

## EFFECT OF HEALTH RECORD AUTOMATION ON HEALTH CARE SERVICE DELIVERY IN PRIVATE HOSPITALS IN KANO

Dr Bayode Olawale Ezekiel<sup>1</sup> and Dr Ibrahim Musa Saulawa<sup>2</sup>

<sup>1</sup>Dept of Community Medicine, Aminu Kano Teaching Hospital, Kano.

<sup>2</sup>Dept of Community Medicine, Federal University, Dutse

Correspondence: 08063846210

<https://orcid.org/0009-0009-8534-7647>

### Abstract

*This research investigates the effect of health record automation, specifically electronic health records (EHR) on health care service delivery in private hospitals in Kano. Utilizing a quantitative methodology with a structured questionnaire administered to 186 healthcare professionals across five leading private hospitals, the study examined operational efficiency, patient care quality, data management, and departmental performance with respect to EHR adoption. Key findings indicate that EHR implementation significantly improves patient information accessibility, reduces the occurrence of missing files, and streamlines the process of accessing and transferring medical data. Statistical analysis confirms a strong positive correlation between EHR use and improved health service delivery, with notable enhancements in patient output and reduced documentation errors. However, challenges such as system interoperability, user training needs, and resistance to change were identified as barriers to optimal use. The investigation further reveals mixed perspectives on the effect of EHR on workflow and waiting times, but overall, most respondents acknowledge its benefits in interdepartmental coordination and performance. The study concludes by recommending targeted staff training, stringent privacy protocols, and phased digital rollout strategies to maximize EHR benefit*

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**Keywords:** Electronic Health Records, Health Automation, Private Hospitals, Healthcare Service Delivery, Kano State, Nigeria.

### Introduction

Health information systems have rapidly evolved with the integration of Information and Communication Technology (ICT), transforming traditional paper records into Electronic Health Records (EHRs) in hospitals globally (Hillestad et al., 2005; Adler-Milstein et al., 2013). EHRs are comprehensive digital platforms for collecting, storing, and retrieving patient data, offering improved efficiency and accuracy in the delivery of health care (Hillestad et al., 2005; Adler-Milstein et al., 2013).

In high-income countries, EHR adoption is widespread, and positive impacts on clinical outcomes and service delivery are well documented (Hillestad et al., 2005; Adler-Milstein et al., 2013). Nigeria's healthcare system, especially among private sector providers, faces challenges in keeping pace with this global trend (Jeminiwa & Fox, 2016; Oleribe et al., 2019). Factors such as infrastructural deficits, financial constraints, and inadequate human resources hamper EHR adoption and usage in many facilities. Nevertheless, several private hospitals in major cities, including Kano, have recently implemented EHR to optimize health care

delivery and patient experience (Jeminiwa & Fox, 2016; Oleribe et al., 2019). However, little is known about the effect of EHR on service delivery in such facilities. This research examines the relationship between health record automation and service delivery in private hospitals in Kano. Specifically, it evaluates how EHR influences record accessibility, clinical decision-making, interdepartmental coordination, and patient management efficiency.

While global studies have extensively explored EHR effects on health care service delivery, there is a paucity of localized research within Kano and environ that specifically addresses these outcomes (Johnson, 2021). Kano's unique infrastructural, cultural, and operational characteristics may present different challenges and opportunities in EHR implementation compared to other regions. As such, there is a need for an in-depth investigation into how these systems affect local healthcare service delivery (Jeminiwa & Fox, 2016; Oleribe et al., 2019). This research, therefore, seeks to critically examine the effect of Electronic Health Records (EHR) on healthcare service delivery in Kano, Nigeria. It aims to empirically investigate whether EHR implementation has positively or negatively influenced the efficiency and quality of healthcare services in this region. This study seeks to fill this gap. The answer to the research question; What is the relationship between Electronic Health Records (EHR) and healthcare service delivery in private hospitals in Kano? will provide insights crucial for healthcare administrators and policymakers in making informed decisions regarding the

adoption and optimization of EHR systems in similar contexts (Adams & Kumar, 2022).

By examining the specific context of Kano, this research contributes to the broader understanding of EHRs in varying healthcare environments, offering valuable data that can guide future EHR implementation strategies in regions with similar characteristics.

The significance of this study lies in its focused examination of how technological advancements in the form of Electronic Health Records (EHR) are reshaping health service delivery within Kano's private healthcare sector. This research endeavors to meticulously evaluate the nexus between EHR usage and the quality of healthcare, aiming to provide detailed insights into the benefits and challenges that come with EHR integration. It is anticipated that the study will shed light on the degree to which EHRs can enhance the accuracy of diagnoses, the efficiency of treatments, and the satisfaction of patients with their care. Administratively, the study will explore how EHRs can potentially streamline hospital operations, reduce duplicative testing and procedures, and better manage hospital resources. Such improvements could be instrumental for hospital administrators to optimize service delivery, especially when operating under financial constraints. The research was also poised to offer valuable contributions to the field of health informatics in Nigeria, adding empirical data and insights that can guide the further development of health information systems in the region. By capturing data and experiences specific to Khadijat Memorial Hospital, Expert Alliance

Hospital, MGK Healthcare, New Greenland Hospital, and Barewa Clinic and Maternity,

the study seeks to illuminate the specificities of EHR impacts on health care delivery in Kano

## Literature Review

### Global Developments in Health Record Automation.

The movement toward electronic record keeping in health care has its foundation in innovations aimed at reducing inefficiencies associated with paper records. Globally, EHR implementation is linked with increased quality of care, patient safety, better clinical outcomes, communication efficiency, and reduced costs (Hillestad et al., 2005; Adler-Milstein et al., 2013). However, the degree of impact is often influenced by contextual factors including policy support, infrastructure, and end-user capacity.

### EHR Benefits in African Health Systems.

Sub-Saharan African countries have lagged in the adoption of EHRs, primarily due to funding, infrastructural, and training limitations (Jeminiwa & Fox, 2016; Oleribe et al., 2019). Case studies from Kenya, South Africa, and Ghana demonstrate that with appropriate investments, EHRs have improved workflow, reduced duplication, and increased provider satisfaction.

### Nigerian Experience.

Nigerian studies highlight both opportunities and obstacles. Akanbi et al. (2012) report notable efficiency gains in facilities that digitize patient records but stress the need for supportive infrastructure and skilled personnel. Barriers identified by Adewole et al. (2016) include inconsistent

power supply, limited internet access, data privacy concerns, and high initial costs. However, successful EHR adopters have reported improved documentation, reduced errors, and strengthened health service delivery (Odetola & Adebisi, 2020; Yusuf & Soar, 2014).

### Methodology

#### Study Design.

This study adopted a descriptive cross-sectional survey design to evaluate the effect of health record automation on service delivery in private hospitals in Kano, Nigeria.

### Population and Sample.

The population for this study is identified as the healthcare professionals who are employed at five selected private hospitals in Kano: Khadijat Memorial Hospital, Expert Alliance Hospital, MGK Healthcare, New Greenland Hospital, and Barewa Clinic and Maternity. This group represents a range of healthcare personnel, including doctors, nurses, medical laboratory scientists, medical laboratory technicians, pharmacists and pharmacy technicians, receptionists and administrative staff, all of whom regularly interact with Electronic Health Records (EHR) within their respective duties. These hospitals have been carefully selected based on their implementation of functional EHR systems and their contribution to a representative cross-section of Kano's private healthcare services. A total of 300 healthcare professionals are employed by these 5 private hospitals. This has been ascertained from the most recent employment records provided by the human resources departments of the hospitals, ensuring that the study's population is accurately reflected and that the source of data is verifiable and up to date.

These hospitals are chosen because they stand out not only for their operational EHR systems but also for their comprehensive implementation of these systems across various service areas. They also exceed the minimum threshold for bed space, ensuring the study's findings are reflective of the EHR's role in a range of healthcare delivery contexts. This selection allows the research to thoroughly investigate how fully functional EHR systems contribute to healthcare service

quality in Kano's private hospital sector. Stratified sampling technique was employed to satisfy professional diversities and the possibility of ample representation of the different cadres of professionals interfacing with HER across different service points.

Using Yamane's formula for sample size at 95% confidence and 5% margin, 171 respondents were required. This figure was increased to 188, factoring in a 10% (17) non-response rate. Stratified random sampling ensured diverse professional representation.

$$n = \frac{N}{1+N(e^2)}$$

where:

- $n$  is the sample size,
- $N$  is the population size (300),
- $e$  is the margin of error (0.05).

Plugging the values into the Yamane formula gives:

$$n = \frac{300}{1+300(0.05^2)}$$

$$n = \frac{300}{1+300(0.0025)}$$

$$n = \frac{300}{1+0.75}$$

$$n = \frac{300}{1.75}$$

$$n \approx 171.43$$

In this study, stratified random sampling has been selected as the sampling technique. This method is appropriate for the revised population of 300 healthcare professionals employed at Khadijat Memorial Hospital, Expert Alliance Hospital, MGK Healthcare, New Greenland Hospital, and Barewa Clinic and Maternity. The stratification was based on their specific roles such as physicians, pharmacists, laboratory personnel, nurses, technicians, and

administrative personnel within these hospitals. By categorizing the population into these strata, we can ensure that each subgroup is proportionately represented in the sample.

Random sampling within each stratum was then employed to select the study participants, thereby allowing for the collection of diverse experiences and perspectives on the use of EHR systems across various professional functions. This sampling technique is particularly chosen for its

effectiveness in reflecting the heterogeneity of the entire population, and its potential to enhance the validity and reliability and representativeness of the research findings. Moreover, stratified random sampling aids in reducing sampling bias, thereby improving the study's generalizability to the broader healthcare worker population in other hospital settings. Allocation of study participants to different study hospitals based on their staff strength 50(27%) to MGK, 45(24%) to Expert Alliance, 43(23%) to Barewa Hospital and maternity, 40(22%) to Khadijat Memorial hospital and 8(4%) to New Greenland hospital. Three factors were considered in the distribution of study participants into the strata based on roles: Nature of job, degree of interaction with the EMR and the number of personnel in each role. 50 representing 27% of the total number of participants were allocated to doctors across all levels, 47(25%) to nurses, 37(20%) to administrative staff across all cadres, 19(10%) to pharmacy personnel, 21(11%) to laboratory

personnel and 12(7%) to others like IT staff, record personnel, CHEWS e.tc.

A validated questionnaire, divided into demographic details, EHR experience, impacts on core delivery metrics, and challenges, was deployed. The reliability coefficient (Cronbach's alpha) was 0.84, confirming strong internal consistency. Physical questionnaires were administered to participants after obtaining institutional ethical clearance and participant consent. Confidentiality and voluntary participation were ensured.

The collected data from structured questionnaires was analysed using SPSS version 22.0. Descriptive statistics using frequencies and percentages were used to summarize the data. Inferential statistics using Pearson's correlation and simple linear regression were used to estimate relationships between EHR implementation and service delivery outcomes. All analyses were conducted at the 0.05 level of significance.

**Results**

**Sociodemographic characteristics of the respondents**

**Table 1: Sociodemographic characteristics of the respondents**

Age group (Years)	Frequency (N)	Percent (%)
18–25	59	32
26–35	76	41
> 35	51	27
<b>Gender</b>		
Male	88	47.3
Female	98	52.7
<b>Marital Status</b>		

Single	90	48
Married	88	47
Divorced	7	4
Widowed	1	1
<b>Education Level</b>		
Diploma	64	34
Bachelor's Degree	75	40
Master's Degree	35	19
Doctorate/Higher	12	7
<b>Hospital distribution</b>		
MGK	50	27
Expert Alliance Hospital	45	24
Khadijat Memorial Hospital	40	22
Barewa Clinic & Maternity	43	23
New Greenland Hospital	8	4
<b>Cadre</b>		
Physician	50	27
Nurse	47	25
Administrative Staff	37	20
Pharmacy Personnel	19	10
Laboratory Personnel	21	11
Others	12	7
<b>Years of Experience</b>		
< 1 year	20	11
1–5 years	99	53
6–10 years	39	21
> 10 years	28	15

Out of the 188 questionnaires distributed, 186 were fully completed and returned, giving a response rate of 99%. More than half (52.7%) of the respondents are

females and had 1-5 years working experience. Similarly, a Bachelor's degree is the highest qualification for most of the respondents (40%).

**Table 2: EHR automation items summary**

<b>Item</b>	<b>Mean</b>	<b>SD</b>	<b>Interpretation</b>
EHR has reduced the incidence of missing files.	2.55	0.54	Agree
EHR has streamlined the process of accessing patient medical history.	2.53	0.53	Agree
EHR allows for effective transfer of data.	2.55	0.51	Agree
EHR improved legibility of prescriptions.	2.61	0.49	Agree

**Table 3: Service delivery items summary**

<b>Item</b>	<b>Mean</b>	<b>SD</b>	<b>Interpretation</b>
EHR has increased the number of patients seen per day.	2.27	0.6	Agree
EHR has positively affected the documentation of treatment procedures.	2.6	0.49	Agree
EHR has improved the performance of my department.	2.54	0.5	Agree
Interdepartmental movement of patients is made easier by EHR	2.57	0.5	Agree

**Table 4: Correlation between EHR automation and service delivery**

Variables	r	p	N
EHR Automation & Service Delivery	0.704	<0.001	186

The correlation between EHR automation and service delivery is presented in Table 4. The Pearson correlation coefficient (r) is .704, p < .001. Hence, there is a strong, positive correlation between HER automation and service delivery.

**Table 5: Simple Linear Regression Predicting Service Delivery from EHR Automation**

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.953 <sup>a</sup>	.908	.901	4.35741	1.983

**Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	5.0% Confidence Interval for B		
	B	Std. Error	Beta			Lower Bound	Upper Bound	
1	(Constant)	-7.290	4.219		-1.728	.092	-15.831	1.251
	EHR_Imp	.074	.004	.953	6.884	<.001	.066	.081

**Impact of EHR on Service Delivery**

Linear regression analysis showed EHR implementation accounted for 90.8% variance in service delivery scores, [ $R^2 = 0.908$ ], and the model was statistically significant ( $[F(1,184) = 376.72, p < 0.001]$ ). For every unit increase in EHR

implementation, there was a predicted 0.074 increase in service delivery performance. Challenges: 41% reported EHR as sometimes time-consuming while 42% cited power/internet outages as key problems and 7% abhorred reported data privacy as key concerns.

## Discussion

The study demonstrates that health record automation via EHR systems has a substantial positive impact on service delivery in private hospitals in Kano, Nigeria. Respondents reported improvements in nearly all measured service dimensions, including patient accessibility (96.8%), reduction in file loss (92.5%), prescription clarity (98.4%), as well as increased efficiency in departmental operations and interdepartmental coordination (97.3%). These findings align with global evidence (Adler-Milstein et al., 2013; Campanella et al., 2016) and corroborate local studies on EHR's role in operational efficiency (Akanbi et al., 2012; Odetola & Adebisi, 2020). Despite these gains, infrastructure remains a significant barrier. Nearly half of users (41–42%) cited time delays and technology-related interruptions (mainly power or internet failure) as core hindrances. The Technology Acceptance Model is validated here; perceived usefulness and technical reliability were major predictors of positive EHR experience. Ongoing training, IT support, and leadership commitment are also critical, particularly in resource-constrained settings (Boonstra & Broekhuis, 2010). Relatively few respondents (7%) expressed concerns about data privacy a finding in line with research suggesting that well-managed privacy protocols can sustain user trust (McGraw & Dempsey, 2009).

## Recommendations

### 1. Infrastructure Investment:

Private hospital owners must invest further in backup power and reliable internet to sustain EHR performance.

### 2. Continuous Training

Ongoing, role-specific and practical training sessions on EHR should be mandatory for staff.

### 3. Quality Control

Routine audits and system evaluations must be instituted to identify inefficiencies and ensure compliance.

### 4. Policy Advocacy:

Hospital associations should advocate government incentives and standards to encourage EHR implementation in private facilities.

### 5. User Engagement:

Management should promote participatory decision-making involving end-users in system upgrades and troubleshooting.

### 6. Further Research:

Future studies should examine EHR impact on patient outcomes, cost-effectiveness, and explore qualitative insights from patients' perspectives.

## Conclusion

Automating health records have proven highly beneficial for private healthcare delivery in the Kano context, particularly in improving efficiency, data integrity, and interdepartmental workflow. However, for EHR deployment to achieve optimal and sustainable results across Nigeria's private sector, significant attention must be paid to infrastructural support, change management, and policy alignment. With appropriate investments, training, and a culture of continuous improvement, EHRs can transform the delivery of private health care in Nigeria and other similar settings

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