

The Scenario of e-Health Systems in Developing Countries (Bangladesh and Malaysia)

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Abstract--- For any countries national interest healthcare system is one of the significant parts. Due to the potential and wider benefits as well as the recent advances in Information and Communication Technologies (ICT) most of the countries are adopting ICT based electronic health (e-Health) system nowadays. Many developed countries have already established a well-developed e-Health system and it seems very beneficial for their healthcare system. The governments of developing countries are also taking initiatives to introduce ICT based e-Health system. Since they are facing a lot of challenges to provide equal treatment opportunity in both rural and urban areas. E-health system will help them to lessen the discrimination between health care system in the urban and rural area in their countries. Developing countries like Bangladesh and Malaysia are also introducing e-Health system. This paper discussed some of the major problems that these countries are facing in their healthcare system and probable solution of these problems in terms of e-Health. The current scenario of e-Health system in Bangladesh and Malaysia are analyzed. Based on that some challenges of e-Health system and recommendation to overcome these challenges are provided in this paper.

Index Terms: Developing country, electronic health, healthcare system, telemedicine, rural areas.

I. INTRODUCTION

Healthcare system of a country is the most significant issue in determining a nation's success. The importance and the role of healthcare systems for the improvement of the quality of life and social welfare in modern society, have been broadly well recognized [1]. Due to the rapid advancement in information and communication technology (ICT) sector, over the past decade, the health care system experienced a noteworthy change in many countries. Electronic health (e-Health) is one of the blessings of ICT. In order to acquire a tangible effect on the advancement of health care system, this e-health concept is a major option [2]-[5]. Most of the developed countries have already established a good and stable health care system with the help of e-Health [6]-[8]. The governments of many countries are also interested to invest in e-healthcare system because of its potential in enhancing the health services available and incrementing the accessibility in remote areas as well [9]. There are several types of research going on e-Health in

developing countries [10]-[14]. Individuals involved in medical sector like physician, nurses, patients and other healthcare service providers can receive the e-health service to deliver better services in a much more reliable method. Collaboration and interconnection between all the people in the medical system and the service receivers is a must to implement this e-health project.

Developing countries like Bangladesh and Malaysia are also taking e-Health system very seriously more than ever. There is a massive difference in the health system of urban areas and rural areas in these countries. People of rural areas are not getting proper medical treatment and sadly many people are dying because of normal diseases whose proper treatment is available in the urban area. Therefore, the governments are taking major steps to improve their e-Health care system, so that they can provide a better health care system to the rural areas from urban areas through e-Health.

This paper discussed the current scenario of e-Health system in Bangladesh and Malaysia. A brief definition of e-Health system is given in section II. The problems of health care system in these countries and how e-Health is beneficial for the betterment of the health care system is analyzed in section III.

The significant projects that have introduced for the improvement of e-Health system in Bangladesh and Malaysia are discussed in section IV and V. Followed by the challenges and recommendations are investigated in section VI. Finally, the paper concludes in section VII.

II. E-HEALTH SYSTEM

Health care system defines the application of ICT across the whole range of function that affects the healthcare through the various existing solutions [15]. It can also be defined as the electronic exchange of health-related data through an electronic connectivity for improving efficiency and effectiveness of health care delivery. Thus e-health can be defined as delivering health care services using the technological tools and techniques like Information and Communication technology, cellular technology, medical support and wireless facilities to provide consistent healthcare support to the patients [2]. Examples of e-health systems are electronic medical records, medical journals, and databases on the internet, video and audio conferencing for doctor appointments, or systems on the internet to

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connect with the doctor or to give feedback to doctors, transfer of test result etc., so they can revolutionize the health care facilities they provide.

The e-healthcare system can provide general support in a bigger scale like management support, healthcare services provision etc. as well as specialized support such as health condition data of the citizen [16]. The health support through internet and technology is executed merging available tools and ensuring the quality of the services provided [17].

III. PROBLEMS OF HEALTH CARE SYSTEM AND PROBABLE SOLUTION IN TERMS OF E-HEALTH

Enormous population of Bangladesh and Malaysia living in destitute rural villages and remote areas. Therefore, they are not getting enough health care facility. The problems that these peoples are facing and probable solution of these problems in terms of e-Health are discussed here.

Well-known and better-equipped clinics and hospitals are in the urban areas those are located far away from their areas. The rural area is poorly linked up with rail and road communication and is subject to frequent rainy days, floods, and other natural disasters. It takes a lot of time to reach in the urban areas to get proper medical treatment. Patients are dying on their way to urban hospitals. E-Health, as well as telemedicine, can provide emergency medical treatment.

In most of the developing countries, the health care budget is not enough compared to the population along with that there is continuing shortage of health professionals, especially in remote areas. E-Health system can be a solution of these problems.

People of the rural areas find it difficult to bear the expense of their treatment in the modern hospitals which are located in urban areas. Moreover, as most of the people of rural areas are illiterate they cannot describe their problem clearly and they cannot tell their previous medical history. E-Health system can reduce the cost of treatment of the villagers and can store the medical history of the patients by this way can reduce the opportunity of miscommunications.

In a developing or underdeveloped country at present, it's not possible for the government to apply the same medical facilities and treatment in rural areas which are available in the urban areas. Also, Private sectors are not that much interested in investing. E-Health system can virtually bring the urban hospitals in rural areas.

Famous doctors will not be interested to be settled in the rural areas due to lack of facilities and a lower standard of living. E-Health system can connect the rural people with the urban doctors.

IV. E-HEALTH SYSTEMS IN BANGLADESH

The number of health service providers like doctors, nurses and midwives in Bangladesh is below 228 per 1000 population and the number of available beds in hospitals is 4 per 10,000 people. There are 57 countries in this world with critical scarcity in healthcare service provides and Bangladesh is one of them [2]. The huge number of population in such a small area and below standard healthcare infrastructure acts as a limiting factor for

providing quality and affordable healthcare services to the general people. So it's quite difficult for the government to provide quality medical treatment for the rural people. Good news is Bangladesh government has taken various steps to provide ICT-based healthcare systems for the rural people.

Currently, health service through the internet, cellular phone, telemedicine service, online database of population health record, GIS in health service, complaint suggestions, and pregnancy care advice through SMS are available in many government hospitals of Bangladesh.

Directorate General of Health Services (DGHS) and the Ministry of Health and Family Welfare in Bangladesh has taken several steps to popularize the e-Health services among the mass people. List of noteworthy contributions by Directorate General of Health Services (DGHS) and the Ministry of Health and Family Welfare in Bangladesh are enlisted in Table 1 [18], [19].

Table 1: Noteworthy contributions by government

Year	Accomplishments
1998	The first e-health project has been established by the Ministry of Health and Family Welfare (MoHFW)
2001	The professional coalition was established to provide a platform for the ongoing e-Health initiatives in the country.
2003	Sustainable Development Network Program (SDNP) was formed in order to execute interconnection and understanding between service providers.
2008	Revisited Management Information System (MIS) department to ensure the best use of ICT to form and maintain e-Health systems in Bangladesh.
2009	The step to provide internet connection starting from health service centers to the sub-district level and extending the scheme to all the union healthcare centers was initiated.
2009	Established health services through mobile phone (mHealth) to all district and sub-district levels hospitals.
2009	Undertook Geographical Information System (GIS) for mapping of health facilities and services.
2010	Introduced bulk SMS services to complain suggestions and pregnancy care advice.
2011	The formal inauguration of telemedicine service in eight hospitals.
2011-2013	In total 28 telemedicine centers have been established in this period.



Year	Accomplishments
2014	The Government won the World Summit on Information prize 2014 for the telemedicine sector.

The project of implementing an online Electronic Health Records (HER) of the citizen of Bangladesh is ongoing. Improving the quality of the service provided enhances the motive of maintaining an integrated health support and record of patients. Rural people, which contributes a maximum of 76% to the total population of Bangladesh, are the main subject of this project. An initiative is being taken to supplement the health workers and medical staffs with high tech devices and high speed internet connection and this project is aimed to be completed by 2016 [2].

Aiming to develop integrated national e-health Enterprise Architecture (eHEA), a software consortium is working with local and non-local IT companies in addition of support from DFID. The data has been collected from 120 million people belonging to rural areas, and the machine-readable forms are now being upgraded to digitization which can now be searched from an online database. In future all of these data can be shared among all the medical points and service providers. More than 300 public hospitals are planned to be automated by a merging initiative between The Ministry of Health and Family Welfare on Bangladesh and World Bank [2].

NGOs, Private Organizations, and Mobile Phone Operators are also providing e-Health services to the people in different areas in Bangladesh. List of noteworthy contributions of NGOs, Private Organizations, and Mobile Phone Operators are enlisted in Table 2 [1], [18], [19].

Table 2: Noteworthy contributions by public sector

Year	Accomplishments
1999	Telemedicine Reference Center Limited abbreviated as TRCL is a private company. In 1999, for healthcare delivery, the use of mobile phone was initiated by TRCL.
2001	Development Research Network abbreviated as D.Net started providing e-Health services in 2001 using their tele centers.
2003	Initiating use of mobile phone for healthcare delivery in 1999 at 2001 TRCL initiated division for "Mobile Health". In telemedicine sector, TRCL is one of the longest serving companies.
2007	At 2007 GSM Association's Global Mobile Award was awarded to Gramophone (GP) which is the largest mobile operator in Bangladesh. For their popular people-centric project "Health Line" they got this award in the category of "Best Use of Mobiles for Social and Economic Development".
2010	e-Clinic service was launched by BIID at 2010. In different areas of Bangladesh, this project was launched in pilot basis.

Year	Accomplishments
2011	"Aponjon" is a brand of mHealth service was launched with about 1500 subscriber on a pilot basis to provide maternal services for expecting and new mothers in Bangladesh.
2012	Aponjon which was launched pilot basis in 2011, launched its service nationwide at 2012 in Bangladesh. Women of all over Bangladesh were able to register.
2015	By 2015, Aponjon aimed to reach over 2 million mothers from different areas of Bangladesh by 2015.
2015	149 villages of Bangladesh are covered by the Health and Demographic Surveillance System (HDSS). This one is one of the major module of the field program mentioned above by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDRDB).

A platform named as Bangladesh Society for Telemedicine and e-health (BStEH) has been organized by a concern of physicians, Information and Communication (ICT) specialist and eminent individuals [1]. Promoting e-health and Telemedicine services in Bangladesh are the prime objectives of BStEH. BStEH monitored not only the research works related to the health sector but also the acceptability of telemedicine and e-Health facilities for the people of Bangladesh. To automate over 300 hospitals, the ministry of health and family welfare in Bangladesh is jointly planning with the World Bank [2].

V. E-HEALTH SYSTEMS IN MALAYSIA

According to the 1996 census population of Malaysia is 21.2 million of which 44% resides in rural areas. The healthcare system tailored predominantly to the needs of urban communities. Major healthcare providers have been the enhancement of the health of 'disadvantaged' rural communities particularly the rural poor, women, infants, children and the disabled. In Malaysia, The Ministry of Health is the key healthcare provider for rural people. In rural areas of Malaysia, general medical professionals are performing a complementary role. Nowadays, because of the increasing number of rural health clinics, people of the rural areas have access to the modern healthcare services along with satisfactory referral facilities. Not only this but also, mobile teams and village medical professional are going door to door to provide healthcare to remote areas. Remarkable improvement has been achieved in the health status of destitute rural people by using universal health status indicators. Despite this significant improvement, there is a huge difference in health status between urban and rural people. Malaysia's telemedicine project is a means of achieving health for all rural people [20].



In July 1997, the Blueprint of Telemedicine of Malaysia has been established. Since then, Malaysia has been pushing the initiative to employ e-health system. Generally, laymen people depend more on the illness rather than taking preventive measures and self-care. An assumption can be made that if the e-health system is carried on effectively, it might reverse the pattern of depending much on illness; e-health is expected to depict a significant role here. The Telemedicine Blueprint 1997 of Malaysia was established based on the motive of utilizing the current advanced technology like Telecommunications, Information and Communication Technology to supplement the healthcare providing system. Integrating the healthcare system with online services shall make it more distributed, connected, and overall reshaped where the different health services are not only delivered promptly but also interconnected to each other through a common platform.

The Multimedia Super Corridor (MSC) project is a Flagship project of Telehealth system which has been incorporated by the Malaysian Government. The long-term objective of Malaysia, Vision 2020, has been supported by the Multimedia Development Flagship Application that has 7 flagship Applications of MSC group; this project is one of them. This project shall contribute to the reshaping of healthcare system by shifting the emphasis from illness to self-care motivation. Making health care system more virtual and technically sound, shall make an e-health system more affordable, technologically sound, user friendly; resulting in an efficient health care delivery system [21], [22].

In order to execute this Flagship project of telehealth, a sub unit under MOHM was established. 4 pilot projects are developed under this flagship project- Mass Customized/Personalized Health Information and Education (MCPHIE), Continuing Medical Education (CME), Teleconsultation and Life-time Health Plan (LHP) [23], [24].

Medical Services Program has reconstructed the unit in the year October 2004. The Telehealth project has undergone a review process and hence restructured in accordance with the upgradation. This reformation came up with 7 components- Lifetime Health Record (LHR), Personalized Life-time Health Plan (PLHP), Health Online, Continuing Professional Development (CPD), Teleconsultation (TC), Call Centre and Group Data Services (GDS) [24]. In 2007, MOHM has once again restructured the telehealth layout by introducing Integrated Health Enterprise (IHE) framework. Other than 5 prime components, newly formed structure is in resemblance with the earlier version; these constitutes of Lifetime Health Record (LHR), Health Online, Teleconsultation (TC) and Continuing Professional Development (CPD) [23], [24]. In Table 3 and 4, some of the pilot projects and modified projects are enlisted.

Table 3: Noteworthy contributions by public sector

Name of the Pilot Project	Purposes/Objectives
Mass Customized/	Making health information and facilities reliable and ensuring its quality with low-

Name of the Pilot Project	Purposes/Objectives
Personalized Health Information and Education (MCPHIE)	cost is the prime concern of this project by using the tools of the internet like Information Technology, multimedia technologies and mass communications.
Continuing Medical Education (CME)	The objective of this project was to use the multimedia information technology properly to strengthen the in-depth knowledge of the health service providers through online learning. This vision shall not require the healthcare service providers to shift their locations and participate in these course programs offered by Universities and training institutions. CME offers these courses in three categories- (i) online courses, (ii) virtual library, (iii) online professional community services.
Teleconsultation (TC)	Through this scheme the health care personnel and the health care providers can be interconnected remotely by means of multimedia information technologies. Real time audio and video conferencing and through online, email or electronic data exchange execute the basic teleconsultation.
Lifetime Health Plan (LHP)	LHP scheme is for individuals seeking personalized/customized healthcare facilities. This scheme was outlined to perform consistently providing medical support, connecting individual and health care service personnel through correct medical relevant information supplemented with assuring quality service to each and every person to the maximum possible state. The sub-application of LHP was made effective to execute this scheme named as Clinical Support System (CSS), Healthcare Information Management and Support Services (HIMSS) and Personalized Lifetime Health Plan (PLHP).

VI. DISCUSSION

Adoption of e-Health system is a transformation process demanding a lot of modifications. There are important issues in relation to utilizing and providing online health services.

Challenges

Though both Bangladesh and Malaysia have taken the different initiative to implement E-Health systems and many of them are already implemented but both the countries are facing various obstacles to the adoption, promotion, and effectiveness of the E-Health system. This study has identified the reasons behind the lack of success from the



implemented E-health system and also major threats for developing effective e-Health in the developing countries like Bangladesh and Malaysia which include:

Table 4: Modified projects

Name of the Modified Project	Purposes/Objectives
Lifetime Health Record (LHR) and Services	Starting from the first time an individual consults his/her health service provider, until every time he/she visits the provider, the record of a person's healthcare report is summarized by this plan.
Lifetime Health Plan (LHP)	Providing individuals with life-time healthcare plan is the main objective of this plan. Based upon the different types of health issues related to human life, it can also be referred to as organized care activity. This plan includes promoting health care issues, cure plans for illness for a particular disease and condition, reminder services, and monitoring health condition.
Health Online	An easily accessible web portal was implemented that contains health issues related information and education that shall influence individuals to care their own health problems. This online service is the updated version of its older version called as Mass Customized/Personalized Health Information Education (MCPHIE).
Teleconsultation (TC)	Addressing the health-related issues remotely instead being present at hospital, healthcare providers can report and sort out the issue by this scheme, which is the objective of this idea. Patients now need not to move from one hospital to the other. Not only this issue shall reduce the expense of health care services but also mitigate the hassle for any patients of changing locations.
Continuing Professional Development (CPD)	CPD substitutes its older version known as Continuing Medical Education (CME). The outline of CPD resembles that of CME. This plan shall supplement the health care personnel's knowledge

- Most of the rural people are not literate enough to use ICT based E-health system. Even as most of the systems are developed in English that become more difficult to use by the rural people.
- In a developing country like Bangladesh, electricity supply is yet to be provided to most of the rural villages.
- The Internet is not widely available in any rural areas. Even where it is available, most of the rural people do not have the internet access because of the high cost.

- Poor ICT infrastructure facilities have damaged efforts to spread the technology to the rural areas where majority of the people resides.
- Lack of skilled trainer.
- Lack of promotional activities regarding e-Health system.
- Lack of awareness among the rural people.
- Most of the village doctors do not know how to use the internet.
- Lack of IT policy for telemedicine sector.
- Most of the older administrative staff in the hospital sectors of the rural areas does not want to adopt and implement new ideas and they are against the use of technology.
- Most of the e-health systems in developing countries are isolated because most of these systems are not developed according to the easiness of use by the rural people and rural health workers.

Recommendations

This study aims to recommend the following policy initiatives are vital conditions and architects for fruitful implementation of e-Health system in rural areas.

- ICT infrastructure should be developed in rural areas.
- The Internet should be available and affordable for the rural people. Also in every village there should be at least one IT center from where rural people can use the internet as well as e-health system.
- Health workers need to be trained properly so that they can effectively train up the rural people regarding the use of the internet as well as e-health system.
- Mandatory training for the village doctors and health professionals regarding the use of computers as well as the internet.
- Need to develop user friendly and effective e-health system for the rural people. For example, e-health system needs to be developed according to the native language of the villagers not in English and simplicity in operating the e-Health system.
- More promotional activities required to make aware the villagers.
- Systems need to be customized to meet the demand of the patients.
- Electronic Health Record needs to be developed by the government at least by the health care institutions to provide faster and quality health care service.
- Security and privacy of the patients should be properly maintained, so that patients can feel secure to provide their personal information.
- A central policy regarding the implementation and use of e-health system.

VII. CONCLUSION

E-Health system promises great potential in providing significant improvement and cost-effective access to health care system. This research has found that in developing countries there are several major problems in health care



system and e-health can act as an opportunity to enhance patient's health care by enabling communication with full confidentiality, privacy, and secrecy, plummeting administrative costs, improving the social standard, as well as enlightening efficiency and flexibility. Progress in adopting e-Health strategies in the developing countries especially in the rural areas has been slow despite various early pilot interventions and successful implementation. In most of the developing countries like Bangladesh and Malaysia, there is a lack of common standards and central policy on ICT-based health services. This causes difficulties in the management of data and sharing those among different databases. In this paper, some suggestions are provided for fruitful implementation of e-Health in rural areas. To get maximum benefit user-friendly and effective e-Health system is required in the rural areas of developing countries. Adding e-Health system in the existing health care can make it easier and cheaper to provide health care to people in remote areas. Also, e-Health system can create more source of employment. We also feel that government should command private sector to invest in telemedicine sector, especially in rural areas. In this respect, it can be concluded that under a central policy from the government, service provider must develop a quality, user friendly and effective e-Health system which can be easily used by rural people and in accordance with that proper training should be provided to the health professionals to use e-Health system and to promote and arrange awareness building program for the rural people, so that they get encouraged and feel secure to use the e-Health system.

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