Review Article

A meta-analysis of telemedicine success in Africa

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Abstract

The use of information and communication technologies (ICT) tools to improve the efficiency of professionalism at work is increasing every time under the dynamic digital environment. Tools such as telemedicine, tele-education, and health informatics have of late been incorporated in the health sector to enable easy access to essential services, for example, in medical areas from referral centers by the patients on one hand and enabling the doctor to doctor consultations for the benefit of patients. Unfortunately, observations indicate dearth efforts and commitment to optimize use of the tools in the majority of the countries south of the Sahara. Sub-Saharan Africa has been left almost behind the rest of the world in terms of development going through decades of economic exploitation by especially the west through its natural and human resources. These factors, ethnic conflicts and endless wars have continued to ruin sub-Saharan Africa's socio-economic development. Information was obtained through a network of telemedicine practitioners in different African countries using internet communication, through E-mail and reviewing existing literature of their activities. This information was compiled from representative countries in each African region and the previous authors' experiences as telemedicine practioners. Most of these countries have inadequate ICT infrastructure, which yet creates sub-optimal application. Sub-Saharan Africa, made up of 33 of the 48 global poorest countries has to extend its ICT diffusion and policy to match the ever developing global economy. In some countries such as Ethiopia and South Africa there is significant progress in Telemedicine while in countries such as Burkina Faso and Nigeria the progress is slow because of lack of political support. Almost all reference to Africa is made in due respect to sub-Saharan Africa, one with big social, economic, and political problems with resultant high morbidity and mortality rates. This also highlights the under-representation of African researchers in the global whelm of information system research. Telemedicine in Africa though has not attracted enough political support is potentially a very useful conduit of health-care given the fact that the continent is resource limited and still enduring the effects of scarce human resource especially in health.

Key words: Africa, e-health, internet, telemedicine, telepathology

The authors are active telemedicine practitioner narrating their experiences in telemedicine but in addition compiled information from a network of telemedicine practioners in different African countries using internet communication

through E-mail and reviewing existing literature of their activities. This information was compiled from representative countries in each African region and opinions expressed are those of the authors.[1-3]

In this study, we sought to make a meta-analysis of the success story of telemedicine and health informatics from the existing data in Africa in light of seeking solutions to the people who need the essential health services in especially the rural areas. It is unclear that Africa still lags behind the information systems development[4-13] although, the rest of the developed world has all the necessary infrastructure and utility of the services.[8] There are technological and non-technological challenges and these are often multi-directional. The technological challenges include lack of infrastructure to host telemedicine projects whereas, the non-technological challenges include individual and government policies, which address the ethical issues like the concerns over patient privacy in telemedicine[14,15] and lack of funding. However, the ethical concerns have been reported not to be specific to telemedicine but also to general medicine practice when managing distant patients as in the case of rural Africa.[16]

Researchers have developed models to overcome both non-technological and technological barriers to telemedicine.[17-19] Whereas, telemedicine would solve many of the medical problems Africa faces, it is observed as one of the modern technologies currently identified to enable some of the e-Health solutions where distance is a critical factor, especially for the rural poor.[20]

In this study, information was obtained through a network of telemedicine practitioners in different African countries using internet communication through E-mail, reviewing existing literature of their activities and basing on experience as active telemedicine practitioners. This information was compiled from representative countries in each African region.

However, although, Africa lags behind in information and communication technologies infrastructure some efforts are underway to a success solution with respect to telemedicine. Development researchers have hailed the Internet as a revolutionary tool that enables efficient global transfer of information for telemedicine, trade and e-commerce, on-line digital libraries and education.[21] Robertson Global Health Solutions Corporation and Montana Health-care Solutions Pty Limited has been reported in this cause. They signed an agreement with Telemedicine, Africa to provide the high quality and cost-effective health-care services and solutions to the medically underserved African populations using the health mobile web telemedicine extensions.[22,23] This would enable better and timely health-care services to be extended to all Africa's rural and urban marginalized communities using a few

available resources especially through partnering together with respective peers in all African states toward the success implementation of telemedicine. Until recently, just a small part of Africa was able to realize and push for telemedicine. South Africa had a slow response[24,25] but has surely moved steps forward to telemedicine success story using either real-time or store and forward methods given the demand for health service enhancement and improvement.[26,27] Lietch believes that technologies present can support telemedicine infrastructure in Africa can be very successful given the sun as a source of solar power to support the rural areas.[28] Kenya has embraced the practice of telemedicine to improve her health infrastructure. Plans have been proposed in this country to introduce identification and verification smart cards to be used in all health centers to enable the effective development and implementation telemedicine.[29]

Other telemedicine projects in sub-Saharan Africa include the fundamental of modern telemedicine for Africa (FOMTA), the Pan-African e-network project and the Reseau en Africue Francophone pour la Telemedicine (RAFT). The FOMTA aims at promoting the development of indigenous regional networks between R and D centers in the developing countries and their respective universities to link them to the European countries.[30] The project uses broadband technology in Africa, Integrated Service Digital Network (ISDN). FOMTA associates developing countries with the generation of new knowledge, innovative and appropriate technologies to cater for the unmet needs and to generate a sustainable economic development.

The Pan African e-network project is another one and so far the biggest project for distance education and telemedicine in Africa resulting from the growing partnership between India and Africa.[31] The second phase was inaugurated to cover twelve African countries which include Botswana, Burundi, Cote de Ivoire, Djibouti, Egypt, Eritrea, Libya, Malawi, Mozambique, Somalia, Uganda and Zambia. The project is also equipped to support e-governance, e-commerce, infotainment, resource mapping and meteorological and other services in the African countries, besides providing very very important people (VVIP) connectivity among the Heads of State of the African countries through a highly secure closed satellite network.

The situation of telemedicine in Mali has been examined in this study. The project in Mali, named, "Keneya Blown," was initiated in 2001 by the Mali University Medical School in Bamako, and financed by the Geneva Government and the Geneva University Hospitals.[32] The project was to develop and use internet-based connections between the national and regional health-care institutions, implement basic services such as e-mail and a medical web portal, and train users,

implement a low-bandwidth, Internet-based distance learning system and to evaluate the feasibility of long distance collaborations for continuing medical education and teleconsultations. It has succeeded in bringing together several health institutions in Bamako, Segou and Tombouctou, where medical teams have been trained for the use of Internet-based tools.

RAFT start in Mali and has extended to 10 African French speaking countries.[33] It webcasts interactive courses that put emphasis on knowledge sharing across care professionals usually in the form of presentations and dialogs between experts in different countries. RAFT is also involved in videoconferences, teleconsultations, collaborative knowledgebase development, support for medical laboratories quality control and the evaluation of telemedicine in the rural areas via satellite connections in the context of multi-sectorial development.

In Sudan, the telemedicine crusade has been championed by Ashrafcom, which advocates promoting access to medical care for consumers and health professionals via telecommunications technology.[34] Ashrafcom seeks to bring together diverse groups from traditional medicine, academic medical centers, technology and telecommunications companies, e-health, medical societies, government and others to overcome barriers to the advancement of telemedicine through the professional, ethical, and equitable improvement in health-care delivery for the benefit of Sudanese people.

Rwanda has also initiated a telemedicine project to address its major challenge of few doctors and other health service providers. This project is expected to provide an alternative solution to the small number of doctors, few specialists in some disciplines, and complete lack of specialists in other disciplines (Nzeyimana, 2012).[35,36]

In Uganda attempts to telemedicine infrastructure appears substantive and will call for sustainability and scalability. However, criticisms have been made of using the high tech approaches where there many basic needs The country's national health policy of poverty reduction, emphasizes the health improvement strategies, and telemedicine features as its missions of guaranteeing access to high quality health-care services.[37] Telepathology in Uganda started humbly as a low-cost static image telepathology involving capturing, storing, and forwarding individual digital images, or galleries of static images, for remote diagnosis e-mailed as an attachment with the clinical information to another pathologist for primary diagnosis or second opinion. This, however, was followed by the use of (ISDN line) to exchange both pathology and radiology images as well as teleconference between two hospitals in Kampala. One of the success areas was the diagnostic feasibility and accuracy of internet based telepathology compared to the convectional diagnostic examination.[38] The introduction of a Coolscope at Mulago Hospital, a motorized microscope remotely operated to view and interpret images has revolutionized Telepathology practice in Uganda. In South Africa, dynamic active telepathology has been successfully practiced over the National Health Laboratory service network using a similar Coolscope in remote small histopathology departments lacking specialists in such areas as dermatopathology, oncology, and hematopathology.[39]

In Nigeria, efforts are underway to design and implement telemedicine infrastructure. However, some negative factors exist; one of these is the less computer literacy among the many already long serving professionals; another is poor financial budget allocation to Ministries of Health. Indeed a number of African countries south of the Sahara are still hesitant to adopt telemedicine as it is deemed an expensive venture but others are making progress [Table 1]. Burkina Faso is one of the African countries where telemedicine has been suspended for some time due to the national financial budgetary constraints (unpublished data).

The table gives snapshots representative of the different regions within sub-Saharan Africa.

The study examined the possible impact of telepathology as one of the modern technologies aimed at improving the professional performance at work especially in the health sector to achieve the Millennium Development Goals that include poverty eradication in Africa. The observation that a good number of African countries are slowly appreciating the modern information technologies calls for the great and urgent desire to achieve the required standards of these technologies. This is largely is hampered by the poor operational budgets which fail to achieve timely and adequate accomplishment of the planned activities and the poor acceptance of the attached benefits of the new policies and technologies among the implementers in the developing countries compared to their peers in the developed countries. This tabular representation of the different regions in sub-Saharan Africa is a way to demonstrate the status of telemedicine in terms of the different applications.

Telemedicine though still in its infancy stages in Africa is potentially a very useful conduit of health-care (36) given the fact that the continent is resource limited and still enduring the effects of scarce human resource especially, in health.

Therefore, it is inferred that support of telepathology technologies could be a great milestone to compliment African governments in the health-care services for the ever rising population against the available planned resources. Achieving proper implementation of telepathology requires improved motivation of health-care service providers and enhanced awareness

Table 1: Telemedicine snapshots of the different regions within sub-Saharan Africa

Country	Hospitals	Success indicators	Information source
Botswana	Africa tele-dermatology project, Botswana, American academy of dermatology	Provides dermatology support to local physicians, dermatologists and health-care workers in hospitals and clinics throughout Africa	Internet source
Congo	There are links made by Interactive Telecommunication network for the world's Health Services and the health center at Pointe Noire in Congo and Luigi Sacco university hospital, Milan	Remote consultation and assistance to most African countries	Internet source
Ethiopia	Fann, St. Louis, and Diourbel	Use of telemedicine technologies	Internet source
Ghana	Remote site in Northern Ghana communicates regularly with the London school of hygiene and tropical medicine and the Tropical disease research center, Geneva. MDnet, Ghana, Vodafone, and Ghana medical association	Data communication on malaria research	Internet source
Kenya	Weltel, Kenya, Dimagi SMS	SMS system to support effective use of ARTs. Supports remote data collection and logistics of moving health-care related products	Internet and E-mail consultations
Mali	Medic mobile, Frontcare SMS	Electronic health records	Internet source
Mozambique	Beira and maputo	Digital microwave terrestrial and satellite link between the two hospitals	Internet source
Senegal	Physician's consultations and referrals	Connection is by ISDN which allows transmission of medical images and other medical information	Internet source
Tanzania	Universities, small clinics in all rural hospitals with satellite connections	iPath network (http://www.ipath-network.com/tanzania/)	E-mail and internet source
Uganda	Internet based dynamic telepathology consultation between Mulago hospital Uganda and Fuerth hospital, Germany	Internet based consultation for primary diagnosis and second opinion	Physical consultations and available internet information
Zambia	Medical library with partner library in university of Florida	Disseminate information to doctors in the region	Internet source

ISDN: Integrated service digital network, SMS: Short message service, ART: Antiretroviral therapy

and skills training of pathologists, other medical cadres and professionals in other disciplines in computer and relevant information technologies to embrace e-health skills, which include telemedicine.

The observed challenge in this direction is for the African countries to observe the social, political, and economic implications of these technologies, to observe the means of diffusion of such technologies to embrace not only the urban populations but also the rural poor. Lastly, there will be a need to underpin the impact of these technologies on the per capita incomes, employment and environment.

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