

Original Research Article

Healthcare providers' perceptions of the impact of electronic medical records on diabetes care at Nakuru county referral and teaching hospital, Nakuru county: an ordinal regression analysis of cadre and experience in Kenya

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ABSTRACT

Background: Electronic Medical Records (EMRs) are central to improving diabetes care, yet provider perceptions remain critical to their effective adoption, particularly in resource-limited settings. This study assessed healthcare providers' perceptions of the impact of EMRs on diabetes care and examined the influence of professional cadre and experience in Kenya.

Methods: A cross-sectional study was conducted among 119 healthcare providers. Perceptions of EMR impact were measured using a Likert scale. Chi-square tests identified associations between socio-demographic variables and perception outcomes. Variables meeting inclusion criteria were entered into an ordinal logistic regression model to determine independent predictors. Model fit was assessed using likelihood ratio tests and Nagelkerke pseudo-R².

Results: Overall, 86.5% of respondents reported positive perceptions of EMR impact on diabetes care (73.9% agree; 12.6% strongly agree). Chi-square analysis showed significant associations between perception and cadre ($\chi^2=33.517$, $p<0.001$), while gender, age and education were not significant. The ordinal regression model was statistically significant ($\chi^2(5)=29.246$, $p<0.001$) and explained 27% of variance. Nurses (OR=27.03, 95% CI: 6.27–116.51, $p<0.001$) and doctors (OR=19.61, 95% CI: 3.37–114.12, $p=0.001$) were significantly more likely to report positive perceptions compared to clinical officers. Although not statistically significant, shorter employment duration showed a consistent trend toward more favourable perceptions.

Conclusions: Healthcare providers in Kenya demonstrate overwhelmingly positive perceptions of EMRs in diabetes care, with cadre emerging as a key determinant. Tailored training and cadre-specific system optimization are recommended to enhance adoption and bridge experience-related gaps, supporting scalable EMR implementation in similar settings.

Keywords: Diabetes care, Electronic medical records, Healthcare providers, Ordinal regression

INTRODUCTION

Diabetes mellitus is a rapidly growing global public health challenge, particularly in low- and middle-income countries where health systems are increasingly burdened

by rising prevalence, long-term complications and resource constraints.^{1,2} Effective management of diabetes requires timely access to accurate clinical information, coordinated care and continuous monitoring of patient outcomes.³ In this context, Electronic Medical Records

(EMRs) have emerged as a transformative digital health intervention with the potential to improve the quality, efficiency and safety of chronic disease management, including diabetes care.⁴ EMRs facilitate real-time documentation, retrieval and sharing of patient data across healthcare providers and departments.^{5,6} Their use has been associated with improved clinical decision-making, reduced medical errors, enhanced medication management and better continuity of care.⁷ In diabetes management specifically, EMRs support longitudinal tracking of blood glucose levels, laboratory results, medication adherence and complication screening, thereby strengthening patient follow-up and improving outcomes.⁸ Despite these advantages, the effectiveness of EMR systems is highly dependent on user acceptance and sustained utilization by healthcare providers.

In many African healthcare settings, including Kenya, EMR implementation has expanded significantly in recent years as part of broader digital health strategies.⁹ However, variability in adoption and usage remains a major concern. While some facilities report improved efficiency and workflow integration, others continue to experience challenges such as system downtime, inadequate infrastructure, limited training and resistance to change.¹⁰ Importantly, healthcare providers' perceptions of EMRs play a critical role in determining the success or failure of these systems, as emphasized in technology acceptance frameworks such as the Technology Acceptance Model.¹¹

Existing literature suggests that perceptions of EMR usefulness are influenced by several factors, including professional cadre, level of training and years of experience.^{12,13} However, evidence from Kenya, particularly in the context of diabetes care, remains limited and fragmented. Understanding how these factors shape provider perceptions is essential for designing targeted interventions that enhance adoption and optimize system performance.

Therefore, this study sought to assess healthcare providers' perceptions of the impact of EMRs on diabetes care in Kenya and to determine the influence of professional cadre and employment duration using an ordinal regression analytical approach. The findings are expected to inform policy, improve EMR implementation strategies and contribute to strengthening digital health systems for chronic disease management in similar resource-limited settings.

METHODS

The study was conducted at Nakuru County Referral and Teaching Hospital (NCRTH), between July and September 2025, a county government-owned facility located in Nakuru City, one of Kenya's major urban centres characterized by a diverse population and a high burden of non-communicable diseases, particularly diabetes mellitus. A facility-based descriptive cross-

sectional study design was adopted, as it was appropriate for assessing the level of Electronic Medical Record (EMR) utilization and examining the relationship between socio-demographic and institutional factors among healthcare providers involved in diabetes care at a specific point in time.

The study population consisted of healthcare providers directly involved in diabetes management, including doctors, nurses and clinical officers working in outpatient clinics, diabetic clinics, inpatient wards and emergency departments within the hospital. A census approach was employed whereby all eligible healthcare providers available during the study period were invited to participate in the study. The sample size was calculated using Cochran's formula $n_0 = (Z^2 \times p \times (1-p)) / e^2$ which yielded a minimum sample size of 384 participants.¹⁴ Since the target population was below 10,000, finite population correction was applied, resulting in an adjusted sample size of 119 respondents. To cater for possible non-response, 128 questionnaires were distributed, of which 119 were fully completed and returned, giving a response rate of 92.9%. The final sample size was proportionally allocated across the healthcare worker cadres using the formula $n_i = (N_i/N) \times n$.

A stratified random sampling technique was used to select study participants. This approach ensured adequate representation of all healthcare worker cadres in proportion to their numbers within the target population. Participants from each stratum were then selected through simple random sampling.

Data were collected using a structured self-administered questionnaire containing both closed-ended and Likert-scale items developed from the study objectives and relevant literature. The questionnaire captured information on socio-demographic characteristics such as age, gender, professional cadre, educational level and work experience, as well as the type of medical record systems used, frequency of EMR access and institutional factors influencing EMR utilization. Prior to the main study, the questionnaire was pre-tested in a similar healthcare setting to assess its validity and reliability. Data collection was carried out over a specified study period with the support of trained research assistants.

Collected data were coded, entered and analysed using the Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive statistics including frequencies, percentages, means and standard deviations were used to summarize the data. Inferential analysis was conducted using Chi-square (χ^2) tests to determine associations between socio-demographic characteristics and the type of medical record systems utilized. Statistical significance was considered at a p value of less than 0.05. Findings were presented in tables.

Ethical approval for the study was obtained from the Mount Kenya University Institutional Scientific and

Ethics Review Committee (MKU-ISERC) under reference number MKU/ISREC/5079. Additional authorization to conduct the study was granted by Nakuru County Referral and Teaching Hospital under reference number NCRT/H/R&EC/VOL I/2025 and by the National Commission for Science, Technology and Innovation (NACOSTI) under license number NACOSTI/P/25/4174375. Written informed consent was obtained from all participants prior to data collection. Participation was voluntary and confidentiality as well as anonymity were maintained throughout the study. No personal identifiers were included in the data collection tools and all information obtained was used strictly for research purposes.

RESULTS

Out of the 119 respondents, 73.9% agreed that EMR use has a positive impact on diabetes care, while 12.6% strongly agreed. 10.9% of the respondents were neutral and 2.5% disagreed. Prior to ordinal regression, chi-square tests were conducted to examine bivariate associations between each predictor variable and healthcare providers' perceptions of EMR use.

Chi-square tests showed that cadre ($\chi^2=33.517$, $df=6$, $p<.001$, $V=0.375$, medium effect) and department ($\chi^2=83.749$, $df=27$, $p<.001$, $V=0.484$, large effect) were significantly associated with EMR perception. Gender,

age and education were not significantly associated with EMR perception (all $p>0.05$). Based on these findings, cadre and employment duration were retained as predictors for the ordinal regression analysis. An ordinal logistic regression model examined the independent effects of cadre and employment duration on healthcare providers' perceptions of EMR utility. The model significantly improved fit over the null model ($\chi^2(5)=29.246$, $p<0.001$), with Nagelkerke pseudo- $R^2=0.270$ indicating 27% variance explained in perception outcomes. Clinical officers and staff with more than 15 years of experience served as reference categories respectively. The results are summarized in Table below.

The analysis reveals that nurses demonstrated high propensity for positive perceptions, with odds 27.03 times greater than those of clinical officers (OR=27.03, 95% CI: 6.27–116.51, $p<0.001$). Similarly, the odds for doctors were 19.61 times higher than the reference group (OR=19.61, 95% CI: 3.37–114.12, $p=.001$). Regarding professional experience, the model indicates that while the association with perception does not reach statistical significance ($p>0.05$), there is a persistent, non-random trend. Those with 1-5 years of experience showed 8.53 times higher odds of positive perceptions compared to providers with over 15 years tenure (OR=8.53, 95% CI: 0.78-93.42, $p=.079$), while 6-10 years' experience yielded 7.80 times higher odds (OR=7.80, 95% CI: 0.81-76.54, $p=0.077$).

Table 1: Sample distribution across healthcare worker cadres at NCRT/H.

Cadre	Total population (N _i)	Proportion (%)	Sample size (n _i)
Doctors	82	14.1	17
Clinical officers	69	11.9	14
Nurses	431	74.1	88
Total	582	100	119

Table 2: Healthcare providers' perceptions of the impact of EMR use.

		N	(%)
Perception on impact of EMRs	Disagree	3	2.5
	Neutral	13	10.9
	Agree	88	73.9
	Strongly Agree	15	12.6
Total		119	100.0

Table 3: Chi-Square tests for predictors of EMR perception.

Predictor	χ^2	df	P	Cramér's V
Gender	7.186	3	0.066	0.246
Age (in years)	10.417	9	0.318	0.171
Education	8.173	9	0.517	0.151
Cadre	33.517	6	0.000	0.375
Employment duration	12.170	9	0.204	0.185
Department	83.749	27	0.000	0.484

Department excluded from regression due to Chi-square assumption violation (>80% cells with expected count <5). Employment Duration shows significant ordinal trend (Kendall's $\tau_b=-0.230$, $p=0.002$).

Table 4: Ordinal regression on healthcare providers' perception of the impact of EMRs.

Predictor	Odds ratio (OR)	95% CI (lower)	95% CI (upper)	P value
Cadre				
Clinical officer		Reference Group	Reference Group	
Doctor	19.61	3.37	114.12	0.001*
Nurse	27.03	6.27	116.51	<0.001*
Employment duration (in years)				
>15	-	-	-	-
1–5	8.53	0.78	93.42	0.079
6–10	7.80	0.81	76.54	0.077
11–15	0.69	0.08	6.33	0.739

Note. Model Fit: $\chi^2(5)=29.246$, $p<0.001$; Nagelkerke $R^2=0.270$. Parallel Lines Test failed: $\chi^2(10)=56.009$, $p<0.001$. *Significant p value ($p<0.01$).

DISCUSSION

The present study examined healthcare providers' perceptions of the impact of EMRs on diabetes care and explored the influence of professional cadre and work experience using ordinal regression analysis. Overall, the findings demonstrated overwhelmingly positive perceptions toward EMR use, with most respondents acknowledging its contribution to improved diabetes management. Notably, professional cadre emerged as a significant determinant of perception, while employment duration demonstrated a consistent though statistically non-significant trend toward varying levels of acceptance. These findings underscore the growing recognition of EMRs as essential tools in chronic disease management within resource-limited healthcare settings and provide important insights into workforce-specific factors that may influence successful digital health implementation in Kenya.

This robust positivity rate substantially aligns with Homa Bay County findings, where 80.9% of EMR users rated systems as easy/very easy and extends Kiambu County data showing 65% favorable perceptions among health workers, collectively challenging early African EMR literature narratives of widespread resistance and low buy-in.^{12,15} The distribution pattern further mirrors South Korean clinician surveys, where 82% across high-usage departments reported workflow improvements, suggesting maturity in user adaptation even within Kenya's fragmented EMR landscape.¹⁶

This is further supported by a study in Ghana, where health professionals demonstrated strongly positive EHR perceptions in Ghanaian semi-rural settings, with 88.9% (54.07% agree + 34.8% strongly agree) reporting improved work efficiency, 65.41% noting significant medical error reduction and 73.33% affirming patient confidentiality protection. Workload reduction was endorsed by 73.34% (47.41% agree + 25.93% strongly agree), while 75.55% confirmed reduced patient waiting times.¹⁷ The high approval level addresses concerns about applicability in African settings by suggesting the possibility of sustainable adoption, while also justifying

immediate broader rollout of EMR protocols, championing training programs and alignment with Kenya's digital health pillars.

The findings directly parallel findings from Saudi Ministry of Health hospitals, where nurses demonstrated favorable EMR perceptions (82% overall mean). EMRs were highly rated for nursing care management tasks such as entering daily care notes (82%), physical assessments (81.1%) and order entry functions like test result retrieval (84%) and procedural information access (81.2%). Patients' health information quality was robust (83.2% accuracy rating), alongside strong user satisfaction (83.4% patient safety improvement; 80.2% enhanced job performance; overall 78.6% satisfaction).¹⁸ At the same time, experience patterns extend University of Nairobi findings documenting early/mid-career workers' greater tech receptivity, consistently showing 2- 4x higher positivity among doctors/nurses across Sub-Saharan reviews.^{12,13}

Healthcare professionals, generally exhibit high positive perceptions regarding the utility of EMRs in clinical practice. The majority of participants (59%) reported positive experiences, highlighting benefits such as streamlined medication charting, elimination of illegible handwriting, faster information retrieval and improved access to patient data. Additionally, 28% of participants noted improvements in their work performance with EMR support and 18% found EMRs beneficial for clinical decision-making through secure and accessible frameworks. Registered nurses, frequently commented on their positive interactions with EMRs and improved inter-cadre collaboration, whereas doctors, emphasized on the impact of EMRs impact on job performance and overall quality of care.¹⁹

However, these positive perceptions are not uniform. As noted in research from Ghana, EMR perception is deeply contingent upon infrastructure reliability. Issues such as system downtime, hardware accessibility and workload pressure can temper even the most positive professional attitudes. Consequently, while cadre dictates the initial alignment with digital workflows, sustained positive

perception among veteran staff may require targeted interventions to bridge the gap between their cumulative clinical experience and the evolving digital requirements of modern healthcare systems.^{20,21}

These results show that job role and level of experience strongly influence how EMR systems are perceived and used, with seniority increasing expectations of performance benefits. These results challenge earlier uniformity technological adoption assumptions, demonstrating the need for cadre-differentiated performance expectations require tailored strategies within Kenya's tiered workforce.²² In practice, EMR interface design and training should be tailored by professional cadres such as doctors, clinical officers and nurses, specific dashboards and years of experience, whereby engaging early career staff while supporting more experienced staff through structured change management to close perception gaps and accelerate EMR implementation and standardization nationwide.

Several methodological limitations of this study warrant consideration. The ordinal logistic regression model violated the proportional odds assumption ($\chi^2(10)=56.009$, $p<0.001$), potentially introducing parameter bias. Additionally, key institutional variables such as clinical department could not be integrated into multivariate models due to severe Chi-square cell count violations ($>80\%$ expected counts <5), omitting operational context. Sample size ($n=119$) applied a finite population correction, the small cohort severely compromised statistical precision. This is evidenced by extremely wide 95% confidence intervals for main effect estimates, particularly for nurses (OR=27.03, 95% CI: 6.27–116.51) and doctors (OR=19.61, 95% CI: 3.37–114.12). The reliance on a single center cross-sectional design at Nakuru County Referral and Teaching Hospital limits external validity to other primary, rural or private Kenyan facilities and precludes causal inferences. Finally, self-administered questionnaires introduce inherent social desirability and recall biases likely inflating the 86.5% positive perception rate which were not cross-validated against objective EMR audit logs or patient glycemic outcomes.

CONCLUSION

The study established that healthcare providers generally hold positive perceptions regarding the impact of EMRs on diabetes care, with the majority of respondents reporting that EMRs enhance efficiency, patient management, continuity of care and access to clinical information. This demonstrates growing acceptance of digital health technologies within Kenya's healthcare system.

Professional cadre was identified as a significant predictor of EMR perception, with nurses and doctors showing significantly higher likelihood of reporting positive perceptions compared to clinical officers. This

suggests that differences in professional roles, workflow interactions and system engagement influence EMR acceptance and utilization.

Although employment duration was not statistically significant, healthcare providers with fewer years of experience consistently demonstrated more favourable perceptions toward EMRs than long-serving staff. This indicates a possible generational or adaptability gap in digital health adoption that may affect long-term implementation success.

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