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Digital Transformation of Mental Health Care: A Strategic Framework for Nigeria's Federal Neuropsychiatric Hospitals

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ABSTRACT

This mixed-methods study investigated the current status of digital health adoption in Nigeria's Federal Neuropsychiatric Hospitals, identified barriers and facilitators, and developed a strategic framework for sustainable transformation in tertiary mental health care. Employing a scoping review of 30 sources and semi-structured interviews with 35 healthcare stakeholders, the research synthesized evidence on electronic health records, telemedicine, and mobile health applications, as well as systemic challenges. Findings revealed fragmented adoption, with only 10-23% routine implementation of digital tools in the hospitals, constrained by infrastructural deficits (e.g., unreliable electricity in 61% of cases), low digital literacy (48% untrained workforce), and policy inconsistencies. Facilitators included national initiatives like the Nigeria Digital in Health Initiative, which supported 40% of pilots, and training programmes boosting uptake by 25-35%. Adaptable global models, such as South Africa's MomConnect, highlighted interoperability for cost reduction. Integrated results informed the Policy, Infrastructure, Technology, and Financing with Leadership, Ethics, and Integration dual-axis model, scoring 4.2/5 in feasibility, with Web human resource systems ranking highest (4.7/5) for administrative efficiency. The framework addressed a "readiness paradox" of robust policies and execution gaps, promoting agile governance and ethical safeguards to mitigate stigma and privacy risks in neuropsychiatric care. A five-year roadmap was developed spanning assessment, scaling, and innovation and envisions 40% efficiency gains, improved clinician well-being, and halving access disparities by 2030 to advance Sustainable Development Goal three in low-resource contexts.

INTRODUCTION

Rapid advancements in digital technologies present a transformative opportunity to enhance healthcare delivery systems globally, especially in developing nations such as Nigeria (Sheikh & Rinvee, 2025). Nigeria lags in adolescent, child, maternal, and newborn health indicators, significantly hindering the attainment of Sustainable Development Goal three (good health and well-being) (Anumudu *et al.,* 2025); and it is imperative to examine how the digitalization of healthcare interventions can reduce systemic healthcare delivery challenges and improve health outcomes. The incorporation of digital technologies, like mobile health (mHealth) applications, in the healthcare sector has the capacity to meaningfully improve patient engagement, operational effectiveness and healthcare accessibility (Alawiye, 2024).

Digital transformation not only improves clinical applications but also enhances management of the healthcare supply chain, thereby improving healthcare service delivery (Umar *et al.,* 2024). Thus, digitalization in the health sector is essential, including the adoption of technologies like electronic health records, telemedicine, mHealth apps, the Internet of Medical Things (IOT) and artificial intelligence (AI). Most of these technologies are meant to ease access to healthcare services, lower costs, improve financial transparency, increase productivity and improve patient outcomes in every healthcare sector (Asogwa & Onah, 2025).

Nigeria's federal neuropsychiatric healthcare system is characterised by a high patient population, insufficient personnel, and inadequate infrastructure (Fashoto *et al.,* 2025). The usability and widespread impact of these digital health technologies in these facilities appear limited, following challenges like limited capacity building of personnel, poor governance, insufficient investments in infrastructure, inadequate infrastructural allocation, and barriers regarding high costs of purchasing digital technologies and ensuring proper coordination (Alobo *et al.,* 2020; Ibeneme *et al.,* 2020). These necessitate a strategy framework that will provide a long-lasting solution; thus,

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this article investigated the current status of digital health adoption in Nigerian federal neuropsychiatric hospitals, identified the barriers and facilitators to digital health uptake, and identified successful digital health models that can be adapted for a resource-appropriate digital transformation roadmap for Nigerian federal neuropsychiatric hospitals.

The Current State of Digitization of Healthcare Delivery in Nigeria

The Nigerian healthcare system is currently experiencing a digital transformation that is both progressive and fraught with obstacles, including:

i. The National Health ICT Strategic Framework (2015–2020): Between late 2014 and early 2015, Nigeria's Federal Ministry of Health and Ministry of Communication & Technology commenced the National Health ICT Strategic Framework (eHealth Strategy) (Federal Republic of Nigeria, 2016). The policy statement clarified its goal of using Information and Communication Technologies (ICTs) to improve healthcare delivery in Nigeria. At present, however, this paradigm has been applied inconsistently across different healthcare levels and regions (Fan *et al.,* 2024; Ravi *et al.,* 2024).

ii. Implementation of Electronic Health Records (EHR): Nigeria's National Health Management Information System Policy (NHMIS) created a unified health system information in 2006, reviewed in 2013, for a more optimally functioning Health Information System (Meribole *et al.,* 2018). While certain private healthcare facilities and tertiary hospitals have integrated EHR systems, the majority of primary and secondary health facilities still utilized paper-based records, and overall, only 18% of health facilities in Nigeria use EHR (Bolatito & Togunwa, 2025). Despite improvements in patient care and administration with the EHR, challenges arose, including issues with the software, resistance from some personnel unaccustomed to digitalization, and frequent power outages that hindered access to the system (Aguirre *et al.,* 2019). To surmount these obstacles, the healthcare system should allocate funds towards electricity generation, distribution, and efficient human capital development.

iii. Telemedicine Programme: Telemedicine has become a very popular and widely used technique following the COVID-19 pandemic and has facilitated access to healthcare services for patients at a comparatively low cost, including in Sub-Saharan Africa (Agbeyangi & Lukose, 2025; Kyei *et al.,* 2024). Challenges of telemedicine in Nigeria include lack of technological infrastructure, inadequate human resources, and gaps in digital training, and these can be overcome by investing in digital infrastructure (Cole *et al.,* 2025).

iv. Applications for Mobile Health (mHealth): In the past few years, mobile health apps are increasingly used in Nigeria, especially in child health, disease management and maternal health (Bossman *et al.,* 2022; Knop *et al.,* 2024). An example is the "Abiye" (Safe Motherhood) project in Ondo State, Nigeria, which used mobile phones to connect pregnant women with doctors (Ajayi & Akpan, 2020). Although mHealth has helped improve maternal health outcomes, the low levels of digital literacy and a lack of smartphones in rural areas limit their sustainable use in low- and middle-income countries like Nigeria (Oyeyemi & Wynn, 2015).

LITERATURE REVIEW

Empirical Insights: The Federal Neuropsychiatric Hospitals in Nigeria

Federal Neuropsychiatric Hospitals in Nigeria play a crucial role in providing mental health services, training, and research. Nigeria has nine Federal Neuropsychiatric Hospitals (Lebimoyo, 2025), from which data was collected for this study. Firstly, the Federal Neuropsychiatric Hospital, Calabar, established in 1903, is Nigeria's pioneer mental health institution that delivers exceptional mental health services. In 1907, the Federal Neuropsychiatric Hospital, Yaba, Lagos was established as a mental health hub that provides quality and effective mental health services. Federal Neuropsychiatric Hospital, Aro, Abeokuta, established in 1944, is also one of the oldest and largest psychiatric hospitals in Nigeria. The Federal Neuropsychiatric Hospital, Enugu, was established in 1962 and provides mental health services to people of the South-East, some parts of the South-South, and the North-Central geopolitical zones. The Federal Neuropsychiatric Hospital, Budo-Egba, Kwara State, was established in 2021 as the ninth tertiary mental health facility in Nigeria and the first in the North-Central geopolitical zone. These federal neuropsychiatric hospitals provide comprehensive neuropsychiatric care for all ages and conditions; they evaluate and diagnose psychiatric patients and treat and rehabilitate substance abuse patients (Lebimoyo, 2025).

Leadership and Institutional Factors

The Federal Ministry of Health is the main government body in charge of making healthcare decisions in Nigeria, and hospital administrators, doctors, nurses, and other healthcare professionals are key stakeholders in how healthcare is run and delivered. Partnerships between the private sector and international organizations are also important for shaping healthcare leadership and services in Nigeria. The Chief Medical Directors (CMDs) are invested in the leadership of the federal hospitals and need to use effective leadership styles, like transformational leadership, in their work for staff retention, staff motivation, and patient care improvement.

MATERIALS AND METHODS

This study employed a mixed-methods design to develop a strategic framework for digital health transformation in Nigeria's tertiary healthcare sector, with a focus on Federal Neuropsychiatric Hospitals (FNHs). The approach integrated a scoping review of secondary literature with primary qualitative data collection through

key informant interviews. This design was selected as the most appropriate for the study's objective, as it allowed for a comprehensive synthesis of existing evidence on digital health adoption, barriers, and facilitators, while grounding the proposed framework in contextual insights from healthcare stakeholders. The scoping review provided breadth and depth to identify global and local digital health models adaptable to Nigeria, while the qualitative component ensured relevance to the resource-constrained tertiary setting. The study adhered to Arksey & O'Malley's (2005) framework for scoping reviews, augmented by Clark & Ivankova's (2016) convergent parallel mixed-methods paradigm, where qualitative and secondary data were analyzed separately and then merged during framework development.

Study Area

The study was conducted in Nigeria, Africa's most populous nation, with a population exceeding 220 million. The focus was on the tertiary healthcare sector, specifically the nine Federal Neuropsychiatric Hospitals (FNHs) managed by the Federal Ministry of Health and Social Welfare. These hospitals were purposively selected due to their role in addressing Nigeria's high burden of neuropsychiatric disorders (estimated prevalence of 13.7% for mental disorders) (Yusuf *et al.,* 2025) and their under-utilization of digital technologies amid systemic challenges like infrastructure deficits and workforce shortages.

Study Population and Sampling

The study population comprised healthcare leaders, administrators, clinicians, and digital health experts affiliated with Nigeria's tertiary healthcare sector. This included Chief Medical Directors (CMDs), heads of departments (e.g., IT, community medicine, and public health), senior clinicians (consultants in psychiatry and internal medicine), and policymakers from the Federal Ministry of Health and Social Welfare or affiliated bodies. External experts from non-governmental organizations and academia with experience in digital health implementation were also included.

A purposive sampling strategy was employed to ensure representation of diverse perspectives and geopolitical zones, targeting 30-40 participants for saturation in qualitative data collection. For the scoping review, no sampling was required; instead, an exhaustive search of peer-reviewed and grey literature was conducted. Inclusion criteria for primary participants were: (i) ≥5 years of experience in tertiary healthcare leadership or digital health; (ii) current affiliation with an FNH or equivalent institution; and (iii) willingness to provide informed consent. Exclusion criteria included participants without direct involvement in healthcare delivery or those unable to communicate in English.

Data Collection

Data collection occurred in two parallel phases from January to June 2025, ensuring convergence during analysis.

Phase 1: Scoping Review of Secondary Data

A systematic search was conducted across electronic databases, including PubMed, Scopus, Web of Science, Google Scholar, and African Journals Online (AJOL), supplemented by grey literature from sources like the WHO Library, Nigerian Ministry of Health repositories, and ResearchGate. Search terms combined MeSH and free-text keywords: ("digital health" OR "eHealth" OR "telemedicine" OR "mHealth" OR "electronic health records") AND ("Nigeria" OR "tertiary healthcare" OR "neuropsychiatric hospitals") AND ("barriers" OR "facilitators" OR "framework" OR "adoption"). Boolean operators (AND/OR) and filters (publication date: 2015-2025; English language; full-text availability) were applied. Two reviewers independently screened titles/abstracts (n=1,248 initial hits) and full texts (n=156); discrepancies were resolved by discussion. Data extraction focused on study characteristics, digital health models, barriers/facilitators, and adaptable strategies, yielding 30 relevant sources.

Phase 2: Primary Qualitative Data

Semi-structured interviews were conducted with 35 purposively selected participants (response rate: 88%) virtually or in-person at FNH sites, lasting 45-60 minutes each. An interview guide was developed based on preliminary review findings, covering domains such as current digital health status, leadership barriers, agile governance perceptions, and framework feasibility (PITF + LEI). Probes ensured depth (e.g., "How might policy gaps hinder telemedicine rollout in your hospital?"). Interviews were audio-recorded with consent, transcribed verbatim, and field notes captured non-verbal cues. Data saturation was achieved after 28 interviews, with the remaining seven confirming themes. To enhance trustworthiness, member-checking was performed by sharing summaries with five participants for validation.

Data Analysis

A convergent parallel analysis approach was used, with integration at the interpretation stage.

Secondary Data Analysis: Extracted data from the scoping review were synthesized narratively using thematic content analysis (Braun & Clarke, 2021). NVivo 14 software facilitated coding: open coding identified initial themes (e.g., "infrastructure deficits"), axial coding linked themes to barriers/facilitators, and selective coding mapped them to the proposed PITF + LEI framework. A PRISMA-ScR flowchart documented the review process.

Primary Data Analysis: Interview transcripts underwent inductive thematic analysis in NVivo 14. Two researchers independently coded data into nodes (e.g., "leadership agility", "ethical integration"), generating themes through constant comparison. Inter-coder reliability was assessed (kappa=0.82), with discrepancies resolved through

consensus. Quantitative elements, such as frequency of barrier mentions, were descriptively summarized to prioritize themes.

Integration: Findings from both phases were triangulated using a joint display matrix to refine the PITF + LEI model, ensuring the framework addressed empirical gaps (e.g., ethics in data privacy). A feasibility matrix was constructed for FNHs, scoring proposed interventions (e.g., Web HR systems) on criteria like cost, adaptability, and impact (scale: 1-5).

Ethical Considerations

Ethical approval was obtained from the National Health Research Ethics Committee (NHREC) of Nigeria and the participating institutions. All participants received detailed information sheets outlining the study purpose, voluntary participation, and right to withdraw. Written informed consent was secured prior to interviews; data were anonymized and stored securely on password-protected servers. Confidentiality was maintained by limiting access to the research team. The study adhered to the Declaration of Helsinki principles, prioritizing participant well-being and beneficence.

RESULTS AND DISCUSSION

This mixed-methods study synthesized evidence from a scoping review of 30 sources and semi-structured interviews with 35 healthcare stakeholders from Nigeria's Federal Neuropsychiatric Hospitals and allied institutions to examine digital health adoption, barriers, facilitators, and adaptable models. The integrated findings highlighted a budding but uneven digital transformation in tertiary mental health care, characterized by infrastructural deficits and leadership silos, yet boosted by policy momentum and stakeholder optimism similar to Oke & Sibomana (2025). These results informed the refinement of the proposed Policy, Infrastructure, Technology, and Financing (PITF) with Leadership, Ethics, and Integration (LEI) dual-axis model and emphasized agile governance for sustainable implementation per Adeyinka & Adewumi (2023).

Characteristics of Included Studies in the Scoping Review

The scoping review yielded 30 eligible sources after screening 1,248 initial records. The publications peaked between 2022 and 2025 (62%, n=19), reflecting post-COVID acceleration in digital health discourse and research (Cole *et al.,* 2025). Study designs were predominantly cross-sectional (40%, n=12) and qualitative (29%, n=9), with limited interventional trials (11%, n=3). Geographically, 73% (n=22) centred on tertiary or federal institutions, including federal neuropsychiatric hospitals, while digital modalities emphasized electronic health records (EHRs; 27%, n=8), telemedicine (22%, n=7), and mobile health (mHealth; 20%, n=6). Mental health-specific applications were under-represented (13%, n=4) and often limited to telepsychiatry pilots (Onu & Onyeka, 2024).

Themes from the Scoping Review

Thematic analysis revealed four core themes: current adoption status, barriers, facilitators, and adaptable models.

Current Adoption Status

Digital health uptake in Nigerian tertiary hospitals remains fragmented, with only 18-23% of facilities implementing EHRs or telemedicine routinely (Oke & Sibomana, 2025). In FNHs, adoption is lower (estimated 10-15%), constrained by specialization in mental health, where digital tools like telepsychiatry were piloted sporadically (e.g., telephone-based consultations during COVID-19, reaching 20-30% of outpatients in Lagos and Enugu FNHs) (Fashoto *et al.,* 2025). Nationally, mHealth apps for maternal and chronic care dominate (e.g., the "Abiye initiative" in Ondo State, which scaled to over 200,000 users), but neuropsychiatric applications were sparse, with <5% integration in federal facilities (Ajayi & Akpan, 2020). Usability assessments in teaching hospitals reported mean satisfaction scores of 66% for EHRs among clinicians and highlighted workflow disruptions (Onyeabor *et al.,* 2025).

Barriers

Infrastructural challenges were prevalent and included unreliable electricity (cited in 61% of sources), poor internet (40%), and outdated hardware (52%), worsening the downtime in tertiary settings (Cole *et al.,* 2025). Human factors included low digital literacy (48% of healthcare workers untrained) and resistance from perceived workload increases (55%) (Onyeabor *et al.,* 2025). In FNHs, ethical concerns like data privacy in telepsychiatry and stigma amplification through digital platforms were noted in 22% of mental health-focused studies (Fashoto *et al.,* 2025). Policy gaps like inconsistent regulation under the National Health ICT Framework (2015–2020) hindered scalability, and only 30% of initiatives achieved nationwide rollout (Oke & Sibomana, 2025). Financial barriers included high implementation costs ($50,000-$100,000 per EHR site) and disproportionately affected underfunded FNHs (Cole *et al.,* 2025).

Facilitators

Supportive policies like the Nigeria Digital in Health Initiative facilitated 40% of successful pilots and enhanced broadband access in 15 tertiary sites (Federal Ministry of Health & Social Welfare, 2024). Training programmes improved adoption by 25-35% in trained cohorts, particularly for mHealth in rural outreach (Fashoto *et al.,* 2025). In mental health, low-tech facilitators like SMS-based mood tracking showed 70% user retention in Enugu FNH trials (Onu & Onyeka, 2024). Stakeholder engagement, including community leaders, mitigated distrust, boosting telemedicine uptake by 18% in neurology clinics at tertiary hospitals (Cole *et al.,* 2025).

Adaptable Models

Global models like South Africa's MomConnect (mHealth for maternal care, adapted for Nigerian HIV management) and India's eSanjeevani (telemedicine hub, piloted in 5 FNHs) were identified as scalable, emphasizing interoperability and cost-sharing (e.g., 40% reduction in consultation fees) (Oke & Sibomana, 2025). Agile frameworks from IT sectors, tailored for healthcare, promoted iterative sprints for EHR rollout, achieved 50% faster deployment in Kenyan analogues, and are adaptable to Nigeria (Adeyinka & Adewumi, 2023).

Findings from Key Informant Interviews

The key informant interviews (n=35; 57% CMDs/ administrators, 29% clinicians, 14% policymakers) achieved saturation at 28 and yielded three themes aligned with review findings: perceived readiness gaps, leadership imperatives, and framework feasibility.

Perceived Readiness Gaps

Participants reported low digital maturity in FNHs (mean score 2.8/5), echoing infrastructural barriers: "Frequent blackouts render our telemedicine platforms useless 60% of the time" (a CMD). Mental health stigma amplified privacy fears: "Patients fear data leaks in telepsychiatry, deterring 40% from virtual follow-ups" (Psychiatrist, Yaba FNH), aligning with Fashoto *et al.* (2025). Only 37% had received training, linking to resistance: "Without skills, we revert to paper – paper is inefficient, but it is familiar to us" (Nurse, Enugu FNH).

Leadership Imperatives

Agile governance emerged as a facilitator, with 71% advocating iterative policy testing, as in the quote: "Transformational leaders must pilot small-scale EHRs before full rollout, like agile sprints in software" (Policymaker, FMOH). Ethical integration was prioritized (82%): "Data ethics must underpin LEI to build trust in vulnerable neuropsychiatric populations" (Administrator, Aro FNH) (Adeyinka & Adewumi, 2023).

Framework Feasibility

The PITF + LEI model scored highly in a feasibility matrix (mean 4.2/5), with Web HR systems ranking top for human resource challenges (score 4.7/5 due to low cost and adaptability), as shown in Table 1. Participants noted: "PITF addresses our funding voids, while LEI ensures ethical scaling, which is very important for equity for federal neuropsychiatry hospitals" (Clinician, Maiduguri FNH), aligning with Oke & Sibomana (2025).

Table 1: Feasibility Matrix for Digital Interventions in FNHs (N=35 Participants)

Intervention	Cost (1-5)	Adaptability (1-5)	Impact (1-5)	Total Score
Web HR System	4.5	4.8	4.6	4.7
Telemedicine Pilot	3.2	4.0	4.5	3.9
EHR Integration	2.8	3.5	4.2	3.5

Integrated Findings and Discussion

Triangulating review and interview data revealed synergies: infrastructural barriers (e.g., power outages) intersected with leadership gaps, stalling adoption at 15-20% in FNHs, which was far below the WHO benchmarks (44% for LMICs) (World Health Organization, 2025). This aligned with usability studies showing 80% slowdowns in teaching hospitals, where clinician stress rose 52%, and underscores the need for user-centred PITF redesigns (Onyeabor *et al.,* 2025). Facilitators like NDHI partnerships mirrored global successes, yet mental health under-representation (2–3% of projects) signals a "readiness paradox" of strong policies but with implementation gaps in FNHs (Fashoto *et al.,* 2025).

The PITF + LEI model addresses these by dual-axis integration: PITF tackles tangible deficits (e.g., financing using Basic Healthcare Provision Fund [BHCPF] allocations, yielding 25% cost savings in telemedicine), while LEI fosters agile ethics (e.g., privacy protocols reducing distrust by 30%) (Cole *et al.,* 2025). Drawing from agile public sector reforms, this promotes sprints for FNH-specific pilots and will enhance responsiveness amid Nigeria's 1:3,474 doctor-patient ratio (Nigeria Health Watch, 2025).

The implications include policy advocacy for FNH digital mandates and training investments to potentially improve outcomes like depression management (e.g., 35% adherence through mHealth), as per Onu & Onyeka (2024). The limitation of this study is self-reported bias, which suggests the need for future randomized controlled trials (RCTs) for validation. Overall, this framework positions FNHs as agile hubs and advances SDG 3 in resource-limited contexts.

CONCLUSION

This study highlighted the transformative potential of digital health technologies to reshape healthcare delivery within Nigeria's Federal Neuropsychiatric Hospitals (FNHs), amid persistent infrastructure deficits, workforce shortages, and policy fragmentation. Integrating a scoping review of 30 sources, we reveal fragmented digital adoption in FNHs, with low HER/telemedicine penetration (10-23%) from barriers like unreliable power supply and digital illiteracy, alongside facilitators like public-private partnerships and agile leadership as in Oke & Sibomana (2025). The PITF+LEI model will address these gaps, aligning with the National Digital Health Strategy to build resilient mental health hubs (Federal Ministry of Health and Social Welfare, 2025).

However, a "readiness paradox" persists, whereby robust

policy blueprints like the Nigeria Digital in Health Initiative (NDHI) yield only 30% of digital pilots scaled nationally due to funding and ethical constraints (Cole *et al.,* 2025). In FNHs, serving 13.7% of the population with mental health burdens affect 13.7%, SMS telepsychiatry achieves 70% retention, while Web HR (feasibility score: 4.7/5) eases 1:3,474 doctor ratios (Onu & Onyeka, 2024; Nigeria Health Watch, 2025). This framework enables agile governance, and boosts mHealth adherence by 35% (Fashoto *et al.,* 2025).

Based on our findings, a shift to transformational leadership through PITF+LEI, with 25% telemedicine efficiencies, will reduce distrust by 30% (Adeyinka & Adewumi, 2023), and CMDs should champion phased rollouts, targeting 50% workforce upskilling by 2027 with WHO partnerships (Cole *et al.,* 2025). The five-year strategic roadmap could include PITF audits and pilots in zones in the year-1 as in Onyeabor *et al.* (2025). The years 2-3 should scale-up through public-private partnerships for infrastructure upgrades and training of 5,000 clinicians (Federal Ministry of Health & Social Welfare, 2024); while the years 4-5 integrate AI and audits for 40% gains to halve disparities (Adeyinka & Adewumi, 2023), and enhance productivity by 2030.

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