AN ANALYSIS OF E-HEALTH IN PUBLIC SECTOR HOSPITALS OF DEVELOPING COUNTRIES

Najam Afaq Qureshi[1], Qamar Afaq Qureshi[2], Kamran Ahmad Chishti[1], Ghulam Muhammad Kundi[2], Shadiullah Khan[2], Robina Akhtar[3], Irfanullah Khan[2]

[1]Department of Pharmacy, SARHAD University Peshawar, Khyber Pakhtunkhwa, Pakistan
[2]Department of Public Administration, Gomal University, Dera Ismail Khan, Pakistan
[3]Institute of Education & Research, Gomal University, Dera Ismail Khan, Pakistan

ABSTRACT

The use of eHealth technologies, including mobile health is spreading rapidly in the developing countries. According to World Health Organization (WHO), the use of mobile phones and computers is gaining momentum in developing nations. Majority of the programs that WHO looked at in Bangladesh, Bolivia, Brazil, Cambodia, Ecuador, India, Indonesia, Kenya, Pakistan, Peru, the Philippines, Rwanda, South Africa, Uganda, the United Republic of Tanzania and Viet Nam, are identified as "technology enabled", meaning they used "information and communications technology" (ICT) to improve their healthcare systems. The leading technologies in this context are phones, computers, and texting. The latter fell into third place because so many people in these countries are illiterate. E-health systems are extending geographic access, data management, facilitating communications between patients and providers, and improving treatment and diagnosis. Among the leading types of tele-health in developing countries are "video chat" programs and phone "hotlines" that provide remote access to physicians. This research paper highlights the different aspects of eHealth systems in connection with adoption and use in developing countries.

Keywords: ICTs, Adoption, Use and Developing States.

INTRODUCTION

The significance of intensifying eHealth applications has also got acknowledgments by some international organizations for example UNDP, WHO and World Bank. These organizations are extending their fuller level support to adopt and use the IT-applications in healthcare practices especially in the low income countries. The use of IS/ICTs extend geographic access to health care. These IT-applications often take the form of telemedicine, which connects doctors and patients via these technologies for example video chat, or health hotlines, which provide patients with round the clock access to qualified doctors, more improved diagnosis and treatment (Shaqrah, 2010).

Developing countries like Pakistan are seeking new solutions to improve healthcare delivery services. Digital technology can help improve the access to healthcare from the metropolitan to remote countryside, connect the people for information and analysis. These electronic devices also facilitate people to have an access to their own health related information and allow healthcare professionals in distant and out-of-the-way areas to obtain suggestions and get the support from their coworkers who have access to information (Durrani et al., 2012).

The recipients of IT-applications in healthcare organizations vary from one person and combined groups of patients, paramedical staff physician and doctors, to national and global policymakers. Those designs and proposals for implementation of IT-applications in healthcare organization find the success which considers needs of the users of E-health

systems. Conversely, and the plans which are not made according to the needs and wants of the users cannot find success (Latifi, 2011).

LITERATURE REVIEW

This section examines the existing studies on eHealth in developing countries.

Health in Public Sector of developing countries

The advents of IT-applications have made many organizations to replace their conventional ways of doing things with the IT-based methods and procedures. Developing countries are now taking initiatives to enhance and give a proper symmetry to the existing paper-based information systems in healthcare organizations for planning and implementing an improved delivery of healthcare services. There is an ever growing belief and confidence that adoption of IT-applications in healthcare organizations can minimize many of the operational cost of extending different healthcare activities to the general public in developing states (Braa et al., 2004; Bra et al., 2007).

ICTs/IS make the data collection and reporting flawless. The use of computers and different software make it possible to convert all paper-based routines tasks to a mechanized nature and facilitate the data collection and report preparation in a well-organized and efficient way (Khoja et al., 2008).

Furthermore the use of technology in data collection increases the authenticity, relevance and quality of the data. Different information systems i.e. Executive Information System (EIS), Management Information System (MIS), and Transaction Processing System(TPS) all can make reporting potentially much more adaptable and well-organized by allowing data to be analyzed at the different organizational levels and generate the reports of the same (Durrani et al., 2012).

Adoption and use of IT-applications in public sector hospitals

Adoption

In comparison with the private organizations, adoption and use of IT-applications in public organizations including healthcare organizations, is slow but is gaining momentum for all sorts of organizational processes (Chen & Perry, 2006). Due to change in the trend and effectiveness of computers, public organizations are making efforts to adopt IT-applications. A new system has got more positive features and potentials.

Therefore, old and customary information systems are gradually being replaced with latest and digital information systems.

Furthermore, in view of these benefits public sector organizations are re-assessing and re-shaping their information system requirements, patterns and structures for more productive ways of conducting business processes (Hussain et al., 2007).

Use

eHealth improves the Routine organizational activities

With the arrival of new technologies, tremendous efforts are being made in developing nations for restructuring their routine organizational activities by introducing ICTs/IS. These new IT-applications are also being adopted in the healthcare organizations to bring modifications in the old and unstructured paper-based information system and for more coordination and administrative efficiency regarding the delivery of healthcare services (Nhampossa, 2006). Not only the healthcare activities are

carried out effectively but there is reduction in the cost of the health-related functions.

The ever increasing awareness and acceptance of eHealth systems in developing countries bring a very considerable savings in cost and extend in-time delivery of treatment and care services (Mengiste, 2010).

To u**se** the strength and capabilities of E-health systems, various developing states including Ethiopia are going on board for IT-applications in healthcare services just to change the existing paper-based health-related data collection methods to digital data collection via health management information systems. For example, Alvarez (2004) highlighted that the steps taken by the government of Ecuador in partnership with donor agencies (such as IDA), to spread out and update the health management, in various health districts of the country just to support primary healthcare services. There are also parallel transformation and improvement proposals for decentralization of public healthcare delivery system and improve and consolidate the existing paper-based information system via IT-applications in various African countries including South Africa (Mosse, 2003), Tanzania (Kimaro, 2006) under the frame work of HISP in collaboration with other international organizations such as WHO and local and national governments (Braa et al., 2007; Lungo, 2008).

According to WHO (2006) ICTs in healthcare settings, systematize and distributes healthcare-related information to healthcare professionals and to the general public, educates the general public about the preventive measures for various diseases. Various eHealth tools and devices are used for communication and learning purposes for example cell phones and internet can be used in promoting good public health .cell phones are used to convey the information about the arrival of various vaccination teams in far flung areas while internet is used as a means for distant learning

Generates better clinical management of patients

Many WHO projects concentrate on developing and implementing these technologies where they are really considered necessary. The Health Internetwork Access to Research Project for example, it gives doctors and physicians in more than 1,200 organizations of developing countries with free of charge or inexpensive online access to 2,400 of the top scientific journals in the health care subjects, thereby making health knowledge society (Dzenowagis & Kernen, 2005). A number of tele-health projects in developing states are made feasible by the fast production of mobile phones and other wireless devices. In addition, the medical education through internet is very effective in stopping the healthcare providers to seek jobs in developed countries. The WHO has also launched a global observatory for IT-applications in healthcare organizations. Its main purpose is to chase developments in relevant fields/subjects simply through collection and analysis of data on digital devices and information systems being used and required by the healthcare institutions in developing countries (Raghupathi & Wu, 2011).

Between more advanced plans, the European Information Society (2010) supports calls for realization of such actions as online health services, implementation of health cards, and health information networks among points of care (Tomasi et al., 2004). An EU health portal and EU-sponsored excellence criteria for health websites are visualized

for the future. Chronic diseases- cancer, diabetes, heart disease, and stroke-are by far the major causes of death all over Europe. Health promotion procedures, well-timed and appropriate diagnosis, and good control can postpone the start and alleviate the effects of these diseases, adoption and use of eHealth systems can make easy and enhance these features of healthcare (Raghupathi & Wu, 2011).

ICTs helps the formation of public health information networks (PHIN) (Detmer, 2003; Scotch et al., 2008), a national multi-organizational business and technical planning for public health information systems in the U.S. (Loonsk et al., 2006). The aim of PHIN is to spread out the functionality of public health applications and combine them across the width of healthcare organizations in and workable needs of public health. There is also an effort to develop a national health information infrastructure. An NHII provides the fundamental information planning to identify and trace global fears to public health by linking local healthcare professionals and health care executives to national data systems (e.g. Centers for Disease Control and Prevention), using high-speed networks (Tang, 2002). A national health information communication network must maintain, a public health system which must possess the feature of examining, supporting, and protecting the physical condition and safety of all the people simply by providing and sharing apparatuses and equipments in order to make possible a better clinical management of patients using vital statistics, quicker notices and warnings, and disease registries (Detmer, 2003). All have the capabilities for high-quality results on the delivery of the healthcare services in public hospitals of the country (Raghupathi & Wu, 2011).

Develops close watch systems

ICTs also allow the development and use of public health close watch systems with main objective of collection, analysis and presentation of facts and figures about various diseases, their causes and preventive measures, and then present correct and complete information to decision makers (Lazarus et al. 2008). Early discovery of a biological attack with agents (anthrax, for example) may be achieved through close watch systems that distinguish infected persons in the early hours of their disease and infection.

The importance of the issue is highlighted in numerous research studies on new computer-based disease surveillance systems. The use of observation data that traces sales of over-the-counter (OTC) health care products, such as cough syrup, obtained by ill persons at the initial stage of their sickness to deal with symptoms (Chen & Perry, 2006; Bellika et al., 2007). They also explained that the advent of electronic patient records and digital devices for dissemination and communication of healthcare related information among the healthcare providers increases the possibility of expanding public health reporting to determine a wide range of clinical conditions and of observing the health of the general public on a large scale (Lazarus et al. 2008; Sengupta et al., 2008).

It helps to maintain very large databases

ICTs have the potential to establish and maintain very large databases of epidemiological data, including but not restricted to life expectancy and mortality, malnutrition, immunization level, infection rates, and sanitation levels. Some countries have recognized ICTs-enabled surveillance systems that depend on

lookout districts selected as agent of the country (Braa et al., 2004**).** Data collection systems for cause-specific death rates, vaccine coverage, the usefulness of vaccines, and the influence of particular health interventions can be observed and checked. Other systems identify pandemics such as the bird flu virus. These systems, when combined with suitable practices of information use, play a role considerably to increased immunization coverage and therefore to reduced infant and child mortality (Raghupathi & Wu, 2011).

Facilitates distant healthcare

Another example of the capability of ICTs in public healthcare delivery is telemedicine/ telematics. These eHealth systems facilitate a number of activities which include distant healthcare and training, particularly in countryside and far flung areas (Androuchko, 2005). As the WHO recommends, it has a most important function of facilitating initial preparation and unending learning. A study about E-health projects in European countries, conducted by the European Health Telematics Observatory (EHTO), shows that training had a 6 percent contribution in adoption and use of IT-applications in healthcare organizations (MacFarlane et al., 2006; Miscione, 2007). Health-telematics is a difficult and complicated word for healthcare systems, services and activities carried out over a distance with the help of digital devices in order to promote worldwide healthcare, disease control, education, management of healthcare activities and research for more improved healthcare (Raghupathi & Wu, 2011). This is part of the universal trend in which healthcare concentration is shifting from hospital-based severe care regarding prevention, promotion of wellness, and maintenance of function in community and home-based facilities. Telemedicine can assist this shift. FCC's Advisory Committee on Telecommunications and Health Care also examined that the combination of healthcare and telecommunications technologies presents a special chance and openings to enlarge the accessibility and affordability of contemporary health care (Soar et al., 2012).

Impact on the deliverance of public health

Finally, ICTs have an influence on the deliverance of public health through eHealth applications. The potential of eHealth to increase life expectancy, literacy, teaching and learning, and standard of living (all dimensions of human development) is noteworthy (Kwankam, 2004; Eysenbach, 2007). Over the last decade, the need to improve and manage new ways of providing effective and well organized healthcare services has matched with major developments in ICTs. As a result there is a spectacular increase in the use of ICT applications in healthcare sector, jointly known as eHealth. Nowadays, the integration and absorption of eHealth into the daily life of healthcare workers is becoming an actuality and truth in both developed and developing states. E-Health is the use, in the health sector, of digital data transmitted, stored and retrieved electronically in support of health care, both at the local site and at a distance (Raghupathi & Wu, 2011).

The WHO program on eHealth for healthcare delivery (eHCD) includes IT-application in healthcare sector to provide prevention from various diseases, facilitate patients' diagnosis, and effective management of patients' care. These applications consist of tele-consultations, tele-referrals, forward-storage concepts

(e.g. tele-radiology and tele-prescriptions) and electronic patient records (EPR) (Raghupathi & Wu, 2011). Through eHealth systems, more and special attention is given to basic healthcare units/centers in far flung areas to develop and enhance the worth and value of healthcare services. By attaching primary healthcare providers with primary healthcare centers and then linking these basic healthcare centers through digital devices to various sections and medical appointment centers in hospitals for the purpose of exchanging the data, a substantial improvement in accessing the data and a considerable cut-down in the the cost is achieved. Therefore, primary healthcare is the main purpose of the electronic healthcare development program (Latifi, 2011).

DISCUSSION & ANALYSIS

Healthcare services in public sector are very much neglected field especially in developing states and need special consideration. The main issues are related with financial limitations and restrictions and the socio-cultural feature of the public sector hospitals (Chisolm et al., 2010). The need for government plan and concentration for the IT-applications in healthcare sector occurs due to a desperate need for improving living standards of general public by providing better healthcare services especially in developing countries. In many cases patients are ignorant of their own medical history, and if hospital records are to be destroyed after five years, there are no records of the patient's medical history. Instead of saving space by destroying the records, healthcare organizations could get the advantages of EHR systems if government combined forces with the public health sector and supported it more (Shaqrah, 2010). EHR systems not only save money, time and space which is usually consumed while creating and preserving patients'-health record manually, but can also provide better solutions to many healthcare-related problems such as; heavy patient load, scarcity of human and ICTs resources, thick population and inadequate healthcare infrastructure. However, before the adoption and use of health information system (HIS) some challenges have to be met and offset by the hospital authorities such as; lack of motivation and support for new technologies, resistance by the healthcare providers to adopt the eHealth systems.

Challenges and fears for which there is rational ground. Literature about USA, UK and Spain (Hier et al., 2004) explains that the obstacles in the developing and the developed nations are alike and they are facing the same disputes but the developed states have more potential to resolve these disputes because of the socio-economic factors. Shortages of computers, low speed processors, lack of computer skills, lack of proper training about EHR systems, are some of the general challenges (Fitzgerald, 2006). In most of the developing countries secrecy, confidentiality, safety and security issues are the main concerns which explain that eHealth-applications are powerless to security, privacy, technological dependence issues, and the technology ultimately has problems too and it will almost certainly remain to be so (Soar et al., 2012), thus, care is required while executing EHR systems. Complete shift from conventional to a computerized system and having no manual record at all in the start might be a problem, so the change needs to be slow and steady with gradual switching to computerization (Eric et al.,2006). The general aim is to save lives and reduce pain. If ICTs, and

therefore EHR systems, can be utilized to contribute to that, it is important to think about adoption and use of IT-applications in healthcare organizations. In addition, economical and organizational barriers have been recognized in United Kingdom and Spain. This explains that implementation of EHR systems is a continuing process which does not end with just introducing the system in healthcare institutions (Shaqrah, 2010).

CONCLUSIONS

ICT is being deployed around the world in many areas of health. Prospective beneficiaries of IS/ICTs consist of different stakeholders in important healthcare organizations, including public sector as a whole especially in low income states. It is clear from the literature that all the people directly or indirectly involved and associated with hospitals must be given importance and recognition. It is important to ensure and verify all the persons and factions within the healthcare organizations that may be the prospected users of E-health systems, along with taking into account their capabilities and requirements also. Beneficiaries are also analyzed on the basis of their locations and accessibility.

A recommended device for decision-makers in scheduling and preparation for intended beneficiaries in broad-spectrum, and beneficiaries within important healthcare organizations in specifically, is to collect as much details regarding the needs of target people as possible. These details may be about the duties and responsibilities of each and every healthcare provider at all the different levels of healthcare organizations, details about the needs and requirements of all healthcare providers in concordance with their capabilities required for using a variety of IT-applications. It is also highly recommended that the authorities must go for short, medium, and long-term farsightedness and planning for maintainability of the E-health systems within a healthcare setup. As e-health continues to evolve, many of the current challenges faced by health systems in developing countries, such as the shortage of health workers in rural areas, the variable quality of care, lack of patient compliance, and fraud, will potentially be mitigated through the wide deployment of ICT. It will be crucial to continue to track which of these purposes are being successfully fulfilled by technology and what devices and use cases are most effective in attaining them. This will require more systematic evaluations and better codification of lessons learnt from existing programs, which in turn will allow programs that are currently struggling to employ technology to make educated decisions about when and how to implement ICT.

REFERENCES

Alvarez, A.J.S. (2004). Challenges of information systems implementation in organizational change management: Insights from the health sector in Equador, *Electronic Journal on Information Systems in developing Countries*, 16(6):1-16.

Androuchko, L. (2005). Issues on E-Health/Telemedicine policy for developing countries, *HEAL THCOM Proceedings of 7th International Workshop on Enterprise Networking and Computing in Healthcare Industry*, pp. 1–4.

Bellika, J.G., T. Hasvold, & G. Hartvigsen (2007). Propagation of Program Control: A Tool for Distributed Disease Surveillance, *International Journal of Medical Informatics* (76): 313–329.

Braa, J., Monteiro, E., & Sahay, S. (2004). Networks of action: Sustainable health information systems across developing countries, *MIS Quarterly*, *28(3)*:337-362.

Braa, J., O. Hanseth, H. A., Mohammed, W., & Shaw, V. (2007). Developing health information systems in developing countries: The flexible standards, *MIS Quarterly*, Special Issue on IT and development, *31*: 381-402.

Burney, A., Mahmood, N., & Abbas, Z. (2010). Information and communication technology in healthcare management systems: Prospects for developing countries, *International Journal of Computer Applications*, *4(2)*: 23-37.

Chen, Y-C., & Perry, J.L. (2006). *Global Healthcare Crises: How Information Technology Can Address Pandemics and Disasters´*, IBM Report.

Chisolm, D.J., Purnell, T.S., Cohen, D.M. & McAlearney, A.S. (2010). Clinician perceptions of an electronic medical record during the first year of implementation in emergency services, *Pediatric Emergency Care*, *26(2)*:107-110.

Detmer, D.E. (2003). Building the national health information infrastructure for personal health, health care services, public health, and research, *BMC Medical Informatics and Decision Making*, *(3)1*: 57-66.

Durrani, H., Khoja, S., Naseem, A., Scott, R. E., Gul, A., & Jan, R. (2012). Health needs and eHealth readiness assessment of health care organizations in Kabul and Bamyan, Afghanistan, *Eastern Mediterranean Health Journal*, *18(6)*: 663-674.

Dzenowagis, J., & Kernen, G. (2005). *Connecting for health: Global vision, local insight*, Report for the World Summit on the Information Society, World Health Organization.

Eric, W. Ford, Menachemi, N., & Phillips, M.T. (2006). Predicting the adoption of electronic health records by physicians: When will eHealth care be paperless? *Journal of American Medical Informatics Association*, *13(1)*: 106-112.

Eysenbach, G. (2007) Editorial: Poverty, human development, and the role of E-health, *Journal of Medical Internet Research*, *(9)4*: 34-44.

Fitzgerald G. (2006). *Effective Technical and human implementation of computer-based system (ETHICS) in Information system development: Methodologies, Techniques and Tools.* Berkshire. UK: The McGraw-Hill Companies.

Hier DB., Rothschild A. LeMaistre A. & Keeler J. (2005). Differing faculty and house staff acceptance of an electronic health record, *International Journal of Medical Informatics*, *74(7-8)*:657-62.

Hussein, R., Mohamed, N., Shahriza, N., Karim, A., & Ahlan, A.R. (2007). The influence of organizational factors on information systems success in e-government agencies in Malaysia, *The Electronic Journal on Information Systems in Developing Countries*, *3(5)*: 101-112.

Khoja S., Scott R., & Gilani S. (2008). E-health readiness assessment: Promoting hope in the health-care institutions of Pakistan, *World Hospital Health Service*, *44(1)*:36-48.

Kimaro, H. C. (2006). *Decentralization and sustainability of ICT based health*

information systems in developing countries: A case study from Tanzania. Faculty of Mathematics and Natural Sciences, University of Oslo. PhD Thesis.

Kwankam, S. Y. (2004). What E-Health can offer? *Bulletin of World Health Organization, 82(10)*: 55-67.

Latifi, R. (2011). Initiate-build-operate-transfer- a strategy for establishing sustainable telemedicine programs not only in the developing countries, *Study Health Technologies Informatics, Vol.165*: 3-10.

Lazarus R., Klompas M., Campion F., McNabb S. J. N., Hou X., Daniel J., Haney G.,DeMaria A., Lenert L. & Platt R.. (2008). Electronic support for public health: Validated case finding and reporting for notifiable diseases using electronic medical data, *Journal of the American Medical Informatics Association, 16(1)*:18–24.

Loonsk J W, McGarvey S R, Conn L A, & Jhonson J. (2006). The public health information network (PHIN) preparedness initiative, *Journal of the American Medical Informatics Association, (13)1*: 1-4.

MacFarlane, A., Murphy, A.W., & Clerkin, P. (2006) Telemedicine services in the republic of Ireland: An evolving policy context, *Health Policy, (76)3*: 245-258.

Mengiste, S. A. (2010). Analyzing the challenges of IS implementation in public health institutions of a developing country: Te need for flexible strategies, *Journal of Health Informatics in Developing Countries, Vol. 4*: 22-36.

Miscione, G. (2007) Telemedicine in the upper Amazon: Interplay with local health care practices, *MIS Quarterly, (31)2*: 403-425.

Mosse, E., & Sahay, S. (2003). Counter networks, communication and health information systems: A case study from Mozambique. *In The IFIP TC8 & TC9/WG8.2+9.4 Working Conference on Information Systems Perspectives and Challenges in the Context of Globalization. M. Korpela, R. Montealegre and A. Poulymenakou (Eds), Athens, Greece*: 35-51.

Nhampossa, J. L. (2006). *Re-Thinking Technology Transfer as Technology Translation: A Case Study of health Information systems in Mozambique*. Faculty of Mathematics and Natural sciences. Oslo, University of Oslo. PhD Thesis.

Raghupathi, W., & Wu, S. J. (2011). The relationship between information and communication technologies and the delivery of public health: A country-level study, *Communications of the Association for Information Systems, Vol. 28*: Article 8.

Scotch, M., Yip, K.Y., & Cheung, K-H. (2008). Development of Grid-Like applications for public health using Web 2.0 mashup techniques, *Journal of the American Medical Informatics Association, (15)6*: 783-786.

Sengupta, S., Calman, N.S. & Hripcsak, G. (2008). A model for expanded public health reporting in the context of HIPAA, *Journal of the American Medical Informatics Association, (15)5*: 569-574.

Shaqrah, Amin, A. (2010). Adoption of telemedicine among health care services: The strategic adoption, *Journal of e-Health Management*, *Vol. 19*: 22-36.

Soar, J., Gow, J., & Caniogo, V. (2012). Sustainability of health information systems in developing countries: the case of Fiji, *Health Information Management Journal, 41(3)*:19-33.

Tang, P.C. (2002). AMIA advocates national health information system in fight against national health threats, *Journal of the American Medical Informatics Association, (9)2*: 123-124.

Tomasi, E., Facchini, L.A., & Maia, M. de F.S. (2004). Health information technology in primary health care in developing countries: A literature review, *Bulletin of the World Health Organization, (82)11*: 867-872.

WHO. (2006). *Building Foundations for eHealth: Progress of Member States,* Report of the WHO Global Observatory for eHealth.