ADOPTION OF ARTIFICIAL INTELLIGENCE IN DOCTOR-PATIENT COMMUNICATION

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Abstract

Artificial intelligence (AI) one of the most revolutionary technological advancements to emerge in recent times is remodeling and shaping the world. As the healthcare sector evolves, the integration of AI in Doctor-patient communication becomes increasingly prevalent. Doctor-patient communication encompasses verbal and non-verbal interactions aimed at creating a good interpersonal relationship, facilitating exchange of information and including patients in decision making for their overall health care. The adoption of artificial intelligence (AI) in healthcare, particularly in the communication between doctors and patients, represents a transformative shift in the health sector. This paper which is theoretical, evaluates the utilization of AI in doctors/patient communication using the theoretical framework of Technology acceptance model. This theory, explores users' acceptance and adoption of technology. It posits that perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of an individual's intention to use and actual usage of a technology. This evaluation examines doctor-patient communication, approaches to doctor-patient communication with a focus on Paternalism and patient-centredness, the various applications of AI in doctors/patient communication, such as virtual health assistants, chatbots, and telemedicine platforms for teleconsultation, accessing information, scheduling of appointments etc. overall treatment and patient management. It scrutinizes the extent to which these technologies meet the diverse needs of users, taking into account factors like accessibility, usability, and reliability. For patients, the convenience of timely medical information, appointment scheduling, and personalized health advice constitutes a significant satisfaction. Meanwhile, doctors benefit from streamlined administrative tasks, improved diagnostic support, and enhanced patient engagement.

Introduction

Communication in healthcare plays a decisive role as an effective strategy in diagnosis and treatment of the patient. A doctor's communication and interpersonal skills encompass the ability to gather information in order to facilitate accurate diagnosis, counsel appropriately, give therapeutic instructions and establish caring relationships with patients. Veritably, doctor–patient communication is one of the most essential dynamics in health care, affecting the course of patient care and clinical adherence Matusitz & Spear (2014). Effective communication between doctors and patients is essential for delivering high-quality healthcare with the best outcome and promoting patient engagement and satisfaction.

Artificial Intelligence (AI) refers to a set of technologies that allow machines to function intelligently and mimic human sensing, comprehension, and action and these technologies will have a significant impact in almost all areas where human intelligence is involved. It can be used by businesses and institutions to personalise activities, optimise operations, promote innovations, and empower and supplement staff (Schoeman et al. 2021). Essentially, AI changes the way people function, allowing for more efficient resource allocation, which leads to increased productivity and allows better service delivery to the public (Borenstein and Howard 2021; Roos 2018). Specifically, the application

AI health care is showing a significant impact on its various activities.

The use and adoption of Artificial Intelligence (AI) is rapidly increasing around the world. With the rapid advancement of AI technologies, there is growing interest in leveraging AI in healthcare, not just in the diagnosis and treatment of illnesses but also in enhancing doctor-patient communication. AI is a rapidly growing technical field that has the potential to change every aspect of human social interactions Pedro et al. (2019). AI-powered services pervade many aspects of human life across the globe; however, adoption rates vary between developed and developing nations Francesc et al. (2019). It is evident that AI is penetrating the African social system through various operations (Schoeman et al. 2021).

Nigeria has a pluralistic healthcare system with public and private health providers, with both modern and traditional healthcare systems. The federal government and state government are allowed to set up hospitals and other health facilities. Effective healthcare delivery is usually a function of the quality, accessibility and affordability of the service. According to the National Bureau of Statistics, there has been a rise in Nigeria's poverty level. The underwhelming performance of health sector is one of the major impacts of high poverty rate in Nigeria. For instance, Nigeria has a very low human development index of 0.52, which ranked Nigeria 152 out of 179 nations. Its per capita GDP is $ 2672 with its infant mortality rate at 9% (World Development Indicators, 2017). The fact that health outcomes are below national standards and benchmarks established worldwide point to the reality that Nigerian population health difficulties are persistent, while the healthcare sector has continued to deteriorate.

Consequently, the ability to afford basic healthcare for common illnesses by the average Nigerian reduced drastically. In Nigeria where access to quality healthcare has long been a challenge, the power of technology is transforming the health sector and making it more accessible and affordable for millions of people. One of the most significant ways that technology is transforming the health industry in Nigeria is through telemedicine. Nigeria has been experiencing health workforce crisis with no end in sight. On the human resources, health personnel are still over stressed as Nigeria health sector is yet to meet the WHO template ratio 1 doctor to 500 patients. In some cases, the patients have to be queueing for hours and if there is a serious case among them the patient may die.

During the COVID-19 pandemic in Nigeria the urgency to curtail its devastating effects led to the implementation of several measures to limit its spread, including movement restrictions and social distancing. This further heightened the need for the adoption of technology in the healthcare sector. With most developing countries relying on hospital visitations for their medical needs, minimizing face-to-face consultations, triage hospital visitations, and patients opting for teleconsultations when possible was believed to help limit the spread of the virus. The Covid era (2019-2021) further exposed the gap between developed countries with robust and efficient healthcare facilities and developing countries with less efficient healthcare systems.

The adoption of teleconsultation during the pandemic began to gain grounds in Nigeria but it was not fully utilized as they are several factors mitigating its maximum adoption which according to Adenuga, Iahad, & Miskon (2020) include poor telecommunication infrastructure, socio-cultural influence, change resistance, lack of awareness, fear of privacy and confidentiality breaches, and impersonation due to quackery, medico-legal issues and willingness to pay for telehealth services. However, the Nigerian Communications Commission (NCC) reported that smartphone penetration in Nigeria has been increasing over the years, with over 196 million and 143 million active telephone and internet subscribers recorded in June 2020, corresponding to an increase of 12.6% and 17.2%, and it is predicted to hit 60% by 2025. This trend is promising and could be leveraged to improve the teleconsultation infrastructure in Nigeria.

The healthcare system is undergoing a digital transformation with telemedicine, and artificial intelligence (AI) plays a significant role in defining everyday medical practice. Digital applications have created new opportunities for the healthcare sector which is also changing the doctor – patient relationship. The growing importance of e-health applications, wearables and AI applications such as chatbots that assist

in teleconsultation, wearables like smart watch can empower patients to collect their own health data if properly utilised. Chatbots like *Zuri* in Kenya, for example, now provide teleconsultation and healthcare services to people without a physical visit to the doctor. Chatbots are computer programs designed to simulate or imitate natural conversation with human users typically through images, text or voice interactions, to provide automated assistance or perform task Nguyen, Ekpanyapong & Chetty (2017). The chat bot system retrieves the query from the database that the user has requested and makes a judgement based on it before presenting the responses.

This paper is a library research which examines artificial intelligence in doctor- patient communication with the Technology Acceptance Model theory as a framework for analysis. The focus is on chatbots and virtual assistant for teleconsultation, remote monitoring/patient management and reminders for actual treatment. This paper adds to the growing literature on artificial intelligence in healthcare delivery especially as it relates to doctor-patient communication

Doctor-Patient Communication

The doctor-patient relationship is the foundation of clinical care. Communication between a doctor/physician and patient involves the exchange of medical information, treatment options and emotional support in a manner that fosters understanding, trust and collaboration. It encompasses not only the transfer of medical knowledge or information but also active listening, empathy and clear explanation of diagnosis, prognosis and treatment plans. The effectiveness of doctor-patient communication is key to the attainment of optimal health outcomes and general wellbeing of the patient. In any health care setting, communication provides an important tool for achieving great success in patient care as well as attaining patient's satisfaction. Markides (2011) cited in Yetunde *et al* (2020) aptly underscores this point by stating that medical practice goes beyond making the correct diagnosis but takes the interest of the patients into consideration through effective doctor-patient interaction. Essentially, in clinical practice, effective doctor-patient communication plays central clinical function by building a therapeutic doctor-patient relationship Ilo, Onya, Nwamoh, Onyemachi, Chukwuonye & Godswill-Uko (2019).

Thus, effective communication between a doctor and a patient is indispensable for positive medical encounters or outcomes and can be regarded an essential prerequisite for optimal medical care Yetunde *et al* (2020). This art of communication, which is important in building a confident relationship between doctors and their patients, also encourages better information-giving from patients and better information-getting from doctors, both of which are particularly important for care delivery and satisfaction even when doctors have limited time with their patients. The practice of good communication skills in the medical profession is integral to the development of meaningful and trustworthy relationship between the doctors and patients and, thus, is beneficial to both of them Ranjan, Kumari & Chakrawarty, (2015).

Doctor's communication and interpersonal skills encompass the ability to gather information in order to facilitate accurate diagnosis, counsel appropriately, give therapeutic instructions and establish caring relationships with patients Nwabueze & Nwankwo, (2016). Although the medical knowledge of a doctor is important, the communication skills of a doctor are as important in the application of such knowledge. Ambady *et al*. cited by Adam (2014) alluded to this fact by asserting that patients' physical wellbeing is highly dependent on effective technical knowledge backed up by a robust and effective interpersonal communication. The physician who encourages open communication may obtain more complete information, enhance the prospect of a more accurate diagnosis, and facilitate appropriate counseling, thus, potentially improving patient's adherence to treatment plans that benefit long-term health with overall patient satisfaction.

Studies show that effective conversation with patients results in improved adherence to medical regimens, better patient satisfaction and a good response to chronic illness treatment Mwende (2022).

Approaches to Doctor-Patient Communication

Doctors use different approaches in patient consultation. This study considers 2 broad approaches namely, paternalistic and patient-centred approach. The paternalistic approach is basically doctor-centred with the entire burden of communication and key health decisions on the doctor. Ukonu *et al* (2020). The paternalistic approach is seen as hard-line approach, where the doctor has autonomy of decision, assuming the role of a decision maker and expects submissiveness from the patient, Pavlekovic (2015). The approach is rooted in the belief that the doctor, due to their expertise and knowledge knows what is best for the patient's health and wellbeing. The patient in this approach feels marginalized in the decision-making process, leading to a lack of autonomy and potential dissatisfaction with the medical care.

In recent years, there has been a shift towards a more patient-centered approach to doctor-patient communication. Roter (2010) cited in Ukonu *et al* (2020) defines patient-centeredness as a biopsychosocial approach to medical treatment that upholds patients' preferences, experiences and expectations, with the patient having ample opportunity to contribute in the healthcare they receive in a way that promotes understanding and partnership. Researchers have attested to the effectiveness of the patient-centred approach in healthcare delivery Guastello, (2014); Mwende (2020) and Ukonu *et al* (2020). King and Hoppe (2023) cited in Ukonu *et al* found that good patient-centred communication is associated with patient recall, patient understanding and patient adherence to therapy.

Ukonu *et al* (2020) in their study *Evaluation of Doctor-Patient communication outcomes in two public hospitals in Enugu State, Nigeria* highlighted some intervening variables that influences the outcome of doctor-patient communication such as culture, education, gender, economic status and religion which is also in agreement with Patricia *et al* (2021) who listed several factors that influence physician-patient relationship such as age, gender, level education, socioeconomic class, communication, trust, access to health care services, religious beliefs and cultural beliefs but two critical components that greatly influenced the doctor-patient relation for effective health care delivery in our research were communication patterns (dynamic shared) and sense of trust.

Culture affects how a patient perceives diseases and their treatment and has the capacity to define a patient's relationship with a doctor while religion moderates many activities including beliefs about treatment. Studies have shown that culture can be a barrier in the doctor-patient communication making it hard for the patient to communicate effectively with doctors and receive sufficient information about their health Ahmed, Rumana and Turin (2017).

Artificial Intelligence in Doctor-Patient Communication

Artificial intelligence (AI) plays a transformative role in healthcare delivery. AI-driven technologies like smart watches, chatbots, health virtual assistants, telemedicine platforms etc. are reshaping how medical information is accessed, interpreted, and communicated, ushering in a new era of personalized and efficient healthcare delivery. AI is fundamentally transforming the dynamics of doctor-patient interactions. This paper explores AI in doctor-patient communication by focusing on chatbots, virtual assistants and telemedicine platforms; highlighting its impact on healthcare accessibility, efficiency, and quality. By leveraging AI, healthcare providers can better understand patient needs, deliver personalized care, and foster collaborative decision-making, ultimately leading to improved patient outcomes and satisfaction. With the adoption of AI like chatbots and virtual assistants; the patient is better equipped with information about the illness and can share in the decision of the treatment process with the doctor.

AI could significantly reduce inefficiency in healthcare, improve patient flow and experience, and caregiver experience and patient safety through the care pathway; for example, AI could be applied to the remote monitoring of patients (eg intelligent telehealth through wearables like smartwatches etc.) to identify and provide timely care of patients at risk of deterioration.

In the growing age of digitization, Artificial Intelligence (AI) powered chatbots are playing a leading role by exemplifying the function of a virtual assistant that could manage a conversation via speech or textual methods. It makes use of voice queries to get answers, perform actions and recommendations according to user needs. They are adaptable to the user's individual language usages, searches, and preferences with continuing use. A conversational bot with a voice and/or chat interface can play a principal role by overcoming the current barriers towards making primary healthcare affordable, accessible, and potentially sustainable in the new digital economy. With the advent of AI, virtual assistants can be seen penetrating to the nook and corner of the world. The instant service and personalized user experience provide a significant opportunity for the utilization of conversational AI for delivering Tele-health. Voice assistants make use of a natural language interface to communicate via speech. Voice technology must be tailored to be useful in the field of healthcare. The two major potential users in healthcare voice assistants are patients and physicians/doctors. Doctors use these applications to access and record the patient's data. At the patient's end, it is a cheaper alternative; AI-enabled virtual assistants that can render 24x7 care to a wide variety of patients. People suffering from chronic diseases, disabled patients, and patients living in rural and farther areas would benefit most from this powerful virtual assistants' tools.

Chatbots facilitate efficient communication and engagement between patients and doctors. Chatbots have also been used in counselling and testing, specifically for HIV; with people especially, the younger populations becoming more comfortable with the counselling services provided Adesina *et al* (2021). However, their use in developing countries is still minimal compared to developed countries Mahajan *et al* (2019). Language considerations, digital media literacy and limited user trust continue to impede the growth and development of chatbots in Africa's healthcare space Phiri *et al* (2023). They hold the potential to improve healthcare access and also ensure patient satisfaction and outcomes in developing countries, especially in rural areas where there are shortages of healthcare professionals.

There are several examples of chatbots in Africa's healthcare landscape which include *Zuri's* health chatbot in Kenya, *Likita* used in the diagnosis of common ailments in Africa, recommending common treatment, helping users to locate doctors/specialists within their location and reminders can be set for medication usage Oyebode & Orji (2018); *Cape Town GREAT4Diabetes WhatsApp Chatbot* which aids in remote monitoring and management of diabetes patients, *Helpmum vaccination chatbot* in Nigeria developed to help nursing mothers prioritise immunization for their children and get needed information on each vaccination.

Theoretical Framework

Technology Acceptance Model

The Technology Acceptance Model (TAM), proposed by Davis in 1989, is a widely used framework to understand users' acceptance and adoption of technology. It posits that perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of an individual's intention to use and actual usage behavior of a technology. **Perceived usefulness** measures how the individuals feel that the new innovation will be valuable in assisting them with performing tasks and accomplish objectives or results. This in turn increases their intention to use it and therefore increases their likelihood of actually adopting the new technology. **Perceived Ease of Use** describes how individuals see an innovation to be easy to learn and utilize, fascinating and alluring for them to use. This may include factors such as how clear it is to newcomers and how it will allow

them to ‘do the job’ rapidly and proficiently. In the event that individuals see innovation as simple to utilize, that will build up their mentality and goal to utilize it and receive it.

In the context of adoption and use of artificial intelligence in doctor-patient communication, the Technology Acceptance Model (TAM) provides valuable insights into the factors influencing its acceptance. For doctors, AI-enabled communication tools may be perceived as useful if they streamline patient interactions, provide accurate diagnostic support, and save time. For example, AI chatbots can assist doctors in answering routine patient queries, allowing them to focus on more complex cases. AI-powered systems can analyze vast amounts of patient data, including medical records and symptoms, to offer insights that aid in diagnosis and treatment planning. This perceived usefulness can drive doctors to embrace AI as a valuable tool in their medical practice.

Additionally, the perceived ease of use of AI technologies is essential for doctors' acceptance. If AI systems are intuitive, seamlessly integrated into existing workflows, and require minimal training, doctors are more likely to incorporate them into their daily practice. User-friendly interfaces and efficient algorithms contribute to the perceived ease of use, facilitating the adoption of AI in doctor-patient communication.

Similarly, patients' acceptance of AI in communication hinges on its perceived usefulness and ease of use. Patients may appreciate AI-powered tools that offer personalized health recommendations, enable remote consultations, offer reminders for treatment/medication and provide timely responses to their inquiries. AI technologies can empower patients by increasing access to healthcare information and facilitating communication with healthcare providers. Moreover, the perceived credibility of AI systems plays a significant role in patient acceptance. If patients trust the accuracy and reliability of AI-generated recommendations and advice, they are more likely to engage with these technologies. Positive experiences and outcomes reinforce patients' confidence in AI-driven communication platforms, contributing to their continued use and adoption.

Hazem *et al* (2016), in their study *Modified technology acceptance model for health informatics,* member respondents from the UK and the Middle-East (Iraq) were focused on. The initial results showed, as suggested by the TAM, that there is an unmistakable positive connection between an apparent helpfulness and usability of an eHealth system, and the eagerness to utilize it. The small-scale study highlights perceived usefulness as the most important criterion for technology acceptance for eHealth and social media.

In summary, the Technology Acceptance Model offers valuable insights into the adoption of AI in doctor-patient communication by emphasizing the perceived usefulness and ease of use for both doctors and patients. As AI technologies continue to evolve, their integration into healthcare communication holds promise for improving medical outcomes and enhancing the patient experience.

Chatbots and Virtual Assistant Application in Healthcare (Doctor-Patient Communication)

A chatbot is a software application or web interface that aims to mimic human conversation through text or voice interactions. Numerous studies have explored the diverse applications of AI in facilitating communication between doctors and patients. Virtual assistants and chatbots have emerged as popular tools for providing personalized support, answering queries, and offering guidance throughout the care process Laranjo et al., (2018). Natural Language Processing (NLP) algorithms enable the analysis and interpretation of unstructured data, leading to

insights that enhance communication and decision-making (Zhang et al., 2019). Telemedicine platforms equipped with AI algorithms facilitate remote consultations, while language translation tools bridge linguistic barriers, improving access to healthcare for multicultural populations (Ienca et al., 2018).

It could be applied in

I. Scheduling of appointments and reminders for patients: they are currently being used in healthcare as intermediates between patients and health providers. One of the most common uses is in scheduling of appointments and reminders for patients; examples include *Welltok* and *Siri*. In facilitating the booking of these appointments, chatbots impressively save time for care providers and improve convenience for patients. It also comes in handy for patients with amnesia.

II. Triaging and educating patients: Based on patient inputs, chatbots provide initial information about health conditions, treatment options, medical advice or direct them to appropriate medical services and resources. These tools provide access to personalized health information and empower patients to take an active role in managing their health Bickmore *et al*., (2010).

III. Remote monitoring and management of chronic conditions: Chatbots aid in closing the geographical gap between doctors and patients by monitoring symptoms and reminding them about their medication, this is going to be a game changer in the management of chronic conditions that have significantly burdened populations. An example of such chatbot is *Ada* which currently has 13.3 million users and has conducted 31.3 million symptom assessments Mahajan *et al* (2019)

IV. Social Interaction: AI-powered chatbots and virtual assistants offer opportunities for social interaction and emotional support, particularly for patients facing chronic illnesses or undergoing long-term treatments. These tools simulate human-like conversations and provide empathetic responses, fostering a sense of companionship and reducing feelings of isolation Meyer *et al*., (2019).

The adoption of AI in doctor-patient communication offers limitless opportunities in ensuring patient satisfaction which leads to a positive health outcome. Several studies have highlighted the use of artificial intelligence like Chatbots, Smart watches, Virtual assistants in patient care for diagnosing, monitoring, teleconsultation etc. A study be Schachner et al (2020) on *Artificial Intelligence-Based Conversational Agents for Chronic Conditions* reviewed several studies that focused on chatbots for chronic conditions like Heart failure, Alzheimer, Depression etc. and she examined what each AI based conversational agent was used for highlighting that some was used as a self-care support tool, educating of patients, disease monitoring, general conversation with Parkinson patients and facilitation of assessments future: speech and communication therapy for patients etc. Though the adoption of AI in doctor-patient communication is taking a snail pace, it is already being used in Africa and Nigeria.

Conclusion

The paper has attempted to identify artificial intelligence in doctor-patient communication focusing on chatbots and virtual assistants. In doing this, the paper observes pertinently that doctor-patient communication is undergoing a transformative shift in this digital age extensively making use of teleconsultation and AI powered applications. The adoption of this transformative technology offers a plethora of benefits as geographical location is no longer a barrier in the monitoring and managing of out-patient and consultation can happen within the comfort of the home. It is clear from the discussion that AI powered chatbots and virtual assistants are already in use though at a snail-pace in Nigeria.

Recommendations

I. Arising from this conclusion, it is recommended that software developers

create AI powered chatbots that can be used for teleconsultation, patient monitoring and as a health support platform especially for chronic disease patients in Nigeria. Considering the important place of emerging technologies, doctors and patients alike should acquire relevant digital technological literacy and skills in manipulating the technology.

II. The Nigerian government and health sector stakeholders should invest in developing and implementing AI-driven healthcare solutions; such as telemedicine platforms and remote monitoring systems to address the country's healthcare challenges.

III. Patients should be educated on the benefits and use of AI-powered healthcare tools, such as chatbots and virtual assistants, to enhance their healthcare experience.

IV. Doctors and healthcare professionals should embrace AI technologies and receive training on its use to improve patient care and communication.

Suggestions for Further Research

Data used in arriving at the conclusion in this paper is secondary data based on library research. Hence, there is need to test empirically the assumptions suggested by the theoretical framework which stated that perceived usefulness and perceived ease of use of the Technology will increase the intention to use and final acceptance of such technology. The empirical examination should use strong methodological approaches like experiment, surveys, focus group discussions etc. that consider the perspectives of both doctors and patients.

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