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CURRENT Position and Challenges of E-health in Tanzania: A review of literature

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Abstract

The paper is a literature review in nature with the aim of reviewing the current status of adoption and use of the eHealth and challenges of the eHealth system in Tanzania. A broad literature search was conducted to offers a narrative overview of an e-health system from wide ranges from international journals, conference reports, organizations' websites, and reports. The inclusion and exclusion process results in a total number of 67 articles (60%) were included for review.

The review shows that there are countless initiatives and development has been taken in the adoption and use of e-health system as the way to improve the health sector across the country. This has demonstrated by a number of eHealth systems in the country such as health information systems, teleconsultations, e-learning platform, teleconferencing, m-health platform, electronic health record, and telehealth system. However, the review reveals that still there are a number of challenges facing the health sector including lack infrastructural, inadequate of ICT related knowledge and skills, governance structure, compliance with eHealth standards and systems interoperability.

Further, the researcher suggests that there need to boot the process of development of national electronic health record system which leads to an integrated system of patient management nation-wide, the formulation of E-legislation which permit the intercountry exchange of patients, data and inter-jurisdictional practice of medicine. Furthermore, the research proposes the e-Health readiness, awareness and assessment of the implemented system as a future research area.

Keywords: eHealth, current status, challenges and healthcare.

Background to problem

The widespread and rapid development of Information and Communication Technology (ICT) has been globally viewed as a catalyst for changes in several sectors including health sectors (Kirigia, et al, 2005; Louw & Hanmer 2002 cited by Ruxwana, et al, 2010; OECD 2010; WHO 2010; Kiberu et al, 2017). The adoption and use of ICT in healthcare (e-health) has become an essential component in facilitating the provision of reliable information by using the Internet and effective communication with wireless communications (Jha et al, 2009; Teixeira et al, 2010; Johnson, 2011; Pai & Huang, 2011 as cited by Paul et al, 2012; Eysenbach 2001 as cited by Hordern, et al, 2011; Wang, et al, 2006; as cited by Kurtinaityte 2007). It is globally recognized that the adoption and use of e-health can satisfy the need to reduce costs, dispense care with no geographically limit (Kwankam, 2004; Eley et al, 2009; Ahmed, et al. 2004 as cited by Olok, et al, 2015), simplify the availability of expert consultation where expertise is inadequate (Alexander et al, 2007), expand the efficiency and effectiveness of healthcare management and delivery (Christensen et al. 2007 as cited by Ranta 2010; Blaya, et al, 2010; OECD 2010; WHO 2010; WHO 2016 as cited by Afarikumah, 2014; Olok, et al, 2015). Further, adoption and use of e-health can provide more rapid access to information, promoting individual health, escaping needless tests, disease monitoring and prevention (Eysenbach 2001 Cited by Olok, et al, 2015; Ranta 2010; Afarikumah 2014; Perera 2012)**.** Furthermore, adoption and use of e-health can reduce professional isolation, increase healthcare worker retention (Richards, et al. 2005; Lewis et al, 2012 as cited by Olok, et al, 2015), increase the opportunity of health- care delivery, health obedience, follow-up and arrangements (WHO 2010; Wickramasinghe et al, 2010; Ahmed, et al, 2014; Piette et al. 2012 as cited by Olok, et al, 2015).

Recognizing the potential of adopting and using of e-health the Tanzanian government through the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) committed major force to support and transform the delivery of quality healthcare services throughout the health sector (TZ eHealth strategy, 2013; Kajirunga, et al, 2015; MoHSW 2009). Several developments have been taken by the government to build more sustainable development of eHealth solutions in the country (MoHSW 2009; Kajirunga, et al, 2015; Darcy, et al, 2014). This includes the development of the National Health Strategic Plan (2013 – 2018), Health Sector Strategic Plan IV (HSSP IV), Tanzania digital health investment road map (2017 – 2023) and the eHealth Strategy with the intentions of integrating all fragmented sections and offer a comprehensive solution to help several interested parties of the health care system (MoHSW 2009; Kajirunga, et al, 2015; Elias et al, 2014 as cited by Darcy, et al, 2014; MOHCDGEC, 2017).

Although the government, partners, and other private organizations progressive to exploit in several initiatives in adoption and use of eHealth in the country (MoHSW, 2009; van Gemert-Pijnen, et al, 2011) aimed to improve the efficiency and effectiveness of healthcare management and delivery (Dünnebeil et al, 2012; Qureshi 2014 as cited by Olok, et al, 2015). The studies show that there is enhancement involved in eHealth implementation and challenges occasioning the slow improvements in service delivery (MOHSW, 2013 as cited by West-Slevin, et al, 2015; Adebesin, et al, 2013; Qureshi, et al, 2013; WHO, 2013 as cited by Kajirunga, et al, 2015;

Dünnebeil et al, 2012; Qureshi 2014 as cited by Olok, et al, 2015). The uptake and diffusion of ICT remains a significant challenge for governments, health managers, healthcare practitioners and system developers (Lazaro et al, 2013; Omary et al 2010 as cited by Kajirunga, et al, 2015; Westbrook & Braithwaite 2010; Karsh et al. 2010 as cited Antonia Hordern, et al, (2011). Therefore, the intention of this study is to assess the current status of adoption and use of the eHealth, the challenges facing the health system in Tanzania and then the study will suggest the ways to accelerate and eradicate the adoption and use of eHealth in Tanzania.

Method used

The study was carried out through a literature review. A comprehensive literature search was conducted to offers a narrative overview of an e-health system in the various range from research papers in international journals, conference reports, organizations' websites (i.e. WHO and MoHSW) and reports. The search was extended by the Google Scholar search engine, Academia, and many other online journals. To facilitate the search several keywords were used as search criteria for example, 'e-healthy', 'developing countries', 'e-healthy adoption in Tanzania' and 'Africa'. The narrative literature review was chosen for the purpose of concise of the diverse studies from which conclusions can be drawn into a general interpretation of existing theories and the reviewers' views (Ferrari, 2015; Odekunle, et al, 2017).

Results and discussion

Results

The online searches process yielded a total of 111 articles. 101 articles acquired from the web articles in the form of a published journal article and 10 from literature resources in the form of policy documents and reports. When the inclusion and exclusion criteria applied. A total of 44 articles (40%) were excluded for the reason that they are not met criteria (21 had no information related to E-Health, 19 duplications and 4 had no publisher name and year). The remaining 67 articles (60%) were included in the study for review. These 67 articles were categorized as regards to the topics characterized by the subject matter of the published articles, thesis or report. The classification was as 34 paper (51%) focused on eHealth in Tanzania, 25 papers (37%) in Africa, while the rest 8 papers (12%) had a global approach.

Discussion

Current status, adoption and use of e-health

Current status

As regards the current status of eHealth in Tanzania several studies reveled that, health sector uses several eHealth applications/system to improve the health services access, efficiency and quality Kanani (2016). The use of Information and Communication Technologies in healthcare (e-health), especially wireless communications and the Internet (Eysenbach 2001 as cited by Hordern, et al, 2011; Wang, Cheng, Cheng, 2006; Laura Kurtinaityte 2007) have automated processes and enhance the way work is done (OECD 2003; Brynjolfsson and Hitt 2006). The change of the healthcare industries priorities in the world has also emphasized the efficient safety and cure of the patients being the main concern. Hence, ICTs has become an essential component in facilitating the provision of reliable information and effective communication (Jha et al, 2009; Teixeira et al, 2010; Johnson, 2011; Pai & Huang, 2011 as cited by Paul et al, 2012).

The government of Tanzania through the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) has continued expand the efficiency and superiority of health care service delivery to the citizen (MoHSW 2009; Archangel, 2007 as cited by Lazaro et al, 2013) and emphasizes the need to adopt and use of ICT in improving the quality of health service delivery and supporting attaining health sector goals through eHealth solutions (Darcy, et al, 2014; Archangel, 2007 as cited by Lazaro et al, 2013; URT 2013 as cited by Nyamtema, et al, 2017).

With regard to the Tanzania National eHealth Strategy (2013 – 2018), Health Sector Strategic Plan [HSSP] III, 2010, Health Sector Strategic Plan IV (HSSP IV) and digital health investment road map 2017-2023 of the health care system (Kajirunga and Kalegele 2015; EHealth strategy 2013; MOHCDGEC 2017) the government manage to transform the Tanzanian healthcare system by influencing the use of ICT to improve health and social welfare of the citizens. This National eHealth Strategy document responds to the current situation evidenced by the widespread implementation of information and communication technology policies and a significant number of eHealth developments.

The adoption and use of the eHealth

More specifically, the review show that there is increased adoption and use of e-Health system. There are more than 128 digital health system in the country (Mzeru and Mwendo 2017; EHealth strategy 2013); which include use of Electronic Health Records System, Mobile Health (M-Health), Telehealth and Distance-Learning Technologies (Kanani 2016; Hall 2017; EHealth strategy 2013).

Electronic Health Records System

A cross examination of several literatures show that, the eHealth systems are highly used in many health facilities in Tanzania. More specifically, the Electronic Health Record System (EHRS) are used as a "repository of patient data in digital form. Basically, they store and exchange these securely. EHRS can be accessible by multiple authorized users" (ISO, 2005 as cited by Odekunle, et al, 2017). They are a key element of medical informatics in today world Hayrinen, Saranto, and Nykanen (2008). They provide quality patient care and safety and reduce cost while increase efficiency of the work, permit access to medical records from remote locations, enhanced speed and easiness of records retrieval (Gaylin et al, 2011; Greenhalgh et al, (nd); Ohemeng-Dapaah et al, 2010; Goldstein, 2007 cited by Akanbi, et al, (2012) being a patient-centered records, EHR offers on-time and protected information only to right users. It is used for clinical care application/functions, clinical research function, and administrative function (Odekunle, et al, 2017: Hall, 2017).

More precisely, a significant number of health facilities have so far been implemented and used Electronic Health Record System (EHRS) in Tanzania (Hall, 2017). More than forty-six (46) regional and district hospitals have implemented and used Electronic Health Record System (MoHSW 2009; MOHSW, 2013; MOHCDGEC 2017; Kajirunga and Kalegele 2015. The most common EHRS is the Health Management Information System (HMIS) which including the government health registration system (Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya or MTUHA, the Swahili name for HMIS). The HMIS integrates various core

functionalities/modules to serve the purpose of Electronic Medical Record (EMR), Laboratory Information System, Tracking and Inventory of Medical Supplies, Billing and Revenue Collection, Practitioner Performance Tracking and Reporting (MTUHA Forms) (President's Office 2017 and Kimollo, Lenoir, Niemi 2010). Also as pointed out in the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) Strategic Plan (2013-2018), several National and Referral Hospitals have implemented some other EHRS, including open source software such as OpenMRS and Care2x for many purpose like managing of HIV/AIDS, and for registration (Kajirunga and Kalegele 2015; EHealth strategy 2013) other software that are commonly used for hospital administration and laboratory data systems include the Jeeva, WebERP, Care2X, Harmony, Bumi expert and Daisa (MoHSW 2009; MOHSW, 2013 and MOHCDGEC 2017). Furthermore, Electronic Logistics Management Information System (eLMIS) and Epicor are implemented in Medical Stores Department (MSD) (MoHSW 2009; MOHSW, 2013; MOHCDGEC 2017; EHealth strategy 2013) and operate nationwide. These systems reflect HSSP IV, the eHealth strategy, and the pharmaceutical section action plan 2020 priorities aimed to expand the efficiency and accountability in supply chain management in the country.

Mobile Health (M-Health) System

The mobile health (M-health) is one among the emerging components of eHealth in many developing countries (Hall 2017; Davey, et al, 2014) particularly Tanzania. According to the Global Observatory for eHealth (GOe), defined mobile health (m-Health) as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices" (Modi, Shruti 2013; WHO (2011) cited by Davey, et al, 2014).

As a rapidly growing application of mobile technologies, m-health has become a promising tool in improving the well-being of people in remote and locations with poor resource (Brinkel, et al, 2014; Chali, et al, 2017; Davey, et al, 2014). In realizing its potential, the Tanzania government and other stakeholders have continued played the tremendous effort in providing the access to basic healthcare services to its citizens from diverse areas, the community, and social groups (Chetley 2006**;** TZ EHealth strategy, 2013; URT 2013 as cited by Nyamtema, et al, 2017; Busagala et al, 2013; Kiberu et al, 2017**).**

A cross examination of several literatures show that, the m-health proven to serve as an access point to national surveillance systems (Davey, et al, 2014; Brinkel, et al, 2014; Chali, et al, 2017); creating cost-efficiencies and improving the ability of health systems to deliver quality healthcare (Hall 2017; Davey, et al, 2014); contributing in supporting of achievement of the health-related Millennium Development Goals (MDGs) (WHO, 2011, Piette, et al, 2012 cited by Brinkel, et al, 2014). More specifically, more than 31 m-Health applications developed and providing health services nationwide (Chali, et al, 2017; Hall 2017; Kanani 2016) and others are still on the pilot scale, waiting to be extended nationwide (Kanani 2016; Chali, et al, 2017; Hall 2017; Davey, et al, 2014). As regards to this development, the adoption and use of m-health systems have successfully able to move the country to another level and significant changes in

healthcare sector. Here are some of the m-Health improvements at present available in the country:

Table 1: mHealth application

Author	mHealth type	Specific intervention	Coverage
Kanani, [24]	Wazazi nipendeni	Mobile App for family planning	Functioned both urban and rural areas
Kanani, [24]; Novartis, [34]	SMS for Life	Malaria medication support	Disseminate health information and reliably support national wide
Hall, [18]; Kanani, [24]	TFDA mobile App	Drug Reactions	Reporting adverse drug reactions
Kanani, [24]; Davey, et al, [13]; UNICEF, [46]	RITA Birth Registration	Register new-born	Facilitating the health worker to record and send birth registration information for issuing a birth certificate
Chali, et al, [10]; Kanani, [24]	The Mobile for Reproductive Health (m4RH)	Family planning	Provide information about family planning via short message service (SMS) or "text messaging

Telehealth platform

The Telehealth platform is another development of e-health in Tanzania. According to Hall (2017) define Telehealth as the use of ICT to facilitate interaction between a health care provider and the patient from a remote location. A cross examination shows that, currently there are several noticeable examples of the use of telehealth, teleradiology and telepathology that take place through real-time and/or store-and-forward basis interaction (Nyamtema, et al, 2017; Hall 2017; Modupeola et al, 2018). The Web service teleconsultation for dermato-pathology diagnosis which cover the pathologists, based at 4 different hospitals in Tanzania in 2010 (Devon et al. 2012; Sohani & Sohani, 2012). More specifically, a significant number of events has been reported a total of 33 teleconferences events conducted, 40 health care providers from several supported facilities took part in the year 2015, several clinical cases about 240 presented and discussed during the teleconferences and a toll-free mobile phone that connect health care providers and consultant to provide service for 24 hours a day, seven days a week across the nation (Nyamtema et al. 2016a; Nyamtema, et al, 2017; Modupeola et al, 2018; Devon et al. 2012; Sohani & Sohani, 2012). Furthermore, Nyamtema, et al, 2017 has also reported that a number of emergency teleconsultations have been received and attended successfully. Almost 38 cases reported, 33 cases (87%) successfully managed and 5 cases (13%) stabilized and given referred; this including complications of pregnancy and labor, medical conditions in pregnancy and abnormalities of menstruation and advised accordingly.

An online eLearning platform

In Tanzania an online eLearning platform well-known in 2014 which is designed and hosted in a web-based eLearning application called Moodle Nyamtema, et al, (2017). As regard to World Health Organization (WHO) define eLearning as the use of electronic technology and media for training and education (WHO, 2016). The online eLearning platform has been found to be most

significant facility in helping to expand the quality of education, increase access to learning in remote locations, improving the knowledge and skills of the health workers as well as increase the number of skilled experts (EHealth strategy, 2013; WHO, 2016).

The review show that, there are significant number of improvement has been done in implementing the platform with the Multi-Protocol Label Switching (MPLS) in the Virtual Private Network to all supported facilities which allow workers in isolated facilities to connect with the system (eLearning) direct through application server in order to address the challenge of internet connectivity in rural locations (EHealth strategy, 2013; WHO, 2016; Nyamtema, et al, 2017).

More specifically, several sessions were held in the eLearning platform to facilitate learning. The sessions included cesarean section, spinal anesthesia (which included two tailor-made education films), management of postpartum haemorrhage and neonatal resuscitation Nyamtema, et al, (2017).

Challenges of e-health

The adoption and use of e-health in Tanzania has brought a lot of potentials. This transpires as results of a greater effort that has been done by the government through the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC). Like many other developing countries, the health care system in Tanzania is still facing several challenges (Busagala, et al, 2013a; Zanifa Omary et al., 2010 cited by Kajirunga and Kalegele 2015; Nyamtema et al, 2016b; McPakeemail and Mensah 2016; cited by Nyamtema, et al, (2017). More specifically, the review show that there are many significant challenges limiting the acceleration of the adoption and use of e-health as well as the integration of all disjointed e-health system to offer one complete solution (Kajirunga and Kalegele 2015; EHealth strategy 2013; Juma, et al, 2012; West-Slevin, et al, 2015; USAID/Tanzania 2013; Busagala and Kawono 2013a; Alsulame, et al, 2015; Kanani 2016). Some of the key challenges facing the healthcare sector include the following:

Inadequate e-health infrastructure

In Tanzania, the government through the ministry and other stakeholder has continued uphold the effort to improve the e-health/ICT infrastructure national wide which include the new standards for health and social welfare service which specify requirements for staffing, equipment, management, and other inputs across five levels of care (West-Slevin, et al, 2015; MOSHW, 2013). However, satisfactory e-health/ICT infrastructure throughout the health sector is still facing the challenges of geographical inequalities in access to health services especial rural area (Adebesina, et al, 2013; Busagala and Kawono 2013a; EHealth strategy 2013; N. B. O. Statistics 2013 as cited by Kajirunga and Kalegele 2015).

More precisely, the review shows that in some of the hospital and healthcare centers have insufficiency resources (power, phones, system, and computers) particularly in rural healthcare centers; all the advanced technologies only remain in the cities (Ruxwana, et al, 2010; Busagala and Kawono 2013a). Busagala and Kawono (2013a) argue that very few and in some cases, no healthcare institutions in rural had modern ICT infrastructure to facilitate the application of the e-health in the country. More specifically, the cross examination show that about 170 out of 5000+

of many hospitals in country have low coverage of facilities President's Office (2017) which is mainly due to the minimal infrastructure, the slowness of broadband Internet connectivity, lack of relevant content necessary to ensure community needs are met and inadequate maintenance of ICTs equipment resulting of staying out of order without maintenance (Hall 2017; Kanani 2016; EHealth strategy 2013; Kajirunga and Kalegele 2015; Juma, et al, 2012; MOSHW, 2013; West-Slevin, et al, 2015).

Lack of compliance with eHealth standards and systems interoperability

In realizing of full benefits of implementation and usage of e-health solutions ~~in the country~~, the standards and interoperability of the system across the country is a crucial aspect. (Ruxwana, et al, 2010; Adebesina, et al, 2013) report that the absence of standard and interoperability of the system cause major barriers to the development e-health in the country.

The review show that, there are significant effort has been put in place in the country such as the development of new standard in 2014 which specify the requirements for staffing, equipment, management, and other inputs across five levels of care to improve service readiness (USAID/Tanzania 2013; West-Slevin, et al, 2015). However, each of which will require a significant investment West-Slevin, et al, (2015) which include the facility, accreditation and quality assurance (USAID/Tanzania 2013; Juma, et al, 2012) which is still a challenge in Tanzania.

Further, the system interoperability of e-health system is still challenging as it is reported by the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) (2013-2018) as Tanzania's HMIS are faced with system interoperability problems (EHealth strategy 2013; Kajirunga and Kalegele 2015). More precisely, the consequence of lack of standard and interoperability of the **eHealth** system result poor and inconsistent data from multiple sources (West-Slevin, et al, 2015; EHealth strategy 2013; MOSHW, 2013); difficult keeping and updating patient records and duplication of diagnosis and patient history (Ruxwana, et al, 2010; Adebesina, et al, 2013; Kajirunga and Kalegele 2015; MOSHW, 2013) together reduce the acceleration of adoption and use of eHealth in the country.

Lack of a governance structure eHealth

A cross examination shows that, the absence of governance structure is a critical challenge facing Tanzania's health sector (USAID/Tanzania 2013; MOSHW, 2013; Kajirunga and Kalegele 2015), which is one way or another hindering the monitoring of the progress of eHealth through the health sector. More specifically, this challenge for example including weak coordination and communication among the central and regionalized points resulted by execution of multiple programs and initiatives that may compete for inadequate staff resources at district and facility level (USAID/Tanzania 2013; Kajirunga and Kalegele 2015); timely distribution national policies with guiding principles and procedures USAID/Tanzania (2013); having different systems with different design and data structure (Kajirunga and Kalegele 2015; USAID/Tanzania 2013: MOSHW, 2013). Furthermore, a major effort taken to design a shared data warehouse by integrating the various information systems into DHIS2 but still only perform data collection and analysis processes. There is still low awareness, the current focus and data standard adoption between the health and ICT staffs Kajirunga and Kalegele (2015). This and

many other challenges together limiting the fast development of application of eHealth and health sector in general.

lack of ICT-related skills, knowledge, and training

The inadequate of ICT related knowledge and skills to most patients and health professionals in Tanzania which resulting in poor use ICT solutions is inherent problems (Kanani 2016; Ruxwana, et al, 2010). More specifically, the review shows that, there are insufficient or lack of ICT knowledge, skills, and awareness of what is available to countries to most of the healthcare workers in most of the healthcare facility in the country special in a rural area (Juma, et al, 2012; Ruxwana, et al, 2010; Kanani 2016; Busagala and Kawono 2013a). Furthermore, this challenge compounded as a result of limited information about the ICT use, inadequacy of training (Busagala and Kawono 2013a; Ruxwana, et al, 2010); and a shortage of awareness raises campaign on the ICTs use in the health sector (Juma, et al, 2012; MOSHW, 2013) as result effect the performance, record keeping and increase the level of resistant in adoption and use of eHealth system.

Conclusion

e-Health applications are progressively becoming an essential part of the healthcare environment in Tanzania. The review shows a superfluous development and initiatives of e-Health-related activities in the country. The Tanzania government through the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) and other stakeholders have constantly continued to improve the health sector through the implementation of e-Health system across the country. This includes the development of health information systems, teleconsultations, e-learning platform, teleconferencing, m-health platform, electronic health record, and telehealth system. Further, although the acceptance and increasing of eHealth services as literature shown still persist a significant challenge. several challenges have also been identified which is, in turn, all are limiting the fast acceleration of adoption and use of eHealth in national wide. Evidence has shown that the e-Health implementations have lacked eHealth infrastructural, inadequate of ICT related knowledge and skills to most of the patients and health professionals, eHealth governance structure, compliance with eHealth standards and systems interoperability all together are enhance gear to development of eHealth system. Furthermore, the initiatives headed for the development of a national electronic health record system platform should be considered which is indeed lead to an integrated system of patient management nation-wide to reduce the medical errors and costs. The formulation of E-legislation which permit the intercountry exchange of patients, data and inter-jurisdictional practice of medicine should be considered. It should be noted that, the awareness of the use the ICT is fully perceived when people enabled in adopting and use it, otherwise, people will be hesitant in the progression of adoption and use of eHealth services. In relation to further research on the improvement and promotion of e-Health tools, readiness, use, and awareness in Tanzania are required.

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Competing Interests

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