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Extent of Electronic Health Records Adoption and Utilization in Secondary and Tertiary Healthcare Institutions in Bayelsa State, Nigeria

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Abstract

Background: Electronic Health Records (EHRs) have been widely promoted as tools for improving healthcare quality, operational efficiency, and institutional effectiveness. However, adoption and utilization remain uneven in many developing countries, including Nigeria, where infrastructural, financial, and organizational barriers persist.

Objective: This study determined the extent of EHR adoption and utilization in selected secondary and tertiary healthcare institutions in Bayelsa State, Nigeria.

Methods: A cross-sectional comparative design was employed. The study population comprised 3,312 healthcare professionals across 70 selected secondary and tertiary healthcare institutions. A sample of 344 was determined using Cochran's formula and adjusted using the finite population correction formula. Multistage sampling was used to select respondents. Data were collected using a validated structured questionnaire (Cronbach's $\alpha = 0.70$) and analyzed using descriptive statistics with SPSS version 25.

Results: Of 344 questionnaires administered, 331 were validly completed and returned (96.2% response rate). The composite mean score for EHR adoption and utilization was 2.80 (SD = 1.32), below the benchmark of 3.00, indicating low adoption. Only 48 respondents (14.5%) were from hospitals with fully adopted EHR systems, 22 (6.6%) from hybrid hospitals, and 261 (78.9%) from non-adopted hospitals. The lowest-rated items were availability of a dedicated IT team (M = 2.58) and adequate technical infrastructure (M = 2.65).

Conclusion: EHR adoption and utilization remain low in secondary and tertiary healthcare institutions in Bayelsa State. The findings highlight the need for targeted investment in digital health infrastructure,

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technical support, and staff training.

Keywords: Electronic Health Records, EHR Adoption, Health Information Management, Digital Health, Bayelsa State, Nigeria

1. INTRODUCTION

The healthcare sector globally has undergone significant technological transformation over the past two decades, with Electronic Health Records (EHRs) emerging as one of the most consequential innovations (Goldzweig et al., 2018). EHRs are digital versions of patients' health information that are created, stored, managed, and shared electronically within and across healthcare institutions. They contain comprehensive patient data, including medical history, diagnoses, medications, laboratory results, and treatment plans, all of which support healthcare delivery and clinical decision-making (Häyrinen et al., 2021).

The potential benefits of EHR systems are well documented. They include improved documentation accuracy, enhanced care coordination, reduced medical errors, faster access to patient information, and improved operational efficiency (Adler-Milstein & Jha, 2017; Buntin et al., 2019). Furukawa et al. (2021) demonstrated that hospitals with advanced EHR capabilities reported reduced medication error rates and improved clinical quality outcomes. Similarly, Menachemi et al. (2021) reported improvements in operational metrics such as patient throughput, documentation completeness, and billing accuracy.

Regardless of these documented benefits, the adoption and utilization of EHR systems remain uneven across healthcare institutions globally. In developed countries such as the United States, government policies and financial incentives have accelerated EHR adoption, with studies reporting that over 90% of hospitals had adopted at least a basic EHR system by 2020 (Adler-Milstein et al., 2021). However, in developing countries, including Nigeria, the situation is markedly different. The World Health Organization (2021) reported that many low- and middle-income countries continue to experience limited EHR adoption because of inadequate ICT infrastructure, unreliable electricity supply, poor internet connectivity, insufficient financial resources, and shortages of skilled personnel.

Nigeria, despite having developed strategic frameworks to promote digital health transformation, continues to face significant challenges in implementing and utilizing EHR systems across healthcare institutions (Federal Ministry of Health, 2022). The country's healthcare system is characterized by a mix of tertiary, secondary, and primary healthcare institutions, with varying levels of technological readiness, infrastructure, and workforce capacity. In Bayelsa State, located in the South-South geopolitical zone, healthcare institutions differ in their levels of EHR implementation and utilization, creating a need for empirical investigation into the actual state of adoption.

Existing studies on EHR adoption in Nigeria have largely focused on tertiary institutions in major urban centers, with limited attention to secondary and tertiary institutions in states such as Bayelsa. Furthermore, most studies have examined adoption at a general level without disaggregating the specific dimensions of adoption and utilization across different hospital categories. This study, therefore, sought to determine the extent of EHR adoption and utilization in selected secondary and tertiary healthcare institutions in Bayelsa State, providing localized evidence to inform policy and practice.

The specific objective of this study was to determine the extent of EHR adoption and utilization in healthcare institutions in Bayelsa State. The research question guiding this objective was: What is the extent of EHR adoption and utilization in healthcare institutions in Bayelsa State?

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2. LITERATURE REVIEW

2.1 Conceptual Review of Electronic Health Records

Electronic Health Records are digital representations of patients' clinical charts and serve as central repositories of health information. The World Health Organization defines an EHR as a secure, digital version of a patient's medical chart, emphasizing accessibility for authorized providers and its role in supporting clinical decision-making (WHO, 2021). Häyrinen et al. (2021) focus on the real-time and collaborative nature of EHRs, highlighting their capacity to allow multiple authorized users to access accurate clinical data concurrently.

From a clinical and organizational perspective, Vest and Kash (2019) describe EHRs as tools that support workflows, enhance patient safety, and improve organizational efficiency. Furukawa (2021) emphasizes that EHRs provide a centralized platform that enables evidence-based decision-making, reducing medical errors and enhancing quality of care. Kruse et al. (2020) provide a comprehensive definition that integrates security, accessibility, clinical utility, and organizational performance.

EHR adoption refers to the process through which healthcare institutions introduce, implement, and integrate EHR systems into their daily clinical and administrative activities. This process goes beyond the installation of technology. It involves changes in how healthcare professionals work, how information is managed, and how decisions are made within the organization (Kruse et al., 2018). EHR utilization, on the other hand, refers to the actual use of EHR systems by healthcare professionals in performing clinical, administrative, and health information management functions.

2.2 Empirical Review of EHR Adoption in Developing Countries

Empirical evidence from developing countries consistently indicates that EHR adoption remains low. Were et al. (2019) conducted a systematic review titled "Electronic Health Record Implementation in Developing Countries: Barriers and Opportunities" and identified unreliable electricity supply, poor internet connectivity, and inadequate funding as major barriers. The review also found that many donor-funded EHR projects collapse once external financial support ends, threatening sustainability.

In a study titled "Barriers to Electronic Health Record Adoption in Ghanaian District Hospitals," Dankwa-Mullan and Bediako-Boateng (2018) identified unreliable electricity supply, limited internet connectivity, inadequate trained personnel, and insufficient funding as major barriers. Healthcare workers also reported difficulties maintaining EHR infrastructure because of financial constraints and lack of technical expertise.

Okonkwo and Adebiyi (2024) carried out a review titled "Physicians' Adoption of Electronic Medical Records in Developing Economies" and found that perceived usefulness and ease of use were the major factors influencing physicians' adoption of Electronic Medical Records (EMRs). The review also identified inadequate infrastructure, unreliable electricity, and poor training as important barriers limiting effective implementation.

Tsegaye and Gashaw (2023) did a meta-analysis titled "Electronic Medical Record Use Among Healthcare Professionals in Ethiopia" and reported a pooled EMR usage rate of about 42 percent. Walle and colleagues (2023) found a pooled readiness rate of approximately 51 percent among healthcare workers regarding EMR adoption in Ethiopia.

In the Nigerian context, Adeleke et al. (2015) assessed EHR implementation among tertiary healthcare institutions and found that only a limited number of hospitals had fully implemented comprehensive EHR systems, while most institutions operated hybrid documentation systems. Afolabi et al. (2021) investigated

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the adoption of digital health technologies in public hospitals in Southwest Nigeria and reported that fewer than half of the hospitals surveyed had functional EHR systems. Nwosu et al. (2023) examined digital health adoption in Nigerian hospitals and reported a gradual increase in EHR implementation, particularly among tertiary healthcare institutions, but noted that many secondary hospitals continued to depend heavily on paper-based record systems.

Adenuga et al. (2017) assessed EHR utilization among healthcare professionals using a sample of physicians, nurses, and health information managers and found that frequency of EHR use differed significantly across professional groups. Health information managers demonstrated the highest level of utilization, while some clinical staff reported irregular use due to workflow challenges and system downtime.

2.3 Theoretical Framework: Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) Theory, propounded by Rogers (2003), provides a useful framework for understanding EHR adoption. According to Rogers, diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system. The theory identifies five characteristics of innovations that influence adoption: relative advantage, compatibility, complexity, trialability, and observability.

In the context of EHR adoption, compatibility reflects the degree to which EHRs align with existing clinical practices, organizational culture, and work routines. Complexity concerns the perceived difficulty of learning and using the system. Trialability refers to the opportunity for healthcare providers to experiment with EHR systems on a limited scale before full implementation. Observability relates to the visibility of results and benefits.

The DOI theory helps explain why EHR adoption remains low in many developing countries. When EHR systems are perceived as incompatible with existing workflows, overly complex, or lacking observable benefits, adoption rates remain low. The theory also emphasizes the importance of communication channels and opinion leaders in influencing adoption decisions, suggesting that hospital champions and clinical leaders can shape perceptions of EHR value.

3. METHODOLOGY

3.1 Study Area

The study was conducted in Bayelsa State, Nigeria, one of the oil-producing states located in the South-South geopolitical zone. The state was created on October 1, 1996, from the former Rivers State. According to Bayelsa State Ministry of Health (2025), there are 309 health institutions in the state, comprising 224 primary healthcare institutions, 81 secondary healthcare institutions, and 4 tertiary healthcare institutions. The healthcare system is characterized by a combination of government-owned hospitals, private clinics, cottage hospitals, and specialist healthcare facilities.

3.2 Study Design

A cross-sectional comparative research design was adopted. This design was considered appropriate because it enables the researcher to collect data from respondents at a single point in time and compare the extent of EHR adoption among selected secondary and tertiary healthcare institutions.

3.3 Study Population

The target population consisted of 3,312 healthcare professionals, including medical doctors, nurses, pharmacists, medical laboratory scientists, and Health Information Management (HIM) personnel, drawn from 70 selected secondary and tertiary healthcare institutions across Bayelsa State.

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3.4 Sample Size Determination

A sample size of 344 healthcare professionals was determined using Cochran's (1977) formula for sample size determination. An initial sample size of 384 was obtained at a 95% confidence level and 5% margin of error. Since the study population was finite (N = 3,312), the finite population correction (FPC) formula was applied, resulting in an adjusted sample size of 344.

3.5 Sampling Technique

A multistage sampling technique was employed. Stage 1 involved purposive sampling to select 70 healthcare institutions out of 85 eligible tertiary and secondary healthcare institutions. Stage 2 involved stratification of healthcare institutions according to ownership and level of healthcare delivery. Stage 3 involved stratification of health workers according to professional categories, with proportionate allocation used to determine the number of respondents from each category. Stage 4 involved simple random sampling to select individual respondents from each stratum.

3.6 Instrument for Data Collection

The instrument used was a structured questionnaire titled "Questionnaire on the Impact of Electronic Health Records on Institutional Effectiveness (QIEHRIE)." Section B of the questionnaire focused on the extent of EHR adoption and utilization, containing 10 items measured on a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1).

3.7 Validity and Reliability of the Instrument

Face and content validity were established through expert review by supervisors and specialists in Health Information Management and Research Methodology. A pilot study was conducted, and the Cronbach's Alpha reliability test yielded a coefficient of 0.70, confirming internal consistency.

3.8 Method of Data Analysis

Data were analyzed using SPSS version 25. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and answer the research question. A criterion mean of 3.00 was adopted as the benchmark for decision-making.

3.9 Ethical Consideration

Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Basic Medical Sciences, Rivers State University (RSU/FBMS/REC/26/696). Additional approvals were obtained from Federal Medical Center, Yenagoa (FMCY/REC/ECC/2025/NOV/971) and Niger Delta University Teaching Hospital, Okolobiri (NDUTH/REC/0125/2025). Confidentiality and anonymity were maintained throughout the study.

4. RESULTS

4.1 Response Rate and Demographic Characteristics

Of the 344 questionnaires distributed, 331 were properly completed and returned, yielding a response rate of 96.2%. Table 1 presents the demographic and professional characteristics of respondents.

Table 1: Demographic and Professional Characteristics of Respondents (n = 331)

Variable	Category	Frequency	Percentage (%)
Profession/Designation	Medical Doctors	68	20.5
	Nurses	124	37.5

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Variable	Category	Frequency	Percentage (%)
	Health Information Management Personnel	62	18.7
	Pharmacists	36	10.9
	Medical Laboratory Scientists	41	12.4
	Total	**331**	**100.0**
Years of Experience	1–5 years	87	26.3
	6–10 years	108	32.6
	11–15 years	72	21.8
	16–20 years	40	12.1
	Above 20 years	24	7.2
	Total	**331**	**100.0**
Gender	Male	152	45.9
	Female	179	54.1
	Total	**331**	**100.0**
Age Bracket	20–29 years	70	21.1
	30–39 years	114	34.4
	40–49 years	87	26.3
	50–59 years	44	13.3
	60 years and above	16	4.9
	Total	**331**	**100.0**
Educational Qualification	Diploma/Certificate	37	11.2
	Bachelor's Degree/HND	152	45.9
	Master's Degree	94	28.4
	Fellowship/PhD	31	9.4
	Others	17	5.1
	Total	**331**	**100.0**

Respondents represented five major professional categories. Nurses constituted the largest group (124, 37.5%), followed by medical doctors (68, 20.5%), Health Information Management personnel (62, 18.7%), medical laboratory scientists (41, 12.4%), and pharmacists (36, 10.9%).

Regarding professional experience, respondents with 6–10 years of experience formed the largest proportion (108, 32.6%). The gender distribution indicated a slight female majority, with 179 respondents

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(54.1%) female and 152 (45.9%) male.

The age distribution showed that respondents aged 30–39 years constituted the largest age group (114, 34.4%). In terms of educational qualification, respondents holding Bachelor's degrees or HND formed the largest proportion (152, 45.9%), followed by those with Master's degrees (94, 28.4%).

4.2 Institutional Characteristics and Level of EHR Adoption

Table 2: Distribution of Respondents by Institutional Characteristics and Level of EHR Adoption

Variable	Category	Frequency	Percentage (%)
Hospital Type	Tertiary Hospitals	172	51.96
	Secondary Hospitals	159	48.04
	Total	**331**	**100.0**
Hospital Ownership	Public (Government-owned)	224	67.7
	Private	107	32.3
	Total	**331**	**100.0**
Level of EHR Adoption	Adopted	48	14.5
	Hybrid Hospitals	22	6.6
	Non-Adopted Hospitals	261	78.9
	Total	**331**	**100.0**

Table 2 presents the distribution of respondents according to hospital type, ownership, and level of EHR adoption. Slightly more than half of respondents (172, 51.96%) were drawn from tertiary hospitals, while 159 (48.04%) were from secondary hospitals.

With respect to hospital ownership, 224 respondents (67.7%) were from public or government-owned hospitals, while 107 (32.3%) were from private hospitals.

The distribution by level of EHR adoption reveals that only 48 respondents (14.5%) were from hospitals that had fully adopted EHR systems, while 22 (6.6%) were from hybrid hospitals. The majority, 261 respondents (78.9%), were from hospitals that had not adopted EHR systems. Overall, only 21.1% of respondents were from hospitals with either fully adopted or hybrid EHR systems.

4.3 Extent of EHR Adoption and Utilization

Table 3: Extent of EHR Adoption and Utilization (n = 331)

Item	Statement	Mean ($\bar{X}$)	SD	Decision
1	My hospital has implemented an EHR system	2.98	1.25	Not Adopted
2	EHRs are used in my department for patient care	2.85	1.32	Not Adopted

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Item	Statement	Mean ($\bar{X}$)	SD	Decision
3	Patient information is stored/retrieved electronically	2.92	1.28	Not Adopted
4	EHRs are integrated into routine clinical workflows	2.78	1.35	Not Adopted
5	Professionals regularly use EHRs for documentation	2.82	1.30	Not Adopted
6	EHRs are accessible to authorised providers	2.88	1.27	Not Adopted
7	Adequate technical infrastructure exists for EHRs	2.65	1.38	Not Adopted
8	Staff have received formal EHR training	2.72	1.35	Not Adopted
9	EHRs are used across multiple departments	2.80	1.33	Not Adopted
10	Hospital has a dedicated IT team for EHR support	2.58	1.40	Not Adopted
Composite Mean		**2.80**	**1.32**	**Not Adopted**

The composite mean score of 2.80 (SD = 1.32) indicates a low level of EHR adoption and utilisation across surveyed hospitals. Only one item approached the adoption threshold (Item 1: "My hospital has implemented an EHR system," M = 2.98), while the lowest scores were recorded for having a dedicated IT team for EHR support (Item 10, M = 2.58) and adequate technical infrastructure (Item 7, M = 2.65).

Standard deviations ranged from 1.25 to 1.40, indicating considerable variability in EHR adoption levels across hospitals and departments.

5. DISCUSSION

The findings of this study revealed a low level of EHR adoption and utilisation among healthcare institutions in Bayelsa State, with a composite mean score of 2.80, which is below the benchmark mean of 3.00. This finding indicates that the implementation and routine utilization of EHR systems remain inadequate across the healthcare institutions studied. It suggests that although some healthcare facilities have introduced digital health initiatives, comprehensive implementation and meaningful utilization of EHR systems have not been fully achieved. Consequently, many healthcare institutions continue to rely on paper-based record systems or hybrid documentation models.

The observed low level of EHR adoption and utilization reflects the current state of digital health implementation in many low- and middle-income countries. The findings align with the World Health Organization (2021) report that despite increasing global investment in digital health technologies, many developing countries continue to experience limited EHR adoption because of inadequate ICT infrastructure, unreliable electricity supply, poor internet connectivity, insufficient financial resources, and shortages of skilled personnel.

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The findings are consistent with several empirical investigations. Kruse et al. (2018), in a systematic review of barriers and facilitators influencing EHR adoption, reported that although many healthcare institutions had implemented EHR systems, the extent of utilization varied considerably across hospital departments. The authors attributed these variations to differences in organizational readiness, leadership commitment, user competence, and the availability of technical support, emphasizing that the installation of EHR infrastructure alone does not guarantee meaningful utilization across an organization.

The present findings also corroborate those of Adeleke et al. (2015), who assessed EHR implementation among tertiary healthcare institutions in Nigeria. Their study found that only a limited number of hospitals had fully implemented comprehensive EHR systems, while most institutions operated hybrid documentation systems combining electronic and paper-based records. Although the study was conducted several years ago, the persistence of similar findings in the present study suggests that progress in achieving comprehensive EHR implementation across Nigerian healthcare institutions has been relatively slow.

Afolabi et al. (2021) investigated the adoption of digital health technologies in public hospitals in Southwest Nigeria and reported that fewer than half of the hospitals surveyed had functional EHR systems. Furthermore, among hospitals that had implemented EHRs, utilization was largely restricted to administrative activities such as patient registration and billing, while comprehensive clinical documentation remained predominantly manual. This finding indicates that digital transformation within many Nigerian healthcare institutions remains at an early stage.

More recently, Nwosu et al. (2023) examined digital health adoption in Nigerian hospitals and reported a gradual increase in EHR implementation, particularly among tertiary healthcare institutions. However, the study found that many secondary hospitals continued to depend heavily on paper-based record systems, resulting in substantial disparities in the level of EHR adoption across different categories of healthcare facilities. This finding supports the results of the present study and suggests that although progress has been made in digital health implementation, adoption remains uneven across the Nigerian healthcare system.

At the global level, Tsai et al. (2020) reported that hospitals with strong institutional support, adequate financial resources, and continuous staff training achieved significantly higher levels of EHR utilization than hospitals lacking these organizational capabilities. The authors further emphasized that EHR utilization should not be viewed merely as the existence of electronic systems but as a multidimensional concept encompassing the frequency of system use, the breadth of departmental coverage, and the integration of EHRs into routine clinical decision-making processes.

The finding that inadequate technical infrastructure was a major barrier aligns with the Diffusion of Innovation Theory, which posits that adoption is influenced by compatibility and complexity. When EHR systems are perceived as incompatible with existing infrastructure and workflows, or overly complex to use, adoption rates remain low. The low mean scores for adequate technical infrastructure (M = 2.65) and dedicated IT team (M = 2.58) suggest that healthcare institutions in Bayelsa State face significant technological and human resource constraints that impede EHR adoption.

6. CONCLUSION

This study has established that the extent of EHR adoption and utilization in secondary and tertiary healthcare institutions in Bayelsa State remains low, with a composite mean score of 2.80. Only 21.1% of respondents were from hospitals with either fully adopted or hybrid EHR systems, while 78.9% were from non-adopted hospitals. The findings highlight significant gaps in technical infrastructure, IT support, and

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staff training. Addressing these gaps is essential for accelerating EHR adoption and realizing its potential benefits for healthcare delivery and institutional effectiveness.

7. RECOMMENDATIONS

From the findings of this study, the following recommendations are made:

1. The Bayelsa State Ministry of Health should develop a clear policy and roadmap for full EHR adoption across all levels of healthcare, with adequate budgetary provision for ICT infrastructure and EHR software procurement.
2. Hospital management should prioritize investment in technical infrastructure, including stable power supply, reliable internet connectivity, and dedicated IT support personnel.
3. Regular training and retraining programs should be organized for healthcare professionals to improve their digital skills and confidence in using EHR systems.
4. Government and hospital management should address infrastructural challenges by providing alternative power sources and stable internet connectivity.
5. Change management programs and awareness campaigns should be implemented to reduce staff resistance to EHR adoption.

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