

Adoption of Telemedicine – Challenges and Opportunities

Completed Research Paper

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ABSTRACT

U.S. health care system is plagued by rising cost and limited access. While the cost of care is increasing faster than the rate of inflation, people living in rural areas have very limited access to quality health care due to a shortage of physicians and facilities in these areas. Information and communication technologies in general and telemedicine in particular offer great promise to extend quality care to underserved rural communities at an affordable cost. However, adoption of telemedicine among the various stakeholders of the health care system has not been very encouraging. Based on an analysis of the extant research literature, this study identifies critical factors that impede the adoption of telemedicine, and offers suggestions to mitigate these challenges.

Keywords

Telemedicine, Telemedicine adoption, health care, information technology.

INTRODUCTION

US Health Care has always been a burning issue in the policy makers' agenda. Health care costs have been rising sharply (Mitchell and Haroun, 2011, p. p.45). Chronic illnesses, including, heart disease, cancer, and diabetes are a primary cause of high health care costs in the US. According to the Center for Disease Control and Prevention (CDC), 1 in 2 adults lives with chronic disease, and 75% of health care costs are due to chronic conditions. (Chronic Disease Prevention and Health Promotion, 2012). Therefore, there is an urgent need to contain the cost of treating chronic illnesses.

Another critical issue impacting US health care is the lack of universal access to quality care. While numerous care providers are available in urban areas, people living in rural and remote areas have very limited access to health care providers. According to an estimate, 60 million people live in areas where there is a shortage of health care professionals, and an additional 16,000 practitioners would be required to meet the primary care needs of this population (HPSA, 2012). Further, people living in rural areas are more prone to chronic diseases, such as, obesity and diabetes compared to their urban counterparts. They also have to travel long distances to get access to basic health care (Mason, Leavitt, and Chaffee, 2012, p. 202). A primary cause of lack of availability of care in rural areas is that the low population density makes it infeasible to establish health care facilities in these areas. Hence, rural communities remain underserved due to a shortage of physicians. It is predicted that this situation is likely to get worse in the next decade (Miller, 2011).

An important provision in the Patient Protection and Affordable Care Act (ACA), signed into law in 2010 by President Obama, is making quality health care accessible to all Americans at an affordable cost (Affordable Care Act, 2012). Health information technologies have great potential to lower health care costs and make health care accessible to all, and thus help realize the goals set in the Affordable Care Act. In particular, telemedicine can play a significant role in making health care available to those living in underserved communities (Bashshur, Reardon and Shannon, 2000). In spite of its known advantages in extending care, the adoption of telemedicine in US has not been very promising. While there is a significant body of IS research addressing adoption of various information technologies (see Venkatesh et al., 2003; Venkatesh et al., 2012), the extant research on adoption of telemedicine is limited. The objective of the current study is to analyze factors affecting adoption of telemedicine, and identify research opportunities to enhance its wider use.

The remaining of the paper is organized as follows. The next section provides an overview of telemedicine. It is followed by an explanation of the research methodology and the framework of analysis. The factors identified by the study are then presented. The paper is concluded with suggestions for future research to mitigate the challenges to the adoption of telemedicine.

OVERVIEW OF TELEMEDICINE

Information technology plays a crucial enabling role in every industry, and it is particularly true in the case of the health care sector. Accurate and timely delivery of health care requires efficient systems and access to quality data to all the people involved in care delivery. Health Information Technology (HIT), if utilized appropriately, can help in providing right care at the right time. Telemedicine has high potential in accomplishing this objective. However, the adoption of telemedicine by care providers has not been very encouraging (Yap, 2012).

Telehealth, Telecare, and Telemedicine are some of the terms used to describe delivery of health care services using information and communication technologies. Telehealth is a broader term that encompasses all possible means of health-service delivery using telecommunications. According to Health Resources and Services Administration (HRSA), telehealth is the “use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration” (HRSA: Telehealth). Telecare, also known as Telehome care, involves monitoring a patient’s medical condition from a distance. It can be used in place of home visits by a care provider (Burke and Weill, 2009, p. 66). It enables the chronically ill and elderly to live independently in their own homes, thus lowering the cost of nursing home stays (Maestrutti, 2011).

Telemedicine, which is an aspect of Telehealth, involves providing clinical care, including diagnosis and treatment of illnesses, and patient monitoring and follow up through the use of information and communications technologies (ICT) (Abdelhak, Grostick, and Hanken, 2012, p. 284). For the purpose of the current study, we use the definition of telemedicine given by Austin and Boxerman (1997), “Telemedicine is the application of computer and communications technologies to support healthcare provided to patients at remote locations.” Thus, certain aspects of Telehealth, namely, healthcare education and administration, are outside the purview of our study. Health care delivery using Telemedicine may be divided into three broad categories, namely, store-and-forward, interactive (real-time), and remote monitoring. Store-and-forward technology involves exchanging medical information such as digital images and clinical information asynchronously between the patient and the health care provider. In the interactive method, health care services are delivered on a real time basis by exchanging information synchronously while the patient and the provider are located in different locations (Burke and Weill, 2009, p. 60). In the remote monitoring method, the patient’s conditions are monitored remotely. A unique aspect of telemedicine is its heavy reliance on high quality and reliable ICT for care delivery. Further, the spatial separation between the patient and the care provider significantly alters the nature of interaction that takes place between the patient and provider in a traditional healthcare setting. These and other related issues create challenges to the universal adoption of telemedicine, which is the focus of investigation in this study.

RESEARCH METHODOLOGY

We conducted a literature search to find studies that have investigated the adoption of telemedicine. A key word search of the Web of Science database matching the key words “telemedicine” or “telehealth”, and “adoption”, resulted in an initial list of 210 records. These articles were retrieved from the database and reviewed to identify ones that investigated barriers to adoption of telemedicine and related technologies. This screening process resulted in a shortlist of 47 articles. These articles were analyzed and the list was further refined. Key concepts were then identified using the concept matrix technique described in Webster and Watson (2002). These concepts were organized using a framework based on Kwon and Zmud (1987).

Kwon and Zmud (1987) studied information systems (IS) implementation from a diffusion of innovation perspective, and presented a framework (See Figure 1) to categorize factors that influence organizational adoption of IS innovations. This framework has been extensively used to investigate the adoption of information technologies (IT) in organizations. The framework includes five categories of factors, namely, individual, structural, technological, task related, and environmental. Individual factors consist of characteristics of individuals who use the technology. These include education, job tenure, and cosmopolitanism or openness to new ideas. Structural factors pertain to the structure of the organizations, such as, specialization, centralization, and formalization that impact work processes in an organization. Technological factors describe the characteristics of the technology being adopted, such as, compatibility, relative advantage and complexity. Task related factors refer to the nature of the task in which the technology will be used. Finally, environmental factors take into consideration aspects of the environment surrounding the organization that may facilitate or hinder the adoption of a new technology.

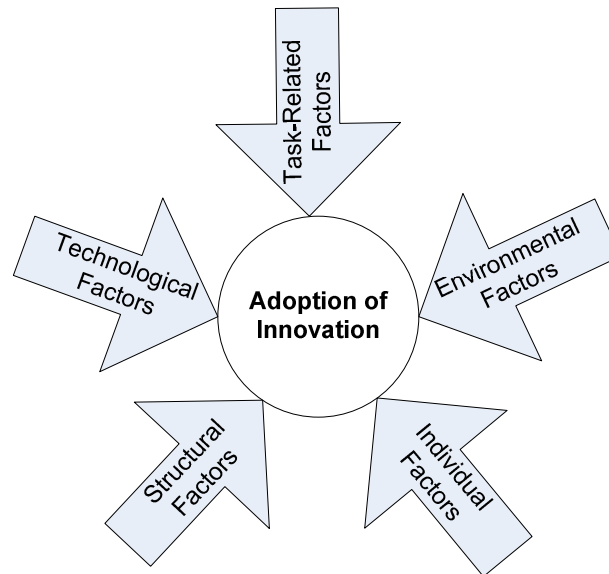


Figure 1: Factors influencing adoption of innovation (based on Kwon and Zmud, 1987)

Kwon and Zmud’s framework is useful in studying adoption of IT in a single organization, whereas our study pertains to adoption of Telemedicine in the health care sector. We have, therefore, adapted Kwon and Zmud’s framework keeping in mind the unique characteristics of the health care sector. Firstly, the health care industry is heavily regulated (Agarwal et al., 2010). Governmental and non-governmental regulatory agencies play a key role in influencing behavior of stake holders in this industry. Secondly, health care delivery invariably involves multiple entities, including the provider organization(s), the payer organization(s), drug manufacturers, and governmental and regulatory agencies. While studying the adoption of telemedicine in the context of a single organization, such as, a hospital or a physician’s office is a meaningful endeavor our study takes a broader view of the adoption process and examines it from the standpoint of the health care eco system. Therefore, the organizational factor in the Kwon and Zmud’s (1987) framework has been replaced with “institutional” factor in our model. Similarly, we dropped task-related factors because this is not applicable in the context of telemedicine adoption. Thus, the framework proposed in our study consists of four key categories that impact successful adoption of telemedicine (Figure 2). These are: individual (physician/patient), institutional (hospital, health centers, payers), regulatory (government/legal), and technological (interoperability, data standards). Individual factors are those that are associated with the individual’s characteristics, attitudes, intentions, and behaviors. In the health care context, these individuals are physicians, nurses, patients, and others whose perceptions can influence the adoption of telemedicine technologies. Institutional factors are related to institutional players in the health care eco system. Regulatory factors include policies and regulations that govern the health care industry. Finally, technological factors influence cost-benefit and technological performance related to security, privacy, usability, and reliability. Figure 2 depicts the framework developed and used in our study.

RESULTS

Figure 2 summarizes the factors unraveled by our analysis. Our findings are presented in the following sections.

Individual Factors

For successful adoption of any technology within an organization, it is very important that the individuals who use the system accept it. There are several studies on user resistance to IS implementation (for a review, see Kim and Kankanhalli 2009). Lack of acceptance by key stakeholders, particularly physicians becomes a major impediment to telemedicine adoption (Gagnon et al., 2003; Chau and Hu, 2002). Individual concerns about loss of face-to-face interaction in a health care setting, skepticism about potential usefulness, and perceived incompatibility between telemedicine technology and organizational routines also affect telemedicine adoption (King, Richards, and Godden, 2007).

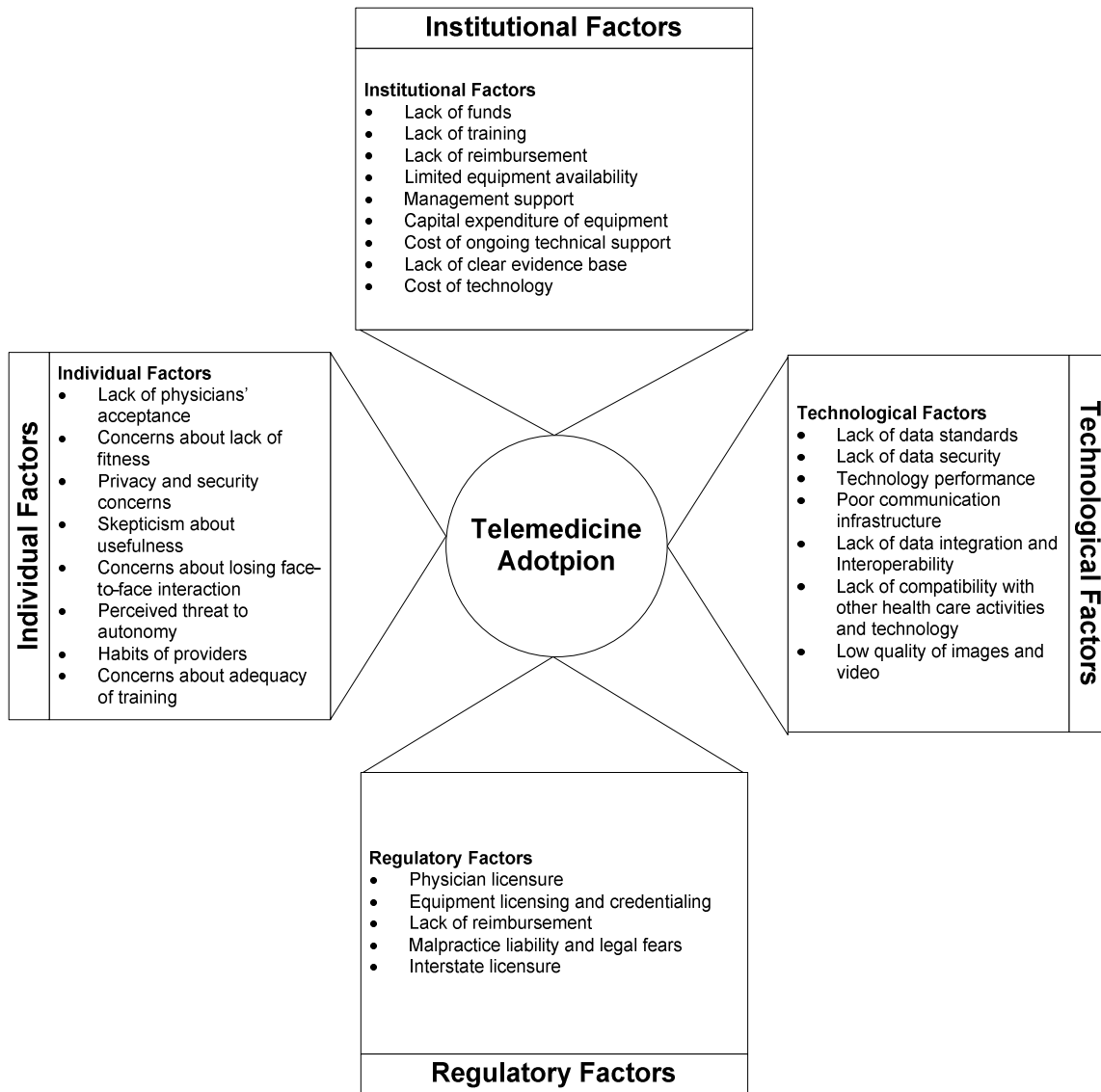


Figure 2: Factors influencing telemedicine adoption

Patient health information is very sensitive, and it is of paramount importance to keep it safe and secure. Care delivery using telemedicine technologies uses technology to connect the patient with the provider. The transmission of health information through the Internet raises concerns about privacy and security issues. Patients’ concerns of privacy and security have been found to become impediments to the implementation and adoption of telemedicine technologies (Baker and Bufka, 2011; Whitten, Buis, and Love, 2007; Courtney, 2008).

Health care has traditionally been a high-touch environment, with clinical protocols geared towards face-to-face interaction between the patient and the care provider. Administering patient care is based on established routines (Goh, Gao, & Agarwal, 2011). Telemedicine disrupts this routine and forces both the patient and the provider to adapt to a new environment and to new routines. Individuals often resist change. Care providers’ resistance to change their routines and individual habits has been found to impede telemedicine adoption (Grigsby et al., 2007).

Apart from the above, the provider’s fear of being overburdened and perception of threat to his/her autonomy, as well as the patient’s discomfort with technology have also been found to affect the adoption process (Kang et al., 2010).

Institutional Factors

In a telemedicine network multiple organizations that are formally and informally affiliated with one another come together to provide necessary care to remote patients (Grigsby, et al., 2007). In the health care eco system, payment or reimbursement to the care providers for their services is made by private insurance companies or through government programs, such as, Medicare and Medicaid. Currently, reimbursements by Medicare are not consistent across various types of telemedicine services. Reimbursement policies have also not been standardized among various private payers (HRSA: Reimbursement Issues). Though Medicare currently reimburses some of the telemedicine services, not all types of services are reimbursed (Kang, et al., 2010).

Several studies have found that a key reason of the slow adoption of telemedicine is inconsistent standards in the reimbursement mechanism for care provided using telemedicine technologies (Grigsby et al. 2012; Silva et al. 2012; Whitten et al. 2007; Ghosh and Ahadome, 2012; Baker and Bufka, 2011; Najjar, 2012). Providers and administrators are reluctant to adopt telemedicine due to a lack of clear guidelines on reimbursement.

Telemedicine infrastructure is expensive. It includes costs of installation, operations, and maintenance. A lack of wider adoption of telemedicine lowers the return on investment (ROI), thus making investment in such infrastructure less attractive. High cost of technology and equipment (Rogove et al., 2012), lack of program funds (Silva et al. 2012), and cost of ongoing technical support (McCue and Palsbo, 2006) have been found to impede the adoption of telemedicine technologies.

In any technology adoption decision, stakeholders expect a strong evidence of benefits. Thus, it is not surprising that health care institutions, including, providers, payers, and governmental agencies, expect a clear evidence base for evaluating investments in telemedicine technologies. This evidence base in terms of both reduction in cost and increase in care quality is required for payers and providers to be convinced about the benefits of telemedicine. Lack of data on the benefits of telemedicine technologies have been a challenge to their adoption (Ghosh and Ahadome, 2012).

Training plays a key role in the adoption of new technologies. Care givers need to be trained in using telemedicine technologies. Lack of proper training and education for medical staff (Lewis et al., 2012; Stronge et al., 2008), and lack of management support (Al-Qirim, 2007; Stronge et al., 2008) also affect the adoption of telemedicine technologies.

Regulatory Factors

Health care sector is heavily regulated. Care providers need to be licensed to provide care. Health care institutions must comply with numerous regulations to operate. Policies and guidelines for licensing physicians to use telemedicine technologies for care delivery are still under development. Currently, physicians providing care using telemedicine are subject to same licensing regulations as physicians providing care in-person (Kang et al., 2010). Licensing and credentialing process is very complicated and expensive. There are also restrictions for providing service across the state lines. For example, physicians providing care using telemedicine from out of the state have to obtain full licensure from the state where the service is being provided (Kang et al., 2010; Najjar, 2012). Apart from provider licensure, the equipment used in telemedicine also has to be approved by the appropriate regulatory agency. The process involved in getting licensure and the penalties associated with malpractice or violation of any regulation scares providers away from adopting telemedicine (Silva et al., 2012; Whitten et al., 2007; Rogove et al., 2012).

We addressed issues regarding lack of guidelines for reimbursement under the category of institutional factors. This also comes under regulatory factor because Medicare and Medicaid is a major payer of health care cost, and governmental policies on reimbursement for telemedicine services have a significant impact on the adoption of telemedicine.

Technological Factors

In any organizations, it is extremely important for various IT systems to communicate with each other seamlessly. In the health care system, multiple organizations – physicians, hospitals, insurance companies, etc. – get involved in the care delivery process. Each of these organizations has their own information systems that store patient health information. When multiple organizations come together to provide patient care, perfect communication among various systems is crucial for the provision of patient care. Interoperability is “the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities” (Interoperability Definition and Background, 2005). In order for health care organizations to adopt telemedicine technology, it is imperative for different systems used by these organizations to interact with each other smoothly. Adoption of telemedicine is hindered because of lack of interoperability standards (Ghosh and Ahadome, 2012; Ackerman, Filart, Burgess, Lee, and Poropatich, 2010).

IT infrastructure for communication is the backbone for proper exchange of data between various IT systems within and across organizations. In the case of telemedicine, ways to store and transmit data need to be considered. Depending on the type of service provided, providers require to store large image files and related video files of patients. Robust telecommunication lines, high speed Internet connections, power backups, and IT systems that are properly tested in the rural community settings would be required for transmitting information back and forth between the patients and the provider. Lack of proper communication infrastructure and performance issues with technology can affect adoption of telemedicine (Kang, et al., 2010).

Standardized, secure, timely, and accurate data are paramount to the success care delivery. When dealing with patient health information, security of data is imperative. Data security refers to “the technical and procedural methods by which access to confidential information is controlled and managed” (Abdelhak et al., 2012, p. 209). Standardization of data would be required for interoperability of various IT systems used in a health care setting. Privacy is concerned with an individual’s right to share their personal information selectively (Abdelhak et al., 2012, p. 209). Laws protect patients by providing guidelines for privacy and confidentiality of medical data. Lack of data standards and security measures to protect patient privacy impede the adoption of telemedicine technologies (Ackerman et al. 2010).

In order to provide useful results, new IT systems must be compatible with the existing technology and processes of an organization. In a complex health care eco system where multiple professionals and specialists come together to provide patient care, compatibility of telemedicine technologies with existing systems becomes even more significant. Adoption of telemedicine depends on its fit with existing organizational routines and practices (King et al., 2007), and its compatibility at the individual, process, and organizational levels (Vuononvirta, et al., 2009; Al-Qirim, 2007).

Usability of the technology and glitches in the IT systems also influence the adoption of telemedicine technologies. According to a study conducted by the U.S. Military, usability, technical problems, and limitations are cited as factors that impede the use of teledermatology systems (Stronge, Nichols, Rogers, and Fisk, 2008).

DISCUSSION AND RESEARCH OPPORTUNITIES

Based on the above discussion, we have identified several opportunities for research and/or policy making to facilitate wider adoption of telemedicine. A brief discussion of each is presented in this section.

First, a key institutional and regulatory issue that severely impedes telemedicine adoption is the non-standard reimbursement policies among payers. Currently, reimbursement policies are not consistent across various services and payers. Future research should focus on effective ways of reimbursing all types of telemedicine services based on evidence in cost savings and clinical quality (Whitten et al., 2007). Physician’s interstate licensure has also been cited as a major adoption barrier. Research should provide evidence that can help facilitate easier licensing and credentialing of telemedicine (Rogove et al., 2012). Both reimbursement and licensing issues are influenced by governmental policies. Researchers can guide policy making by creating data sets that may be used to assess efficacy of telemedicine on quality and cost of health care.

Second, there is an urgent need for training and education for both care providers and patients. Many patient and provider concerns including, skepticism about usefulness of telemedicine, diminishing quality of communication in clinical settings, lack of compatibility between telemedicine technologies and organizational routines, can be overcome with proper training and education. Health care administrators need to design appropriate training mechanisms to promote telemedicine adoption among providers and patients.

Interoperability among various IT systems is the third key issue. Effective exchange of confidential patient information securely among various entities in the health system is imperative. This improves care quality and reduces cost by controlling redundancies. Electronic health record systems in hospitals, clinics, and physician offices must interoperate with telemedicine systems for wider adoption of telemedicine. Consistent standards for both data and software applications are required for seamless exchange of data among various systems (Ghosh and Ahadome, 2012; Ackerman et al., 2009).

Fourth, at the individual level, a formidable issue is resistance to change. It is not easy to change routines overnight. However, with proper education and training, it is possible to influence changes in routines for better care delivery. Many nurses, physicians, and even patients believe that providing patient care requires high-touch, not high-tech (Richie, 2012). We agree that telemedicine is only one of the mechanisms to provide care, and it may not be an appropriate medium in situations where high-touch is required. However, it is very well suited to chronic disease management. Identifying appropriate scenarios where telemedicine is likely to be most effective can facilitate its adoption.

Fifth, concerns about privacy and protection of patient information, and providers’ fear of malpractice liability have been major challenges to telemedicine adoption. Researchers need to develop sophisticated IT systems to protect confidential

patient data (Ackerman et al., 2009). Government and regulatory agencies must develop necessary legal framework to encourage providers to adopt telemedicine. Finally, the factors identified in this study provide a basis for conducting a survey of stakeholders in the health care ecosystem to shed further light on the adoption of telemedicine technologies.

CONCLUSION

Access to health care is very limited in many rural areas of the U.S. Telemedicine provides an excellent means to provide care to rural underserved communities at an affordable cost. However, adoption of telemedicine faces challenges from various fronts. Based on a review of extant literature we have identified several factors that impede the wider adoption of telemedicine technologies and recommended research opportunities to facilitate their adoption.

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