own keywords to describe web content (e.g., blogs, images, audio/video, etc.) for future retrieval. Unlike controlled keywords assigned by professional indexers (often trained librarians), users as content providers assigned their own keywords (not from controlled dictionaries). However, if the assigned keywords to PHR content are difficult to use due to low recall on archived items, then organizational structures such as a personal classification scheme are key to resolving these issues. Once trained in how to construct a personal classification scheme and archive it with a plan for retrieval, patients and consumers can achieve better recall. Being a personal librarian for one's own health record collection thus becomes an important PHR training goal.

This study also identified PHR barriers. External barriers included high volume of information, scattered information, and the difficult language of PHR information. Individual factors relevant to health and technology literacies were not identified as critical when compared to the external factors. This result implies that people do not recognize a lack of health literacy as a factor affecting effective PHR management. This finding is consistent with previous literacy studies, suggesting patients/consumers require high

demands on institutional (organizational) supports in PHR adoption while ignoring personal limitations [11]. In order to be successfully implemented, PHRs and accompanying training should improve individuals' literacy skills, especially regarding the organization and evaluation of information. These skills are traditionally incorporated in core curricular of library and information science programs rather than general education. Again, what used to be taught to information specialists must be taught to the general public as part of literacy education.

Fourth, the findings from this survey identified as primary factors are consistent with general personal information management literature. In personal information management studies, respondents complain about information fragmentation and associated organization; patients/consumers may not keep track of their decisions and often forget to use or cannot find information; patients/consumers can become overwhelmed by available information, possibly because of lack of literacy and overall volume; and patients'/consumers' approaches to personal information management vary greatly across a variety of information forms requiring diverse training to accommodate this variation [37]. As identified, the four components -- labeled as *Collecting, Searching, Sharing*, and *Implementing* -- potentially indicate specific activities for use as measures of health and information management literacies.

For these four components of individual PHR management skills, this study found several major predictors. Predictors of self-reported PHR skills suggest that education, health status, health knowledge, and computer/technology knowledge are highly associated with the rating. Mixed results were found in individual PHR management skills that were formed based on primary PHR activities. For instance, the collection skills were only associated with self-rated health knowledge, while the implementation skills were found to be associated with more predictors including age, race, education, self-rated health knowledge, and self-rated computer knowledge. In predicting sharing skills, this study found that being older and non-White needs further improvement in PHR sharing skills because they seem to have low literacy than other respondents. Overall, the skills to increase health literacy will be critical for PHR adoption by diverse populations.

This study has some limitations. First, the nature of a self-report survey may yield subjective and higher ratings on skills-based measures, including health knowledge and computer knowledge, in addition to health information management skills. In order to resolve this issue, an objective health literacy scale measuring multiple dimensions of an individual's skills and knowledge will be developed and tested with PHR users. Second, the respondents were not recruited from real PHR users'. Rather, they were the general public who may or may not currently use PHRs. In addition, this study respondents are overwhelmingly white population that might introduce some bias into the finding. Most importantly, this study does not include representative samplings of people with disease–chronic conditions or ambulatory concerns [38]. Due to higher expectations for chronic care management through PHR tools, it would appear to be important to indicate differing results within the differing patient groups [39-40]. The use of mTurk service in this study might yield some concerns (Berinsky, Huber & Lenz, 2012). In their recent study, Paolacci and his colleagues noted that mTurk introduced practical advantages, including supportive structure, subject anonymity or

identifiability, prescreening, longitudinal studies, and cultural diversity [41]. Whether the mTurk introduces any sampling bias or not might be a good topic for future studies. Further studies on diverse populations recruited from representative demographic and disease groups will inform the development of PHR training materials and educational venues that will serve as the most useful for instructional strategies.

CONCLUSIONS

The rise of the consumer empowerment movement offers opportunities for individuals to engage in their own healthcare. Consumer empowerment assumes that patients/consumers are capable of understanding sophisticated medical information. Yet, this study echoes numerous health literacy studies that concluded that a majority of people still need further education to manage health information in ways that provide optimal care and data management. In PHR training, consumers should be exposed to information about what PHRs can offer, which PHRs should be maintained or removed, and how to organize them for efficient use. If properly centered on care documentation and information sharing with collaborative support from providers, patients, insurers, and policy makers, through training PHR adoption can help achieve literacy improvement.

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References

1. Tang PC, Ash JS, Bates DW, Overhage JM, Sands DZ. Personal Health Records: Definitions, Benefits, and Strategies for Overcoming Barriers to Adoption. J Am Med Inform Assoc. 2006 Mar-Apr;13(2):121–126. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447551/. 10.1197/jamia.M2025 [PubMed: 16357345]
2. Detmer D, Bloomrosen M, Raymond B, Tang P. Integrated personal health records: transformative tools for consumer-centric care. BMC Med Inform Decis Mak. 2008 Oct 6.8:45. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2596104/. 10.1186/1472-6947-8-45 [PubMed: 18837999]
3. Yasnoff WA, Humphreys BL, Overhage JM, et al. A consensus action agenda for achieving the National Health Information Infrastructure. J Am Med Inform Assoc. 2004 Jul-Aug;11(4):332–8. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC436084/. 10.1197/jamia.M1616 [PubMed: 15187075]
4. Anderson RM, Funnell MM. Patient empowerment: myths and misconceptions. Patient Educ Couns. 2010; 79(3):277–82. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2879465/. 10.1016/j.pec.2009.07.025 [PubMed: 19682830]
5. Tenforde M, Nowacki A, Jain A, Hickner J. The Association Between Personal Health Record Use and Diabetes Quality Measures. J Gen Intern Med. 2012; 27(4):420–424. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3304034/. 10.1007/s11606-011-1889-0 [PubMed: 22005937]
6. Chrischilles E, Hourcade JP, Doucette W, et al. Personal health records: a randomized trial of effects on elder medication safety. J Am Med Inform Assoc. 2013; 0:1–8. Available at: http://jamia.bmj.com/content/early/2013/12/10/amiajnl-2013-002284.full.pdf+html. 10.1136/amiajnl-2013-002284

7. Agarwal R, Anderson C, Zarate J, Ward C. If We Offer it, Will They Accept? Factors Affecting Patient Use Intentions of Personal Health Records and Secure Messaging. J Med Internet Res. 2013 Feb 26.15(2):e43. Available at: http://www.jmir.org/article/citations/2243. [PubMed: 23470453]
8. Beckjord EB, Finney Rutten LJ, Squiers L, Arora NK, Volckmann L, Moser RP, Hesse BW. Use of the internet to communicate with health care providers in the United States: estimates from the 2003 and 2005 Health Information National Trends Surveys (HINTS). J Med Internet Res. 2007; 9(3):e20. http://www.jmir.org/2007/3/e20/. 10.2196/jmir.9.3.e20 [PubMed: 17627929]
9. Ralston JD, Rutter CM, Carrell D, Hecht J, Rubanowice D, Simon GE. Patient use of secure electronic messaging within a shared medical record: a cross-sectional study. J Gen Intern Med. 2009; 24(3):349–55. http://europepmc.org/abstract/MED/19137379. 10.1007/s11606-008-0899-z [PubMed: 19137379]
10. Roblin, Douglas W.; Houston, Thomas K., II; Allison, Jeroan J.; Joski, Peter J.; Becker, Edmund R. Disparities in Use of a Personal Health Record in a Managed Care Organization. J Am Med Inform Assoc. 2009; 16(5):683–689. Available at: http://www.sciencedirect.com/science/article/pii/S1067502709001303. [PubMed: 19567790]
11. Price MM, Pak R, Muller H, Stronge A. Older adults' perceptions of usefulness of personal health records, Universal Access in the Information Society. 2013; 12(2):191–204.
12. Buntin MB, Burke MF, Hoaglin MC, Blumenthal D. The Benefits Of Health Information Technology: A Review Of The Recent Literature Shows Predominantly Positive Results. Health Aff. 2011; 30:3464–471. Available at: http://content.healthaffairs.org/content/30/3/464.short. 10.1377/hlthaff.2011.0178
13. Nazi KM. Veterans' voices: use of the American Customer Satisfaction Index (ACSI) Survey to identify *MyHealtheVet* personal health record users' characteristics, needs, and preferences. J Am Med Inform Assoc. 2010; 17(2):203–211. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3000775/. 10.1136/jamia.2009.000240 [PubMed: 20190065]
14. Wagner PJ, Dias J, Howard S, et al. Personal health records and hypertension control: a randomized trial. J Am Med Inform Assoc. 2012; 19(4):626–634. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3384099/. 10.1136/amiajnl-2011-000349 [PubMed: 22234404]
15. Tang PC, Ash J, Bates DW, Overhage JM, Sands DZ. Personal Health Records: Definitions, Benefits, and Strategies for Overcoming Barriers to Adoption. J Am Med Inform Assoc. 2006; 13(2):121–26. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447551/pdf/121.pdf. [PubMed: 16357345]
16. Agarwal, R.; Khuntia, J. (Prepared by Insight Policy Research under Contract No HHSA290200710072T). AHRQ Publication No 09-0075-EF. Rockville, MD: Agency for Healthcare Research and Quality; Jun. 2009 Personal Health Information and the Design of Consumer Health Information Technology: Background Report. Available at: http://healthit.ahrq.gov/sites/default/files/docs/citation/09-0075-EF.pdf
17. Kupchunas WR. Personal Health Record: New Opportunity for Patient Education. Orthopaedic Nursing. 2007; 26(3):185–191.10.1097/01.NOR.0000276971.86937.c4 [PubMed: 17538475]
18. Day K, Gu Y. Influencing factors for adopting personal health record (PHR). Studies in Health Technology and Informatics, Health Informatics: Building a Healthcare Future Through Trusted Information. 178:39–44. Available at: http://ebooks.iospress.nl/publication/21655. 10.3233/978-1-61499-078-9-39
19. Kickbusch IS. Health literacy: addressing the health and education divide. Health Promot Int. 2001; 16(3):289–297. Available at: http://heapro.oxfordjournals.org/content/16/3/289.full.pdf+html. 10.1093/heapro/16.3.289 [PubMed: 11509466]
20. Unruh, KT.; Pratt, W. Barriers to Organizing Information during Cancer Care: "I don't know how people do it"; AMIA Annu Symp Proc. 2008. p. 742-746.Published online 2008. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2656024/pdf/amia-0742-s2008.pdf
21. Agosto DE, Hughes-Hassell S. People, places, and questions: An investigation of the everyday life information-seeking behaviors of urban young adults. Library & Information Science Research. 2005; 27(2):141–163.

22. Jones, W.; Maier, D. [January 1, 2014] Report from the Session on Personal Information Management, Workshop of the Information and Data Management Program, National Science Foundation. Available at: http://pim.ischool.washington.edu/final%20PIM%20report.pdf
23. Jones W. Finders, keepers? The present and future perfect in support of personal information management. First Monday. 2004; 9(3) Available at: http://firstmonday.org/ojs/index.php/fm/article/view/1123/1043.
24. Jones W. Personal information management. Annual review of information science and technology. 2007; 41(1):453–504.
25. Jones W. The future of personal information management, part I: our information, always and forever. Synthesis lectures on information concepts, retrieval, and services. 2012; 4(1):1–125.
26. Taha J. The effects of age, cognition, and health numeracy on use of a patient portal of an electronic medical record (EMR). Open Access Dissertations. 2012 Paper 814.
27. Taha J, Sharit J, Czaja SJ. The impact of numeracy ability and technology skills on older adults' performance of health management tasks using a patient portal. Journal of Applied Gerontology. 2014; 33(4):415–435.10.1177/0733464812447283
28. Sharit J, Lisigurski M, Andrade AD, Karanam C, et al. The Roles of Health Literacy, Numeracy, and Graph Literacy on the Usability of the VA's Personal Health Record by Veterans. Journal of Usability Studies. 2014 Aug; 9(4):173–193. 2014.
29. Kirsch, IS.; Jungeblut, A.; Jenkins, L.; Kolstad, A. Adult Literacy in America: A First Look at the Findings of the National Adult Literacy Survey (NALS). Washington, DC: National Center for Education Statistics, U.S. Department of Education;
30. Sparks A, Nussbaum JF. Health literacy and cancer communication with older adults. Patient Education and Counseling. 2008; 71(3):345–350. [PubMed: 18374536]
31. Chaffin AJ, Maddux CD. Accessibility accommodations for older adults seeking e-health information. J Gerontol Nurs. 2007 Mar; 33(3):6–12. [PubMed: 17378186]
32. Siek KA, Khan DU, Ross SE. A Usability Inspection of Medication Management in Three Personal Health Applications. Lecture Notes in Computer Science. 2009; 5619:129–138.
33. Kim EH, Stolyar A, Lober WB, et al. Usage Patterns of a Personal Health Record by Elderly and Disabled Users, Usage Patterns of a Personal Health Record by Elderly and Disabled Users. AMIA Annu Symp Proc. 2007; 2007:409–413. [PubMed: 18693868]
34. Eysenbach G. Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness. J Med Internet Res. 2008; 10(3):e22. [PubMed: 18725354]
35. Paul Wicks P, Massagli M, Heywood J. Sharing Health Data for Better Outcomes on PatientsLikeMe. J Med Internet Res. 2010; 12(2):e19. [PubMed: 20542858]
36. Dixon BE, McGowan JJ. Enhancing a taxonomy for health information technology: an exploratory study of user input towards folksonomy. Studies in health technology and informatics. 2009; 160(Pt 2):1055–1059. [PubMed: 20841845]
37. Pratt W, Unruh KT, Civan A, Skeels MM. Managing health information in your life. Communications of the Association for Computing Machinery (CACM). 2006; 49(1):51–55. Available at: http://faculty.washington.edu/wpratt/Publications/CACMp51-pratt.pdf.
38. Jha AK, et al. Use of Electronic Health Records in U.S. Hospitals. N Engl J Med. 2009; 360:1628–1638. Available at: http://www.nejm.org/doi/pdf/10.1056/NEJMsa0900592. 10.1056/NEJMsa0900592 [PubMed: 19321858]
39. Ancker, Jessica S.; Osorio, Snezana N.; Cheriff, Adam; Cole, Snezana N.; Silver, Michael; Kaushal, Rainu. Patient activation and use of an electronic patient portal. Informatics for Health and Social Care. 2014:1–13.
40. Patel, Vaishali N.; Dhopeshwarkar, Rina V.; Edwards, Alison; Barron, Yolanda; Likourezos, Antonios; Burd, Luba; Olshansky, Dmitry; Kaushal, Rainu. Low-income, ethnically diverse consumers' perspective on health information exchange and personal health records. Informatics for Health and Social Care. 2011; 36(4):233–252. [PubMed: 21851182]
41. Berinsky, AJ.; Huber, A.; Lenz, GS. Evaluating Online Labor Markets for Experimental Research: Amazon. com's Mechanical Turk. Political Analysis. first published online March 2, 2012 Available at: http://pan.oxfordjournals.org/content/early/2012/03/02/pan.mpr057.full.pdf+html

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Table 1

Profiles of PHR Survey Respondents

Demographics	**PHR Characteristics (Mean, SD)**										
	Self-reported status				**Information Requirements**			**PHR management Status**			
(Number, %)	**Health Status**	**Computer Knowledge**	**Health Knowledge**	**PHR Skills**	**General Health**	**Specific Health**	**Personal treatment**	**File Folders**	**Scan & Save**	**Email Archive**	**Web Archive**
Gender (P - Value)	0.484	.000**	0.624	0.797	0.896	0.038*	0.303	0.104	0.756	0.344	0.016*
Male (N=303, 52.3)	2.48(0.99)	3.03(0.84)	2.43(0.93)	2.04(1.04)	1.92(1.03)	2.41(0.98)	1.39(1.23)	2.65(1.13)	1.74(1.3)	2.1(1.26)	1.39(1.17)
Female (N=254, 43.9)	2.41(0.98)	2.73(0.86)	2.36(0.89)	2.08(0.98)	1.89(1.17)	2.62(0.97)	1.53(1.42)	2.67(1.13)	1.66(1.32)	2.08(1.36)	1.4(1.27)
Total	2.45(0.98)	2.89(0.86)	2.4(0.91)	2.06(1.01)	1.91(1.09)	2.51(0.98)	1.46(1.32)	2.66(1.13)	1.7(1.31)	2.09(1.3)	1.39(1.22)
Age (P - Value)	0.187	.002**	0.291	0.236	0.031*	0.167	.000**	0.437	.007**	.008**	.000**
20-25 (N=148, 25.6)	2.48(1.03)	2.88(0.85)	2.29(0.92)	1.95(1.07)	2.05(1)	2.59(0.95)	1.55(1.23)	2.78(1.02)	2(1.26)	2.33(1.25)	1.59(1.21)
26-30 (N=141, 24.4)	2.57(0.87)	3.1(0.75)	2.5(0.89)	2.2(0.97)	1.89(1.14)	2.5(0.95)	1.15(1.22)	2.58(1.24)	1.71(1.36)	2.23(1.32)	1.49(1.26)
31-40 (N=151, 26.1)	2.46(0.97)	2.91(0.87)	2.37(0.98)	2.05(1.05)	1.92(1.13)	2.57(0.96)	1.33(1.29)	2.58(1.15)	1.61(1.33)	2.01(1.35)	1.28(1.2)
41-65 (N=128, 22.1)	2.32(1)	2.72(0.91)	2.43(0.83)	2(0.95)	1.82(1.08)	2.33(1.01)	1.7(1.42)	2.58(1.13)	1.49(1.25)	1.8(1.24)	0.98(1.06)
66 or above(N=8, 1.4)	2(1.07)	2.38(0.92)	2.63(0.74)	2.38(0.74)	0.88(0.99)	2.25(1.67)	3(1.41)	2.88(1.36)	1(1.41)	2(1.69)	2.25(1.39)
Total	2.45(0.97)	2.9(0.86)	2.4(0.91)	2.05(1.01)	1.91(1.1)	2.5(0.98)	1.45(1.31)	2.64(1.14)	1.7(1.31)	2.1(1.31)	1.36(1.21)
Race (P - Value)	0.768	0.263	0.657	0.51	0.32	0.505	0.982	0.567	0.115	0.626	.001**
White (N=490, 84.6)	2.46(0.97)	2.91(0.84)	2.4(0.9)	2.05(1.01)	1.89(1.09)	2.52(0.97)	1.44(1.33)	2.65(1.16)	1.68(1.34)	2.09(1.32)	1.3(1.22)
African American (N=33, 5.7)	2.27(0.91)	2.67(0.92)	2.42(0.87)	2.18(0.95)	2.06(1.22)	2.3(1.26)	1.39(1.32)	2.42(1.12)	1.48(1.23)	1.97(1.33)	1.36(1.08)
Native American (N=7, 1.2)	2.71(1.11)	3.29(0.49)	2.86(0.9)	2.57(0.98)	1.71(1.25)	2.29(1.11)	1.57(1.62)	2.86(1.35)	2.43(1.13)	2.14(1.46)	2.14(0.9)
Asian (N=30, 5.2)	2.37(1.1)	2.97(0.81)	2.37(1)	1.87(1.04)	2.17(0.87)	2.5(0.73)	1.47(0.94)	2.77(0.77)	2.23(0.94)	2.17(1.18)	2.23(0.94)
2+ Races (N=17, 2.9)	2.59(1.06)	2.59(1.12)	2.18(1.19)	2(1.17)	2(1.17)	2.59(1)	1.65(1.32)	2.65(1.17)	1.47(1.37)	2.59(1.12)	1.41(1.12)
Total	2.46(0.97)	2.9(0.85)	2.4(0.91)	2.06(1.01)	1.91(1.09)	2.5(0.98)	1.45(1.31)	2.64(1.14)	1.7(1.32)	2.1(1.31)	1.37(1.21)
Education (P - Value)	.000**	0.008**	0.008**	0.047*	0.16	0.767	0.547	0.255	0.07	0.51	0.067
High School (N=173, 29.9)	2.21(1)	2.82(0.88)	2.25(0.95)	1.88(1.04)	1.78(1.07)	2.45(1)	1.57(1.35)	2.57(1.23)	1.71(1.3)	2.01(1.33)	1.19(1.09)
Associate degree (N=112, 19.3)	2.33(1.07)	2.8(0.87)	2.43(0.89)	2.05(1)	1.86(1.15)	2.45(0.98)	1.47(1.37)	2.77(1.04)	1.81(1.35)	2.23(1.28)	1.45(1.25)
Bachelor’s degree (N=222, 38.3)	2.62(0.9)	2.94(0.85)	2.41(0.89)	2.14(0.97)	2.05(1.07)	2.57(0.98)	1.38(1.27)	2.57(1.13)	1.67(1.31)	2.14(1.29)	1.49(1.27)
Master’s degree (N=55, 9.5)	2.67(0.79)	3.25(0.78)	2.7(0.92)	2.25(1.06)	1.83(1.04)	2.5(0.97)	1.3(1.22)	2.75(1.14)	1.85(1.35)	2.13(1.36)	1.38(1.25)

Demographics	PHR Characteristics (Mean, SD)										
	Self-reported status				Information Requirements			PHR management Status			
(Number, %)	Health Status	Computer Knowledge	Health Knowledge	PHR Skills	General Health	Specific Health	Personal treatment	File Folders	Scan & Save	Email Archive	Web Archive
Professional or Doctorate (N=15, 2.6)	2.87(0.74)	2.73(0.59)	2.8(0.41)	2.27(0.96)	1.93(1.33)	2.53(0.99)	1.27(1.44)	3.07(0.88)	0.8(0.86)	1.73(1.44)	0.87(1.06)
Total	2.45(0.97)	2.9(0.85)	2.4(0.91)	2.06(1.01)	1.91(1.09)	2.5(0.98)	1.44(1.31)	2.64(1.14)	1.7(1.32)	2.11(1.31)	1.37(1.21)

Note:

*P < 0.05,

**P <0.01

Table 2

PHR Activities and Barriers

PHR Activities	Num.	Sum	Mean	Std.	PHR Barriers	Num.	Sum	Mean	Std.
Articulate health issues when I visit my doctors	577	1658	2.87	1.037	High volumes of information to keep	577	1197	2.07	1.193
Understand my health information when discussing with my care providers	571	1585	2.78	1.059	Scattered information at distant, multiple sites	576	1186	2.06	1.220
Identify high quality information	574	1561	2.72	1.063	Language used is not understandable	578	1095	1.89	1.230
Identify highly credible resources	573	1535	2.68	1.030	Lack of controls on privacy, confidentiality, and access issues	578	1026	1.78	1.226
Know where to look for my health information	572	1512	2.64	1.139	Resistance to share of personal health information	576	1012	1.76	1.230
Know how to find helpful health resources from Internet	578	1477	2.56	1.220	Lack of time to manage information	577	1004	1.74	1.284
Know how to narrow or broaden my search	574	1473	2.57	1.191	Lack of privacy security about yourself and your health conditions	572	962	1.68	1.222
Can distinguish which health resources are available from different sources	575	1446	2.51	1.202	Lack of up-to-date information to support efficient care	577	948	1.64	1.100
Identify timely updated health information	574	1431	2.49	1.087	Lack of accurate information to support care decision	578	931	1.61	1.066
Keep my health records	578	1349	2.33	1.284	Lack of cooperation from healthcare providers	575	931	1.62	1.177
Decide organizational strategy	577	1218	2.11	1.305	Poor search functions to locate information	576	865	1.50	1.150
Share my health knowledge	572	1210	2.12	1.240	Difficult navigation to locate information	574	855	1.49	1.114
Request copies of my health records	578	1192	2.06	1.273	Lack of budget to manage information	574	846	1.47	1.181
Use appropriate meta-information	577	1065	1.85	1.330	Lack of people who can interpret information	577	820	1.42	1.120
Anticipate future use of my archived health records	574	1017	1.77	1.248	Lack of confidence about the benefits of personal health information.	577	818	1.42	1.134
Share my health information to support care for family	570	1011	1.77	1.243	Lack of technology to exchange information	576	810	1.41	1.162
Integrate multiple records	576	961	1.67	1.270	Lack of knowledge to identify valuable information	576	772	1.34	1.089
Organize information by a classification scheme	576	886	1.54	1.346	Lack of credibility for personal health information	577	771	1.34	1.081
Express my opinions or exchange emotional support	578	869	1.50	1.266	Lack of spaces to keep information	576	762	1.32	1.177
Attempt to establish the mapping	574	855	1.49	1.229	Lack of knowledge to understand information	575	759	1.32	1.085
Assign keywords	576	772	1.34	1.312	Reluctance to adopt technology	576	744	1.29	1.161
Remove, when no longer needed	576	659	1.14	1.137	Lack of skills to organize information	576	712	1.24	1.087
Use Web applications to organize health info	578	567	.98	1.171	Lack of memory to locate information	578	646	1.12	1.065
Share my clinical schedule	578	556	.96	1.150	Lack of searching skills to locate information	577	621	1.08	1.011

PHR Activities	Num.	Sum	Mean	Std.	PHR Barriers	Num.	Sum	Mean	Std.
Share my health information with others through network drive (e.g., cloud storage)	576	450	.78	1.075	Lack of Internet/Network connection	575	457	.79	1.015

Table 3

Primary Factors of PHIM skills extracted

	Component			
	1	2	3	4
Factor 1: Collecting				
keep my health records	.812			
request copies of my health records	.782			
integrate multiple records	.813			
anticipate future use of my archived health records	.748			
decide organizational strategy	.726			
attempt to establish the mapping between information needs and previously collected information	.675			
Factor 2: Finding				
know how to narrow or broaden my search		.742		
use appropriate meta-information		.659		
know how to find helpful health resources from Internet		.704		
can distinguish which health resources are available from different sources		.673		
Factor 3: Sharing				
use Web applications to organize my health information			.743	
share my health information with others through network drive			.820	
share my clinical schedule			.746	
express my opinions or exchange emotional support			.657	
Factor 4: Implementing				
articulate my health issues when I visit my doctors				.772
understand my health info when discussing with my care providers.				.777
identify high quality information				.832
identify highly credible resources				.845
identify timely updated health information				.758
Eigenvalue	*8.899*	*1.661*	*3.099*	*1.166*
Variables Explained	*40.452*	*7.552*	*14.086*	*5.298*
Reliability (Cronbach alpha)	*0.906*	*0.837*	*0.763*	*0.908*

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	Component			
	1	**2**	**3**	**4**
Mean (SD)	*16.75 (5.98)*	*2.37 (1.24)*	*1.06 (1.17)*	*2.71 (1.06)*

Table 4

Hierarchical Regression Analysis of PHR Skills (Overall Self-Rating)

Predictors	***R***	***R²***	**Δ*R²***	**Δ*F***	***df***	***β***	***sig***
Demographic	.129[a]	.017	.017	2.414	4, 567		
sex						-.017	.692
age						-.004	.919
race						.002	.966
education						0.129*	.002
Health Status	.332[b]	.110	.093	59.305	1, 566	0.313**	.000
Knowledge	.771[c]	.594	.484	336.034	2, 564		
Computer Knowledge						0.08*	.006
Health Knowledge						0.701**	.000

*P < 0.05,

**P < 0.001

[a]Health Status: five-point response scale from Poor (0) to Excellent (4)

[b]Computer/Technology Skills and Knowledge: five-point response scale from Poor (0) to Excellent (4)

[c]Health knowledge: five-point response scale from Poor (0) to Excellent (4)

Table 5

Hierarchical Regression Analysis of PHIM Collection Skills

Predictors	***R***	R^2	ΔR^2	ΔF	***df***	β	***sig***
Demographic	.094[a]	.009	.009	1.278	4, 568		
sex						-.012	.770
age						.037	.379
race						-.028	.505
education						.076	.071
Health Status	.102[b]	.010	.002	.897	1, 567	.041	.344
Knowledge	.277[c]	.077	.066	20.308	2, 565		
Computer Knowledge						.052	.225
Health Knowledge						0.251**	.000

*P < 0.05,

**P < 0.001

[a]Health Status: five-point response scale from Poor (0) to Excellent (4)

[b]Computer/Technology Skills and Knowledge: five-point response scale from Poor (0) to Excellent (4)

[c]Health knowledge: five-point response scale from Poor (0) to Excellent (4)

Table 6

Hierarchical Regression Analysis of PHIM Searching Skills

Predictors	*R*	R^2	ΔR^2	ΔF	*df*	*β*	*sig*
Demographic	.161[a]	.026	.026	3.781	4, 568		
sex						-.032	.447
age						0.134*	.002
race						.059	.161
education						.023	.582
Health Status	.163[b]	.027	.001	.365	1, 567	.026	.546
Knowledge	.321[c]	.103	.076	24.077	2, 565		
Computer Knowledge						0.184**	.000
Health Knowledge						0.18**	.000

*P < 0.05,

**P < 0.001

[a]Health Status: five-point response scale from Poor (0) to Excellent (4)

[b]Computer/Technology Skills and Knowledge: five-point response scale from Poor (0) to Excellent (4)

[c]Health knowledge: five-point response scale from Poor (0) to Excellent (4)

Table 7

Hierarchical Regression Analysis of PHIM Sharing Skills

Predictors	**R**	R^2	ΔR^2	**ΔF**	**df**	**β**	**sig**
Demographic	.181[a]	.033	.033	4.792	4, 568		
sex						.035	.396
age						-0.131*	.002
race						-0.102*	.015
education						.013	.750
Health Status	.187[b]	.035	.002	1.447	1, 567	.051	.230
Knowledge	.297[c]	.088	.053	16.376	2, 565		
Computer Knowledge						0.136*	.002
Health Knowledge						0.165**	.000

*P < 0.05,

**P < 0.001

[a]Health Status: five-point response scale from Poor (0) to Excellent (4)

[b]Computer/Technology Skills and Knowledge: five-point response scale from Poor (0) to Excellent (4)

[c]Health knowledge: five-point response scale from Poor (0) to Excellent (4)

Table 8

Hierarchical Regression Analysis of PHIM Implementing Skills

Predictors	***R***	R^2	ΔR^2	ΔF	***df***	β	***sig***
Demographic	.259[a]	.067	.067	10.193	4, 568		
sex						-.072	.079
age						0.157**	.000
race						0.144*	.001
education						0.096*	.020
Health Status	.262[b]	.069	.002	1.161	1, 567	.045	.282
Knowledge	.378[c]	.143	.074	24.411	2, 565		
Computer Knowledge						0.098*	.019
Health Knowledge						0.243**	.000

*P < 0.05,

**P < 0.001

[a]Health Status: five-point response scale from Poor (0) to Excellent (4)

[b]Computer/Technology Skills and Knowledge: five-point response scale from Poor (0) to Excellent (4)

[c]Health knowledge: five-point response scale from Poor (0) to Excellent (4)