TELEHEALTH IN YEMEN: AN OVERVIEW AND A PROPOSED MODEL

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ABSTRACT. Yemen's Health sector has grown significantly gauged from the increasing number of hospitals, health units, health centers, beds and medical staff. Despite the country's direction towards the health sector development and improvement, Yemen ranked poorly in all central factors of health services and access. This paper aims to propose a high level telehealth model which is peculiar to Yemen in terms of its existing health services, culture, geography and ICT readiness. In achieving the aim, a series of interview and document study were conducted to access its ICT potential - infrastructure; rural communication; and available manpower and skill set. It is hoped that implementation of the framework will be able to address the issue.

Keywords: national dialogue conference, healthcare, ICT

INTRODUCTION

In recent years, the health sector in Yemen has witnessed a remarkable development as viewed through the increasing number of hospitals, health units, health centers, the number of beds and medical staff (Ministry of Public health and Population, 2014). Yemen is headed towards the development and improvement of the health sector and raising the level of services provided by this sector. However, it is still lagging behind other Middle East and North African in health factors such as life expectancy, child mortality, immunization, and malnutrition (UNICEF 2015; WHO 2000). Besides, the sector is plagued with many challenges, including: poorly equipped health centers, limited financial and manpower resources, shortages in technical and medical facilities, and limited spread of health services (Government of Yemen, 2012).

The National Dialogue Conference (NDC) in 2013 has brought together political and civil society figures to formulate a constitution and bring closure to the unrest that began in 2011 and decades of unresolved grievances and conflicts within Yemen. The objective of NDC was to reform the political, economic, health, social and living conditions and develop a new vision for the future of Yemen. Included in the NDC formulation is the introduction of important recommendations to enhance the current state of healthcare in Yemen: To redirect the financial resources to invest in the health sector towards places more in need, especially in rural areas and poorer places; To adopt legal and legislative processors to ensure the implementation of strategies to enhance the health care in Yemen; to address the need of a proper governance of the institutions working in the field of health management practices and the provision of health

information systems; To rehabilitate health professionals in the field and; To promote the investment in health information systems (Government of Yemen 2013).

In proposing a telehealth model for Yemen, it is important to take into *consideration the peculiarities* of the country: the availability of infrastructure and technology, geography and population dispersion, and the readiness of its people to participate in an ICT based service. In arriving at the proposed telehealth model, the research has resorted to the following:

Review and analysis of existing models. The research has compared the implementation of telehealth models of selected countries which share some common characteristics with Yemen in term of population size, technology uptake, culture and social practice, and geography. Some of the models reviewed are eCAALYX, OLDES and inCASA (Boulos et. al, 2011; Novak et. al, 2009; Lamprinakos, 2015).

Experts' opinion. The research has identified and solicited opinions from experts who comprised of independent researcher in related area and policy makers from the ministry of public health in Yemen.

In view of efforts to improve the Yemen's health sector, this paper presents the work-in-progress of our research in the area of Telehealth in Yemen. First, it presents an overview of Yemen and the current state of its healthcare. A short description of general Telehealth is then presented. The findings were then used as basis in the construction of a proposed conceptual model of Telehealth implementation in Yemen. A discussion and a recommendation on moving forward with the proposed model concludes the paper.

CURRENT HEALTH CARE IN YEMEN

Yemen, with a total area of 527,970 sq. km is located in the southern part of the Arabian Peninsula (Library of Congress 2008). It has a population of more than 26 million (Central Intelligence Agency 2013), dispersed in urban, rural and around 112 islands. Three-quarters of the population live in rural areas (Gherissi 2011) with only 25 percent (of rural areas) covered by health services (Library of Congress 2008).

The dispersion of its population posed complex challenges in providing access to good health care to all its people (Koch 2005). Rural health hospitals are difficult to access due to road and transport issues. Patients have to travel for long distances to get to these healthcare units (Nkqubela et.al. 2010). The current situation of the healthcare in Yemen can further be reflected by the following status:

Population health indicators

Yemen population growth rate is 2.72% with total fertility rate at 4.09 children born per woman while the birthrate and death rate were estimated to be 31.02 per 1,000 and 6.45 per 1,000 respectively. Life expectancy at birth in Yemen has remained low compared with other developing countries which are 64.83 years for males and 62.72 years for females, or 67.04 years overall (Central Intelligence Agency 2013; UNICEF 2015).

Health overview

In recent years, the health sector has witnessed a remarkable development through the increasing number of hospitals, health units, health centers, the number of beds and medical staff. Although the country is headed towards the development and improvement of the health sector and raising the level of services provided by this sector, the country is still among the countries that suffer a lot of health problems and diseases. The fact that this sector still faces many challenges, including: the low share of health spending, almost making a lot of health

centers suffer from lack of equipment, financial resources and cadres, technical and medical facilities in addition to the limited spread of health services (Gail et. al. 2000).

Organization of the health sector

The organization responsible for the health sector in Yemen is the Ministry of Public Health and Population. This organization is divided in two parts which are: the public health sector and the private health sector.

Yemen's health facilities, budget, and workforce have increased significantly since 1992. There are approximately 25 physicians per 100,000 residents which are well below the expected national ratio of 214 (Government of Yemen 2012). The health sector spending as a proportion of Yemen's total public expenditure rose from 3.98% at 2002 to 5.41% at 2012. The average annual growth rate of the health sector spending for the period from 2002 to 2012 is 19.4% (Government of Yemen 2012). However, these changes are not enough to deliver quality health services to all rural areas (Al-Ghaiti 2009).

Researchers have reported common challenges facing Yemen in delivering quality health care services to its people. Among the challenges stated were poverty, high illiteracy, proper sanitation and limited economic as well as social development (Gail et. al, 2000; Richardson 2000). Another research by Taher (2009) included strategic planning, coordinated management, monitoring and evaluation, organizational structure of the health care system, fees, the low quality and frequent lack of adequate drugs and equipment in public facilities in the list of challenges. Al Ghaithi et al. (2009) mentioned that the challenges were lack of mechanism in exchanging health information, lack of appropriate health information system legislation and policies, poverty and high illiteracy rates. In 2011, the World's Midwifery document highlighted that the challenges includes difficult terrain, especially in the mountains and deserts, culture, rapid population growth with three-quarters of the population living in rural areas as well as high illiteracy rate (Gherissi, 2011). As a result, Yemen's health indicators are among the lowest in the region.

ICT infrastructure

ICT strategy and implementation are crucial in enhancing healthcare services. The Yemen's National Information Center was set up in 1995 for the development of the national information sector, establishing information units in government sectors and developing human skills in the informational side (Yemen, 2012). Efforts have been made to create a national telecommunications network. This network consists of microwave radio relay, cable, tropospheric scatter, GSM (Global System for Mobile Communications) and CDMA mobile-cellular telephone systems. Yemen has 1.1 million telephone main lines in use and 13.9 million mobile lines. The IWS (2012) reported 3,691,000 Internet users as of June, 2012 which is equivalent to 14.9% of Yemen's population. ICT solutions are responsible for building knowledge repositories that will drive the integration and connectivity of public health, healthcare, health research, and health education.

The development of rural communications

The rural telephony services are limited to a narrow range for several reasons. Most notably the mountain barriers and the lack of electricity in many villages and in addition the high cost of service delivery. As of 2012, Yemen has developed 115,000 phone lines (Government of Yemen 2012).

E-government and Information worker

The Yemen Government has adopted the e-government where the site is designed to include the province. Currently it covers 31 locations for the ministries and government agencies

and 20 sites for the provinces. The first phase was operationalized in 2002, which covers the city of ICT (Information Communication Technology) in Sana'a. As a result, the total work-force in the IT sector has reached 25,000 including computer operators, according to a survey carried out by the National Information Center in 2011. The growing specialized IT training sessions has also been a factor to the improvement on the information worker.

TELEHEALTH

Telehealth, which refers to healthcare services and other healthcare-relevant activities have formed a new aspect from traditional healthcare as a result of the new technologies which has improved the service content and delivery channels (Khan, Qurashi and Hayee 2007). The most distinctive feature of telehealth compared with traditional healthcare is the prefix of "tele", which means "over a distance". Therefore, understanding the development of the technology is fundamental to the study of telehealth (Guler, Ubayli 2002). The term telehealth has its origin in telemedicine meaning "the use of audio, video and other telecommunications and electronic information processing technologies for the transmission of information and data relevant to the diagnosis and treatment of medical conditions, or to provide health services or aid healthcare personnel at distant sites" (Koch 2005).

Wootton, et al. (2009) has outlined the strategic drivers of telehealth in his research which can be summarized as follows: An ageing population; Change the services from treatment to prevention and then to care; Changing models of care; Expanding diagnosis and treatment options; Improved ICT; Market forces; Pressures to reduce healthcare costs; Consumer demands; and Urbanization and globalization.

Other research also classifies the drivers of telehealth into categories of technological drivers. The technical drivers consist of: Computing and information technology; Networks and Telecommunications infrastructure; and Technology-led societies (Khan, Qurashi and Hayee 2007).

PROPOSING A TELEHEALTH MODEL FOR YEMEN

Taking into consideration the attempt of Yemen to find solutions to improve the quality of healthcare delivery and services and to overcome the challenges that prevents it, it would be prudent to take advantage of telehealth technology. The subsequent paragraph presents a proposed telehealth model for Yemen:

The proposed model, as shown in Figure 1, is built of 3 major components: Access, Service, and Database. The access considers channel which are available and fits the purpose of access for health service recipient and provider. In this case a patient may access the service via a service center through a mobile phone call or by visit (physically) to the service center. The service center is a facility equipped with ICT based tools which support diagnostics distanced from (but connected to) health professionals. The service center also provides teleconsulting service which is between a health technician at the service center and a health professional.

All consultation activities which include diagnostic reports and patient record are maintained in an electronic data base.
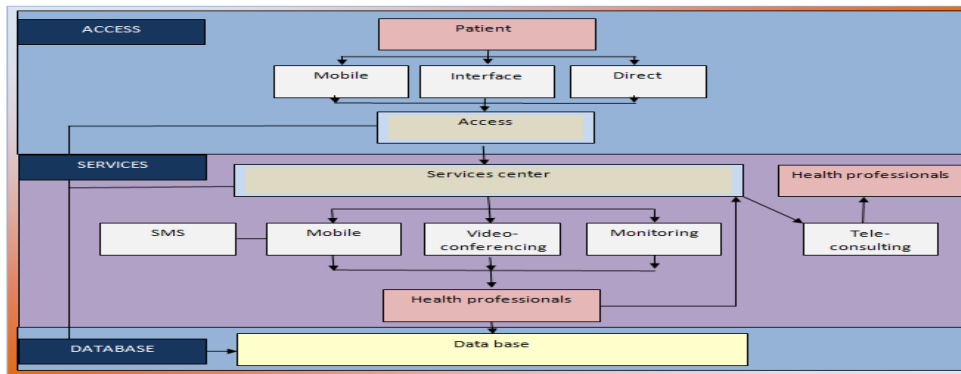
Figure 1. Possible Model for Telehealth in Yemen

DISCUSSION

The NDC formulation is a mandate to carry out an intensive transformation to enhance the current status of healthcare in Yemen. Crucial reforms are being carried out through financial investment, legal policies, governance, restoration of healthcare personnel and health information systems. The telehealth system in Yemen would be an answer to health information system. However, at the point of writing, Yemen is going through a warring situation and political unrest which have aggravated its already challenged healthcare service. This has intensified the need for a clever and do-able telehealth model. For Yemen, the fitting and suitable model is not about the best or leading technology. Rather, it is a quest for an affordable and easy to implement model. Learning from existing telehealth model, Yemen will have to improve the status of its ICT and technology infrastructure in order to support the transfer of information across the country and a successful telehealth solution. The absence or inadequate accesses to technological resources at many rural hospitals pose a major barrier in implementing the model (solutions). This, alongside the lack of infrastructure, services and expertise, limited resources, low literacy levels and professional threatens the country's aspiration for an improved living situation.

Hence, the NDC formulation must resolved these underlying problems soonest before a better yet more sophisticated model can be implemented. Further challenges in providing access to healthcare services are due to geographic distribution, as much of the population resides in rural areas. Establishing a unique patient identifier is another challenge as some adults and children do not have ID documents. In addition, there are shortcomings in the knowledge and the skills of patients and health professionals to use ICT. Yemen can fully implement telehealth and improve its healthcare system significantly for the better once the ICT problems have been handled systematically. Special attention need to be given to improve basic infrastructure: hardware, appropriate software and telecommunications. ICT skills through training programs and policies for technology should also be introduced.

CONCLUSION

This paper attempts to find solutions to improve the quality of Yemen's healthcare services through telehealth technology. Various reforms are under way to improve the current health care indicators. ICT infrastructure needs to be assessed strategically for a successful implementation of telehealth in Yemen. The future research for this study is to recommend the ICT developments in Yemen to cater for telehealth.

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