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Chi Zhang
Southern Polytechnic State University, chizhang@spsu.edu

Mehruz Kamal
State University of New York at Brockport, mkamal@brockport.edu

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ABSTRACT

Patient engagement and patient-provider communication is critical to improving health outcomes and reducing healthcare costs. Most of the research in this area has focused on the adoption and use of health information technology from a provider's point of view. There is hardly any research that puts the patient at the center of this issue. This paper places the patient at the center and discusses how health information technology tools may facilitate patient engagement. This is done by reviewing past research on patient engagement, and health information technology solutions. It then maps the issue of patient engagement to the Information Success model to provide a lens through which further research may be carried out to develop and evaluate technology solutions for improved patient engagement.

Keywords

Patient engagement, health information technology, healthcare, evaluation

INTRODUCTION

With the new implementation of the American Recovery and Reinvestment Act (ARRA), the Health and Technology for Economic and Clinical Health (HITECH) Act was created to provide incentives for health professionals to improve the processes of sharing clinical information among physicians, hospitals, labs, pharmacies and patients (HITECH, 2009). The goal is to not only create interconnected electronic health records (EHRs) but to engage patients and families in their care (Ammenwerth, 2006; Borland, 2012). Patient engagement and patient-provider communication are critical to improving health outcomes and reducing healthcare costs. Policy makers have called for more patient-centric healthcare systems. This means that health professionals must shift their focus from *how* their EHRs can improve their internal processes to implementing patient engagement objectives to meet government standards (ONC, 2012). Under the standard specified in meaningful use stage 2 that the Center of Medicare & Medicaid Services (CMS) released in 2012, electronic health records (EHR) systems must support online access for patients to retrieve their health information, provide care coordination through health information exchange between providers, support patient engagement while ensuring the safety and security of patient data (ONC, 2012). Research conducted by Intuit Health suggests that 73% of Americans would use secure online communications to conduct health related activities such as scheduling appointments, submitting prescription request, obtaining lab results, completing medical forms and paying medical bills online (Lewis, 2011). Another survey by Dell indicates that approximately 75% of the adults interviewed would like their EHR's to be shared between various healthcare provider services as well as have the capability to communicate with their physician using e-mail or access their health record through a web portal (Sarasohn-Kahn, 2011). In early 2012, the Center for Health Information & Decision Systems (CHIDS) at University of Maryland announced the "Innovate 4 Healthcare Challenge" competition (CHIDS, 2010). The Challenge calls for solutions (tools, processes and technologies coupled with a business strategy) to use information technology to strengthen patient engagement with healthcare providers. In light of this call, the research questions for this paper are: (1) *What are the current broad categories of technologies that can facilitate patient engagement?* (2) *How do we begin to evaluate these technologies in improving patient engagement?*

BACKGROUND

What is Patient Engagement?

The Center for Advancing Health defines patient engagement as "actions individuals must take to obtain the greatest benefit from the health care services available to them" (Center for Advancing Health, 2010). The term is also defined as "engagement in one's own health, care and treatment" (Parsons et al., 2010). Patient engagement focuses on an individual's behaviors that are critical to health outcomes. One of the major challenges that the health care industry and doctors face today is the increasing prevalence of chronic illness and rising levels of obesity, which can lead to diabetes and heart disease or kidney disease (Uncapher, 2005). Patient engagement is believed to enable the management of chronic diseases through making the right decisions, regular medications, self-care behaviors, exercising and self-monitoring. There are a number of reviews of self-management effectiveness (such as Chodosh et al., 2005). "Patient self-management education (may include

primary prevention, behavior modification programs, and compliance/ surveillance)" is included by Disease Management Association of America as one of the six necessary disease management components (May et al., 2007). The Chronic Care model (CCM) is a widely adopted approach to improving ambulatory care through patient-centered and evidence-based care. Enhancements in self-management supported by information and technology, linked with community and health systems, is the core feature of CCM. Factors that affect patient willingness to engage in managing their healthcare using information technology include: (1) technology-related factors (technology access, technology skills); (2) patient-related factors (patient's age, sex and education level, patient knowledge and beliefs, emotional experiences and coping skills); (3) illness-related factors (stage and severity of illness, complexity); (4) social/economic factors (family, community, other social supports and resources); and (5) factors related to the healthcare team (communication between patient and physicians/staff/health system organization; quality of care, and ancillary care) (Caron-Flinterman et al., 2007; Davis et al. 2007; Heisler, 2008).

Measuring Patient Engagement

As discussed in the previous section, patient engagement plays an important role in controlling chronic diseases. As a result, being able to assess or measure patient engagement becomes essential to the overall healthcare of patients. This section reviews two important measures for patient engagement – Patient Activation Measure and Engagement Behavior Framework. These will later be used to assess patient engagement using technology tools.

Patient Activation Measure (PAM).

Patient activation refers to patient engagement in preventive behavior, healthy behavior, disease specific self-management behavior, and information seeking behavior (Hibbard et al., 2004). The Patient Activation Measure (PAM) developed by Hibbard's team has been successfully used to predict outcomes with a wide range of conditions including chronic diseases, heart diseases, cancer, to name a few (Begum et al., 2011; Deen et al., 2010; Frosch et al., 2010; Greene et al., 2011). PAM is a tool at the individual level of analysis that guides interventions to support patient activation and helps target the types of support information patients need and evaluate efforts to increase activation (Hibbard et al., 2004). In determining PAM, thirteen questions segmented into four distinct levels of patient activation behaviors are used. Patients giving positive responses to Level 1 questions imply that they believe *active role is important* in managing their own healthcare; positive responses to level 2 questions imply that patients have *confidence and knowledge to take action*; positive responses to level 3 questions imply that those patients *are taking action*; and finally positive responses to level 4 questions imply that patients are *staying the course in actively engaging* in their healthcare management even under stressful conditions.

Engagement Behavior Framework

Engagement Behavior Framework (EBF) identified by the Center for Advancing Health (Center for Advancing Health, 2010) is a qualitative description of individual behaviors that patients must perform to optimally benefit from their care. The behaviors are categorized in ten areas: (1) find safe, decent care; (2) communicate with health care professionals; (3) organize health care (e.g., make appointments); (4) pay for health care; (5) make good treatment decisions; (6) participate in treatment; (7) promote health (e.g., set priorities for changing behaviors to optimize health and prevent disease); (8) get preventive health care (e.g., evaluate recommended screening tests); (9) plan for the end of life; and (10) seek health knowledge.

Both measures outlined above highlight that in order to improve patient engagement, different platforms and tools can be used to bridge the communication line between patient and medical personnel, improve health literacy, improve clinical decision-making either indirectly (such as communication, knowledge) or directly (decision support applications), improve self-care and patient safety (Coulter et al., 2007). The next section discusses several technology solutions to facilitate improved patient engagement.

Health IT Solutions for Patient Engagement

Communications tools (such as text messages, email, fax)

Various communication tools and methods such as phone calls, e-mail, text messaging, and social media, offer individuals an opportunity to engage in their personal healthcare on a more personal level. Research posted by Wall Street Journal Online (iHealthBeat, 2006) indicates that patient's desire for electronic health communication with their providers is high. athenahealth Inc. (athenahealth, 2010) uses data and client case studies to study the different approaches that are used for patient communication as well as the extent to which those approaches are currently being used in the industry as compared to the patient's desired levels of use. It is seen that online communications trends generate greater patient engagement demand for access of electronic health services between patients and healthcare providers.

Online Portal

Integrating an online portal will improve visibility in health services available while also creating immediate access to electronic health records and automating patient self-services. An online portal will also improve internal efficiency of the clinical workflow and promote automated front-end administration allowing appointment scheduling, Rx refills, lab results and communication with health providers to be effortless. Group Health conducted a study where they allowed patients and providers to use a secure messaging tool to communicate back and forth via a web portal. The messaging process included patients generating messages that were triaged by support staff and then routed to the appropriate provider (Carrell et al., 2008). Initiating conversations through patient engaged activities will allow providers to understand the patients' expectations of the services being offered through the portal. Health providers are then better able to document the business, functional, and technical requirements for the online portal. Subsequently, the design of the online portal should consider the type of functionality that would be valuable to patients. Several benefits can be noted for implementing an online web portal for patients. Patients will be able to securely retrieve health records more quickly. The online portal would also meet the meaningful use requirement to provide patient notification of services within 72 hours (Woodcock, 2011). The most useful features noted were examining laboratory results, examining medications and requesting prescription refills (Davis et al., 2007). The users stated that by having the ability to request prescription refills could prevent a trip to the clinic or onset of illness due to delayed medications. By giving patients access to the appropriate tools and necessary training, an online portal not only can improve care and potentially save lives but also motivate patients to engage more in personal healthcare.

Mobile health application

Patients are being encouraged to use mobile medical applications to participate in their health management such as tracking their own blood pressure or monitoring their temperatures rather than having a home visit from medical staff (Borland, 2012). The benefits of utilizing such mobile applications include early interventions and reduce hospital admissions. Some applications can give patients the reminders about their medications, sense emergency situations through scanning devices, send SOS signals to the patient's doctor, and give automated signals for upcoming appointments (e.g. for blood work or dialysis). A core aspect of these mobile applications is that they are very interactive and this allows patients to become more knowledgeable about their condition as they start using it. One issue that we need to be aware of is the possibility that mobile health applications may not reach out to currently unengaged patients but instead further engage those who already track their health. Providers need to find ways to engage the patients who lack either the means or the skills to participate in mobile health.

Social media

New media tools such as twitter, Facebook and other social media are transforming the way doctors and patients interact. In this age of information, patients have greater access to medical knowledge and take a broader interest in understanding their healthcare. Patients utilize social media to understand their options, risks, benefits and alternatives when making decisions based on clinical issues discussed (Woolf et al., 2005). A study reports that "approximately 69% of US adults reported having access to the Internet in 2007. Among Internet users, 5% participated in an online support group, 7% reported blogging, and 23% used a social networking site" (Chou et al., 2009). They suggest that "health communication programs utilizing social media must first consider the age of the targeted population to help ensure that messages reach the intended audience."

EVALUATING HEALTH IT IN STRENGTHENING PATIENT ENGAGEMENT

The evaluation of health IT and health applications are critical to ensure their effectiveness in facilitating patient engagement. Evaluation can be performed at the individual, group, organization and society level. In this study, our focus is on the individual level of analysis as we believe that true patient engagement must be for the specific individual looking to take active role in managing their health condition. In this section, we tie in the elements of patient engagement from our discussion so far to elements of health IT tools. We do this by mapping patient engagement to the Information Success model developed by DeLone and McLean (DeLone et al., 2004) to provide a lens through which further research may be carried out to develop and evaluate technology solutions for improved patient engagement. The information systems success model (DeLone et al., 2004) presents a dynamic process with six dimensions – system quality, information quality, service quality, system use, user satisfaction, and net benefits. We consider the six dimensions of the DeLone and McLean IS success model as applied to health IT applications and tools (outlined in the Background section) as follows: (1) System quality, measures the desired characteristics of a health IT system. Usability, availability, reliability, adaptability, and response time are examples of qualities that are valued by users of information systems. These measures have been extensively used to determine the success of electronic commerce systems in extant studies (Loh et al., 2007). We contend that these measures are also applicable to health IT tools and applications as most of the tools and applications described in the earlier sections of this paper are Internet based technologies that incorporate similar technical infrastructures. (2) Information quality for health IT systems is extremely crucial. The content being provided through the system to patients should not only be personalized

(personal health records), accurate, complete, relevant, easy to understand, but at the same time secure and have policies in place that comply with HIPAA rules. (3) Service quality is another important factor for health IT applications and tools. For patients not well-versed in using technology and/or for patients that might need assistance in navigating through the information presented to them through the information system, there needs to be support staff on hand to deal with such issues. (4) System use measures everything from a visit to a health web portal (mobile or otherwise) and navigation within the portal to information retrieval (e.g. health records) via email to execution of transactions such as prescription refills and filling out medical forms. (5) User satisfaction in the health IT environment involves patients being able to locate the appropriate information and interact with the system based on the patient's intended purpose of use. For example, if a patient is searching for symptoms for a disease, he/she should be able to see all the information neatly organized and presented in an easy to understand manner. (6) Net benefits in the context of this study deals with improved patient engagement. A positive net benefit implies that patients are actively engaged in managing their health through the use of various health IT tools and applications.

Figure 1 below outlines a preliminary lens to understand the issues discussed so far. We propose that health IT factors, i.e. system quality, information quality, and service quality influence an individual patient's use of that application or tool. These three factors also directly correspond to user satisfaction. The extent of system use and user satisfaction then corresponds to the net benefits achieved from the specific system being used by the individual. In the context of patient engagement, we suggest that the net benefits are the differing levels of patient engagement achieved using the specific health IT application or tool. There are arrows leading back from the net benefits dimension to system use and user satisfaction. This implies that as patients have a positive experience in being able to connect with their healthcare providers, view their health records, etc., they have a greater tendency to continue to do so in the future which will then again lead to more net patient engagement outcomes.
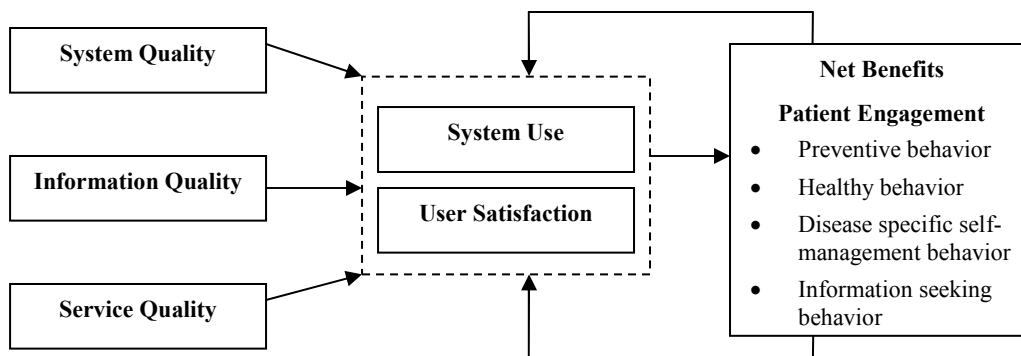

Figure 1. DeLone and McLean IS success model applied to Health IT applications and tools

In figure 1, we have used the PAM (Hibbard et al., 2004) and EBF (Center for Advancing Health, 2010) measures to gauge the extent of patient engagement. Specifically, a patient will be portraying: 1. ***Preventive behavior*** if he/she uses health IT applications and tools to actively identify when new situations arise with their health condition by establishing and maintaining electronic communication with their health providers. In addition patients can maintain lifestyle changes by staying abreast of new approaches and ideas on health websites and related social media applications. 2. ***Healthy behavior*** if he/she uses health IT applications and tools to become well-versed in regularly monitoring existing health conditions by accessing their records and in addition by learning about treatment options for their health condition for better decision making, and maintain regular diet, exercising, and self-care behavior which can prevent further problems with their health. 3. ***Disease specific self-management behavior*** if he/she uses health IT applications and tools to follow through on medical treatments that need to be done at home (e.g. regular medications), keep track of symptoms or problems associated with his/her health condition and be able to tell a doctor concerns he/she has. 4. ***Information seeking behavior*** if he/she uses health IT applications and tools to actively search for healthcare information and facilities and providers using health web portals, search engines, and using social media and email to communicate and share experiences with other patients.

Table 1 below outlines the various technology tools that may be evaluated in order to assess the level of patient engagement. Column 1 outlines examples of the specific technology, column 2 discusses how a patient would utilize that technology for health related uses, column 3 outlines the specific PAM (Hibbard et al., 2004) level, and column 4 gives the EBF (Center for Advancing Health, 2010) .

Technology	Use Scenario	PAM	EBF
Email, Health websites, social media	A patient may use forum feature to share with and learn from other patients about disease preventive approaches.	*Preventive behavior*	
		Level 4	7 and 8
Medical provider portals	A patient may visit their medical provider's online portal and log in to view their health records. Doing so will keep them informed on their current health condition.	*Healthy behavior*	
		Level 3	5 and 6
Online payment tools, online/mobile applications	A patient may pay their doctor's visit fees online or be able to track their existing medications and request refills, and follow through medical treatments at home.	*Disease-specific self-management behavior*	
		Level 2	2, 3, and 4
Search engines, web portals, social media, email.	A patient may use online search engines to locate medical facilities or doctors for their specific health problems.	*Information seeking behavior*	
		Level 1	1

Table 1. Technology and Levels of Patient Engagement

As can be seen from table 1, The PAM (Hibbard et al., 2004) level and the EBF (Center for Advancing Health, 2010) categories forms a basis on which we may investigate a piece of health IT tool or application – not only in terms of the system, information, and service characteristics but takes it one step further to assess whether it impacts patient engagement.

CONCLUSION

Patients who are engaged in their own care understand their healthcare regime better as they take a more knowledgeable role in managing their health. They assist doctors in making right treatment decisions and hence are bound to be healthier and face lesser events of medical emergencies. Most health information systems studies in the past focused on implementation issues in hospitals and clinics and also on physician's adoption of electronic health records. Very few studies center on the patient and their use of technology to manage their own healthcare. This study is aimed to address this gap by providing a lens through which further research may be carried out to develop and evaluate technology solutions for improved patient engagement. This guiding lens addresses the essential components of the technology and the relationship with patient engagement.

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