REVIEW ARTICLE

Telemedicine and biomedical care in Africa: Prospects and challenges

IJ Okoroafor, FN Chukwuneke[1], N Ifebunandu[2], TC Onyeka[3], CO Ekwueme[4], KK Agwuna[5]

Department of Otorhinolaryngology Surgery, University of Nigeria Enugu Campus, [1]Department of Oral and Maxillofacial Surgery, University of Nigeria Enugu Campus, [4]Department of Community Medicine, University of Nigeria Enugu Campus, [5]Department of Radiology, University of Nigeria Enugu Campus, [3]Department of Anesthetics, University of Nigeria Enugu Campus, Enugu, [2]Department of Internal Medicine, Federal Teaching Hospital, Abakaliki, Ebonyi State, Nigeria

Abstract

The use of information and communication technology for health care delivery, particularly in poor settings where access to medical services is inadequate, holds promise in expanding health care access. In rural or impoverished environment, where disease is prevalent, doctors are scarce, and health care infrastructure is inadequate, telemedicine holds a good prospect in improving the health conditions of the people. However, telemedical practice in Africa cannot be without challenges because some aspects are often difficult to implement in underdeveloped settings where ignorance and poverty are rife. Apart from nonavailability of facilities and poor communication, most Africans have different understanding of ailments, which often affect the health system. Considering the increasing disease burden in Africa and the need for tremendous progress in achieving the health component of the millennium development goals, telemedicine should be of concern to health policy makers. This paper critically examines the prospects and challenges of telemedical practice in Africa through a systematic review of 31 relevant publications which, in addition to the authors' knowledge and experience in biomedical care in Africa, supported the information as presented.

Key words: Africa, challenges, medical care, prospects, telemedicine

Date of Acceptance: 28-Jan-2016

Introduction

The modern medical practice at present is centered on the growing quest for technological advancement in health care delivery. Telemedicine involves the application of telemedical practice using modern technology to improve the quality of healthcare delivery and promotion of medical education in the absence or limited healthcare facilities.[1-3] The term "telemedicine" derives from the Greek "tele" meaning "at a distance" and the present word "medicine," which itself derives from the Latin "mederi" meaning "healing." Telemedicine utilizes information and telecommunication technology to transfer medical information for diagnosis, treatment, and education.[4] The practice of medical care using interactive audiovisual and data communications, diagnosis, consultation and treatment, as well as education and the transfer of medical data, has progressively advanced the course of health care delivery in recent times. Telemedicine helps eliminate distance barriers and can provide access to medical services that would often not be consistently available in distant rural communities.[5-7] Thus, with the help of telemedical

Address for correspondence:
Dr. FN Chukwuneke,
Department of Oral and Maxillofacial Surgery, College of Medicine, University of Nigeria Enugu Campus, Enugu, Nigeria.
E-mail: ichiefn2002@yahoo.com

Access this article online

Quick Response Code:

Website: www.njcponline.com

DOI: 10.4103/1119-3077.180065

How to cite this article: Okoroafor IJ, Chukwuneke FN, Ifebunandu N, Onyeka TC, Ekwueme CO, Agwuna KK. Telemedicine and biomedical care in Africa: Prospects and challenges. Niger J Clin Pract 2017;20:1-5.

practice, the people in rural area can get treatment from the medical personnel in any part of the world.[8] It also serves as a communication linkage between the public and private hospitals for the exchange of information at all levels of healthcare which in essence will minimize the visiting time and hospitalization of patients. Telemedicine could also be used to save lives in critical care and emergency situations.[9]

By the storage of patients' health information and data using computers for follow-ups, telemedical practice has gone further than diagnosis and treatment. Where patient has moved out of base and faced with the reality of seeing another doctor other than his usual physician, the patient's records on request and with consent can be sent to the attending physician. This is possible because the information had already been stored in a computer database.[10] Computer software can be used for diagnosis of diseases and examination of internal organs of the body. Computer-assisted surgery is a fast-advancing field in medicine, which combines medical expertise with computer intelligence to give faster and more accurate results in surgical procedures.[8,10] Telemedicine through computer networking facilitates communication between patients and their doctors. It also helps in obtaining experts' opinions and sharing of knowledge between doctors. With internet communication and visual technology, medical professionals can now sit on opposite sides of the globe, exchange clinical images, and communicate with colleagues on issues concerning their patient's management. Updates in the medical field, advancements in medical information about new methods of treatment, diagnosis, and management can reach the common man within minutes.[11]

Phone communication through the use of wireless options has also contributed immensely to the field of medical practice in recent times. Patient who is far away from his/her doctor can send a text message about his health condition and the doctor will equally look at the text and the complaint, thereof make a provisional diagnosis and prescribe drugs for the patient. The doctor will also follow-up the case so that if patient's condition is not improving, then a need for face-to-face consultation will then become necessary. By this, the patient has saved the time, inconveniences, money, and period of hospitalization. This technology is poised to alter how health care is delivered, the quality of the patient experience, and the cost of health care.[12] Mobile phone technology as a component of mobile Health (mHealth) is helping with chronic disease management, empowering the elderly and expectant mothers, reminding people to take medication at the proper time, extending service to underserved areas, and improving health outcomes and medical system efficiency.[13]

A clinician working in an area with limited option of diagnostic facilities can take a picture of his patient ailment, send it through mobile phone to a colleague in an area with advanced technology for evaluation, and thereafter gets a feedback. In some countries, these technology activities have been tremendous. According to the world health survey of 114 nations, mHealth initiatives have been established in many countries, but there is a variation in adoption levels.[14] The survey observed that the most common activity was the creation of health call centers, which respond to patient inquiries. This was followed by using SMS for appointment reminders, accessing patient records, measuring treatment compliance, raising health awareness, monitoring patients, and physician decision support. As usual there were big differentials between developed and developing nations with Africa having the lowest rate of mHealth adoption whereas North America, South America, and South-East Asia showed the highest adoption levels.[15] Most countries are implementing mHealth through various types of public–private partnerships.[16] It has been observed that one of the biggest problems for elderly patients is forgetting to take their prescription drugs,[17] which can be of help with mHealth technology. With personal reminders via E-mail, automated phone calls, or text messages, patients no longer need to visit doctors' offices to be reminded to take their medicine.[18] The advent of telemedicine emanated from the need to diagnose and treat patient at low cost but effective treatment in an environment with limited option of diagnosis and treatment options such as seen in Africa.

Method of Literature Search

We carried out internet search of articles, conference proceedings, media reports, and textbooks on health informatics and telemedicine published anywhere locally and globally without limitation of time span and language using Google, Google Scholar, PubMed, African Journal Online, Medknow, Hinari and NIH.gov, Researchgates, and Elsevier. In addition to electronic publications, we also searched for journals and textbooks on health informatics, culture, and biomedical care in Africa from the University Libraries. The search engines yielded 31 relevant publications which, in addition to the authors' knowledge and experience in biomedical care in Africa, supported the information as presented in this article.

Biomedical Care in Africa: An Overview

Biomedical care in Africa and the influence of culture on the health-seeking behavior of Africans cannot be underestimated. Many African cultures have different notions and understanding of the causes of diseases. Most people believe that diseases are caused by supernatural beings, the handiwork of neighbors, or vengeance from an offended "Gods" as a result of transgressions committed in the past by an individual or parents. Unlike a doctor trained in Western biomedicine, the traditional African healer looks for the cause of the patient's ailments as misfortune in relationship between the patient and the social, natural,

and spiritual environments,[19-21] which reflects on the people's attitude and understanding of their health matters. In an environment where poverty and ignorance are in common place, health care delivery is often hampered by chain reactions of events between poor health policies and individual's attitude to health-seeking behavior.

The complexity of African society with different cultural and religious practices also reflects on the people's attitude and understanding of their health matters. The extended family values are still the norms. An individual who has been benefited from the family structure is expected to owe allegiance to the system in return, and in certain situations, do not have autonomy to decide on his or her health matters without the family input. Consequently, most people do not often accept the model of health care system provided for them.[22]

Religion, on the other hand, also plays an important role in shaping our health-seeking behavior. The proliferation of worship centers, prayer houses, and spiritual healing centers is on the increase and most people find succor to these places for the treatment of their ailment. Most Africans are very religious and this extends to their understanding of their health matters and health-seeking behavior. Some religious leaders have all become healers themselves. Most patients now depend on their pastors or spiritual leaders in matters that concern their health. In certain cases, most patients may find it difficult to discuss their ailment on phone except with their pastor's approval. This is because in this environment, most people do not just make decision based on their health matters without a first look at the spiritual notion concerning their health.[23] Consequently, most people more often seek succor in the hands of these spiritual healers and diviners. Priority in these situations should therefore be focused on educating and creating awareness on proper health-seeking behavior among our populace to embrace the modern technology, since Africa cannot live in isolation against the rest of the world in the face of increasing burden of diseases.

Prospect of Telemedical Practice in Africa

Despite the epidemiologic realities and the burden of diseases in Africa, telemedical practice through information and communication technology (ICT) is still rudimentary in most African societies. Understanding the role of ICT in health care delivery is important in the global efforts to reduce the burden of diseases and health inequalities, especially in Africa. The use of ICT for health care delivery, particularly in poor settings where access to medical services is inadequate, holds a promise in expanding health care access in the developing countries. In rural or impoverished environment, where disease is prevalent, doctors are scarce, and health care infrastructure is inadequate, telemedicine is an innovative solution that connects the developing world to the resources of the developed world.[24] Telemedicine holds a good prospect in improving the health conditions of people in an environment without adequate healthcare infrastructure and manpower such as Africa. It provides the possibilities of transmission of health information for diagnosis and treatment at a low start-up cost for effective implementation of medical care in the midst of understaffed clinics and undertrained health practitioners.

Telemedicine can provide a network of professional interactions between health practitioners in Africa and experts in other countries through ICT, thereby providing the means for an export of medical knowledge and exchange of ideas through a visual communication system between the patients in Africa and consultants in abroad. In certain situation, the patient and the consultant will be seeing each other via ICT, and all the specifications from the investigation done will be digitalized and made available immediately to the consultant across. Thereafter, the consultant can make his diagnosis and possibly advice the patient on treatment alternatives. By using simple digital camera and other visual technologies to document patients' ailments and sending it to a specialist doctor for consultation and advice, local doctors and nurses can learn and be able to manage certain cases through professional communication network.

Interestingly some African countries are making a big progress in the use of ICT for medical care delivery. Josh Nesbit of Medic mobile in Malawi developed software that allowed health workers to text in medical information for rural patients.[25] Rather than spend hours commuting to clinics, they could get quick diagnosis on routine symptoms and suggested treatments. According to him, "within 6 months of the system going live, the number of patients being treated for tuberculosis doubled, more than 1200 h in travel time were eliminated, and emergency services became available in the area for the 1st time."[25] Telemedical practice makes doctors more efficient because they do not have to be in the physical presence of a patient to judge his or her condition. Visual technology allows health practitioners to overcome the limitations of geography in health care and access information at a distance and that is what Africa needs at this time to cope with ever increasing burden of diseases and limited option of diagnostic and treatment facilities.

The use of mobile phones cannot be underestimated. With mobile phone technologies, medical practitioners in rural areas can update and retrieve patients' records from anywhere within a network coverage. This ensures that the patients' medical records are always current. Apart from enhancing the quality of patient care, the adoption of e-prescription applications through the elimination of redundant paperwork, also facilitates more efficient and effective delivery of patient care.[26] Teleprescription in

Africa is becoming common with increasing cost of health care, poor infrastructural development, erratic power supply, poor road network, and inaccessibility to specialist health centers. Applications and use of phone prescription if well designed will provide accurate billing method and also eliminate the number of prescription errors as well as facilitate real-time access to medical records, thereby decreasing back and front office inefficiencies associated with script writing.[27] The applications could be designed to support functionality that automatically alerts the physician if the medication prescribed will react adversely with other medications.[28]

In certain cases, mobile phones could be used to alert the public about fake drugs through SMS messages. In Nigeria, the National Agency for Food and Drug Administration Control (NAFDAC) has devised a means through which the public is alerted about a fake drug by simply instructing the patient to copy a specified pin number attached to the particular drug and the individual thereafter text the pin number to the NAFDAC drug regulatory center which will confirm whether the drug is fake or genuine. Noting that adverse drug effects are a major cause of death in the world with tens of thousands deaths occurring across the world each year because of medication or prescription errors, Ikhu-Omoregbe and Azeta[29] at the Department of Computer and Information Sciences, Covenant University, Ota, Nigeria, suggested the adoption of voice-based mobile applications (vbmopa) in health care as a means of eliminating some of these errors because they allow prescription information to be captured and heard through voice response rather than in the physician's handwriting. According to them, many of such errors involve the administration of the wrong drug or dosage by care givers to patients due to indecipherable handwritings, drug interactions, confusing drug names, etc. The adoption of voice-based mobile applications therefore could eliminate some of these errors because they allow prescription information to be captured and heard through voice response rather than in the physician's handwriting. This method could therefore be of help to alleviate costs and improve life savings in healthcare centers across the world, especially in developing countries where treatment processes are usually cumbersome and paper-based. Telehealth therefore holds a lot of prospect to achieving health care delivery bearing in mind that most African countries live in poor setting environment in the presence of high burden of diseases.[30]

Telemedical Practice in Africa and the Challenges

Health ICT is expected among other things to improve health outcomes and reduce healthcare delivery costs and services. To implement these health information systems successfully and transform our health care system to meet global demand, telemedical practice in Africa cannot be without challenges. Some aspects are often difficult to implement in underdeveloped settings and should be addressed to exploit on the potentials these new tools offer to produce successful outcomes taking into account the complexity of African society.

Apart from nonavailability of some of these digital tools at affordable prices, poor communication network, and erratic power supply, most African societies have different notions and understanding of what ailment is. As stated earlier, biomedical care in Africa is a complex one because many African cultures have different understandings of the causes of disease which more often affect individual's health-seeking behaviors, public health system, policy, planning, and implementations. Most patients often look at their ailments as a misfortune associated with the social, natural, and spiritual environments. Therefore, physician's/patients contact for healing in African setting may become imperative. Most patients prefer getting face-to-face consultation with their doctors whereas some prefer interacting with their spiritual leaders before thinking of orthodox intervention. In addition, people may be concerned about their ailments being disclosed to others through visual and communication medium such as internet, especially in environment where stigma is attached to some diseases.

Confidentiality and privacy may be hampered by the use of communication gadgets that are not controlled by the individual and as such may result in serious invasion of patient's privacy. In some cases, there is rejection in the family when an ailment is disclosed through network that is unrestricted. For example, the traditional African society places an invaluable premium on procreation and in some communities, a woman's place in her matrimony is only confirmed on positive reproductive outcome.[31] Infertility is rife in Nigeria and HIV/AIDS infection is a global pandemic, which has led to a drop in life expectancy across the world. In Africa, a number of cultural norms relating to gender roles and power dynamics constitute a serious barrier to the issues of sexuality and infertility. Couples are concerned about their infertility diagnostic test being disclosed to each other, especially before marriage. This concern is understandable, especially in an environment that lacks the modern concepts and attitude toward sexual matters. A situation where one stumbles on the partners' health matters with no prior information may lead to abandonment of the individual by the partner. However, with time and further research, these challenges will be addressed to provide quality and timely health care delivery in Africa.

Conclusion

Telemedicine involves the use of ICT in health care delivery such as treatment, prevention of disease and injuries,

research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities. In an environment with limited option of treatment such as Africa, this should be a welcome development; however, the complexity of African society in the context of social structure and cultural dynamism may be an impediment to proper implementation of health care delivery through telemedical practice. Considering the epidemiologic realities and the burden of diseases in the continent, the method to be employed for effective implementation of telemedical practice in Africa should be of concern to health policy makers, medical practitioners, information technologists, researchers, and biomedical experts, taking into consideration the constantly transforming global society in health matters. Developing telemedical practice in Africa that will take into account our peculiar environment is therefore paramount to the provision of improvement and quality access to healthcare delivery.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest

References

1. Nakajima I, Sastrokusumo U, Mishra SK, Komiya R, Malik AZ, Tanuma T. The Asia Pacifi c telecommunity's telemedicine activities. Asian Telemedicine inititive 2006. p. 280-2. [doi: 10.1109/HEALTH.2006.246471].
2. George R, Schwartz C, Gene C, Schwartz R. Principles and Practice of Emergency Medicine. Vol. 2. Lea and Febiger Tokyo; 1992. p. 3202.
3. Van't-Haaff C. Virtually On-sight. Just for Canadian Doctors. 2009. p. 22. Available from: http://www.justforcanadiandoctors.com/pastissues/JFCD2009. [Last accessed on 2015 Jun 30].
4. WHO. A Health Telematics Policy in Support of WHO's Health-for-All Strategy for Global Health Development: Report of the WHO Group Consultation on Health Telematics, 11-16 December, Geneva, 1997. Geneva: World Health Organization; 1998.
5. Kifle M, Mbarika V, Datta P. Telemedicine in sub-Saharan Africa: The case of teleophthalmology and eye care in Ethiopia. J Am Soc Inf Sci Technol 2006;57:1383-93.
6. Mishra A. Telemedicine in otolaryngology (an Indian perspective). Indian J Otolaryngol Head Neck Surg 2003;55:211-2.
7. Froehlich W, Seitaboth S, Chanpheaktra N, Pugatch D. Case report: An example of international telemedicine success. J Telemed Telecare 2009;15:208-10.
8. John Blyth W. Telecommunications, Concepts, Development, and Management. 2nd ed. Glencoe: McGraw-Hill Company; 1990. p. 280-2.
9. Saylor M. The Mobile Wave: How Mobile Intelligence Will Change Everything.: Perseus Books Vanguard Press. New York; 2012. p. 153.
10. Andrea J. Wireless technology poised to transform health care. Rady Bus J 2010. Available from:http://www.management.ucsd.edu/journal/2010-articles/rbj2010-wireless. [Last accessed on 2016 Feb 29].
11. Nakajima I, Chida S. Telehealth in the Pacific: Current status and analysis report (1999-2000). J Med Syst 2000;24:321-31.
12. Sinha V. Mobile Health Technology Can Reach the Remotest Corners, Voice of America News; 2010.
13. Kaplan WA. Can the ubiquitous power of mobile phones be used to improve health outcomes in developing countries? Global Health 2006;2:9.
14. Hao W, Jing L. Mobile phone based health care technology. Recent Pat Biomed Eng 2009;2:15-21.
15. World Health Organization. mHealth: New Horizons for Health Through Mobile Technologies, Global Observatory for eHealth Series. Vol. 3. Geneva: World Health Organization; 2011.
16. Robert L. Vital Signs Via Broadband: Remote Monitoring Technologies Transmit Savings. Better Health Care Together Coalition; 24 October, 2008. p. 1.
17. Berger E. Telemedicine: Has its time come? Ann Emerg Med 2010;56:A15-17.
18. Nurses Happier Using Telecare, Says International Survey, eHealth Insider website, 2005. http://www.digitalhealth.net/news/21237. [Last retrieved on 2009 Apr 04].
19. Darshan S, Bertus H. Vitality, Health and Cultural Diversity. Compass Newsletter for Endogenous Development No. 3; 2000. Leusden p. 4-7.
20. De Smet P. Herbs, Health and Healers: Africana as Ethnopharmacological Treasury. Bert en Dal. Leusden. Afrika Museum; 1999.
21. Juan S, Ponce D, Lisperguer G. Native Cures for Body and Spirit. Compas Newsletter for Endogenous Development No. 3; 2000. Puerto Rico p. 38-9.
22. Morgan LM. Community participation in health: Perpetual allure, persistent challenge. Health Policy Plan 2001;16:221-30.
23. Chukwuneke FN, Ezeonu CT, Onyire BN, Ezeonu PO. Culture and biomedical care in Africa: The influence of culture on biomedical care in a traditional African society, Nigeria, West Africa. Niger J Med 2012;21:331-3.
24. Sanjeev D, Anuradha D, Jai Vir S. Mobile-Health Approach: A Critical Look on Its Capacity to Augment Health System of Developing Countries. Indian J Community Med. 2014;39(3):178-182. [doi:10.4103/0970-0218.137160].
25. Wang H, Liu J. Mobile phone based health care technology. Recent Pat Biomed Eng 2009;2:15-21.
26. World Health Organization. Adherence to Long-term Therapies: Evidence for Action. 2003. p. 1-16. Available from: http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf. [Last accessed on 2016 Feb 29].
27. Sweeney C. How Text Messages Could Change Global Healthcare. Popular Mechanics. In: Darrell M. West: Going Mobile. HE Booking Institution, 75 Massachusetts Ave. Washington DC. 2011. p. 20036.
28. Anita M, Maria J, Gunvor G. The mobihealth usability evaluation questionnaire. eHealth Int J 2005;2(1):9-14. Available from: http://www.ehealthinternational.org. [Last accessed on 2016 Feb 19].
29. Ikhu-Omoregbe NA, Azeta AA. A voice-based mobile prescription application for healthcare services (VBMOPA). Int J Electr Comput Sci 2010;10(02):69-72.
30. Bok S. The limits of confidentiality. In: Callahan JC, editor. Ethical Issues in Professional life. New York: New York University Press; 1988. p. 230-9.
31. Umeora O, Chukwuneke F. Ethical dilemma and management of infertility in HIV seropositive discordant couples: A case study in Nigeria. Ann Med Health Sci Res 2013;3:99-101.