Electronic Health Records Implementation in Government own Hospitals Across Calabar Metropolis, Cross River State, Nigeria

Elemi Eko Edu[1], Prof. Kenneth S. Ordu[2], Dr. Ikpoko-ore-ebirien Dike Isaruk[3], Associate Prof. Anthony Ike Wegbom[4], Dr. Adetomi Bademosi[5],

[1, 2,4,5]Department of Public Health, Rivers State University, Port Harcourt, Nigeria.
[3]Rivers State College of Health Science and Management Technology, Department of Public Health Rivers State University, Port Harcourt, Nigeria.
Corresponding author email: dykeman1974@gmail.com & dykeman121@gmail.com; Tel: +2348063841529

Direct Research Journal of Health and Pharmacology

Vol. 13(1), Pp. 12-17, April 2026

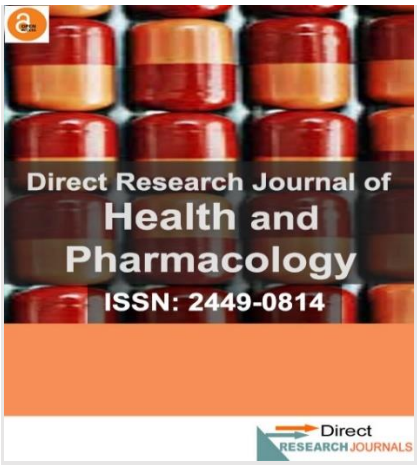
Research Article
ISSN: 2449-0814
https://journals.directresearchpublisher.org/index.php/drjhp; https://www.ajol.info/index.php/drjhp

Received 8 January 2026; Accepted 5 April 2026; Published 14 April 2026

ABSTRACT

This study assessed the level of Electronic Health Records (EHR) implementation in Government own hospitals across Calabar Metropolis, Cross River State, Nigeria. A cross-sectional descriptive design was adopted, involving 334 healthcare workers from five public hospitals. Data were collected using a structured, validated questionnaire and analyzed using descriptive statistics and multivariate regression. Approximately 50.3% of respondents reported moderate EHR implementation, while 49.7% reported low implementation. Personnel resources were identified as the most available (45.51%), while inadequate funding was the greatest challenge (31.94%). Manual data transmission dominated at 90.42%. Significant variations in implementation levels were observed across professional categories, staff status, and years of service. The study recommends targeted capacity building, infrastructural investment, and inclusive implementation strategies.

Keywords: *Electronic Health Records, EHR Implementation, Healthcare Delivery, Calabar Metropolis, Nigeria*



Citation: Elemi, E. E., Ordu, K. S., Isaruk, I. D., Wegbom, A. I. & Bademosi, A. (2026). *Electronic Health Records Implementation in Government own Hospitals Across Calabar Metropolis, Cross River State, Nigeria*. Direct Research Journal of Health and Pharmacology Vol. 13(1), Pp. 12-17,.
https://doi.org/10.26765/DRJHP17094393

INTRODUCTION

The global transition from paper-based medical records to Electronic Health Records (EHRs) has fundamentally transformed healthcare delivery systems. EHR systems serve as computerized repositories for patient health information, integrating clinical data, laboratory results, medication orders, and treatment histories into a

centralized digital platform (Tang & McDonald, 2020). The World Health Organization has recognized EHR as a primary technology platform for managing and documenting patient health information worldwide (WHO, 2017).

In Nigeria, EHR implementation has gained policy attention, yet progress has remained slow, with approximately 6% of hospitals meeting meaningful use criteria for EHR adoption (Thede & Schwirian, 2021). Challenges encompass inadequate infrastructure, financial constraints, lack of trained personnel, resistance to technology change, and poor data security frameworks (Institute of Medicine, 2020). In Calabar Metropolis, Cross River State, understanding the current level of EHR implementation and the factors influencing adoption is essential for developing effective digital health transformation strategies. Public hospitals in Calabar Metropolis continue to grapple with inadequate ICT infrastructure, unstable power supply, limited computer and internet access, insufficient funding, and a shortage of personnel with digital competencies (Holroyd-Leduc et al., 2021). Prior research indicates that up to 45% of healthcare workers in Nigeria entered the workforce before widespread EHR adoption, resulting in significant gaps in computer literacy (Fawdry et al., 2017). Without structured training and institutional support, these gaps translate into barriers that impede successful EHR implementation. This study addresses the need for empirical evidence on the current implementation landscape and its determinants across Government own hospitals in Calabar Metropolis.

Specific objectives

1. To assess the level of implementation of EHR across public hospitals in Calabar Metropolis.
2. To determine the resources available for EHR implementation across the study hospitals.
3. To identify the major challenges faced during EHR implementation in the study facilities.
4. To examine how socio-demographic and professional characteristics of healthcare workers influence EHR implementation levels.

LITERATURE REVIEW

EHR systems have been widely recognized as essential tools for improving the quality, efficiency, and safety of healthcare delivery. The Diffusion of Innovations Theory (Rogers, 1962) provides a useful framework for understanding EHR adoption, identifying relative advantage, compatibility, complexity, trialability, and observability as key determinants of adoption rates. Applied to EHR implementation, this framework suggests that perceptions of system usefulness and compatibility with existing workflows significantly shape adoption behavior (Hayrinen et al., 2019).

Research from Nigeria consistently highlights inadequate infrastructure as a primary barrier. Overhage (2020) documented that barriers include inadequate computers (50%), lack of uniform hospital standards (55%), and high start-up financial costs (60%). Gusen et al. (2016) further identified unstable power supply, limited internet connectivity, and insufficient technical support as major constraints. Professional background and educational attainment significantly influence EHR adoption; professionals with higher qualifications demonstrate greater digital literacy and receptiveness to EHR systems (Alharthi et al., 2021). The Technology-Organization-Environment (TOE) Framework further explains adoption by identifying technological, organizational, and environmental factors that collectively influence implementation outcomes.

METHODOLOGY

A cross-sectional descriptive design was adopted. The study was conducted across five Government own hospitals in Calabar Metropolis: University of Calabar Teaching Hospital, University of Calabar Medical Centre, Federal Neuropsychiatric Hospital Calabar, General Hospital Calabar, and Nigerian Navy Reference Hospital Calabar. The total staff population was 4,106. Using the Cochran's formula with a 95% confidence interval (Z=1.96) a 5% error margin, (e=0.05), and 50% assumed proportion (p=0.5, for maximum variability) that requires a sample size of approximately 4,10 6individuals a sample size of 384 was derived; 334 respondents constituted the final analyzed sample. A proportionate-to-size sampling technique was employed. Data were collected via a validated structured questionnaire from June 1 to October 1, 2025. The instrument achieved an overall Cronbach alpha reliability index of 0.87. Data were analyzed using IBM SPSS Version 25.0, incorporating descriptive statistics and multivariate regression analysis.

RESULTS

The results are presented in tables across the study objectives, followed by interpretations of key findings.

The study workforce is predominantly female (63.06%), mid-career (mean age 39.27 years), and composed largely of HIM professionals (32.34%) and nurses (30.24%). Most respondents hold HND/BSc qualifications (50.45%) and are full-time staff (79.94%), indicating a relatively stable, moderately educated workforce with varying digital health exposure (Table 1). Personnel constituted the primary available resource (45.51%), suggesting human capital availability but infrastructural deficiency. Inadequate funding (31.94%) was the leading implementation challenge, followed by lack of computer and internet facilities (25.00%) and unstable power

Table 1: Socio-Demographic Characteristics of Respondents (n=334).

Variable	Frequency (n)	Percentage (%)
Age Group		
Less than 25 years	45	13.47
25–29 years	61	18.26
30–39 years	89	26.65
40–49 years	64	19.16
50 years and above	75	22.46
Mean Age: 39.27 ± 0.79 years		
Gender		
Female	210	63.06
Male	123	36.94
Professional Category		
Doctors	40	11.98
Health Information Management	108	32.34
Medical Laboratory Scientists	62	18.56
Nurses	101	30.24
Pharmacists	23	6.89
Qualification		
ND/Technician	68	20.42
HND/BSc	168	50.45
Postgraduate	97	29.13
Staff Status		
Full-Time	267	79.94
Casual	67	20.06
Years of Service		
5 years or less	129	38.62
5–10 years	136	40.72
More than 10 years	69	20.66

supply (22.22%), collectively revealing systemic infrastructural gaps. The dominance of manual data transmission (90.42%) indicates minimal electronic integration, signifying that most hospitals remain in early transitional phases of digital health adoption (Table 2).

The near-equal split between low (49.70%) and moderate (50.30%) implementation levels, with no hospital achieving high implementation, confirms that EHR adoption in Calabar Metropolis is in a transitional phase. The mean implementation index of 1.50 ± 0.50 indicates that while electronic systems are operationally present, full institutional integration across all workflow processes has not yet been achieved. This reflects a hybrid phase where paper and electronic documentation coexist (Table 3). Doctors (65.00%) and HIM Practitioners (61.11%) reported the highest rates of moderate implementation, reflecting their central roles in clinical documentation and data governance. Conversely, nurses (61.39% low) and medical laboratory scientists (59.68% low) showed predominantly low implementation, indicating misalignment between EHR system design and their workflow needs.

Table 2: Distribution of EHR Implementation Characteristics Across Study Hospitals (Objective 1 & 2).

Variable	Frequency (n)	Percentage (%)
Major Resource Available for EHR Implementation		
Personnel	152	45.51
Finance	103	30.84
Technical	79	23.65
Mode of Training on EHR System		
Visual Training	127	38.02
Workshop	126	37.72
Seminars	81	24.25
Biggest Challenges During Implementation (Objective 3)		
Inadequate funding	92	31.94
Lack of computer & internet facilities	72	25.00
Unstable power supply	64	22.22
Inadequate training	33	11.46
Lack of interoperability standards	27	9.38
Mode of Data Transmission		
Manual Transmission	302	90.42
Electronic Transmission	32	9.58
Cybersecurity Measures		
Data Encryption	152	45.51
Antivirus Installation	150	44.91
Cybersecurity Systems/Password-Protected Logins	32	9.58

Table 3: Level of EHR Implementation Across Study Hospitals (Objective 3).

Implementation Level	Frequency (n)	Percentage (%)
Low Implementation	166	49.70
Moderate Implementation	168	50.30
High Implementation	0	0.00
Total	334	100.00
Mean Implementation Index: 1.50 ± 0.50		

Casual staff (76.12% moderate) outperformed full-time staff (43.82% moderate), possibly due to newer staff having greater digital adaptability. Longer-serving staff (>10 years: 66.67% low) showed lower integration, consistent with established paper-based practice routines.

Postgraduate-qualified staff showed slightly higher moderate implementation (54.64%), confirming that higher educational attainment supports digital health adoption (Table 4).

Table 4: EHR Implementation Level by Professional Category and Staff Characteristics (Objective 4).

Category	Low Implementation % (95% CI)	Moderate Implementation % (95% CI)
Professional Category		
Doctors	35.00 (21.91–50.83)	65.00 (49.17–78.09)
HIM Practitioners	38.89 (30.15–48.41)	61.11 (51.59–69.85)
Medical Lab Scientists	59.68 (47.07–71.12)	40.32 (28.88–52.93)
Nurses	61.39 (51.54–70.38)	38.61 (29.62–48.46)
Pharmacists	47.83 (28.74–67.57)	52.17 (32.43–71.26)
Staff Status		
Casual Staff	23.88 (15.15–35.54)	76.12 (64.46–84.85)
Full-Time Staff	56.18 (50.15–62.04)	43.82 (37.96–49.85)
Years of Service		
5 years or less	41.09 (32.91–49.79)	58.91 (50.21–67.09)
5–10 years	49.26 (40.93–57.64)	50.74 (42.36–59.07)
More than 10 years	66.67 (54.76–76.77)	33.33 (23.23–45.24)
Qualification		
ND/Technician	54.41 (42.51–65.83)	45.59 (34.17–57.49)
HND/BSc	50.00 (42.47–57.53)	50.00 (42.47–57.53)
Postgraduate	45.36 (35.73–55.36)	54.64 (44.64–64.27)

DISCUSSION

The finding that EHR implementation in Calabar Metropolis is distributed between low and moderate levels, with no facility achieving high implementation, is consistent with LMICs evidence documenting a transitional or hybrid phase of digitalization where electronic systems coexist with paper-based documentation (Oluoch et al., 2019). The predominance of personnel as the primary available resource, alongside inadequate funding and infrastructure as leading challenges, reflects the structural deficits characterizing digital health systems in resource-constrained settings (WHO, 2019; Gusen et al., 2016). The dominance of manual data transmission (90.42%) underscores the limited extent of electronic integration within the study hospitals. This is particularly concerning given that real-time electronic data exchange is fundamental to realizing EHR benefits, including improved care coordination and enhanced clinical decision-making (Boonstra et al., 2017). Professional variations in implementation levels are consistent with findings from other healthcare settings; doctors and HIM practitioners demonstrated higher moderate implementation reflecting their central documentation roles, while nurses showed comparatively lower integration (Kruse et al., 2018). The higher moderate implementation among casual staff compared to full-time employees may reflect greater adaptability and contemporary ICT skills among newer workforce entrants, while long-serving staff may be more entrenched in established paper-based routines (Oleribe et al., 2019).

Conclusion

EHR implementation across public hospitals in Calabar Metropolis remains in a transitional phase characterized by near-equal distribution between low and moderate adoption levels. No facility achieved high implementation, confirming that full institutional integration has not been realized. Systemic infrastructural deficits, particularly inadequate funding, limited ICT access, and unstable power supply, are the primary implementation constraints. Professional category, employment status, and years of service significantly shape implementation levels, underscoring the need for targeted, workforce-responsive digital health strategies. Sustainable EHR adoption requires coordinated investment in infrastructure, inclusive capacity building, and organizational change management tailored to diverse healthcare worker profiles.

RECOMMENDATIONS

i. Health authorities should consolidate existing EHR systems through standardized protocols promoting consistent cross-departmental utilization, particularly among nurse and laboratory science cadres.
ii. Government and hospital management should prioritize investment in reliable internet connectivity, stable power supply, and adequate hardware to address the most prevalent infrastructural barriers.
iii. Change management programs addressing the specific adaptation challenges of long-serving full-time staff should be developed, leveraging mentorship from digitally adaptable newer employees.
iv. Regular, structured EHR training programs with refresher components should be implemented for all professional categories, ensuring equitable access to digital health competency development.
v. Policymakers should develop regulatory frameworks promoting EHR standardization, interoperability, and data governance across public health institutions in Cross River State.

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