THE ROLE OF COMMUNICATION (E-HEALTH / M-HEALTH) IN HEALTHCARE DELIVERY IN NIGERIA

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Abstract
This paper reviewed and discussed how electronic health (E-health) and mobile health (M-health) technologies can and have transformed healthcare communication and delivery in Nigeria. It highlighted the role of E-health in enabling remote consultations, the use of drone in delivering medical supplies in remote areas, re-evolution of electronic health records, and health information systems (digitalization of health centers). Additionally, the paper emphasize how M-health has facilitated health services through mobile devices, including health apps, SMS reminders, and real-time health monitoring. The paper discussed the benefits of these technologies in improving access to healthcare services, particularly in underserved areas, and how government initiatives and collaborations with mobile network providers have supported their implementation. The challenges of e-health and m-health communication in Nigeria and ways forward were proffered which included amongst others a chatting of a better synergy between the government and mobile service providers as well improving electric power supply in the Nation.

Key Words: Communication (E-Health / M-Health), Healthcare Delivery

Introduction
Communication, through E-health (electronic health) and M-health (mobile health), has significantly impacted healthcare delivery in Nigeria. These technologies have improved access to medical services, particularly in remote and underserved areas. Both E-health and M-health have been supported by government initiatives in Nigeria. The National Health ICT Strategic Framework of the Federal Ministry of Health (FMOH) as contained in the National Health Promotion Policy FMOH (2019) aims to integrate information and communication technology into healthcare delivery. The integration of communication through electronics and mobile devices in healthcare delivery holds potentials in improving health promotion as well as health protecting behaviours. Growing evidence indicates that comprehensive policies and programmes that simultaneously address health promotion and health protection may be more effective in preventing disease and promoting health and safety than either approach taken separately (Hamilton-Ekeke, 2013; Hamilton-Ekeke, et al., 2021; Hamilton-Ekeke, Adeleke, & Telu, 2021, Hamilton-Ekeke, 2022). Although additional evidence of the effectiveness of this approach is needed, there is an increasing acknowledgement of the potential advantages of integration. Integrating health promotion and health protection efforts may contribute to greater improvements in behavior change (Sorensen, Barbeau, Stoddard, Hunt, Kaphingst & Wallace, 2005)

In a review study conducted by Adeleke et al. (2019) on E-Health and Healthcare Delivery in Nigeria, the authors highlighted the role of E-health in providing telemedicine services, electronic health records, and health information systems. These innovations according to them have facilitated remote consultations and patient data management, contributing to more efficient and patient-centered care. Furthermore, an earlier research paper by Oyeyemi et al. (2014) on the role of M-Health in strengthening health systems in developing countries: using Nigeria as a case study; emphasizes the impact of M-health on healthcare delivery. The authors discussed the use of mobile phones to deliver health information, reminders for medication adherence, and real-time health monitoring. This approach empowered patients to actively manage their health and also enhanced communication between healthcare providers and patients. Additionally, collaborations with mobile network providers have led to the successful deployment of M-health solutions, as highlighted in the work of Mbuagbaw et al. (2014) titled mobile phone text messaging interventions in healthcare settings.

Overview of E-Health / M-Health in Nigeria

In Nigeria, communication has become a pivotal aspect of healthcare delivery, particularly with the advent of E-health and M-health. E-health refers to the use of electronic means to manage health information and services, while M-health involves the utilization of mobile devices for healthcare purposes. These technological advancements have transformed how healthcare is accessed and delivered, bridging geographical gaps and enhancing patient-provider interactions. The World Health Organization (WHO) has defined M-Health as the use of mobile and wireless technologies to support the achievement of health objective (WHO, 2020). Also the National Institutes of Health has defined M-Health as the use of mobile and wireless devices (cell phones. tablets, etc) to improve health outcomes, healthcare services, and health research (Olatosi, et al., 2018). M-Health can be comprehensively put as 'the use of mobile devices in collecting, collating and aggregating of patient-level health data, providing healthcare information to practitioners, researchers, and patients, real-time monitoring of patient vitals, and direct provision of care'. In Nigeria, where healthcare infrastructures are limited, E-health and M-health solutions have played a significant role in improving access to medical services. This improvement is more felt in remote and underserved areas. Mobile apps, SMS reminders, and telemedicine platforms enable patients to consult doctors, access medical advice, and even receive prescription reminders from the comfort of their homes, amenities hitherto enjoyed only by advanced nations. The role of E-Health and M-Health in healthcare delivery in Nigeria is advantageous as they have proven essential in a country with a diverse population spread across vast distances.

Types of E-Health

The term E-Health encompasses a range of services or systems that are at the edge of healthcare delivery through information technology, which includes:

Electronic Health Record (EHR): most medical operations in Nigerian healthcare centers like hospitals and Primary Health Centres are already operating the EHR system.

This represents one of the first areas where hospital physicians and other healthcare operations adopted the use of technology. The database contains patient records. This includes dates and times for patient visits, treatment given, medications prescribed, doctor's notes and other pertinent information. It is an irreplaceable source of information. Nurses access information from it every day. Ojo and Popoola, (2015) sees EHR as a collection of a patient's medical history which includes diagnoses, medications, treatment plans, allergies, and laboratory test results. It enables the communication of patient data between different healthcare professionals. EHR allow patients' health information to be managed in a digital format and their data can be shared with other providers across multiple organizations (Ojo & Popoola, 2015).

Benefits of EHR Systems are paramount in two major areas in the healthcare industry: physician productivity and patient satisfaction. Physician Productivity - EHR implementation has the ability to speed up physician diagnoses and digitize administrative tasks, which are associated with 30% of healthcare costs. Other ways EHRs can enhance physician productivity include: fewer file pulls, reduced transcription costs, 24/7 access to patient information, and improved billing and scheduling. Patient Satisfaction - today's patients want to have a firmer grasp on monitoring and controlling their own health data and medical records. EHR gives the ability to quickly obtain their data and see which areas of their health history require improvement. Additionally, EHR provide patients with: 24/7 access to their records, easier chronic disease management, reduced turn-around time for messages to a physician and improved delivery of education materials (Ojo & Popoola, 2015).

The second type of E-Health is computerized Physician Order Entry (CPOE): Also known as computerized provider order entry or computerized practitioner order entry, this refers to the process of a medical professional entering and sending medication orders and treatment instructions electronically via a computer application instead of on paper charts (Omeleke & Taleat, 2017). It can be used in requesting diagnostic tests and treatments electronically and receiving the results. The advantage of CPOE is that it reduces errors related to ambiguity of handwriting or transcription of medication orders. By enabling healthcare providers to quickly transmit orders electronically, CPOE can improve efficiency when submitting medication, lab and radiology orders to their respective departments or facilities. CPOE can also streamline reimbursements by flagging orders that may require preapproval from insurance plans, reducing a return on initially denied insurance claims (Omeleke & Taleat, 2017).

The third type of E-Health discussed in this paper is Electronic Prescribing (e-prescribing or e-Rx) which is computer-based electronic generation, transmission, and filling of a medical prescription, taking the place of paper and faxed prescriptions. E-prescribing allows a health practitioner to electronically transmit a new prescription or renewal authorization to a community or mail-order pharmacy through prescription software. There are several software systems used in healthcare deliveries that make for efficient and seamless operations in the health sector in general and these include: clinical decision support system (CDSS) which is used to sift through enormous digital data to suggest next steps for treatment, medical devices are one of the most interesting breakthroughs in the

internet, which involves communication between sensors. Patients are given wearable devices, such as a heart monitor. The medical devices use sensors to record vital signs and other information and then communicate it to computer systems at the hospital or physician's office. Nurses can then monitor information from the medical devices while the patients are at home. Intravenous devices are another area where technology is used to monitor IV bags and lines, sending an alarm to nurses if a kink or block develops (Buowari & Kanmodi, 2021).

Types of M-Health

Mobile health (M-Health) is healthcare and public health practice and education supported by mobile communication devices such as cell phones, tablet computers, and personal digital assistants (PDA). M-Health also involves several mode of operations such as telemedicine, telerehabilation, telesurgery, teledentistry, drug retrieval and delivery system, mobile patient chart etc. Telemedicine is the remote diagnosis and treatment of patients by means of telecommunications technology (Fraser & McGrath, 2000). Telemedicine encompasses the use of technologies and telecommunication systems to administer healthcare to patients who are geographically separated from providers (Adeleke et al., 2020). For example, a radiologist may read and interpret the imaging results for a patient in a different Local Government area or even a different State whose hospital does not currently have a radiologist on staff. Or a physician may conduct an urgent-care consultation via video for a non-life-threatening condition (Uche & Uche, 2014). Telemedicine encourages physical and psychological diagnosis and treatments at a distance, including telemonitoring of patients.

The second M-Health discussed in this paper is telerehabilatation or e-rehabilitation, which is the delivery of rehabilitation services over a distance through telecommunication network and internet like mobile phones and tablets through video calls and voice calls. Telerehabilitation allows patients to interact with healthcare providers remotely and can be used both to assess patients and to deliver therapy. Fields of healthcare that utilize telerehabilatation include: physical therapy, occupational therapy, speech therapy, pathology, audiology, and psychology.

The third M-Health delivery method is telesurgery - according to Choi, et al., (2018) telesurgery is an emerging surgical system that utilizes wireless networking and robotic technology to connect surgeons and patients who are distantly located from one another. The system overcomes today's challenge of shortage of surgeons, and brain drain syndrome (locally referred to as japarism) that is a major issue in Nigerian healthcare delivery. Telesurgery helps to overcome the challenge of geographical inaccessibility of immediate and high-quality surgical care, significant financial burden, potential complications, and long-distance travel. This technology not only benefits the patients but also provides technical accuracy and ensures the safety of surgeons (Agboola et al., 2017).

The fourth M-Health delivery is teledentistry **-** according to American Dental Association (2020) refers to the use of telehealth systems and methodologies in dentistry. It is used to deliver virtual medical, health, and education services. Telehealth is not a specific service, but a collection of means to enhance care and health education delivery.

Teledentistry can include patient care and education delivery using, but not limited to, the following modalities:

Synchronous (live video): Live, two-way interaction between a person (patient, caregiver, or provider) and a provider using audiovisual telecommunications technology.
Asynchronous (store and forward): Transmission of recorded health information (for example, radiographs, photographs, video, digital impressions and photomicrographs of patients) through a secure electronic communications system to a practitioner, who uses the information to evaluate a patient's condition or render a service outside of a real-time or live interaction.

Remote patient monitoring (RPM): Personal health and medical data collection from an individual in one location via electronic communication technologies, which is transmitted to a provider in a different location for use in care and related support of care (Olatosi et al., 2018).

Healthcare delivery system in Nigeria

Historically Nigerian healthcare delivery system followed the typical pattern of many other African countries (Ogunlesi et al., 2008). It started with the colonial medical services, political independence led to important changes in policy and strategies. The development of' health services according to Ogunlesi et al (2008), has been influenced by global trends in ideas and directives. The aim of the health system is mainly health development as process of continuous and progressive improvement of the health status of the population. However, the Nigerian healthcare delivery system is comprehensive and is centered on promotive, protective, preventive, restorative and rehabilitative to every citizen of the country (Federal Ministry of Health 2007). The Nigerian healthcare delivery system is developed at three levels of care (primary, secondary and tertiary) (FMOH, 2007). Each level is supported by a higher level to which the patient is referred. The levels include: Primary Healthcare Level which is the first level of contact between the individual and the health system. It provides general health services or preventive, curative, promotive and rehabilitative nature to the population. The provision of care at this level is largely the responsibility of local governments with support from the state ministry of health (FMOH, 2007). Private medical practitioners also provide health care at this level. Primary healthcare forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and community with the national health system brining healthcare as close as possible to where people live and work, and constitutes the first element of a continuing healthcare process. The basic components of primary health care are: health education, promotion of food supply and nutrition, supply of safe water and basic sanitation, maternal and child health, immunization, prevention and control of endemic and epidemic diseases, treatment of common diseases, provision of essential drugs and dental health.

The second level of care is the Secondary Healthcare Level where more complex health problems are dealt with. This level provide specialized services to patients referred from the primary healthcare level, through out-patient and in-patient services of hospitals

for general medical, surgical, pediatrics, obstetrics and gynecology patients and community health services. Adequate supportive services such as laboratory, diagnostic, blood bank, rehabilitation and physiotherapy are also provided. The third level of care is the Tertiary Healthcare Level which involves super-specialized care and highly specialized services. These services are provided by teaching hospitals and other special hospitals providing care for specific disease conditions or specific groups of patient (Buowari & Kanmodi, 2021). In all these levels, both private and public healthcare services are available with specific guidelines coordinating their activities. According to Hamilton-Ekeke (2022) apart, from the scientific and orthodox practice, there also exist the traditional and alternative medical practices within the health system. To further the overall national health policy, governments of the federation work closely with voluntary agencies, private practitioner and other non-governmental organizations to ensure that the services provided by these other agencies are in line with those of government (Uche & Uche, 2014).

Challenges in healthcare delivery in Nigeria addressed by E-Health and M-Health

E-health involves the use of electronic platforms and information technology to manage health records, provide remote consultations, and streamline administrative processes. M-health, on the other hand, leverages mobile devices such as smart phones to deliver healthcare services and information. These technologies have addressed various challenges in healthcare delivery in Nigeria which includes:

i. Access to healthcare: E-health and M-health have improved access to healthcare services, particularly in rural and remote areas where medical facilities are scarce. Patients can use mobile apps and online platforms to access medical information, schedule appointments, and consult healthcare professionals remotely.
ii. Remote consultations for improved care: Telemedicine platforms enable patients to consult with doctors without the need for physical visits, reducing travel time and expenses. This is especially beneficial in a country with vast geographical distances and transportation challenges like Nigeria.
iii. Centralizing health information: E-health platforms centralize health records, making patient information readily accessible to authorized medical personnel. This enhances continuity of care and reduces the risk of medical errors.
iv. Disease surveillance: E-health and M-health technologies aid in disease surveillance and outbreak management by facilitating real-time data collection and reporting.
v. Healthcare training: Medical professionals can access online training resources and continuing medical education through E-health platforms, keeping them updated with the latest medical knowledge.
vi. Appointment Reminders: M-health solutions provide automated appointment reminders and medication alerts through SMS, ensuring patients adhere to treatment plans.
vii. Emergency Response: Mobile apps equipped with emergency features enable users to seek help quickly in critical situations, improving response times and potentially saving lives (Oliver et al., 2017).

Oyelade et al. (2017) opined that the future directions of E-Health and M-Health offer promising benefits, although, challenges like limited internet connectivity and digital literacy persist, disproportionately affecting marginalized communities. Addressing these disparities is crucial to ensure equitable access to healthcare technologies. However, challenges like limited internet connectivity, digital literacy, and infrastructure gaps still need to be addressed to ensure equitable access to these technologies across the population; overall, the integration of E-Health and M-Health technologies have the potentials to revolutionize healthcare delivery in Nigeria by improving access, communication, and the overall quality of care.

Conclusion

The integration of communication technologies, specifically E-Health and M-Health, has ushered in a new era of healthcare delivery in Nigeria. These technologies have transcended geographical and infrastructural barriers, redefining how healthcare is accessed, delivered, and managed across the nation. E-Health solutions have revolutionized patient care by streamlining administrative processes, centralizing health information, and improving care coordination. The Nigeria Electronic Health Record System (NEHRS) has emerged as a cornerstone in the digital transformation of healthcare, ensuring seamless sharing of patient data and enhancing the accuracy of diagnoses. This efficient data management has led to improved treatment outcomes and a reduction in medical errors. M-Health platforms have empowered both patients and healthcare providers and practitioners through remote consultations, health awareness campaigns, and real-time emergency response systems. Apps like 'Rescue Nigeria' have demonstrated the potential of mobile technology in expediting emergency medical services, ultimately saving lives.

However, the journey towards a digitally-driven healthcare landscape is not without its challenges. Limited internet connectivity and disparities in digital literacy continue to hinder the equitable distribution of these technologies, particularly in remote and underserved areas. Addressing these challenges requires concerted efforts from governmental bodies, healthcare institutions, and technology providers to ensure that the benefits of E-Health and M-Health are accessible to all segments of society. Furthermore, the convergence of communication technologies with healthcare in Nigeria has sparked a transformative change. E-Health and M-Health have transcended traditional boundaries, delivering healthcare access, information, and support in unprecedented ways. While challenges remain, the trajectory is promising, as the nation inches closer to a future where every citizen can reap the benefits of these innovations.For communication through E-Health and M-Health in healthcare delivery in Nigeria to be enhanced,\the following are suggested:

i. Infrastructure development and connectivity improvement: establish partnerships between government, private sector, and telecommunication companies to improve internet connectivity in remote areas. This would ensure seamless access to E-Health and M-Health services for all citizens.
ii. Digital literacy programmes: launch educational campaigns to improve digital literacy among healthcare providers and patients. Training programs and

workshops can empower individuals to effectively use E-Health and M-Health tools for better healthcare outcomes.

iii. Integration into primary healthcare: integrate E-H and M-Health technologies into the primary healthcare system. Collaborate with local clinics and community health workers to facilitate virtual consultations, health education, and appointment scheduling.

iv. Data security and privacy measures: implement robust data security measures to ensure the privacy of patient information. Develop guidelines and regulations that safeguard sensitive health data while encouraging the adoption of E-Health and M-Health solutions.

v. Research and innovation: invest in research to explore innovative ways to leverage E-Health and M-Health technologies for specific healthcare challenges in Nigeria. Support local startups and developers in creating tailored solutions that address the country's unique healthcare needs.

vi. Telemedicine regulations: develop clear regulatory frameworks for telemedicine practices. This would provide legal guidelines for remote consultations, prescriptions, and telehealth reimbursement, boosting the confidence of both patients and healthcare providers.

vii. Public-Private Partnerships: foster collaborations between government entities, private sector organizations, and non-governmental organizations to jointly develop and implement E-Health and M-Health initiatives. This approach can leverage resources and expertise to achieve broader impact.

viii. Monitoring and evaluation: establish mechanisms for monitoring and evaluating the effectiveness of E-Health and M-Health interventions. Data-driven insights can guide improvements and adjustments to ensure optimal outcomes.

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