Journal of Medicine, Nursing & Public Health

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ISSN: 2706-6606

Stratford Peer Reviewed Journals and Book Publishing
Journal of Medicine, Nursing and Public Health
Volume 8||Issue 1||Page 31-43|| February |2025|
Email: info@stratfordjournal.org ISSN: 2706-6606

Perceived Quality of Electronic Health Records Systems Among Health Workers in Public Health Facilities in Kiambu County, Kenya

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***How to cite this article*: Mbuthia, P. M., Otieno, G. O., & Rucha, K. (2025). Perceived Quality of Electronic Health Records Systems Among Health Workers in Public Health Facilities in Kiambu County, Kenya.** ***Journal of Medicine, Nursing and Public Health, 8*(1), 31–43. https://doi.org/10.53819/81018102t7045**

Abstract

Healthcare system is facing an unprecedented high number of patients across the world. Patients increase comes along with increased permanent surge of medical knowledge and techniques available for treatment and diagnosis. This study investigated health worker's perceptions on quality of electronic health records systems in public hospitals within Kiambu Kenya. This research study employed descriptive cross-sectional study design using both quantitative and qualitative methods. Simple random sampling technique was used where an approximate sample size of 370 participants was used out of the entire population of health workers. Questionnaire self-administered to study participants were used for data collection. Statistical Package for Social Sciences Version 25 (SPSS) was used to process the data. Data was then scrutinized using descriptive and inferential statistical methods. The study revealed that respondents with experience below 10 years (58.8%) perceived that the quality of EHRs was very good. Respondents also perceived that their facilities had good internet connectivity (52.2%,), proper ICT infrastructure (51.6%), proper power backup system (66.5%) and easiness to retrieve patient data at (74.3%). Moreover, the study revealed that managements have availed all resources for use in EHRs (50.6%), while (58.6%) agreed that workflow was not interrupted while using EHRs and there was positive organizational culture towards EHRs (66.8%). In conclusion more than half (54.3%) of the respondents were of the opinion that the overall quality of EHRs in their work station was very good. The study concludes that the perceived quality of EHRs in Kiambu County is generally positive, influenced by socio-demographic, technological, and organizational factors. The study recommends enhancing EHR quality through improved ICT infrastructure, staff training, resource allocation, and further research on private-sector perceptions and patient experiences.

Keywords: *Electronic heath record system, usher perception, healthcare systems, public health facility, information technology*

1.0 Introduction

Healthcare system is facing an unprecedented high number of patients across the world. Patients increase comes along with increased permanent surge of medical knowledge and techniques available for treatment and diagnosis, resulting into increasing financial cost hence health workforce should focus on working together as health services becomes highly specialized. To achieve such an ambitious goal a health system should have an information system that ensures a coordinated health workers services to patients that is well integrated and high quality patients treatment. Electronic health records systems provide a comprehensive patient digital chart which contains information from all health workers involved in patient care. Unlike electronic medical records systems (EMRs) which focus on data from a single practice or facility EHRS encompass data from multiple sources which is sharable to other organization. In a study done by Hoerbst and Ammenwerth (2010) computerized health records systems are supporting these needs where these systems are reducing gaps in health facilities patient's specific data, longitudinal and complete client's data collection enhancing easier exchange of patient's information across entire health workforce. In past few years' computer based records systems are characterized more by actual implementation of these systems in exacts clinical day to day situations. To date concepts which could only fit in scientific situations have evolved from prototype stages and now they are in use in daily patient's attendance.

In another study done by Akanbi and Ocheke (2012) on Use of Electronic Health Records in sub-Saharan Africa developing nations have realized EHRs or some sections of the computerized systems. Despite achievements on choice and use of certain systems in a given environment general success of these systems depends on other factors aside of software engineering. There is great variation of these requirements depending on country, region or facility factors such as technical, social demographics of health workforce or organizational limits. In Kenya computer systems used in managing patients heath information and making reports were assessed towards the end of 2007 and mid 2009 by ministry of health Kenya (MOH) information systems department (HMIS), the second assessment was donor funded and conducted by USA center for disease control and prevention (CDC) and finally the third assessment was conducted by AIDS and STIs National Programme in Kenya (NASCOP) according to a study done by Muinga and Magare(2018).

Earlier computer system implementations faced issues like data security, vendor support, sustainability, and interoperability. In 2010, Electronic Standards and Guidelines (ESG) were introduced to improve software quality and data compatibility. Despite these efforts, public health institutions in Kenya experience mixed outcomes with computerized systems. This study investigates factors influencing the perceived quality of electronic health records in Kiambu County.

1.1 Perceived quality of electronic health records

There are high expectations that EHRs simplifies healthcare givers work, however workers spend more time using these systems than concentrating on client's needs. Several studies done on adoption of EHRs such as Berrone et al (2009) on systems environments and sustainability, Levin (2006) study on total quality management revealed how organizations are on hurry to adopt these computerized systems without communicating their key benefits to all the stakeholders who

includes patients, authorities and care givers. These have led to health care institutions succumbing to pressure making unreasonable choices of EHRs for their facilities without proper consultations on how suitable that systems to suite that facilities needs Angst et el (2010). For the user of an electronic health system a system that is of high quality must perform the expected and intended roles under the expected environmental pressure, and perform all the functions without any failures over the expected life span. Studies done in USA by office of national coordinator for heath information showed health workers are experiencing challenges such as excessive alerts, medication error and systems outages with these systems despite their overrated usability, high performance and security raising the quality questions of these systems to offer high quality care.

2.0 Methods and Materials

This study employed a descriptive cross-sectional design using both quantitative and qualitative methods, targeting 2,703 health professionals in public health facilities who use EHRs, with a sample size of 370 participants meeting the inclusion criteria. A 100% response rate was achieved as all self-administered questionnaires were duly returned. Research approvals were obtained from relevant bodies, including Kenyatta University Graduate School, KUERC, NACOSTI, and Kiambu County's health department. Participants were informed of the study's purpose, assured confidentiality, and provided voluntary consent. Data analysis followed four stages—cleanup, reduction, differentiation, and expansion—where data editing, coding, and tabulation were conducted to detect abnormalities. SPSS Version 25 was used for processing, with descriptive statistics (frequencies and percentages) summarizing data, and inferential statistics, including Pearson's Product-Moment correlation, used to examine relationships between independent and dependent variables for generalization.

3.0 Results

This section presents the findings of the study. They are structured in accordance with the objectives.

3.1 Objective 1: Perceived quality of electronic health records systems

More than half (54.3%) of the respondents were of the opinion that the overall quality of EHRs in their work station was very good, however 17.9% were of a contrary opinion whereas 27.8% were neutral. This is shown in the figure 1 below.

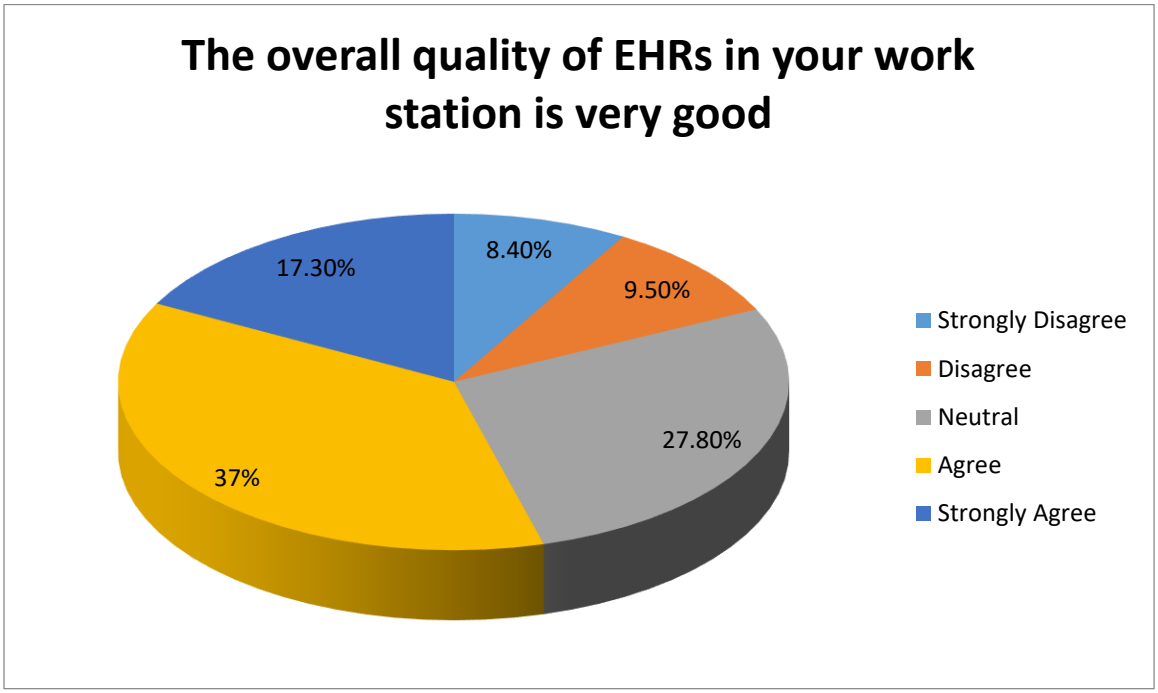

Figure 1: Overall quality of EHRs in your work place

3.2 Objective 2: Socio-demographic characteristics influencing perceived quality of EHRs

Majority of females (57.7%) perceived that systems in work place are of high quality compared to males (52%). Respondents aged below 35 years perceived that quality of systems as good (56.8%) while certificate holders (68.5%) agreed that the systems were of high quality. Health records officers (57.3%) perceived that the quality of systems was very good being highest among cadre's while respondents with experience below 10 years (58.8%) perceived that the quality of EHRs was very good compared to their counterparts above 35 years (37.1%). This is shown in the table 1. below:

Table 1: Results On Socio-Demographic Factors Against Perceived Quality Of Ehrs

Quality statement		**Overall quality of EHRs in the work station is very good**			
		Disagree	**Neutral**	**Agree**	**Total**
		F **(%)**	F **(%)**	F **(%)**	
Gender	Female	45 **(20.3)**	61 **(27.6)**	115 **(52)**	**221**
	Male	21 **(14)**	42 **(28.1)**	86 **(57.7)**	**149**
Age	< 35 Yrs	47 **(16.7)**	74 **(26.4)**	159**(56.8)**	**280**
	≥ 36 Yrs	19 **(20.8)**	29 **(32.2)**	42 **(46.6)**	**90**
Education	College	36 **(25.5)**	64 **(27.7)**	131 **(56.7)**	**231**

	University	28 **(21.2)**	38 **(28.8)**	66 **(49.9)**	**132**
Qualification	Certificate	4 **(11.4)**	7 **(20)**	24 **(68.5)**	**35**
	Diploma & Higher Dip	35 **(16.2)**	66 **(30.7)**	114 **(53)**	**215**
	Graduate & Post Grad	27 **(22.6)**	30 **(25.2)**	62 **(52)**	**119**
Designation	Nurse	6 **(17.6)**	11 **(32.3)**	17 **(50)**	**34**
	Doctor	4 **(12)**	13 **(39.4)**	16 **(48.4)**	**33**
	Lab Tech	6 **(21.4)**	10 **(35.7)**	12 **(42.7)**	**28**
	Pharmacist	6 **(18.8)**	10 **(31.2)**	16 **(49.9)**	**32**
	Clinical Officer	11 **(22.8)**	11**(22.9)**	26 **(54.1)**	**48**
	Pharm Tech	13 **(24.5)**	12 **(22.6)**	28 **(52.7)**	**53**
	Others	2 **(6.2)**	7 **(21.8)**	23 **(71.8)**	**32**
Working Experience	< 10 Yrs	45 **(15.4)**	**75 (25.6)**	**172 (58.8)**	**292**
	≥ 10 Yrs	**21(26.8)**	**28(35.8)**	**29(37.1)**	**78**

The dependent variable for this study had more than two outcomes which were ordered and hence ordinal logistic regression (ORL) was used to determine whether an association existed between the dependent variable and other explanatory variables. An ORL model fitted with all social demographic factors was a good fit in predicting the outcome variable compared to the null model (p 0.01). However, except for work experience (p 0.01), there was no statistical evidence that any of the other social demographic factors influence the perceived quality of EHRs. The null hypothesis of study was therefore rejected and alternative hypotheses upheld since there was enough statistical evidence that work experience influence the perceived quality of electronic health records systems in public health facilities in Kiambu County. This is shown in the table 2 below:

Table 2: Results Of An Ordinal Logistic Regression Model On Socio-Demographic Factors Against Perceived Quality Of EHRs

Perceived Quality of EHRs (Outcome Variable)		Results			
		Odds ratio	**95% CI**	**z value**	**p value**
Predictors	Gender	1.20	0.83, 1.73	0.97	0.33
	Age	1.03	0.85, 1.24	0.34	0.73
	Education	0.71	0.44, 1.15	-1.37	0.16
	Qualification	0.95	0.76, 1.19	-0.42	0.67
	Designation	1.00	0.92, 1.10	0.17	0.86
	Work experience	0.74	0.59, 0.94	-2.42	**0.01****

3.3 Objective 3: Technological factors influencing perceived quality of EHRs

Table 3 presents results on technological factors influence on the perceived quality of electronic health records, on availability of good internet connectivity 52.2% of the respondents agreed; only 50.8% of the respondents had been trained on the use of EHRs; however, 82.7% affirmed that they had basic skills to operate EHRS whereas 88.9% said that they were computer literate. On ICT infrastructure, 51.6% of the respondents were convinced that the hospitals had proper infrastructure to support EHRS, while 66.5% agreed that power backup up system set was available in their facility to in case of electricity power outage. On data backup in case of a computer crash, 59.7% of the respondents said that it was happening, moreover 74.3% agreed that it was easy to retrieve and avail patient's data and information when required.

Table 3: Results on technological factors influencing the quality of EHRs

Technological rating aspects	Disagree	Neutral	Agree
	F **(%)**	F **(%)**	F **(%)**
Health facility has good internet connectivity to support use of EHRS	106 **(28.6)**	69 **(18.6)**	195 **(52.7)**
You underwent training of how to use the existing EHRs in place	139 **(37.6)**	46 **(12.4)**	185 **(50)**
You have the basic ICT skills to use EHRs e.g.ms word, excel, internet use and emails.	27 **(7.3)**	37 **(10.0)**	306 **(82.7)**
The hospital has proper ICT infrastructure for EHRs	105 **(28.4)**	74 **(20.0)**	191 **(51.6)**
You are computer literate	18**(4.9)**	23 **(6.2)**	329 **(88.9)**
There is standby power backup up system set up when electricity is lost	87 **(24.1)**	35 **(9.5)**	246 **(66.5)**
There is data backup in case of a computer crash to avoid patients information is loss	75 **(20.3)**	74 **(20.0)**	221 **(59.7)**
It's easy to retrieve patient's information and avail it whenever it's needed.	46 **(12.4)**	49 **(13.2)**	275**(74.3)**

The dependent variable for this study had more than two outcomes which were ordered and hence ordinal logistic regression (ORL) was used to determine whether an association existed between the dependent variable and other explanatory variables. An ORL model fitted with all technological factors was a good fit in predicting the outcome variable compared to the null model (p 0.00). There was strong statistical evidence that presence of good internet, presence of a data backup plan and the easiness of retrieving information from the EHRs influence the perceived quality of EHRs (p 0.00, 0.00, 0.00 respectively) hence the null hypothesis of the study was rejected and alternative hypothesis upheld. This is shown in the table 4. below:

Table 4: Results of an Ordinal Logistic Regression model on technological factors against perceived quality of EHRs

Perceived Quality of EHRs (Outcome Variable)		Results			
		Odds ratio	**95% CI**	**z value**	**p value**
Predictors	Presence of good internet	1.35	1.10, 1.65	2.98	**0.00****
	Training on use of EHRs	1.03	0.88, 1.22	0.45	0.652
	Having basic skills in ICT	1.15	0.89, 1.50	1.12	0.264
	Presence of ICT infrastructure	1.51	1.22, 1.88	3.77	**0.00****
	Being computer literate	0.84	0.64, 1.09	-1.27	0.20
	Presence of power back up	0.93	0.84, 1.02	-1.41	0.15
	Presence of data back up	1.32	1.08, 1.60	2.81	**0.00****
	Easiness of retrieving information from the EHRs	1.37	1.10, 1.71	2.90	**0.00****

3.4 Objective 4: Organizational factors influencing perceived quality of EHRs

Table 5 presents results on organizational factors influencing the perceived quality of electronic health records. On commitment of management towards success of EHRs, 65.1% agreed, half of the respondents (50.6%) were convinced that the top management in their facility had availed all resources necessary for implementation of EHRs. Moreover, (58.6%) of the respondents agreed that EHRs do not interrupt workflow and they decrease workload, besides 52.2% affirmed that the organizational structure changed after the implementation of EHRs in their facility. On the organizational culture, (66.8%) were convinced that the culture was encouraging positive use of EHRs, 69.8% had the necessary training and job skills to use EHRs; however, 37% did not affirm on the availability of technical support from ICT department in their facility, however 58.1% of the respondents agreed to the statement that the top management had clearly defined the goals of EHRs in the facility.

Table 5: Results on organizational factors influencing the perceived quality of EHRs

Organizational rating aspects	Disagree	Neutral	Agree
	F (%)	F (%)	F (%)
Top management in facility is committed towards the success of EHRs.	70 **(18.9)**	59 **(15.9)**	241 **(65.1)**
The top management has availed all resources necessary for implementation of EHRs	93 **(25.2)**	90 **(24.3)**	187 **(50.6)**
EHRs does not interrupt workflow and decreases workload	74 **(20)**	79 **(21.4)**	217 **(58.6)**
The organizational structure changed after the implementation of EHRs	91 **(24.6)**	86 **(23.2)**	193 **(52.2)**
The organizational culture encourages positive use EHRs	60 **(16.2)**	63 **(17.0)**	247 **(66.8)**
You have the necessary training and job skills to use EHRs	60 **(16.2)**	51 **(13.8)**	258 **(69.8)**
There is technical support from ICT Department	78 **(21.1)**	59 **(15.9)**	233 **(63)**
The top management has clearly defined the goals of EHRs	86 **(23.8)**	67 **(18.1)**	215 **(58.1)**

The study employed ordinal logistic regression (OLR) to analyze the relationship between the dependent variable, which had ordered outcomes, and various explanatory variables. The OLR model incorporating all organizational factors demonstrated a significantly better fit in predicting the outcome variable compared to the null model (**p** < 0.001). Strong statistical evidence indicated that the availability of resources to support EHR use, the potential of EHRs to reduce workload without disrupting workflow, and a positive organizational culture significantly influenced the perceived quality of EHRs (**p** < 0.001 for all three factors). Additionally, weak statistical evidence suggested that having the necessary skills to use EHRs and clearly defined top management goals also contributed to perceived EHR quality (**p** = 0.05 for both factors). Consequently, the null hypothesis was rejected in favor of the alternative hypothesis, confirming the influence of these organizational factors on EHR system quality perceptions. This is shown in the table 6 below:

Table 6: Results of an Ordinal Logistic Regression model on organizational factors against perceived quality of EHRs

Perceived Quality of EHRs (Outcome Variable)		Results			
		Odds ratio	95% CI	z value	p value
Predictors	Commitment of top management	1.20	0.96, 1.49	1.68	0.09
	Availability of resources	1.60	1.25, 2.04	3.80	**0.00****
	No interruption of workflow/decreasing workload	1.39	1.16, 1.66	3.63	**0.00****
	Changes in organization structure	1.01	0.84, 1.22	0.15	0.88
	Positive organizational culture	1.47	1.18, 1.83	3.51	**0.00****
	Having requisite skills	0.91	0.83, 1.00	-1.95	**0.05***
	Presence of technical support	1.03	0.85, 1.25	0.34	0.73
	Clearly defined goals	1.21	0.99, 1.48	1.95	**0.05***

4.0 Discussion

The study revealed that more than half (54.3%) of the respondents rated the overall quality of EHRs in their workstations as very good, while 46.2% did not view these systems as a hindrance to their relationships with clients. Additionally, 58.1% agreed that top management had clearly defined EHR goals within their facilities. These findings align with the studies by Bavafa et al. (2013) and Bhargava & Mishra (2014), which highlighted the positive impact of EHRs on consultant doctors' productivity. In Kiambu, 73.3% of respondents acknowledged that EHR use improved their productivity. However, the findings contrast with Seidmann and Lahiri (2012), who suggested that EHR gaps disrupt patient movement. In this study, a majority (60.7%) of respondents stated that patient flow within facilities was not interrupted. The study also found that 81% affirmed patient information security, 69% reported ease of system use, and 78.1% were comfortable entering data into the system. Additionally, 73.8% of health workers confirmed that they could clearly read typed orders, reducing errors.

Regarding system sustainability and management commitment, 65.1% of respondents agreed that their facility's management was dedicated to the success of EHRs. However, nearly half (49.5%) were not convinced that all necessary resources had been allocated for implementation, raising concerns about long-term sustainability. Health workers with more experience expressed a desire for greater flexibility in EHRs to enhance patient care, consistent with Galanter (2015). The study also found that perceptions of EHR quality varied with work experience—58.8% of respondents with less than ten years of experience rated their EHRs as high quality, compared to only 37.1% of those with over ten years of experience. Additionally, 52.7% of respondents confirmed good

internet connectivity, while 74.3% found it easy to retrieve and access patient information, supporting Evans (2016) on the importance of internet availability for seamless EHR operations.

The study also identified gaps in ICT infrastructure and training. While 51.6% of respondents believed the existing infrastructure was good, 28.4% disagreed, and 48.4% were unconvinced that their hospitals had sufficient infrastructure to support EHRs, aligning with Kinyungu and Teresia (2009). Additionally, 37.6% had never received training on their facility's EHR system, though 88.9% of respondents were computer literate, with 82.7% possessing basic ICT skills such as using MS Word, MS Excel, the internet, and email. These findings support studies by Wager et al. (2001) and Lakovidis (1998) on leadership commitment, as 65.1% of respondents agreed that top management was dedicated to EHR success, and 58.1% confirmed that management had clearly defined EHR goals. Contrary to Davis' study, which suggested that EHRs increase workload and interrupt workflow, 58.6% of respondents in Kiambu stated that EHRs did not disrupt workflow and, in fact, reduced workload. Furthermore, 52.2% affirmed that organizational structures had changed following EHR implementation. Lastly, the study aligns with Jamal's research on the importance of fostering an organizational culture that ensures proper EHR adoption, as 66.8% of respondents believed their facility's culture encouraged positive EHR use

5.0 Conclusion

The study concludes that the perceived quality of EHRs in Kiambu County is generally positive, with more than half (54.3%) of respondents expressing satisfaction, citing ease of use, beneficial outcomes outweighing challenges, and overall contentment with the systems. Work experience, as a socio-demographic factor, was found to be statistically significant in influencing the perceived quality of EHRs, highlighting the importance of socio-demographic variables in predicting EHR quality in public health facilities. Additionally, technological factors such as good internet connectivity, proper ICT infrastructure, data backup systems, and ease of patient information retrieval significantly influenced EHR quality, confirming their relevance in EHR implementation success. Lastly, organizational factors, including resource availability, workload reduction, and a positive organizational culture toward EHR use, were also statistically significant in shaping perceptions of EHR quality. Therefore, the study concludes that socio-demographic, technological, and organizational factors are key predictors of the perceived quality of EHRs in public health facilities.

6.0 Recommendation

The study recommends that Kiambu county health department should include EHRs quality strengthening improvement in their work plans so that all staffs are satisfied with the existing systems and deliver seamless services. The facility management teams need to factor in work experience when recruiting, training, and retraining to strengthen staff's skills in using EHRs hence boosting their confidence and perception on quality of EHRs in their facility. Health facilities management's teams should ensure that all their work stations have good internet connectivity, proper ICT infrastructure and proper data backup systems in their facilities to ease use and retrieval of patients' information from electronic health records systems. All the necessary resources needed for implementation of EHRs in facilities should be provided as this will have reduced workload secondly to EHRs malfunctions and also bring in a positive organizational culture towards the use of EHRs. The study also recommends a research to assess how health workers in private health facilities perceive quality of EHRs in their work stations compared to their counterparts working

in government facilities need to be done. A Research is also needed to establish clients and patient's perception on the quality of electronic health records systems in their health facilities and finally a further study focused not only on four variables, perceived quality, individual factors, technical factors and organizational factors more studies can be done with a focus on more factors affecting perceived quality EHRs.

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