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ASSESSMENT OF DIGITAL HEALTH TECHNOLOGIES IN IMPROVING PATIENT CARE IN THE NIGERIAN HEALTHCARE SYSTEM

Ejuchegahi A. Angwaomaodoko^{1*}, Edime Yunusa, Ph.D² and Prof. Julius Olugbenga Owoyemi³

***Correspondence:** Ejuchegahi A. Angwaomaodoko

¹Department of Education, College of Education, Kean University, Union, NJ, USA

^{2&3}Department of Sociology, Faculty of Social Sciences, Prince Abubakar Audu University, Anyigba, Kogi State – Nigeria

ABSTRACT

Digital Health Technologies (DHTs) including telemedicine, electronic health records (EHRs), mobile health (mHealth) applications, and Artificial Intelligence (AI)-enabled tools have emerged as central instruments for strengthening health systems and improving patient care, particularly in resource-constrained settings such as Nigeria. This paper undertakes a systematic narrative assessment of the extent to which digital health technologies have improved patient care within the Nigerian healthcare system. Adopting a desk-based, qualitative document-analysis design, the paper synthesises conceptual, theoretical, and empirical literature to examine the adoption, application, and outcomes of DHTs in Nigerian healthcare delivery. The review was anchored on Diffusion of Innovation Theory, complemented by the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology, and the World Health Organization's Health System Building Blocks framework. Findings from the reviewed literature indicated that DHTs have improved treatment adherence, expanded access to care in underserved and rural communities, strengthened maternal and child health outcomes, and enhanced clinical decision-making and data quality. However, the pace and depth of adoption remain constrained by infrastructural deficits, epileptic power supply, low broadband penetration, high implementation costs, inadequate digital literacy among healthcare workers and patients, fragmented policy implementation, and weak interoperability among health information systems. The paper concluded that digital health technologies possess

considerable potential to improve patient care in Nigeria, but that this potential is only partially realised due to systemic and infrastructural bottlenecks. It recommended coordinated investment in digital infrastructure, harmonisation of a national electronic health record standard, sustained capacity building for healthcare personnel, community-sensitive implementation strategies, and stronger public–private collaboration to accelerate the digital transformation of the Nigerian healthcare system.

1.0 INTRODUCTION

The twenty-first century has witnessed an unprecedented transformation in the way healthcare is conceived, organised, and delivered, driven largely by rapid advances in information and communication technology (ICT). Across the globe, health systems are increasingly integrating digital tools ranging from electronic health records and telemedicine platforms to artificial intelligence-assisted diagnostics and wearable health devices into routine clinical and administrative practice. The World Health Organization has recognised this shift through its Global Strategy on Digital Health 2020–2025, which frames digital health as an essential enabler of universal health coverage and a critical lever for achieving the health-related Sustainable Development Goals (World Health Organization, 2021). In high-income countries, digital health adoption has matured considerably; for instance, electronic health record usage among physicians in the United States exceeds ninety per cent, reflecting decades of policy incentives, infrastructural investment, and professional training (Babatope et al., 2024).

Within the African continent, the digital health trajectory has followed a markedly different path, shaped by infrastructural limitations, financing constraints, and fragmented governance structures. Nevertheless, sub-Saharan Africa has become what some scholars describe as a new breeding ground for digital health innovation, owing to the rapid penetration of mobile telephony, the proliferation of low-cost health applications, and donor-supported digital pilot projects addressing maternal, child, and infectious disease burdens (Ogunniran et al., 2023). Countries such as Kenya, South Africa, Rwanda, and Nigeria have each pursued distinct pathways toward digitising their health systems, with varying degrees of success shaped by local political, economic, and infrastructural realities.

Nigeria, as the most populous country in Africa with a population exceeding two hundred million people, occupies a uniquely important position in this continental narrative. The Nigerian healthcare system is characterised by a heavy disease burden spanning infectious diseases,

maternal and child health complications, and a rising prevalence of non-communicable diseases, compounded by a severe shortage of healthcare personnel. Nigeria's doctor-to-population ratio stands at approximately one physician to every 9,000 people, far below the World Health Organization's recommended threshold of 2.3 skilled health workers per 1,000 population (Egwudo et al., 2025). Against this backdrop, digital health technologies have been positioned by policymakers, development partners, and healthcare providers as pragmatic instruments capable of extending the reach of scarce clinical expertise, improving the efficiency of care delivery, and strengthening data-driven decision-making across the country's fragmented three-tier health system.

The Federal Ministry of Health and Social Welfare has articulated this ambition through successive policy instruments, including the National Health Information and Communication Technology Strategic Framework (2015–2020), the National Digital Health Strategy (2021–2025), and, more recently, the Nigeria Digital in Health Initiative (NDHI), which seeks to establish a unified national electronic medical record architecture, strengthen health information exchange, and digitise patient record systems across public healthcare facilities (Nigeria Digital in Health Initiative, n.d.). These policy efforts have been accompanied by a proliferation of digital health interventions implemented by government agencies, non-governmental organisations, and private technology firms, spanning telemedicine consultation platforms, SMS-based maternal health reminders, mobile applications for disease surveillance, and pilot deployments of artificial intelligence in diagnostic imaging and vaccination uptake prediction (Egwudo et al., 2025).

Despite this growing policy attention and the expanding body of empirical research on digital health in Nigeria, the practical translation of these technologies into measurable improvements in patient care remains uneven and, in many respects, poorly understood at a systemic level. While isolated interventions have demonstrated positive outcomes particularly in maternal and child health and disease surveillance broader structural challenges, including poor internet connectivity, unreliable electricity supply, high costs of digital devices and data, low digital literacy, and weak interoperability among competing health information systems, continue to undermine the scale and sustainability of digital health gains (Babatope et al., 2025; Olukorode et al., 2024).

It is this tension between technological promise and implementation reality that necessitates a systematic, theoretically grounded assessment of digital health technologies and their

contribution to patient care within the Nigerian healthcare system. This paper responds to that need by synthesising conceptual, theoretical, and empirical literature to critically assess the extent, mechanisms, and constraints of digital health technology's contribution to improved patient care in Nigeria.

1.1 STATEMENT OF THE PROBLEM

Nigeria's healthcare system continues to grapple with longstanding structural deficiencies, including inadequate health infrastructure, an acute shortage of skilled health personnel, weak referral and continuity-of-care mechanisms, and significant urban–rural disparities in access to quality care (Egwudo et al., 2025). These challenges have historically translated into poor health outcomes, including high maternal and child mortality rates, delayed diagnosis and treatment of both communicable and non-communicable diseases, fragmented patient records that impede continuity of care, and preventable medical errors arising from poor documentation and information loss during patient transfers between facilities.

Digital health technologies have been widely promoted as a viable response to these systemic challenges, promising to bridge geographic gaps in access through telemedicine, improve clinical documentation and decision-making through electronic health records, extend health education and behaviour-change communication through mobile health platforms, and support disease surveillance and resource planning through digital health information systems. However, despite over a decade of policy formulation dating back to the National Health ICT Strategic Framework of 2015 and substantial donor and private-sector investment, adoption of digital health technologies among Nigerian healthcare institutions remains disproportionately low. Empirical evidence indicates that electronic health record adoption in Nigeria remains as low as eighteen per cent of healthcare facilities, compared to over ninety per cent in advanced health systems (Babatope et al., 2025), while telemedicine and mHealth interventions, though numerous, are frequently implemented as short-term, donor-funded pilot projects with limited geographic coverage and weak prospects for scale-up or sustainability (Egwudo et al., 2025).

This creates a paradox: a health system with an urgent need for the efficiency and access gains that digital health technologies promise, yet one in which such technologies remain fragmented, under-resourced, and inconsistently integrated into routine care delivery. Furthermore, much of the existing Nigerian digital health literature is intervention-specific focusing narrowly on single technologies, single diseases, or single geopolitical zones leaving a gap in comprehensive, theoretically grounded assessments that synthesise evidence across the major categories of digital

health technology (telemedicine, electronic health records, mobile health, and artificial intelligence) and relate this evidence systematically to patient care outcomes at a national level. It is this gap between the proliferation of fragmented, technology-specific studies and the absence of an integrated theoretical assessment of digital health technology's contribution to patient care—that this paper seeks to address. Without such a synthesis, policymakers, healthcare administrators, and researchers lack a coherent evidence base upon which to prioritise investment, design implementation strategies, and formulate policies capable of translating Nigeria's digital health ambitions into measurable and sustainable improvements in patient care.

1.2 AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to assess the role and contribution of digital health technologies in improving patient care within the Nigerian healthcare system, through a systematic synthesis of conceptual, theoretical, and empirical literature.

The specific objectives of the study are to:

- i. Examine the extent of adoption and utilisation of digital health technologies within the Nigerian healthcare system.
- ii. Assess the effect of telemedicine on access to, and quality of, patient care in Nigeria.
- iii. Evaluate the role of electronic health records (EHRs) in improving patient care coordination, safety, and continuity in Nigerian healthcare facilities.
- iv. Examine the contribution of mobile health (mHealth) applications to patient outcomes, particularly in maternal, child, and chronic disease care.
- v. Identify the challenges and barriers hindering the effective adoption of digital health technologies in Nigeria and propose evidence-based strategies for improvement.

2.0 CONCEPTUAL REVIEW

2.1 Digital Health Technology

Digital health technologies (DHTs) refer to the broad range of tools, platforms, and services that employ information and communication technologies to support, optimise, and transform the prevention, diagnosis, treatment, and management of disease, as well as the monitoring and promotion of wellness (Egwudo et al., 2025). The United States Food and Drug Administration situate digital health within a wide domain that encompasses mobile health, health information technology, wearable devices, telehealth, and artificial intelligence and machine learning applications in medicine. Within the scholarly literature, DHTs are commonly classified into five broad categories: telemedicine and telehealth, mobile health (mHealth), electronic health records

and health information systems, artificial intelligence and machine learning applications, and wearable or remote-monitoring devices (Egwudo et al., 2025).

Each category serves distinct but often overlapping functions within the care continuum. Telemedicine facilitates remote clinical consultation, diagnosis, and monitoring, thereby extending specialist expertise to geographically distant or underserved populations. Electronic health records digitise patient information to support continuity of care, reduce documentation errors, and enable data-driven clinical decision-making. Mobile health applications leverage the ubiquity of mobile telephony to deliver health education, appointment reminders, adherence support, and remote data collection, particularly in maternal, child, and chronic disease care. Artificial intelligence and machine learning tools are increasingly deployed for diagnostic support, predictive analytics, and administrative optimisation, although their application within Nigeria remains at an early and largely exploratory stage (Adigwe et al., 2024).

2.2 Patient Care

Patient care denotes the totality of clinical, psychosocial, and administrative processes through which health professionals attend to the needs of individuals seeking health services, encompassing diagnosis, treatment, continuity of management, communication, and the overall patient experience. Quality patient care is typically assessed along dimensions of safety, effectiveness, timeliness, efficiency, equity, and patient-centeredness. Within the context of digital health, improved patient care is understood not merely as the deployment of technological tools, but as demonstrable gains in these quality dimensions such as reduced waiting times, more accurate diagnoses, improved treatment adherence, fewer medical errors, and greater access to care among previously underserved populations (Olukorode et al., 2024).

2.3 The Nigerian Healthcare System: Structure and Context

The Nigerian healthcare system operates a three-tier structure comprising primary, secondary, and tertiary levels of care, with primary healthcare constitutionally assigned to local government authorities, secondary care to state governments, and tertiary care predominantly under federal control. This decentralised structure, while intended to promote localised responsiveness, has historically produced fragmented governance, inconsistent funding, and weak coordination across tiers of government, a challenge that extends directly into digital health governance, where the absence of a single, centrally enforced information architecture has permitted the proliferation of disparate, non-interoperable digital systems across states and facilities (Federal Ministry of Health, 2016).

This structural fragmentation is compounded by chronic underfunding of the health sector, a persistent shortage of healthcare professionals partly attributable to emigration (the so-called "japa" phenomenon among Nigerian health workers), and stark rural–urban disparities in the distribution of health infrastructure and personnel. It is within this context of a large, disease-burdened, and structurally fragmented population served by an under-resourced and unevenly distributed health workforce that digital health technologies have been proposed as instruments capable of narrowing access gaps, improving efficiency, and strengthening the overall resilience of the health system (Ogunniran et al., 2023).

2.4 Digital Health Policy Architecture in Nigeria

Nigeria's digital health policy environment has evolved through several successive frameworks. The National Health ICT Strategic Framework (2015–2020) represented the country's first comprehensive attempt to articulate a coordinated vision for health information technology, emphasising the development of a national health information exchange, civil registration and vital statistics systems, and a unified health workforce registry (Federal Ministry of Health, 2016). This was succeeded by the National Digital Health Strategy (2021–2025), which sought to build upon the earlier framework by prioritising interoperability standards, digital identity integration, and cybersecurity considerations. More recently, the Nigeria Digital in Health Initiative has been introduced to consolidate these efforts by promoting a national electronic medical record architecture, expanding health data exchange systems, and streamlining workforce planning through digital tools.

Notwithstanding these successive policy frameworks, implementation has been persistently hampered by weak inter-governmental coordination, inconsistent funding commitments, and the continued reliance of many public health facilities on paper-based record systems. This gap between policy articulation and operational reality forms a recurring theme throughout the empirical literature reviewed in subsequent sections of this paper.

3.0 LITERATURE REVIEW

This section reviews the extant literature on digital health technologies in Nigeria, organised according to the five objectives guiding this study. The review draws on scoping reviews, systematic reviews, cross-sectional surveys, qualitative studies, and randomised controlled trials conducted predominantly within the last decade, in order to construct a comprehensive picture of the state of digital health technology adoption and its relationship with patient care outcomes in Nigeria.

3.1 Adoption and Utilisation of Digital Health Technologies in Nigeria

A growing body of scholarly work has sought to map the extent and pattern of digital health technology adoption across Nigerian healthcare settings. Oke's (2025) scoping review of 230 studies conducted between 2010 and 2024 documented a marked increase in Nigerian digital health research output, with mobile health, eHealth, and telemedicine constituting the dominant thematic categories, yet concluded that practical, facility-level implementation continues to lag substantially behind the volume of published research.

Similarly, Egwudo et al. (2025), in a scoping review of thirty-one empirical studies conducted between 2014 and 2024, found that digital health technologies enhanced treatment adherence, healthcare utilisation, and community engagement, while simultaneously identifying persistent operational, infrastructural, and cultural barriers that constrain adoption at scale.

The literature further reveals marked geographic and institutional unevenness in adoption. Adoption tends to be concentrated in tertiary and faith-based teaching hospitals located in southwestern Nigeria, particularly Lagos, Oyo, and Osun states, with comparatively limited penetration in primary healthcare centres and in the northern geopolitical zones (Egwudo et al., 2025). This pattern reflects broader disparities in infrastructure, healthcare financing, and institutional capacity across the country, and raises important equity considerations regarding who benefits from digital health innovation.

3.2 Telemedicine and Access to, and Quality of, Patient Care

Telemedicine has attracted considerable scholarly and policy attention as a mechanism for extending specialist care to Nigeria's underserved rural population, over sixty per cent of whom reside outside major urban centres (Ogunniran et al., 2023). The literature identifies teleconsultation, remote patient monitoring, and electronic consultation (e-consult) systems as the dominant modalities of telemedicine practice in Nigeria. Olayiwola et al. (2020) documented the use of electronic consultations to bridge severe subspecialty care access gaps, demonstrating that e-consult systems enabled primary care providers to obtain timely specialist input without requiring patients to travel long distances for in-person referral.

The COVID-19 pandemic served as a significant accelerant of telemedicine adoption in Nigeria, with physicians who had prior telemedicine experience found to be over four times more likely to continue the practice during the pandemic period (Iliyasu et al., 2024). Despite this momentum, the literature consistently identifies telecommunication infrastructure as the principal constraint on telemedicine's effectiveness, with national broadband penetration estimated at approximately

forty-seven per cent as of 2023 and rural areas significantly underrepresented in this figure, undermining the reliability of video consultations and remote diagnostics (Ogunniran et al., 2023).

3.3 Electronic Health Records and Patient Care Coordination

Electronic health records occupy a central position in the digital health literature owing to their potential to enhance documentation accuracy, support clinical decision-making, and facilitate continuity of care across providers and facilities. Olukorode et al. (2024), in a review of Nigerian EHR literature, found that EHR implementation meaningfully improved data collection and documentation quality, although the authors noted a scarcity of studies quantitatively linking EHR adoption to direct patient satisfaction outcomes. Ayamolowo et al. (2023), studying nurses in a faith-based teaching hospital in Ilishan, Ogun State, found that while EHR utilisation improved documentation efficiency, uptake was significantly associated with nurses' computer literacy and prior ICT training.

Babatope et al. (2024, 2025) provide some of the most direct evidence on the scale of the EHR adoption gap in Nigeria, reporting that EHR adoption among Nigerian healthcare facilities remains as low as eighteen per cent, compared with over ninety per cent among physicians in the United States. Their analysis attributes this gap to infrastructural deficits, high implementation costs, inadequate training, and weak policy enforcement, echoing earlier findings by Salam et al. (2023) and Alobo et al. (2020), both of whom characterised EHR systems as an "underutilised tool" within Nigeria's healthcare system despite their demonstrated potential to reduce medical errors and improve care coordination.

3.4 Mobile Health Applications and Patient Outcomes

Mobile health applications constitute the most extensively researched category of digital health technology in the Nigerian literature, reflecting the exceptionally high penetration of mobile telephony relative to fixed broadband infrastructure. The literature documents a wide range of mHealth interventions targeting maternal and child health, HIV and tuberculosis treatment adherence, non-communicable disease management, and immunisation uptake. Babatunde et al. (2025) described the development of an indigenous mobile application for pregnant women in Nigeria, designed to increase access to prenatal information given that the country accounts for approximately twenty per cent of global maternal mortality.

Randomised controlled trials provide some of the strongest evidence within this literature. Akande et al. (2024) demonstrated the effectiveness of an m-Health intervention in improving

the sexual and reproductive health knowledge and behaviour of in-school adolescents through a cluster randomised controlled trial, while earlier trials by Okunade et al. (2021) and others established the efficacy of mobile technology in improving cervical cancer screening uptake in Lagos. Ezeah (2024), applying the Technology Acceptance Model to mobile health communication in maternal care, found that perceived usefulness and perceived ease of use were significant determinants of women's willingness to adopt mHealth tools for antenatal and postnatal support.

3.5 Barriers to Digital Health Technology Adoption in Nigeria

Across nearly all categories of digital health technology, the literature converges on a consistent set of structural barriers. These include inadequate and unreliable electricity supply, poor broadband and mobile network coverage particularly in rural areas, the high cost of internet data and digital devices relative to household income, low digital literacy among both healthcare workers and patients, weak interoperability between disparate and often donor-designed digital systems, inadequate policy enforcement, and cultural or gender-related barriers to technology access, particularly disparities in mobile phone ownership among women in rural communities (Egwudo et al., 2025; Babatope et al., 2025).

4.0 EMPIRICAL REVIEW

This section synthesises empirical (primary) studies conducted within Nigeria, organised in line with the study's five objectives, in order to ground the theoretical assessment in concrete, data-based findings.

4.1 Empirical Evidence on the Extent of DHT Adoption and Utilisation

Egwudo et al. (2025) conducted a scoping review encompassing thirty-one observational and experimental studies published between 2014 and 2024, involving a combined sample of over 122,000 participants across healthcare workers, patients, caregivers, and community members. The review found that fifty-eight per cent of the included studies focused on healthcare workers as the primary study population, with the majority of interventions concentrated in maternal, newborn, and child health, followed by tuberculosis, hypertension, and HIV-related interventions. Notably, the review found that eleven of the thirty-one studies were structured as short-term pilot projects lacking long-term follow-up, while a similar number were feedback or assessment studies without defined implementation continuity, underscoring a systemic pattern of fragmented, non-scalable digital health interventions in Nigeria.

Complementing this, Oke's (2025) bibliometric-style scoping review of 230 studies conducted between 2010 and 2024 found that cross-sectional designs accounted for 36.5 per cent of published Nigerian digital health research, followed by reviews (27.8 per cent), with general digital health technology, mobile health, and eHealth constituting the dominant thematic foci. The study observed that the volume of research output increased sharply after 2020, likely reflecting the catalytic effect of the COVID-19 pandemic on digital health interest and investment, yet cautioned that this growth in scholarship had not been matched by a commensurate expansion in real-world facility-level implementation.

4.2 Empirical Evidence on Telemedicine's Effect on Access and Quality of Care

Iliyasu et al. (2024), in a physician survey examining telemedicine adoption during the COVID-19 pandemic, found that physicians with pre-pandemic telemedicine experience had an adjusted odds ratio of 4.10 (95% confidence interval: 1.79–9.40) for continued telemedicine engagement during the pandemic, providing robust quantitative evidence of the pandemic's role in normalising remote consultation practices among Nigerian clinicians. Olayiwola et al. (2020) similarly documented that electronic consultation systems successfully connected primary care providers in underserved areas with subspecialists, reducing the burden of unnecessary physical referrals and shortening the time to specialist input.

At the same time, empirical survey-based research on telemedicine's infrastructural context paints a more cautionary picture. Nigeria's national broadband penetration was estimated at approximately forty-seven per cent as of 2023, with rural populations significantly underrepresented in this coverage; a mixed-methods study further found that sixty per cent of surveyed healthcare providers and patients identified the high cost of internet subscription as a major deterrent to telemedicine use, while unreliable power supply was independently identified as a further significant barrier to sustained telecommunication-dependent care delivery (Ogunniran et al., 2023).

Collectively, these empirical findings suggest that while individual telemedicine interventions can and do improve access to specialist care, the aggregate, system-wide effect of telemedicine on quality of care in Nigeria remains constrained by the very infrastructural conditions the technology depends upon.

4.3 Empirical Evidence on Electronic Health Records and Care Coordination

Babatope et al. (2024), using a facility-based assessment methodology, identified government policy weaknesses, inadequate ICT infrastructure, insufficient training exposure, poor internet

connectivity, and financial constraints as the principal factors militating against effective EHR implementation in Nigeria, situating the country's eighteen per cent EHR adoption rate against a backdrop of over ninety per cent adoption among United States physicians. Ayamolowo et al. (2023), surveying nurses at a faith-based teaching hospital in Ilishan, Ogun State, found a statistically significant association between nurses' prior computer literacy and their reported utilisation of EHR systems, suggesting that technology-related human capital, rather than the presence of EHR infrastructure alone, is a key determinant of effective utilisation.

Olukorode et al. (2024), reviewing five original Nigerian studies examining EHR effects on patient-related outcomes and data quality, concluded that EHR implementation meaningfully improved the quality of clinical data collection and documentation across the reviewed facilities, and that one included study found improved patient satisfaction with pharmacy services following EHR adoption. However, the authors emphasised that the paucity of studies quantitatively linking EHR use to broader patient safety or clinical outcome indicators represents a significant evidence gap in the Nigerian literature, limiting the strength of causal claims regarding EHR's contribution to improved patient care.

4.4 Empirical Evidence on mHealth Applications and Patient Outcomes

Empirical trial-based evidence on mHealth interventions in Nigeria is comparatively more robust than that available for EHRs or telemedicine, owing to the relative ease of deploying SMS- and mobile-application-based interventions within randomised study designs. Akande et al. (2024), through a cluster randomised controlled trial, found that an m-Health intervention significantly improved sexual and reproductive health knowledge and reduced risk behaviours among in-school adolescents in Nigeria. Earlier trial evidence by Okunade et al. (2021) demonstrated that mobile technology-supported reminders (the mHealth-Cervix intervention) significantly increased cervical cancer screening uptake among women in Lagos, illustrating the capacity of low-cost mobile interventions to influence preventive health-seeking behaviour.

Babatunde et al. (2025) described the iterative, community-informed development of an indigenous maternal health mobile application in Ibadan, designed specifically to address low prenatal information access, given that Nigeria accounts for a disproportionately high share of global maternal mortality. Complementing this developmental evidence, Ezeah's (2024) Technology Acceptance Model-based study of mobile health communication in maternal care found that perceived usefulness and perceived ease of use were both statistically significant predictors of pregnant women's behavioural intention to adopt mobile health tools for antenatal

engagement, providing theoretical corroboration for the empirical uptake patterns observed in trial-based studies.

4.5 Empirical Evidence on Barriers and Facilitators of DHT Adoption

Across the empirical literature, barriers to digital health technology adoption in Nigeria cluster around four recurring domains: infrastructural (unreliable electricity and network coverage), financial (device and data affordability, high implementation costs to institutions), human capital (digital literacy gaps among both providers and patients), and socio-cultural (gender disparities in phone ownership, community trust, and language accessibility) (Egwudo et al., 2025). Empirical studies also identify facilitating strategies, including community engagement through local leaders, culturally sensitive programme design, continuous in-service training for healthcare workers, and the use of low-bandwidth technologies such as SMS and interactive voice response systems in settings with limited smartphone penetration.

5.0 THEORETICAL FRAMEWORK

This paper's assessment of digital health technology adoption and its effect on patient care in Nigeria is anchored on Rogers' Diffusion of Innovation Theory, complemented by the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology, and the World Health Organization's Health System Building Blocks framework. These four theoretical lenses are deployed in a complementary fashion: Diffusion of Innovation explains the macro-level spread and adoption trajectory of digital health technologies across the Nigerian health system, the Technology Acceptance Model and its extension, UTAUT, explain micro-level individual adoption behaviour among healthcare workers and patients, and the WHO Building Blocks framework situates digital health within the broader architecture of health system strengthening.

5.1 Diffusion of Innovation Theory

Rogers' Diffusion of Innovation Theory conceptualises the adoption of an innovation as a process that unfolds over time through five sequential stages such as knowledge, persuasion, decision, implementation, and confirmation and is shaped by the perceived relative advantage, compatibility, complexity, trialability, and observability of the innovation, as well as by the characteristics of adopters, who are classified along a continuum from innovators and early adopters to the early majority, late majority, and laggards (Rogers, 2003).

Applied to the Nigerian context, this theory offers a useful explanatory frame for the markedly uneven geographic and institutional distribution of digital health technology adoption observed in

the empirical literature: tertiary and faith-based teaching hospitals in southwestern Nigeria, often better resourced and more closely linked to research and donor networks, have tended to function as early adopters, while primary healthcare centres and northern facilities, constrained by weaker infrastructure and lower relative advantage perception, remain in the laggard category. The theory further illuminates why donor-funded pilot interventions frequently fail to progress beyond the trialability stage into sustained, system-wide implementation, as documented by Egwudo et al. (2025).

5.2 Technology Acceptance Model (TAM)

Davis' Technology Acceptance Model posits that an individual's behavioural intention to use a technology is primarily determined by two beliefs: perceived usefulness, defined as the degree to which a person believes that using a particular system would enhance their performance, and perceived ease of use, defined as the degree to which a person believes that using the system would be free of effort (Davis, 1989). TAM has been explicitly applied within the Nigerian digital health literature, notably by Ezeah (2024) in the context of mobile health communication for maternal care, where perceived usefulness and perceived ease of use were found to significantly predict women's intention to adopt mHealth tools. TAM's explanatory value in this paper lies in its capacity to account for the individual-level adoption behaviour of healthcare workers and patients that underlies the macro-level diffusion patterns described above—for instance, explaining why nurses with greater prior computer literacy demonstrated higher EHR utilisation in the study by Ayamolowo et al. (2023).

5.3 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology extends TAM by integrating performance expectancy, effort expectancy, social influence, and facilitating conditions as direct determinants of behavioural intention and technology use behaviour, moderated by gender, age, experience, and voluntariness of use. UTAUT's incorporation of facilitating conditions encompassing organisational and technical infrastructure support renders it particularly well suited to the Nigerian context, where the empirical literature consistently identifies infrastructural deficits (unreliable electricity, poor network coverage, and inadequate technical support) as decisive barriers to sustained digital health technology use, independent of individual attitudes toward the technology itself. The theory's attention to social influence also helps explain the empirically documented importance of community leader endorsement and peer

influence in driving mHealth and telemedicine uptake among both healthcare workers and community members in Nigeria (Egwudo et al., 2025).

5.4 WHO Health System Building Blocks Framework

The World Health Organization's Health System Building Blocks framework identifies six interacting components essential to a functioning health system: service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership and governance (World Health Organization, 2010). This framework provides the systemic lens through which this paper situates digital health technology, treating DHTs not as a standalone intervention but as a cross-cutting enabler that interacts with, and is constrained by, each of the six building blocks.

For example, EHR adoption (a health information system intervention) is shown throughout the empirical literature to be dependent on workforce digital literacy (health workforce), sustained budgetary commitment (financing), and coherent policy enforcement (leadership and governance), illustrating the framework's central proposition that health system strengthening including digital health strengthening requires synchronised progress across all building blocks rather than isolated technological deployment.

5.5 Integrated Theoretical Application

Collectively however, these four frameworks provide a layered theoretical architecture for this paper's assessment: Diffusion of Innovation explains why and how digital health technologies spread unevenly across Nigerian healthcare institutions over time; TAM and UTAUT explain the individual cognitive and social determinants of healthcare worker and patient adoption behaviour; and the WHO Building Blocks framework situates these adoption dynamics within the broader systemic architecture of infrastructure, workforce, financing, and governance that ultimately determines whether individual and institutional adoption translates into sustained, system-wide improvements in patient care. This integrated theoretical approach directly informs the discussion section that follows, in which empirical findings are interrogated against the explanatory propositions of each framework.

6.0 METHODOLOGY

6.1 Research Design

This study adopted a qualitative, theoretical (desk-based) research design, employing a narrative literature review and document analysis approach. Unlike primary empirical research, which generates new data through fieldwork, this paper synthesises, critically appraises, and

theoretically interprets existing conceptual, theoretical, and empirical literature on digital health technologies and patient care within the Nigerian healthcare system. This design was chosen because the study's aim to assess the state, mechanisms, and constraints of digital health technology's contribution to patient care at a national, cross-technology level is best served by an integrative synthesis of the fragmented, technology-specific and geographically dispersed body of existing Nigerian digital health research, rather than by a single, narrowly scoped primary study.

6.2 Sources of Data

Data for this study were drawn exclusively from secondary sources, comprising peer-reviewed journal articles, scoping and systematic reviews, government policy documents, and reports from credible international health organisations. Literature was sourced from reputable academic databases and publishers, including PubMed/MEDLINE, PLOS Digital Health, BioMed Central (BMC), Frontiers, JMIR Publications, Nature (Scientific Reports), and Wiley Online Library, alongside official Nigerian government policy documents such as the National Health ICT Strategic Framework and materials published by the Nigeria Digital in Health Initiative.

Priority was given to literature published between 2019 and 2026, in order to ensure the currency and relevance of the assessment, although foundational theoretical works such as Rogers' Diffusion of Innovation Theory, Davis' Technology Acceptance Model, and Venkatesh et al.'s UTAUT were retained irrespective of publication date, given their enduring conceptual relevance.

6.3 Search Strategy and Selection Criteria

A structured search strategy was employed using combinations of key terms including "digital health," "telemedicine," "electronic health records," "mobile health," "artificial intelligence," "patient care," and "Nigeria." Inclusion criteria comprised: (i) studies or documents focused wholly or substantially on Nigeria or with disaggregated Nigerian data within a broader African or global study; (ii) studies addressing at least one recognised category of digital health technology; (iii) studies published in English in peer-reviewed journals or by credible institutional or governmental sources; and (iv) studies providing sufficiently verifiable authorship and publication information to permit accurate academic citation.

Studies were excluded where they addressed digital health technologies outside the Nigerian context without extractable Nigeria-specific findings, where authorship or publication details

could not be reliably verified, or where the content was purely promotional or commercial in nature.

6.4 Method of Data Analysis

Data extracted from the reviewed literature were analysed using thematic and narrative synthesis techniques. Following established practice in scoping and narrative reviews, literature was organised and coded according to the study's five research objectives, with recurring themes such as infrastructural barriers, adoption drivers, and outcome domains identified inductively across the reviewed sources.

Findings were then interpreted through the lens of the study's theoretical framework, comprising Diffusion of Innovation Theory, the Technology Acceptance Model, UTAUT, and the WHO Health System Building Blocks framework, in order to move beyond descriptive summary toward theoretically grounded critical interpretation, consistent with the conventions of a theoretical review paper intended for peer-reviewed publication.

6.5 Limitations of the Methodology

As a desk-based theoretical review, this study is inherently limited by its reliance on previously published literature and does not generate new primary data. The quality and depth of the assessment are therefore bounded by the scope, rigour, and currency of the existing Nigerian digital health literature, much of which, as noted in the empirical review, remains geographically concentrated in southwestern Nigeria and skewed toward short-term pilot interventions. Consequently, the generalisability of findings to the entirety of the Nigerian healthcare system, particularly to the northern geopolitical zones where digital health research remains comparatively sparse, should be approached with appropriate caution.

7.0 DISCUSSION

This section interrogates the perspectives and findings of the reviewed authors in relation to each of the study's five objectives, situating the discussion within the theoretical framework articulated in Section 5.0, in order to critically evaluate the extent to which digital health technologies have contributed to improved patient care within the Nigerian healthcare system.

7.1 On the Extent of DHT Adoption and Utilisation

The findings of Egwudo et al. (2025) and Oke (2025), when juxtaposed together, present a somewhat paradoxical picture of Nigerian digital health technology adoption: a rapidly expanding body of research and pilot activity, occurring alongside persistently low levels of sustained, facility-level implementation. This paper contends that this paradox is best explained

through the Diffusion of Innovation lens specifically, the theory's distinction between the "trialability" and "implementation" stages of the adoption process.

The prevalence of short-term, donor-funded pilot studies identified by Egwudo et al. (2025), eleven of thirty-one reviewed studies, suggests that Nigerian digital health innovation has, for over a decade, remained substantially clustered at the trial and demonstration stage, with insufficient structural and financial mechanisms in place to translate successful pilots into the "confirmation" stage of institutionalised, system-wide adoption.

Whereas Oke (2025) frames this primarily as a research–practice gap requiring greater collaboration among government, private sector, and academic stakeholders, this paper argues that the gap is more precisely a diffusion-stage bottleneck rooted in the absence of sustainable financing and policy enforcement mechanisms capable of carrying innovations beyond the pilot phase, a structural interpretation that has more direct implications for policy design than a general call for "collaboration."

7.2 On Telemedicine's Effect on Access and Quality of Care

The empirical evidence reviewed particularly Iliyasu et al.'s (2024) finding of significantly higher continued telemedicine engagement among physicians with prior experience, and Olayiwola et al.'s (2020) documentation of successful electronic consultation systems provides credible evidence that telemedicine, where successfully implemented, does improve access to specialist expertise for underserved populations.

However, this paper interrogates a tension in the literature between intervention-level success and system-level infrastructural constraint. Ogunniran et al. (2023) rightly foreground telecommunication infrastructure, citing forty-seven per cent national broadband penetration and cost barriers affecting sixty per cent of surveyed providers and patients, as the decisive constraint on telemedicine's scalability. Applying UTAUT's construct of "facilitating conditions," this paper argues that the persistence of these infrastructural gaps means that telemedicine's demonstrated clinical benefits, however real at the level of individual studies, cannot yet be generalised into a claim of system-wide improvement in access to and quality of care across Nigeria. The authors reviewed are, in this sense, in broad agreement that telemedicine's potential significantly outpaces its current infrastructural readiness a conclusion this paper endorses, while further noting that this infrastructural gap is not merely technical but reflects deeper underinvestment in the "financing" and "leadership and governance" building blocks identified in the WHO framework.

7.3 On Electronic Health Records and Care Coordination

A notable point of scholarly convergence emerges between Babatope et al. (2024, 2025), Salam et al. (2023), and Aloba et al. (2020), all of whom independently characterise Nigerian EHR systems as significantly "underutilised" despite their well-established international evidence base for reducing medical errors and improving care coordination. This paper interrogates this convergence critically: while these authors correctly diagnose the eighteen per cent adoption gap and attribute it to infrastructural, financial, and training deficits, comparatively less attention is paid in this literature to the absence of a single, nationally mandated EHR interoperability standard, a gap that Egwudo et al. (2025) identify as a key strategic priority, recommending a standardised EHR system "to facilitate the seamless transfer of patient information" across facilities.

This paper argues that this interoperability gap, rather than adoption cost alone, may represent the more consequential long-term constraint on EHR's contribution to patient care, since even facilities that successfully adopt EHR systems in isolation continue to operate as disconnected data silos, thereby forfeiting one of EHR's most clinically significant benefits: continuity of patient information across the referral pathway. Ayamolowo et al.'s (2023) finding linking nurses' computer literacy to EHR utilisation further substantiates, through the TAM lens, that perceived ease of use remains a binding constraint even where EHR infrastructure exists, suggesting that infrastructure investment alone, without parallel investment in workforce digital literacy, is unlikely to yield the full anticipated gains in care coordination.

7.4 On mHealth Applications and Patient Outcomes

Among the four technology categories examined, mHealth presents the most consistently positive empirical evidence base, with randomised controlled trials by Akande et al. (2024) and Okunade et al. (2021) providing credible causal evidence of improved health knowledge, behaviour, and preventive care uptake. This paper interrogates why mHealth interventions appear to demonstrate stronger empirical outcomes than EHR or telemedicine interventions, and argues, through the Diffusion of Innovation lens, that this reflects mHealth's comparatively lower complexity and higher compatibility with existing infrastructure specifically, its reliance on basic mobile telephony and SMS technology rather than broadband connectivity or sophisticated hardware, rendering it more readily "trialable" and scalable within Nigeria's constrained infrastructural environment.

Ezeah's (2024) TAM-based finding that perceived usefulness and ease of use predict maternal mHealth adoption further corroborates this interpretation: mHealth tools, by virtue of their technical simplicity, more readily satisfy the ease-of-use threshold than this paper's discussion of EHR adoption identified as a binding constraint for more complex technologies. Nonetheless, this paper cautions against over-generalising mHealth's success, noting that Egwudo et al. (2025) identify gender disparities in mobile phone ownership and equity concerns as persistent limitations, meaning that mHealth's apparent scalability advantage does not automatically translate into equitable outcome distribution across gender and socioeconomic lines.

7.5 On Barriers to Adoption and the Path Forward

Across all reviewed authors, there is substantial consensus that infrastructural deficits—unreliable electricity, poor network coverage, and high connectivity costs constitute the most frequently cited barrier to digital health technology adoption in Nigeria. This paper interrogates whether this consensus, while empirically well supported, has led the literature to somewhat underweight governance and financing barriers relative to purely technical ones.

Applying the WHO Building Blocks framework, this paper argues that infrastructural deficits are themselves substantially downstream of weaknesses in the "leadership and governance" and "financing" building blocks specifically, the historically weak enforcement of successive national digital health strategies since 2015, and the continued reliance on short-term donor financing rather than sustained domestic budgetary commitment. Viewed this way, the authors' shared emphasis on infrastructure, while accurate at the proximate level, may understate the extent to which infrastructural remediation itself depends on prior governance and financing reform, a reframing with direct implications for the recommendations that follow in this paper.

8.0 CONCLUSION

This paper assessed the role and contribution of digital health technologies in improving patient care within the Nigerian healthcare system, through a theoretically grounded synthesis of conceptual, empirical, and policy literature. The evidence reviewed demonstrates that digital health technologies such as telemedicine, electronic health records, mobile health applications, and, to a nascent extent, artificial intelligence, possess demonstrable and, in several documented instances, statistically significant potential to improve patient care outcomes in Nigeria, including enhanced treatment adherence, expanded access to specialist care, improved maternal and child health behaviour, and better clinical documentation quality.

However, this potential remains only partially realised. The literature converges on a consistent diagnosis: adoption is geographically and institutionally uneven, concentrated in better-resourced tertiary facilities in southwestern Nigeria, and constrained nationally by infrastructural deficits, financing gaps, weak interoperability, low digital literacy, and inconsistent policy enforcement.

9.0 RECOMMENDATIONS

Arising from the theoretical assessment and discussion presented in this paper, the following recommendations are proposed for policymakers, healthcare administrators, technology developers, and researchers seeking to strengthen the contribution of digital health technologies to patient care in Nigeria:

1. The Federal Ministry of Health should institutionalise a single, nationally mandated electronic health record interoperability standard, enforced across Federal, State, and Private healthcare facilities, to eliminate the data silos identified throughout the empirical literature and ensure seamless continuity of patient information across the referral pathway. The ministry should also foster structured public–private partnerships with telecommunications companies and technology firms to expand affordable broadband access and reduce the cost of digital devices and data, directly addressing the infrastructural and financial barriers most consistently identified across the reviewed literature.
2. The Federal Government of Nigeria should prioritise sustained domestic budgetary investment in digital and electricity infrastructure, rather than continued reliance on short-term donor financing to move digital health pilot interventions beyond the trialability stage of the innovation-diffusion process into stable, institutionalised implementation.
3. Policymakers in the Nigerian healthcare system should expand structured, continuous digital literacy training for healthcare workers at all tiers of care, recognising that infrastructural investment alone, without corresponding investment in workforce capacity, is insufficient to secure the perceived ease-of-use threshold necessary for sustained technology adoption.
4. Technology Developers should design and scale mHealth interventions using low-bandwidth, high-compatibility technologies such as SMS and interactive voice response systems, particularly for maternal, child, and chronic disease care in rural and underserved communities, building on the demonstrated scalability advantage of such tools relative to more infrastructure-intensive technologies.
5. Government at all levels should address gender and socioeconomic disparities in digital health access directly, through targeted interventions such as subsidised mobile devices or

data access for women in rural communities, to ensure that the equity gains promised by digital health technologies are not undermined by unequal access to the underlying devices and connectivity. There should also be inter-governmental coordination between federal, state, and local health authorities to close the governance gap identified in this paper as a root cause of Nigeria's fragmented digital health landscape, including stronger enforcement mechanisms for existing national digital health strategy commitments.

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