Original Article

Challenges and Attitudes Towards Electronic Health Record Implementation in Secondary Healthcare Settings: A Review of Two Centres

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ABSTRACT

Introduction: Electronic Health Records （EHRs） are recognized globally for their role in improving healthcare quality, patient safety, data management, and operational efficiency. However, their adoption in low-resource settings such as Nigeria remains challenging. This study investigated healthcare professionals' attitudes towards EHR implementation and identified key challenges in two secondary healthcare centres in Abuja. Methods: A cross-sectional survey was conducted among 201 healthcare professionals, using structured electronic questionnaires based on the Unified Theory of Acceptance and Use of Technology （UTAUT）. The survey incorporated Likert scale questions, both close-ended and open-ended questions, and stratified sampling ensured balanced representation. The validity of the data was established through a pilot study. A mixed-methods approach was adopted, incorporating quantitative analysis, utilizing both descriptive and inferential statistics, and thematic analysis of open-ended questions to achieve a more comprehensive understanding. Results: Out of 201 questionnaires distributed,123were completed, resulting in a 61.2% response rate. Unreliable internet connectivity 90（73.2%）， lack of power generators 114（92.7%）， absence of new uninterruptible power supplies （UPS）96（78.0%）， and lack of antivirus protection 119（98.7%） were major challenges to EHR implementation. Additionally,52（42.3%） of respondents demonstrated previous knowledge of computers which combined with the available technical support reported by 50（40.7%） of participants to positively influenced attitudes toward EHR usage. Conclusion: The adoption of Electronic Health Records in secondary healthcare centres is significantly hindered by unreliable internet connectivity, insufficient power backup systems, and poor cybersecurity. These infrastructural issues are further complicated by limited technical expertise among staff. However, previous knowledge of computers and the presence of technical support have been shown to improve staff attitudes towards using EHRs.

Keywords: Electronic Health Records （EHRs）, Infrastructure Challenges, Healthcare Professionals' Attitudes.

Introduction

Electronic Health Records （EHRs） are globally recognized as a fundamental technology for modernizing healthcare systems, offering significant potential benefits in terms of patient safety, data quality, and operational efficiency. [1,2] The international experience with EHR adoption, however, reveals a complex and varied landscape.[2–4] While countries such as Estonia and Denmark have achieved near-total digitalization through strong national policies and active professional involvement, rollouts in the UK, Germany and the US demonstrate that success is often contingent upon comprehensive legal backing, significant financial incentives, and user-centred design.[3,4] Despite these advancements, common challenges across these regions persist, and they include high implementation costs, inadequate training, and resistance from medical personnel. [5,6]

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In Africa, countries like South Africa and Rwanda have leveraged eHealth strategies, often with international support, to incrementally digitalise their health systems.[7,8] Similarly, Nigeria has a history of health information technology initiatives dating back to the late 1980s, culminating in several strategic plans, including the National Strategic Health Development Plan (NSHDP).[9] Despite these early efforts and the critical need for digital transformation underscored by recent public health crises, Nigeria still operates without a comprehensive national policy or legal framework to guide and standardize EHR implementation.[7,9] This gap results in fragmented, institution-specific EHR adoption, leading to persistent challenges concerning data security, system interoperability, and end-user acceptance. Thus, the objectives of this study are:

i. To assess healthcare professionals' attitudes towards EHR implementation and use.
ii. To identify challenges faced by healthcare professionals in the two secondary healthcare centres.

Methods

A mixed-methods approach was employed, incorporating quantitative analysis to assess the challenges and attitudes related to EHR implementation, alongside thematic analysis of open-ended survey responses to further elucidate healthcare professionals' experiences and perspectives.

The research population comprised medical doctors and registered nurses, collectively referred to as healthcare professionals (HPs). The medical doctors included both general practitioners and consultants from various specialties, while the registered nurses encompassed individuals holding professional certificates (RN, RM), university degrees such as Bachelor of Science (BSc) and Bachelor of Nursing Science (BNSc), as well as advanced degrees including Master of Science (MSc) and Doctor of Philosophy. Exclusion criteria were applied to medical doctors and nurses who were undergoing their one-year internship following university graduation. All healthcare professionals engaged in either full-time or part-time employment at the selected hospitals were eligible for inclusion in the study.

Stratified sampling was utilized to ensure proportional representation, calculating a required sample size of 201 participants using the Taro Yamane formula,[10] with recruitment via in-person invitations and WhatsApp. Informed consent was obtained from all participants, with details provided in the introductory section of the questionnaire. Participation in the study was strictly voluntary, with participants free to withdraw their consent at any point without completing the questionnaire or facing any negative repercussions. The principal investigator was solely responsible for electronic data collection, and to avoid double submission, after making his submission the respondents' email address is automatically blocked. Upon conclusion, all data remained under the exclusive control of the principal investigator and were securely stored in the cloud with password protection. Data were collected using a modified electronic questionnaire that included demographic items, Likert scale questions derived from previous studies using the Unified Theory of Acceptance and Use of Technology (UTAUT) framework [8–10] to assess the attitudes of healthcare professionals to EHR adoption, close-ended and open-ended questions to identify challenges and seek opinions regarding the technology adoption. Respondents were presented with Likert-scale questions such as "I have required knowledge and training to operate EHR"; "I have the resources to operate EHR" and were required to tick one among "Strongly disagree; Disagree; Undecided; Agree; or Strongly Agree." Open-ended questions such as "What internet-related challenges do you experience with the use of EHR? What infrastructure upgrade would you recommend improving EHR functionality? How do government regulations/policy affect your use of EHR?" Respondents were required to answer in their own words.

Ethical approval was obtained from the Health Research and Ethics Committee of the Federal Capital Territory, Abuja. Validity was confirmed through a pilot test. [10,11] Data analysis was performed using SPSS version 20. Chi-square tests were used to compare categorical variables, such as attitudes towards EHR implementation. Responses to the open-ended questions were assigned numerical codes, and the categories were derived through manual thematic analysis, and then statistical tests were applied to the coded data. [12] Statistical significance was set at $p < 0.05$.

Results

Chi-square test of independent variables was performed. Frequency distribution (counts, percentage) for categorical variables (sex, profession), measures of central tendency, and dispersion for continuous variables (age, years of experience) was employed. Of the 201 questionnaires distributed, 123 were returned fully completed, yielding a response rate of 61.2%.

The resulted indicated that the ages of 31-40 were more in the study 38(30.9%), majority 60(49.9%) have 11-20years practice experience, females were more than the males at 76(61.8%), and most of the respondents had a university degree 60(48.8%). However, 6 (4.9%) of the study population were information technology (IT) literate.

Thematic analysis was done before employing chi-square goodness-of-fit test, a quantitative test

comparing the observed category frequencies to an expected distribution. The result indicates that internet-related challenges were dominate by 90(73.2%). An additional 17(13.8%) reported both poor network and power outages. Few reported no challenges 9(7.3%), power outage alone 5(4.1%), or time-consuming connections 2(1.6%). The distribution differed significantly from the null expectation ($p < 0.001$).

Table 1: Demographic Characteristics of Respondents, Frequency and Descriptive analysis.

Variable	N (%)	p-value
Age		
21-30	26 (21.1)	
31-40	38 (30.9)	<0.001
41-50	28 (22.8)	
51-60	29 (23.6)	
61-70	2(1.6)	
Years of Practice		
0-5	34 (27.6)	
6-10	28 (22.8)	<0.001
11-20	61 (49.6)	
Gender		
Female	76 (61.8)	<0.001
Male	47 (38.2)	
Qualification		
University Degree	60 (48.8)	
Professional Certificate	12 (9.8)	< 0.001
Both	51 (41.5)	
Specialty		
General practice	79 (64.2)	<0.001
Consultant	44 (35.8)	
IT literate		
Yes	6 (4.9)	
No	117 (95.1)	<0.001
Computer Proficiency		
Beginner	14 (11.4)	
Intermediate	82 (66.7)	<0.001
Advanced	27 (22.0)	

Table 2: Internet-related Challenges, thematic analysis and Chi-square goodness-of-fit test.

Variables	n (%)	p-value
None	9 (7.3)	
Poor Network	90 (73.2)	
Power outage	5 (4.1)	< 0.001
Time-Consuming	2 (1.6)	
Poor Network and power outage	17 (13.8)	

A one-sample binomial test was used for each dichotomous (Yes/No) item. This test assesses whether the observed Yes/No counts differ from expected proportions (commonly 50:50).

Infrastructure upgrades were uncommon among participants. Generators were reported by 9(7.3%), inverters by 21(17.1%), solar by 11(8.9%), and UPS by 27(22.0%); antivirus software and "none" were reported by 4(3.3%) and 4(3.3%) respectively. For each item, the observed Yes/No distributions differed significantly from the null expectation ($p \leq 0.001$ for generator, inverter, none, UPS, and antivirus; $p = 0.001$ for solar), indicating that most sites lacked these infrastructure upgrades.

Table 3: Infrastructure Upgrade, a one-sample binomial test analysis.

Variable	n (%)	p-value
GENERATOR		
No	114 (92.7)	< 0.001
Yes	9 (7.3)	
INVERTER		
No	100 (81.3)	< 0.001
Yes	21 (17.1)	
NONE		
No	119 (98.7)	
Yes	4 (3.3)	< 0.001
SOLAR		
No	112 (91.1)	0.001
Yes	11 (8.9)	
UPS		
No	96 (78.0	< 0.001
Yes	27 (22.0)	
ANTIVIRUS		
No	119 (98.7)	< 0.001
Yes	4 (3.3)	

Table 4: Government Regulations and Policies; thematic analysis and chi-square goodness-of-fit.

Variable	**N(%)**	**p-value**
None	52 (42.3)	
Functional Internet	7 (5.7)	
Funding	9 (7.3)	
Provision of Computer	7 (5.7)	
Provision of Infrastructure	20 (16.3)	< 0.001
Steady Power Supply	5 (4.1)	
Supervision	4 (3.3)	
Training	19 (15.4)	

Responses regarding government regulations and policies varied, with the largest group 52(42.3%) reporting no relevant policies. Other responses included provision of infrastructure 20(16.3%),

training 19(15.4%), funding 9(7.3%), functional internet 7(5.7%), provision of computers 7(5.7%), steady power supply 5(4.1%), and supervision 4(3.3%).

The distribution of responses differed significantly from a uniform expectation ($p < 0.001$), indicating most participants perceived an absence of government policy action, and prioritized infrastructure and training as the most needed policy areas.

Collapsing the five-point Likert responses into five observed categories, chi-square test of proportions was used to test whether the observed distribution across the five Likert categories differs from an expected distribution.

Facilitating conditions were rated positively by participants. For each item, responses clustered toward agreement: 60-50(48.8%–40.7%) agreed and 18-28(14.6%–22.8%) strongly agreed across items (48.8% agreed that facilitating conditions were present). Fewer respondents strongly disagreed 5-11(4.1%–8.9%) or disagree 12-22(9.8%–18.1%).

Table 5: Facilitating Conditions; chi-square test of proportion.

Variable	n (%)	p-Value
Strongly Disagree	5 (4.1)	< 0.001
Disagree	12 (9.8)	
Neutral	18 (14.6)	
Agree	60 (48.8)	
Strongly Agree	28 (22.8)	
I have the required Knowledge & Training		
Strongly Disagree	9 (7.3)	< 0.001
Disagree	19 (15.4)	
Neutral	24 (19.5)	
Agree	52 (42.3)	
Strongly Agree	19 (15.4)	
There is available Technical Assistance		
Strongly Disagree	10 (7.9)	< 0.001
Disagree	22 (18.1)	
Neutral	25 (20.7)	
Agree	50 (40.7)	
Strongly Agree	16 (12.6)	
Compactable with my other devices		
Strongly Disagree	11 (8.9)	< 0.001
Disagree	21 (17.1)	
Neutral	23 (18.7)	
Agree	50 (40.7)	
Strongly Agree	18 (14.6)	

Items concerning required knowledge and training, availability of technical assistance, and device compatibility showed similar patterns (Agree/Strongly Agree combined: 57.7%, 53.3%, and 55.3%, respectively). Statistical testing of the response distributions for each item indicated highly significant departures from the null expectation ($p < 0.001$ for all items), consistent with overall positive perceptions of facilitating conditions.

Discussion

This review of two secondary-care centres identified a complex interplay of human, technical, organizational, and policy barriers to Electronic Health Record (EHR) implementation alongside generally positive staff attitudes toward facilitating conditions. Two hundred and one questionnaires were distributed, 123 were returned fully completed, reporting a response rate of 61.2%. Female respondents were 76(61.8%), mid-career 38(largest group 31–40 years), experienced 61(49.6% with 11–20 years), and university educated 60(48.8%), yet only 6 (4.9%) reported being IT-literate and 27(22.0%) had advance proficiency in use of computer. Poor network connectivity dominated internet-related problems 90 (73.2%), frequently compounded by power instability.

Infrastructure upgrades (generators, inverters, solar, UPS, antivirus) were uncommon. A plurality reported the absence of relevant government policies 52(42.3%) and prioritized infrastructure and training as urgent policy needs. Despite objective deficits, respondents tended to agree that facilitating conditions (knowledge/training opportunities, technical assistance, device compatibility) were present or attainable. These findings reflect and extend prior literature on technological adoption in low-resource health settings and highlight specific implementation priorities. [5-7, 10]

The workforce profile, predominantly female, mid-career, and experienced, parallels demographics reported in other Nigerian and regional healthcare studies. [7,13] The low proportion of self-reported IT-literacy 6(4.9%) is striking and aligns with prior assessments showing limited digital skills among health workers as a core barrier to e-health adoption in similar settings.[13,14] UTAUT-based work indicates that performance expectancy, effort expectancy, social influence and facilitating conditions shape technology acceptance. [8,15] Our data suggest a disconnect, although many respondents report positive perceptions of facilitating conditions and willingness to engage (Agree/Strongly Agree 55–58% across items), their very low IT literacy and the pervasive infrastructural deficits likely diminish actual performance expectancy

and increase perceived effort, reducing real-world uptake. [9,15,16]

Poor network connectivity reported by 90(73.2%) and frequent power outages (either alone or combined with poor network) are consistent with a body of evidence identifying unreliable power and connectivity as major impediments to health information technology (HIT) adoption in low- and middle-income countries. [17-19] The near absence of infrastructure upgrades, generators 9(7.3%), UPS 27(22.0%), solar 11(8.9%), antivirus 4(3.3%) confirms that these facilities lack the technical backbone required for reliable EHR operation. Sittig et al. [20] and Boonstra et al. [21] emphasize that such infrastructural instability contributes to system downtime, loss of data integrity, and clinician frustration—factors that undermine sustained use and can generate negative attitudes over time. The limited availability of antivirus solutions and backup systems raises patient-safety and data security concerns, reflecting broader governance issues. [22,23]

Nearly half of respondents perceived an absence of relevant government policies; many prioritized infrastructures provision and training as necessary policy actions. This resonates with literature underscoring the critical role of government regulation, financing, and governance frameworks in enabling EHR adoption. [23-25] The "meaningful use" and related regulatory efforts in high-income settings illustrate how policy incentives and standards can accelerate adoption,[25] while the absence of such coherent frameworks in low-resource settings often results in fragmented, unsustained initiatives. [26,27] De Pietro & Francetic's [23] systematic review highlights that governance and regulation must be tailored to local contexts and aligned with national health priorities; our findings show staff perceive this alignment as largely absent.

Although objective infrastructure was poor, respondents reported relatively positive perceptions of facilitating conditions; many agreed or strongly agreed that knowledge/training, technical assistance, and device compatibility were present. This favourable disposition is important because perceived facilitating conditions and training opportunities are strong predictors of behavioural intention and system use in the UTAUT framework. [8,9,15] However, prior research cautions that perceived training availability must translate into effective, context-appropriate capacity building to change behaviour. [9,10] Agarwal and Prasad, [28] and Croll [29] point out that voluntariness, perceived ease of use and direct experience modify acceptance; thus, piecemeal or poorly designed training programs may not be sufficient to overcome infrastructural and experiential barriers. The reliability of available technical assistance is also crucial; Sittig et al. [20] and Gagnon et al. [16] document that accessible, timely support reduces clinician frustration and errors, bolstering sustained use.

UTAUT and diffusion theories emphasize multiple determinants of adoption beyond technical feasibility: leadership, change management, user involvement, and perceived relative advantage. [15,30] Kotter's change model, [31] and lessons from international implementations, [19, 26, 27] indicate that successful EHR rollouts require visible leadership, communication, pilot testing, champions, and staged implementation. Our study's combination of positive staff attitudes toward facilitating conditions and widespread infrastructural deficits suggests a readiness gap; personnel may be willing but organizational systems and governance are not yet prepared to support effective change. This pattern echoes multi-site lessons showing that technical readiness and social/organizational readiness must converge for success. [20, 32]

Findings parallel those from Nigerian tertiary hospitals, [7] and other African contexts [18] where infrastructural, financial and human-capacity constraints impede EHR adoption. Systematic reviews, [21, 32, 33] identify similar critical success factors (robust infrastructure, stakeholder engagement, training, governance and iterative implementation) underscoring the generalizability of our observations. Internationally, Sittig et al. [20] and De Benedictis et al. [27] report that even well-resourced systems encounter organizational resistance and workflow disruption; in low-resource settings these challenges are magnified by fundamental infrastructure and policy gaps.

Strength and Limitations

This study combined thematic qualitative categorization with quantitative tests (chi-square goodness-of-fit, binomial tests, descriptive statistics), aligning with recommended mixed analytic practices for survey data. [12, 34] The study's focus on secondary-care settings fills a knowledge gap between primary-care readiness studies and tertiary-hospital reports. [7, 19] However, sampling and measurement limitations should temper interpretation. Convenience-based or non-probability approaches [35, 36] may have contributed to selection bias; the reliance on self-report introduces potential social desirability and misclassification biases. [37, 38]

The cross-sectional design prevents causal inference about how infrastructure or training predict EHR acceptance over time. [39, 40] The small number of IT-literate respondents limited subgroup analyses examining how digital skills modify perceptions; an area where validated instruments and pilot testing within that group would strengthen future studies. [10,35, 41] Finally, while our study focused on two centres, the consistency of our findings with broader

literature [21,22] suggests the issues identified are relevant beyond the immediate sites, though generalizability remains constrained.

Recommendations

1. Invest in foundational infrastructure: Consistent with Ginter et al. [17] and Ludwick & Doucette, [19] immediate investments in reliable power (generators, UPS, solar hybrids), resilient internet connectivity and essential cybersecurity (antivirus, backups) are prerequisites. Without these, EHRs will be unreliable, risking clinician disengagement and patient harm. [20, 22]
2. Develop and fund coherent governance frameworks: National and institutional policies that set standards for interoperability, data security, procurement, funding and accountability (mirroring lessons from "meaningful use" and international guidance) are necessary to coordinate investments and to incentivize adoption. [23-25]
3. Prioritize scalable, role-specific training and ongoing technical support: Training must be practical, continuous, competency-based, and complemented by accessible technical assistance, which influences both perceived facilitating conditions and behavioural intention. [9, 10, 16]
4. Employ structured change-management approaches: Adoption efforts should apply Kotter's principles and diffusion strategies (create urgency, build guiding coalitions, pilot innovations, identify champions, and institutionalize gains) to address organizational resistance and align workflows. [26, 30, 31]
5. Sequence implementation to local readiness: Phased rollouts, starting with units where infrastructure and staff readiness are highest, allow iterative learning, reduce disruption and generate local champions. [27, 32, 33]

Future Research Directions

Future studies should examine causal pathways linking infrastructure, IT literacy, training and policy to EHR adoption using longitudinal designs and larger, representative samples. [39, 40] Comparative studies across facility levels (primary, secondary, tertiary) and regions would help identify scalable models and context-specific adaptations. [7, 18]

Implementation science approaches and pragmatic trials could evaluate phased infrastructural investments, training modalities, and governance interventions to identify effective, cost-efficient strategies. [27, 33] Additionally, qualitative work exploring clinician workflow, perceptions of usefulness, and experiences with pilot EHR modules can inform user-centred design and change strategies. [26, 32]

Conclusion

EHR implementation in the two surveyed secondary-care centres is constrained primarily by infrastructural deficits (unreliable internet and power), and by an acute shortage of IT capacity and infrastructure upgrades. Staff attitudes toward facilitating conditions are relatively positive, indicating potential human-resource readiness if structural barriers are addressed. The findings align with extensive international and regional literature emphasizing that technology adoption requires synchronized investments in infrastructure, training, governance, and change management. Policy makers, facility leaders, and funders should prioritise coordinated, context-appropriate infrastructure upgrades, sustained training programs, robust technical support, and clear governance frameworks to translate positive staff attitudes into durable EHR adoption and improved health system performance.

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