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CHALLENGES AND STRATEGIES FOR IMPROVING ELECTRONIC MEDICAL RECORDS IMPLEMENTATION: A CASE STUDY OF FEDERAL MEDICAL CENTRE, JABI, ABUJA, NIGERIA

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ABSTRACT

Electronic Medical Record (EMR) systems are essential tools for improving healthcare delivery through efficient management of patient information, yet their implementation in many developing-country hospitals remains constrained by technological, organizational, and human-related barriers. This study assessed the challenges and strategies for improving EMR implementation at the Federal Medical Centre (FMC), Jabi, Abuja, Nigeria. Specifically, it assessed the level of EMR implementation and utilization, identified technological, organizational, and human-related challenges affecting adoption, examined healthcare workers' perceptions and readiness, and identified strategies for improvement. A case study research design was adopted. The study population comprised 620 healthcare professionals and administrative staff, from which a sample of 264 was determined using Cochran's formula and selected via stratified random sampling. Data were collected using a structured, online, five-point Likert-scale questionnaire, validated by the supervisory team and lecturers external to the department, with a pilot-study Cronbach's alpha of 0.791 across 28 items. Two hundred and fifty completed questionnaires (94.7% response rate) were analysed in SPSS version 26 using descriptive statistics and the Pearson Chi-square test of independence at the 5% significance level.

Findings revealed a high level of EMR awareness (88.0%) and utilization, with 78.0% of respondents reporting departmental use and 68.0% using the system daily, predominantly for patient record management. Major challenges included inadequate availability of computers (52.0% disagreement), unreliable internet/network services (57.2% disagreement), unstable

electricity supply (68.0% disagreement), insufficient staff training (54.0% disagreement), limited technical support (56.0% disagreement), and staff resistance to change (62.0% agreement). Healthcare workers nonetheless demonstrated strongly positive perceptions of EMR value and high readiness to continue using the system (84.0% willingness). Pearson Chi-square analysis confirmed statistically significant relationships between technological, organizational, and human-related factors and EMR adoption ($\chi^2 = 28.571$, df = 1, $p < 0.001$), and between healthcare workers' perception/readiness and EMR utilization ($\chi^2 = 13.141$, df = 1, $p < 0.001$).

The study concludes that effective EMR implementation at FMC Jabi requires adequate ICT infrastructure, continuous staff training, reliable technical support, and sustained management commitment, and recommends targeted investment in ICT resources and capacity-building programmes to strengthen EMR adoption and utilization. The findings provide empirically grounded, institution-specific evidence to guide hospital management, health informatics practitioners, and policymakers seeking to strengthen EMR implementation in comparable Nigerian tertiary healthcare institutions.

KEYWORDS: Electronic Medical Records; EMR implementation; EMR adoption; healthcare workers; ICT infrastructure; healthcare information management; Nigeria.

1. INTRODUCTION

The rapid advancement of Information and Communication Technology (ICT) has transformed healthcare delivery worldwide, with digital health technologies increasingly recognised as essential tools for strengthening health systems and achieving universal health coverage (World Health Organization [WHO], 2021). Among these innovations, the Electronic Medical Record (EMR), a computerised system for collecting, storing, managing, retrieving, and exchanging patients' health information in digital form, provides healthcare professionals with immediate access to comprehensive patient data, including demographics, medical history, diagnoses, medications, allergies, laboratory results, and clinical progress notes (Kruse et al., 2021). By enabling accurate, up-to-date, and readily accessible patient information, EMRs support informed clinical decision-making, improve continuity of care, reduce medical errors, and enhance patient safety.

While developed countries such as the United States, Canada, the United Kingdom, and Australia have achieved widespread EMR adoption with documented improvements in coordinated care, reduced diagnostic duplication, and evidence-based clinical practice

(Boonstra, Versluis, & Vos, 2022), implementation in sub-Saharan Africa, including Nigeria, has progressed considerably more slowly. Persistent barriers include inadequate ICT infrastructure, unstable electricity supply, limited internet connectivity, insufficient funding, and shortages of skilled information technology personnel (WHO, 2021). Although several Nigerian tertiary hospitals have initiated EMR projects, many healthcare facilities continue to depend largely on paper-based records, limiting healthcare efficiency, compromising continuity of care, and constraining health managers' ability to use health information for planning and decision-making (Ojo & Popoola, 2021).

Studies have identified numerous barriers to successful EMR implementation in Nigeria, including inadequate technological infrastructure, poor internet connectivity, unstable electricity, high procurement and maintenance costs, insufficient staff training, resistance to organisational change, weak institutional policy, and data privacy and security concerns (Adenuga, Kekwaletswe, & Coleman, 2020; Ojo & Popoola, 2021; Afolabi & Ilesanmi, 2023). Successful implementation requires more than hardware and software installation; it demands careful planning, effective change management, stakeholder engagement, supportive leadership, continuous training, reliable ICT infrastructure, and sustained financial investment (Kruse et al., 2021).

The Federal Medical Centre (FMC), Jabi, Abuja, is a major tertiary referral hospital within Nigeria's Federal Capital Territory, serving a large and diverse patient population and requiring efficient health information management to support timely clinical decision-making and quality patient care. Although the hospital has introduced EMR systems, the extent of implementation, utilization, and the specific factors influencing its effectiveness have not been sufficiently documented. This study therefore assessed the challenges and strategies for improving EMR implementation at FMC Jabi, with the specific objectives of: (i) assessing the level of EMR implementation and utilization; (ii) identifying the technological, organizational, and human-related challenges affecting adoption; (iii) examining healthcare workers' perceptions and readiness toward EMR use; and (iv) identifying measures for improving implementation and utilization.

2. Literature Review and Theoretical Framework

2.1 Concept and Importance of Electronic Medical Records

An Electronic Medical Record is a computerised repository of patient information generated during encounters between patients and healthcare providers, designed to support documentation, retrieval, continuity of care, clinical decision-making, healthcare

administration, and medical research (Häyrinen, Saranto, & Nykänen, 2008; Waegemann, 2003). EMRs consolidate demographics, medical history, diagnoses, medications, allergies, immunisation records, laboratory investigations, and clinical notes into a single platform, improving the availability, accuracy, completeness, and timeliness of clinical information relative to paper records (Kruse et al., 2018). Embedded clinical decision-support features, including alerts, reminders, and medication-interaction warnings, further reduce medical errors and improve adherence to evidence-based practice (Bates et al., 2003).

Beyond direct patient care, EMRs enable interdisciplinary collaboration through shared, real-time access to patient information across departments (Campanella et al., 2016), and generate structured data valuable for epidemiological surveillance, clinical research, quality improvement, and health policy formulation (Jensen, Jensen, & Brunak, 2012). EMRs also provide security mechanisms generally unavailable in paper systems, including authentication, encryption, audit trails, and role-based access control, although healthcare institutions must continuously strengthen cyber-security infrastructure to safeguard sensitive patient information (Keshta & Odeh, 2021).

2.2 Challenges of EMR Implementation

The literature identifies seven recurring categories of barriers to EMR implementation. Inadequate technological infrastructure, including insufficient computers, unreliable internet, and unstable electricity, disrupts clinical workflow and forces reversion to paper documentation (Boonstra & Broekhuis, 2010; Kruse et al., 2018). Insufficient financial resources constrain acquisition of hardware, software, training, and ongoing maintenance, particularly in public hospitals with constrained budgets (Boonstra & Broekhuis, 2010). Resistance to change among healthcare workers arises from perceived increased workload, disruption of established routines, and limited confidence with digital technology (Adedeji, Irinoye, & Ikono, 2022). Inadequate training and low digital literacy reduce system utilization and increase documentation errors (Oluoch et al., 2020). Data privacy and security concerns affect user and patient trust (Keshta & Odeh, 2021; Kumar & Snooks, 2020). Poor technical support and system maintenance produce downtime and discourage sustained use (Alotaibi & Federico, 2020). Finally, lack of organizational readiness and management support undermines resource allocation, staff engagement, and overall implementation outcomes (Adenuga et al., 2020; Woldemichael et al., 2021).

2.3 Strategies for Effective EMR Implementation

Corresponding to these barriers, the literature identifies evidence-based implementation strategies: adequate infrastructure development (Ojo & Popoola, 2021); continuous training

and capacity building (Oluoch et al., 2020); strong management and leadership support (Adenuga et al., 2020); user involvement in system design (Boonstra & Broekhuis, 2010); data security and privacy protection measures (Kumar & Snooks, 2020); provision of continuous technical support (Alotaibi & Federico, 2020); development of supportive policies and standardisation (Adler-Milstein & Jha, 2020); and a gradual, phased implementation approach with pilot testing (Boonstra & Broekhuis, 2010).

2.4 Theoretical Framework: Technology Acceptance Model

This study is anchored on the Technology Acceptance Model (TAM), developed by Davis (1989) as an adaptation of the Theory of Reasoned Action (Fishbein & Ajzen, 1975). TAM proposes that an individual's acceptance of technology is shaped primarily by Perceived Usefulness (the degree to which a user believes a technology will improve job performance) and Perceived Ease of Use (the degree to which a user believes using it requires little effort), which together shape attitude, behavioural intention, and ultimately actual system use (Davis, 1989; Venkatesh & Davis, 2000). In healthcare, TAM has been widely applied to explain professionals' acceptance of EMRs, EHRs, and telemedicine (Holden & Karsh, 2010), with studies showing that healthcare workers who perceive EMRs as useful and easy to use are more likely to adopt and consistently use them (Venkatesh & Bala, 2008), while inadequate infrastructure, poor technical support, insufficient training, and security concerns reduce these perceptions and thereby limit adoption (Ajami & Bagheri-Tadi, 2013). TAM's principal limitation is its emphasis on individual perception at the expense of organisational, cultural, and infrastructural context (Bagozzi, 2007); this study addresses that limitation by examining perception and readiness alongside technological and organisational factors as joint predictors of EMR adoption and utilization.

2.5 Empirical Review and Research Gap

Empirical studies consistently report that EMR adoption improves quality of care, information accessibility, and clinical decision-making, but that success depends on organisational readiness, infrastructure, and user acceptance (Kruse et al., 2021); that leadership support, staff training, and infrastructure significantly influence implementation outcomes (Adenuga et al., 2020); and that resistance to change, inadequate training, and low digital literacy reduce EMR adoption among healthcare workers (Adedeji, Irinoye, & Ikono, 2022). In the Nigerian context specifically, poor infrastructure, unstable electricity, inadequate funding, and weak technical support have been identified as major barriers (Ojo & Popoola, 2021), while financial constraints and policy limitations continue to affect digital health implementation more broadly (Afolabi & Ilesanmi, 2023). However, most existing

Nigerian studies examine digital health or EMR adoption broadly across multiple facilities or focus narrowly on staff perception, without an integrated, institution-specific assessment of technological, organizational, and human-related challenges alongside staff perception and readiness within a single tertiary hospital. This study addresses that gap using FMC Jabi, Abuja, as its empirical setting.

3. Materials and Methods

3.1 Research Design and Setting

A case study research design was adopted to permit an in-depth investigation of EMR implementation within its real-life context at the Federal Medical Centre (FMC), Jabi, Abuja, Nigeria, a tertiary referral hospital within the Federal Capital Territory.

3.2 Population, Sample Size, and Sampling Technique

The study population comprised 620 healthcare professionals and administrative staff involved in the use and management of EMR systems at FMC Jabi, including doctors, nurses, health information management personnel, ICT staff, and administrative staff. The sample size was determined using Cochran's (1977) formula for populations under 10,000: $n_0 = Z^2pq/d^2 = (1.96^2 \times 0.5 \times 0.5)/0.05^2 = 384.16$, adjusted for the finite population (N = 620) using $n = n_0/[1 + (n_0 - N)/N]$, giving a final sample size of 264. A stratified random sampling technique was used to select respondents across the five professional strata, ensuring representation of staff with relevant knowledge and experience of EMR use.

3.3 Research Instrument, Validity, and Reliability

Data were collected using a structured, online, self-administered questionnaire comprising four sections: (A) socio-demographic data; (B) EMR implementation and usage; (C) challenges affecting EMR implementation; and (D) perception, readiness, and measures for improvement. Items in Sections C and D were measured on a five-point Likert scale (Strongly Agree = 5 to Strongly Disagree = 1). Content validity was established through review by the research supervisors and lecturers external to the department, and a pilot study yielded an overall Cronbach's alpha of 0.791 across 28 items, exceeding the 0.70 acceptability threshold and indicating good internal consistency.

3.4 Data Collection Procedure

Following institutional ethical approval, the questionnaire was administered online to eligible healthcare professionals and administrative staff, allowing respondents to complete it at their convenience, which improved response rate, data organisation, and reduced transcription error.

3.5 Data Analysis

Data were analysed in SPSS version 26. Descriptive statistics (frequencies, percentages, and means) summarised demographic characteristics and Likert-scale responses. For hypothesis testing, composite scores were computed for each construct (EMR adoption; technological, organizational, and human-related factors; perception and readiness; and EMR utilization) by summing relevant item scores; respondents scoring at or above the construct mean were classified as 'Good', and those below as 'Poor'. These categorical variables were cross-tabulated and tested using the Pearson Chi-square test of independence at a 5% significance level, with the null hypothesis rejected where $p < 0.05$.

3.6 Ethical Considerations

Ethical approval was obtained from the Achievers University, Owo, Research Ethics Committee (approval number AUO/REC/2026/206) and subsequently submitted to the management of FMC Jabi. Participation was voluntary, informed consent was obtained from all participants, no personal identifiers were collected, and respondents retained the right to withdraw at any stage without consequence.

4. RESULTS

4.1 Response Rate

Of 264 questionnaires distributed, 250 were returned and validly completed, a response rate of 94.7% (Table 1).

Table 1. Returned questionnaires.

Questionnaire Status	Frequency	Percentage (%)
Distributed questionnaires	264	100
Returned questionnaires	250	94.7
Not returned	14	5.3

Source: Fieldwork (2026).

4.2 Socio-Demographic Characteristics of Respondents

Respondents were predominantly aged 30–39 years (42.4% combined), female (58.0%), Nurses (34.0%), holders of HND/BSc qualifications (67.2%), and had 0–10 years of service (50.0% combined) (Tables 2).

Table 2: Socio-Demographic Characteristics of Respondents.

Age (Years)	Frequency	Percentage (%)
25–29	42	16.8
30–34	55	22.0
35–39	51	20.4

40–44	43	17.2
45–49	31	12.4
50–54	18	7.2
55–59	10	4.0
Total	250	100.0

Sex	Frequency	Percentage (%)
Male	105	42.0
Female	145	58.0
Total	250	100.0

Professional Role	Frequency	Percentage (%)
Medical Records Personnel	45	18.0
Doctors	40	16.0
Nurses	85	34.0
Pharmacists	20	8.0
Laboratory Scientists	25	10.0
Administrative Staff	35	14.0
Total	250	100.0

Qualification	Frequency	Percentage (%)
Technician/ND	62	24.8
HND/BSc	168	67.2
Others	20	8.0
Total	250	100.0

Years in Service	Frequency	Percentage (%)
0–5 years	58	23.2
6–10 years	67	26.8
11–15 years	48	19.2
16–20 years	35	14.0
21–25 years	22	8.8
26–30 years	14	5.6
31–35 years	6	2.4
Total	250	100.0

Source: Fieldwork (2026), Tables 2.

4.3 Awareness and Utilization of EMR

A large majority of respondents (88.0%) were aware of the hospital's EMR system, 78.0% reported departmental use, and 68.0% used the system daily, primarily for patient record management (48.0%) (Tables 3).

Table 3: Awareness and Utilization of EMR.

Awareness of Electronic Medical Record (EMR) system	Frequency	Percentage (%)
Yes	220	88.0
No	18	7.2
I don't know	12	4.8
Total	250	100.0

Departmental use of EMR	Frequency	Percentage (%)
Yes	195	78.0
No	22	8.8
Partially	33	13.2
Total	250	100.0

Frequency of EMR usage	Frequency	Percentage (%)
Daily	170	68.0
Weekly	35	14.0
Occasionally	30	12.0
Never	15	6.0
Total	250	100.0

Respondents' ability to use Electronic Medical Record system	Frequency	Percentage (%)
Very Good	50	20.0
Good	110	44.0
Fair	65	26.0
Poor	25	10.0
Total	250	100.0

Source: Fieldwork (2026), Table 3.

4.4 Challenges Affecting EMR Implementation

Combined disagreement (Disagree + Strongly Disagree) exceeded agreement for computer availability (52.0% vs 38.0%), internet/network reliability (57.2% vs 34.0%), power supply stability (68.0% vs 24.0%), adequacy of training (54.0% vs 38.0%), and technical support availability (56.0% vs 34.0%), indicating these as substantial barriers. Management support was rated more favourably (52.0% agreement vs 36.0% disagreement), while a majority found the system easy to use (58.0% agreement) despite 62.0% acknowledging staff resistance and 56.0% agreeing that EMR increases workload (Table 4).

Table 4: Challenges Affecting EMR Implementation

Availability of computers for EMR usage	Frequency	Percentage (%)
Strongly Agree	35	14.0
Agree	60	24.0
Undecided	25	10.0
Disagree	80	32.0
Strongly Disagree	50	20.0
Total	250	100.0

Reliability of internet/network services	Frequency	Percentage (%)
Strongly Agree	28	11.2
Agree	57	22.8
Undecided	22	8.8
Disagree	88	35.2
Strongly Disagree	55	22.0
Total	250	100.0

Stability of power supply for EMR operations	Frequency	Percentage (%)
Strongly Agree	18	7.2
Agree	42	16.8
Undecided	20	8.0
Disagree	95	38.0
Strongly Disagree	75	30.0
Total	250	100.0

Adequacy of EMR training received	Frequency	Percentage (%)
Strongly Agree	30	12.0
Agree	65	26.0
Undecided	20	8.0
Disagree	80	32.0
Strongly Disagree	55	22.0
Total	250	100.0

Availability of technical support	Frequency	Percentage (%)
Strongly Agree	25	10.0
Agree	60	24.0
Undecided	25	10.0
Disagree	85	34.0
Strongly Disagree	55	22.0
Total	250	100.0

Management support for EMR implementation	Frequency	Percentage (%)
Strongly Agree	40	16.0
Agree	90	36.0
Undecided	30	12.0
Disagree	60	24.0
Strongly Disagree	30	12.0
Total	250	100.0

Ease of using Electronic Medical Record system	Frequency	Percentage (%)
Strongly Agree	45	18.0
Agree	100	40.0
Undecided	30	12.0
Disagree	50	20.0
Strongly Disagree	25	10.0
Total	250	100.0

Staff resistance towards EMR usage	Frequency	Percentage (%)
Strongly Agree	70	28.0
Agree	85	34.0
Undecided	20	8.0
Disagree	50	20.0
Strongly Disagree	25	10.0
Total	250	100.0

Electronic Medical Record increases workload	Frequency	Percentage (%)
Strongly Agree	60	24.0
Agree	80	32.0
Undecided	25	10.0
Disagree	55	22.0
Strongly Disagree	30	12.0
Total	250	100.0

Source: Fieldwork (2026), Table 4.

4.5 Perception and Readiness towards EMR

Healthcare workers reported strongly positive perceptions of EMR value: 82.0% agreed it improves patient care quality, 80.0% agreed it reduces medical error, 78.0% agreed it makes work easier, 84.0% expressed willingness to continue using EMR, and 70.0% expressed confidence in using the system (Tables 5).

Table 5: Perception and Readiness towards EMR.

EMR improves patient care quality	Frequency	Percentage (%)
Strongly Agree	110	44.0
Agree	95	38.0
Undecided	18	7.2
Disagree	17	6.8
Strongly Disagree	10	4.0
Total	250	100.0

Electronic Medical Record reduces medical error	Frequency	Percentage (%)
Strongly Agree	95	38.0
Agree	105	42.0
Undecided	20	8.0
Disagree	18	7.2
Strongly Disagree	12	4.8
Total	250	100.0

Electronic Medical Record makes work easier	Frequency	Percentage (%)
Strongly Agree	90	36.0
Agree	105	42.0
Undecided	20	8.0
Disagree	20	8.0

Strongly Disagree	15	6.0
Total	250	100.0

Willingness to continue using Electronic Medical Record	Frequency	Percentage (%)
Strongly Agree	120	48.0
Agree	90	36.0
Undecided	15	6.0
Disagree	15	6.0
Strongly Disagree	10	4.0
Total	250	100.0

Confidence in using Electronic Medical Record system	Frequency	Percentage (%)
Strongly Agree	80	32.0
Agree	95	38.0
Undecided	30	12.0
Disagree	28	11.2
Strongly Disagree	17	6.8
Total	250	100.0

Source: Fieldwork (2026), Tables 5.

4.6 Measures for Improving EMR Implementation

More staff training (28.0%) and stable electricity supply (22.0%) were the most frequently recommended measures; workshop-based training (48.0%) and monthly training frequency (46.0%) were the most preferred formats; and regular staff training (32.8%), improved internet connectivity (22.4%), and stable electricity supply (18.8%) were the leading open-ended suggestions for improvement (Table 6).

Table 6: Measures for Improving EMR Implementation.

Recommended measures for improvement	Frequency	Percentage (%)
More staff training	70	28.0
Better internet access	45	18.0
Stable electricity supply	55	22.0
Replacement of obsolete computers	30	12.0
More technical support	35	14.0
Increased manpower	10	4.0
Management encouragement	10	4.0
Staff incentives	5	2.0
Total	250	100.0

Preferred type of training	Frequency	Percentage (%)
Workshop	120	48.0
Online Training	40	16.0
On-the-Job Training	90	36.0
Total	250	100.0

Preferred frequency of Electronic Medical Record training	Frequency	Percentage (%)
Monthly	115	46.0
Quarterly	95	38.0
Yearly	40	16.0
Total	250	100.0

Respondents' suggestions for improving EMR implementation	Frequency	Percentage (%)
Regular staff training	82	32.8
Improved internet connection	56	22.4
Stable electricity supply	47	18.8
More computers	39	15.6
Better technical support	36	14.4
Increased management support	28	11.2
Recruitment of ICT personnel	21	8.4
Other suggestions	12	4.8

Source: Fieldwork (2026), Table 6.

4.7 Test of Hypotheses

Hypothesis One tested the relationship between technological, organizational, and human-related factors and EMR adoption. Cross-tabulation and Pearson Chi-square analysis revealed a statistically significant relationship ($\chi^2 = 28.571$, df = 1, $p < 0.001$), leading to rejection of the null hypothesis: respondents reporting adequate technological, organizational, and human support were substantially more likely to report Good EMR adoption (Table 7).

Table 7. Relationship between technological, organizational, and human factors and EMR adoption.

Factors Affecting EMR Adoption	Good EMR Adoption	Poor EMR Adoption	Total
Adequate technological, organizational and human support	120	20	140
Inadequate technological, organizational and human support	55	55	110
Total	175	75	250

Pearson Chi-square = 28.571, df = 1, p = 0.000. Decision: H_0 rejected.

Hypothesis Two tested the relationship between healthcare workers' perception/readiness and EMR utilization. A statistically significant relationship was found ($\chi^2 = 13.141$, df = 1, $p < 0.001$), and the null hypothesis was rejected: respondents with positive perception and high readiness were substantially more likely to report Good EMR utilization (Table 31).

Table 8. Relationship between healthcare workers' perception and readiness and EMR utilization.

Perception and Readiness Level	Good EMR Utilization	Poor EMR Utilization	Total
Positive perception and high readiness	170	25	195
Negative perception and low readiness	30	25	55
Total	200	50	250

Pearson Chi-square = 13.141, df = 1, p = 0.000. Decision: H_0 rejected.

5. DISCUSSION

This study assessed EMR implementation at FMC Jabi, Abuja, focusing on awareness and utilization, challenges, staff perception and readiness, and improvement strategies. The high level of awareness (88.0%) is consistent with Adenuga, Kekwaletswe, and Coleman (2020), who identified awareness as a prerequisite for successful adoption, while the finding that complete departmental integration has not yet been achieved (only 78.0% full departmental use, with 13.2% partial use) mirrors Ojo and Popoola's (2021) observation that Nigerian healthcare facilities typically experience gradual, uneven EMR adoption shaped by differences in infrastructure readiness and organisational support.

The identification of inadequate computer availability, unreliable internet, and unstable power supply as the most strongly endorsed barriers corroborates Ojo and Popoola (2021) and Boonstra and Broekhuis (2010), both of whom identified infrastructural deficiency as a primary constraint on EMR sustainability, particularly in developing healthcare settings where continuous power and connectivity cannot be assumed. That power supply recorded the highest combined disagreement (68.0%) among all challenge items suggests that electricity reliability, more than any other single factor, is the binding infrastructural constraint at this institution. Similarly, the finding that insufficient training and limited technical support constitute significant challenges aligns with Oluoch et al. (2020) and Alotaibi and Federico (2020), who found that inadequate user preparation and unresolved technical problems both reduce confidence in, and sustained use of, electronic health systems.

The coexistence of substantial staff resistance (62.0% combined agreement) and perceived increased workload (56.0%) alongside strongly positive perceptions of EMR's clinical value (82.0% agreement that EMR improves patient care quality; 84.0% willingness to continue use) echoes the pattern identified by Adedeji, Irinoye, and Ikono (2022): resistance in this context appears to reflect transitional friction, workload and unfamiliarity during the shift

from paper to digital documentation, rather than rejection of EMR's underlying value. This interpretation is reinforced by the Technology Acceptance Model, under which high perceived usefulness (evident here) should predict favourable behavioural intention even where perceived ease of use is imperfect, precisely the pattern observed.

The statistically significant relationship between technological, organizational, and human-related factors and EMR adoption ($\chi^2 = 28.571$, $p < 0.001$) empirically confirms the socio-technical premise underlying much of the reviewed literature (Kruse et al., 2021; Adenuga et al., 2020): EMR adoption is not primarily a technology-acquisition problem but a joint function of infrastructure, organisational support, and human factors acting together. Likewise, the significant relationship between perception/readiness and utilization ($\chi^2 = 13.141$, $p < 0.001$) is consistent with TAM's central proposition (Davis, 1989; Venkatesh & Bala, 2008) and with Kumar and Snooks (2020), who found that user trust and confidence significantly shape sustained EMR use. Together, these results indicate that improving EMR outcomes at FMC Jabi requires simultaneous attention to infrastructure, organisational support, and staff perception/readiness, rather than intervention on any single dimension in isolation.

6. CONCLUSION

This study assessed the challenges and strategies for improving Electronic Medical Record implementation at the Federal Medical Centre, Jabi, Abuja, and found that EMR awareness and utilization have reached a substantial level among healthcare workers, with most respondents using the system daily, primarily for patient record management, and expressing strongly positive perceptions of its contribution to patient care quality, error reduction, and workflow efficiency. At the same time, the study found that effective and consistent EMR utilization remains constrained by inadequate computer availability, unreliable internet connectivity, unstable electricity supply, insufficient training, and limited technical support, and that staff resistance and perceived workload increase persist despite generally favourable attitudes toward the technology's value. Statistically significant relationships were confirmed both between technological, organizational, and human-related factors and EMR adoption, and between healthcare workers' perception/readiness and EMR utilization, demonstrating empirically that successful EMR implementation depends on the joint alignment of infrastructure, organisational support, and human acceptance rather than on technology provision alone. The study concludes that sustainable EMR implementation at FMC Jabi, and by extension at comparable Nigerian tertiary hospitals, requires an integrated strategy

combining reliable ICT infrastructure, continuous staff training, dependable technical support, and sustained management commitment.

7. Recommendations

Based on the findings, the following five recommendations are made, each specifying the responsible party and the corresponding action:

1. FMC Jabi Hospital Management and ICT Department: should conduct an infrastructure audit and undertake phased procurement of functional computers, reliable backup power solutions (including generators and/or solar power), and dedicated internet bandwidth for EMR-dependent departments, prioritising units currently reporting the lowest availability and reliability scores.

2. Department of Health Information Management and Human Resources/Training Unit, FMC Jabi: should institute regular, workshop-based and on-the-job EMR training on a monthly-to-quarterly cadence, consistent with staff-expressed preferences, targeting both new users and staff reporting low confidence or fair/poor self-rated EMR competence.

3. FMC Jabi ICT Department: should establish or strengthen a dedicated, adequately staffed technical support team with defined response-time targets for troubleshooting, software updates, and system maintenance, to reduce downtime and rebuild user confidence in system reliability.

4. Hospital Management and Departmental Heads: should implement structured change-management measures, including staff involvement in EMR planning and evaluation, transparent communication of EMR benefits, and workload-adjustment support during the documentation transition, to address the resistance and perceived workload increase identified among healthcare workers.

5. Federal Ministry of Health, in collaboration with FMC Jabi Hospital Management: should develop and enforce clear institutional EMR policies covering data governance, privacy protection, user responsibilities, and system standardisation, and should mobilise sustained budgetary allocation for EMR infrastructure and maintenance beyond initial implementation.

8. Implications of the Study

The findings carry several practical and policy implications. First, the statistically confirmed joint influence of technological, organizational, and human-related factors on EMR adoption implies that hospital management cannot expect infrastructure investment alone to resolve implementation gaps; training, technical support, and change management must be funded

and scheduled concurrently with infrastructure upgrades rather than sequentially. Second, the finding that staff resistance and perceived workload increase persist despite strongly favourable perceptions of EMR's clinical value indicates that resistance at FMC Jabi is primarily transitional rather than attitudinal, implying that targeted workload and change-management support during the adoption period is likely to be more effective than persuasion-based campaigns aimed at convincing staff of EMR's usefulness. Third, because power supply and internet connectivity recorded the strongest disagreement among all challenge items, infrastructure interventions should be sequenced with electricity and connectivity reliability addressed first, as other investments (training, technical support) are unlikely to yield full benefit while these foundational constraints persist. Fourth, for health informatics research and practice in comparable Nigerian tertiary hospitals, the study demonstrates the practical value of testing technological, organizational, human, and perception/readiness factors as an integrated model rather than in isolation, since their statistically confirmed joint association with adoption and utilization outcomes has direct implications for how limited hospital resources should be sequenced and prioritised.

9. Contributions to Knowledge

1. Provision of an institution-specific, statistically validated assessment of EMR implementation at a major Federal Capital Territory tertiary hospital, extending a Nigerian EMR literature that has previously concentrated on multi-facility or state-level assessments rather than in-depth single-institution case studies.
2. Empirical demonstration, through Chi-square analysis of composite technological, organizational, and human-factor scores, that these three dimensions jointly and significantly predict EMR adoption, providing quantitative support for the socio-technical premise that technology alone does not determine implementation success.
3. Application of the Technology Acceptance Model to explain the observed coexistence of staff resistance and strongly positive perceived usefulness, offering a theoretically grounded interpretation of transitional resistance during EMR adoption that is transferable to other Nigerian tertiary institutions undergoing similar digital transitions.
4. Generation of a validated 28-item, four-section survey instrument (overall Cronbach's alpha = 0.791) covering EMR usage, technological/organizational/human challenges, perception and readiness, and improvement strategies, which can be adapted for EMR-implementation assessment in comparable tertiary healthcare institutions.

10. Limitations of the Study

This study has several limitations. First, it relies on self-reported perceptions of EMR awareness, utilization, challenges, and readiness rather than objective system-usage logs or infrastructure audit data, and is therefore subject to possible response bias. Second, the online questionnaire administration, while improving response rate and data organisation, may have under-represented staff with the lowest digital access or literacy, potentially producing a modest positive bias in reported EMR competence and utilization. Third, the case-study design, focused on a single tertiary hospital, limits the generalisability of findings to other Nigerian tertiary institutions with differing infrastructural, financial, or organisational profiles; the findings are most directly applicable to comparably resourced Federal Medical Centres. Fourth, the cross-sectional nature of the design captures a single point in time and cannot establish causality between technological/organizational/human factors and EMR adoption, nor track changes in implementation over time. Future longitudinal and multi-institutional studies, incorporating objective infrastructure and system-usage data, are recommended to build on these findings.

Author Contributions

Fayomi Stephen Mayowa: Conceptualisation, methodology, investigation, formal analysis, data curation, writing — original draft, writing — review and editing. Folasade Adediran: Supervision, conceptualisation, validation, writing — review and editing. Samuel Adeoye: Co-supervision, methodology review, validation, writing — review and editing. All authors read and approved the final manuscript.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data Availability Statement

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request, subject to institutional ethical approval and participant confidentiality safeguards.

Ethical Approval

This study was conducted in accordance with institutional ethical guidelines. Ethical approval was obtained from the Achievers University, Owo, Research Ethics Committee, and permission was obtained from the management of the Federal Medical Centre, Jabi, Abuja. Informed consent was obtained from all individual participants included in the study.

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