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Electronic Medical Records Adoption In The Out-Patient Departments Of Kenyatta National Hospital: Influence Of Organizational Factors.

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Abstract
Background: *Adopting and using electronic medical records (EMR) is an emerging trend in health care practice. Electronic medical rollout is a key element of health systems strengthening activities. This system integrates more activities in healthcare, making services efficient and effective. Despite efforts by the Kenyan government to subsidize medical equipment, EMR implementation lag persists. KNH, being the largest referral Hospital in East and Central Africa, has not yet fully adopted EMR, making it a challenge to provide effective and efficient services. Various organisational are key to EMR implementation, thus, there is need for a comprehensive understanding on the factors affecting its adoption. The research therefore aimed to assess organizational factors influencing EMR adoption in the out-patient departments at Kenyatta National Hospital, Nairobi City County, Kenya.*
Materials and Methods: *A descriptive cross-sectional research design was used employing both quantitative and qualitative techniques. The study targeted 216 respondents selected through stratified random sampling method. Data was collected using structured questionnaires and key informant interviews after obtaining informed consent from the respondents. Pretesting of instruments was conducted at Moi Teaching and Referral Hospital (MTRH), where the validity and reliability of the research instruments were verified. All necessary ethical approvals and permits were obtained before commencing the study. Analysis was done using SPSS version 25.0. Frequencies and percentages were used for descriptive statistics, while Chi-square and linear regression were applied for inferential statistics.*
Results: *The response rate was 89.4% (n=193).67.4%(n=130)respondents indicated that lack of training on EMR system usage was a concern,62.7%(n=121) stated that the hospital had not provided financial support for EMR adoption, 71%(n=137)indicated that users were not involved the process of EMR implementation while 56.5% (n=109) indicated that there was no adequate technological expertise for EMR implementation. The association between the dependent (EMR adoption) and independent variables(organizational factors) was statistically significant.(P Value=0.0001). Regression analysis generated a model with predictors of EMR adoption being occupation, level of education and organizational factors.*
Conclusion: *It was apparent that organizational factors are key determinants of EMR adoption at the out-patient departments at Kenyatta National Hospital in Nairobi City County.*
Key Words: *EMR, Adoption, KNH, organisational.*

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I. Introduction

The potential of Electronic Medical Records systems to making health care delivery effective is globally recognized. Electronic Medical Records are computer-supported health systems used in provision of health care. EMR systems are instruments used in boosting medical care provision in hospitals by providing them with a platform for integration of new devices and functionalities into care delivery processes (Vera, E. et al.,2019). EMR is not only a system for collecting information, but rather, it is a collection of components that ensure that the collected data is aggregated, synthesized and visualized in a meaningful way. (Eusebi, C. et al.,2023).

In the early 1990s, the concept of EMR, while birthed, was not yet fully implemented. Despite the lack of application of digital tools in the management of health records, computer programs were already in use for provision of data summaries as well as calculation of patient demographics. (Salon, P.2022). The next logical step discovered by medical planners was the implementation of a completely integrated EMR system. The number of interested parties, as well as those who adopted EMRS grew tremendously in the 21st century. However, despite the heightened interest and average adoption, EMR implementation is still low due to unassailable organizational constraints, more so financial. (Honavar, S.G.2020).

Electronic Medical Records is the foremost global invention to emanate in healthcare provision. EMR systems integrate several equipment that could better clinical decisions and thus favour a healthcare system that is safe effective and efficient (Gagnon,j.2022).Since the 90's majority of developed countries have adopted EMR systems in basic healthcare. Netherlands reports over 90% of utilization of EMR by healthcare workers. Though this technology has existed over the years, studies have recorded a low implementation rate, about 20% in healthcare organizations. In Africa, while significant efforts have been done in adoption of ICTs in healthcare, research shows the region still lags compared to other developing countries. In Ethiopia, for example, Samuel et al.,(2016) findings show that adoption of modern technologies is way low compared to those of developed countries such as Finland. In Kenya while the adoption of ICTs in healthcare has been quiet it is evident that that it has brought with it numerous benefits.

Based on available literature, the adoption of EMR systems has led to numerous benefits in healthcare provision. According to Anyango, A. J (2019), EMR improves healthcare service quality, which is one of the main reasons for its existence of healthcare organisations. It heals challenges faced by storing and accessing patient information on paper. In addition, using EMR can improve services and the workflow of all activities that occur in hospitals. (Delelegn, E. et al.,2021). This, in turn, reduces the workload of medical staff and patient turnaround time. (Frimpong, M.A. et al.,2022). EMR systems assist clinicians in making better decisions, thereby increasing the security of services provided as well as increasing patient satisfaction. (Gagnon, J. 2022).Ngunyu, D. & Okoro, C. (2020) appreciate the possibility of EMRS to improve timeliness and availability of routine reports in low-resource countries.

Problem statement

Developing countries are increasingly integrating EMR systems into their health systems to ensure service efficiency and effectiveness, especially at provincial and national levels. (Derecho. K. C. et al.,2024). Slow adoption has increasingly turned out to be a serious problem in the provision of quality care in the health industry. (Mhembere, T.B 2019). To make this industry more effective and effective, faster implementation of EMR is necessary. To boost the EMR implementation rate, most developed countries have tried to empower their health care institutions economically. Resultantly, EMR adoption has improved, although the rate of implementation is still slow.

Rapid ICT growth in Kenya has not helped accelerate the full implementation of EMR systems. KNH, though being the largest referral hospital in East and Central Africa, has not yet fully adopted EMR. As far as the management of patients is concerned, the use of manual systems in KNH ensures that monitoring health activities is close to impossible. The hospital has tried several times to fully adopt EMR but much without success.
Thus, the study sought to assess out factors that influence EMR adoption in the outpatient departments at KNH.

II. Materials And Methods

This study employed a descriptive cross-sectional research design, utilising both quantitative and qualitative methods to investigate organizational factors influencing EMR adoption in the outpatient department at KNH. The sample targeted was 216 professional health care workers. All professional workers stationed at the outpatient departments who were willing to participate were included, while those who qualified based on the inclusion criteria, yet were either absent during the study period or did not consent to take part in the study, were excluded. Research participants were identified through proportional stratified random sampling method. This sampling method was used to ensure all targeted cadres were adequately represented. The study sampled 53.3 % of the respondents of each cadre. After written informed consent was obtained, semi-structured questionnaires were given to the participants to complete and return. A key informant guide which was also designed in line with the objectives was used to guide the face-to-face interviews. This acted as a confirmatory tool for the questionnaire findings. Quantitative and qualitative data collection techniques were used to collect data from the respondents and key informant interviews. The study collected data on organizational factors as independent variables and EMR adoption as the dependent variable. The quantitative technique produced quantifiable data while qualitative technique produced data in form of words. Both techniques were complimentary. Qualitative techniques provided extensive explanations while quantitative techniques produced the numeric data needed to test hypotheses and meet the required objectives. Analysis was done using SPSS version 25.0. Descriptive and inferential statistics were applied. Frequencies and percentages were used for descriptive statistics. Chi-square and linear regression

were applied for inferential statistics. The level of confidence was set at 95% and the hypothesis testing was done. The results were presented in frequency, tables and figures.

III. Results

Out of the 216 questionnaires distributed, 193 (89.4%) were completed, accurately filled and returned. A total of six (6) face-to-face semi-structured interviews were conducted. The thematic analysis was undertaken, and recurring themes were incorporated in the findings.

The respondents background/demographic characteristics are displayed in table 1 below:

Table 1: Participants' background information

Variable	Frequency (n)	Percent(%)
Age in years		
20-30	34	17.6
31-40	76	39.4
Over 41	83	43.0
Total	**193**	**100.0**

Variable	Frequency (n)	Percent(%)
Gender		
Male	89	46.9
Female	104	53.1
Total	**193**	**100**

Variable	Frequency (n)	Percent(%)
Educational Level		
College certificate	6	3.0
College Diploma	126	65.3
Bachelor's degree	47	24.4
Postgraduate degree	14	7.3
Total	**193**	**100**

Variable	Frequency (n)	Percent(%)
Designation		
Medical doctor	26	13.6
Nursing officer	36	18.7
Laboratory technologist	41	21.2
Pharmacy technologist	27	14.0
Health information officer	30	15.5
Radiographer	22	11.4
Clinical Officer	11	5.7
Total	**193**	**100.0**

Variable	Frequency (n)	Percent (%)

Experience in healthcare		
< 1 year	3	1.6
1-5 years	40	20.7
6-10 years	52	26.9
Above 11 years	98	50.8
Total	**193**	**100.0**

Participants aged 41 to 60 years old were the majority (43.0%). The second largest age group were those aged between 31-40 years (39.4%% %, n=76). 17.6% (n=34) were aged less than 30 years. Over half of the respondents were females (53.9%, n=104) and 46.1% (n=89) were males. Sixty-five-point three percent of the participants had attained college diploma training, followed by 24.4% (n=47) with undergraduate training. 7.3 % (n=14) had a postgraduate degree, and only 3.0% (n=6) had certificate training. Half of the participants (50.8%, n=98) worked hospital for more than 11 years,6 to 10 years, 26.9%(n=52), 1 to 5 years 20.7%(n=40) and 1.6%(n=3) had worked for less than five years.

Organizational factors

The organizational factors were categorised into EMR training, user involvement, financial support, and adequate technical personnel. The findings from these 4 areas are summarized in table 2 below:

Table 2: Organizational factors influencing EMR adoption

Statement	**True**	**False**
Management provided training on EMR usage	63(32.6%)	130(67.4%)
Management provided financial support for EMR usage	72(37.3)	121(62.7%)
User involvement in the process of EMR adoption	54(29.0%)	137(71.0%)
Provision of adequate technical expertise for EMR adoption	84(29.0%)	109(56.5%)

Out of the 193 respondents, 67.4% (n=130) stated that they had not been trained on EMR usage, 62.7% (n=121) stated that the hospital had not provide financial support for EMR adoption,71.0(n=137) indicated that the users were not involved in the process of EMR implementation while 56.5%(n=109) stated that there was lack of adequate personnel for EMR adoption.

The face-to-face interviews revealed that training was a major area of concern. Lack of training is a key contributor to system failure. Before EMR adoption, staff ought to be trained to enhance their knowledge and understanding of the efficacy of EMR systems. Repetitive findings also revealed that adequate funding, adequate technical expertise were key to systems implementation.

A sample of the interviews:

"The hospital management should train staff on EMR usage to adopt the EMR systems fully. Training is fundamental to effective EMR system adoption. Staff training is not just an optional component of EMR implementation, it is a necessary investment in the realization and sustainability of EMR systems in the hospital. Prioritising training in a health organisation empowers the team to leverage the EMR system to its fullest potential, ultimately leading to improved care. Lack of continuous training is a top barrier to EMR adoption especially for systems upgrade"

"Lack of funding and inadequate technical expertise have also been a challenge to full implementation of EMR. Limited funding and staff attrition has somehow affected us(staff initially trained have left for greener pastures). Sufficient funds, adequate budgeting and financial support are necessary for full system implementation of systems, lack of which hinders system implementation. Inadequate IT staff is a major obstacle towards EMR adoption"

"Lack of user involvement in EMR system implementation is also a challenge to EMR system adoption. Potential users determine the usability of the system. Failure to do this the users may reject the new system thus contributing to its failure. User involvement directly influence EMR adoption success."

Association of organizational factors and EMR adoption.

Results displayed in table 3 show that training on EMR system usage χ^2 (27.782,p=0.0001),user involvement in EMR implementation usage χ^2(47.316,p=0.0001),financial support by the organization usage χ^2 (22.191,p=0.0001) and availability of adequate technical personnel χ^2 (27.782,p=0.0001) were all associated with EMR adoption. All the four organizational categories under investigation were found to be statistically significant.(p value <0.05).

Table 3: Relationship between organisational factors and EMR Adoption

Parameter	*EMR fully adopted n (%)*	*Partial EMR adoption n (%)*	*No Adoption n (%)*	*Chi square statistic (X^2)*	*P value*
Management provided training on EMR usage					
No	3(15.79)	81(.23)	46(80.70)	27.782	**0.0001**
Yes	16(84.21)	36(30.77)	11(19.30)		
User involvement					
No	11(57.89)	113(96.58)	57(100.0)	47.316	**0.0001**
Yes	8(42.11)	4(3.42)	0(0.00)		
Financial support for EMR adoption					
No	4(21.05)	71(60.68)	46(80.70)	22.191	**0.0001**
Yes	15(78.95)	46(39.32)	11(19.30)		
Adequate technical personnel					
No	42(1.05)	64(54.70)	41(71.93)	15.387	**0.0001**
Yes	15(78.95)	53(45.30)	16(28.07)		

Linear Regression

Regression analysis was undertaken to measure the relationship between the statistically significant variables. Regression analysis in table 4 showed an association between specific organizational factors and EMR adoption was statistically significant. Specifically, doctors, pharmaceutical technologists, and individuals with diploma, undergraduate, or master's degrees show significantly higher usage of EMR.

Table 4: Determinants of EMR adoption

Model	**Coef(β)**	**Std .Err**	**t**	**Sig**	**95% confidence**	
Occupation					Lower	Upper
Doctor	**0.872**	**.188**	**-4.63**	**0.0001**	**-1.244**	**-.499**
Health information officer	**-0.59**	**.169**	**3.49**	**0.0001**	**.256**	**.923**
Pharmaceutical technologist	**0.580**	**.171**	**3.40**	**0.0001**	**.243**	**.917**
Level of education						
Diploma	**0.760**	**.290**	**2.62**	**0.010**	**.186**	**1865**
Undergraduate	**0.727**	**.292**	**2.48**	**0.014**	**.149**	**1.305**
Postgraduate	**0.894**	**.324**	**2.76**	**0.006**	**.254**	**1.534**
Organizational factors	**-.270**	**.1229**	**-2.20**	**0.029**	**-.512**	**-.027**

Predictors(constant) occupation, highest level of education, subsection organizational factors.
Dependent variable: EMR adoption.

IV. Discussion

Electronic Medical Records is the foremost global invention to emanate in healthcare provision. Excellent health care is considered the heart of millennium Development Goals(MDGs) because it is aligned to the global agenda for poverty reduction, universal health care access as well as human development.(Katyal,2018). In this era of technology, where things need to be done effectively and efficiently, the existence of electronic medical records has become necessary in a hospital setup. The introduction of EMR significantly influences the management in filing, chart tracking, retrieving, sharing data of medical records. Once the medical records are in electronic form, in various operations, the basic functions of the healthcare system would become very easy. Therefore, for patient care operations to be more efficient and effective, quicker EMR adoption is paramount. We therefore set to explore organizational factors that influence Electronic Medical Records adoption at the National referral Hospital. We further explored five subcategories organizational factors: Training on systems usage, financial availability, user involvement and adequate technological expertise.

Organizational factors contribute to challenges affecting the adoption of EMR system. Training was a major area of concern. Most respondents (67.4%) stated that they had not been trained on EMR system usage. Training of EMR system usage is key to in EMR adoption. Concurs with Mtebe et al.,(2018) who indicated that potential user of the system need to be trained and supported on system use otherwise they would reject the new system thus contributing to its failure.Yehualashet et al. (2021)in his study identified lack of training as a top barrier to EMR implementation**.** Bekele, T. A.et al., (2019). reports inadequate training as one of the major

organizational barriers towards EMR adoption. Training significantly increases EMR use (Oumer.A.M., et al.,2019).

User involvement was also identified as a one of the organizational factors that critical in EMR adoption. Majority of the respondents (71%) indicated that they were not consulted in the process EMR implementation. User involvement in EMR implementation in inevitable. This corresponds with Scheibner et al., (2021) who stated that stake holder engagement is key to systems implementation. Pereira, B. M., & Silva, R. D. (2018)Highlights user involvement, as one of the key determinants of EMR adoption. Garcia, J. M., & Perez, S. (2018) argue that user engagement during selection/implementation phases is critical to avoid rejection. It is worth noting that most systems are developed without engaging potential users which prevent efficient and effective provision of healthcare services. Further instances where users are not involved many at times implementation fails.

Financial support by the organization was also found to be a key factor in the adoption of EMR systems. Majority of the respondents(62.7%) indicated that the hospital lacks funds for EMR adoption. Johnson, E. A., & Adams, L. (2018) Reports that EMR adoption is slow in developing countries due to widespread lack of training, infrastructure, leadership, and funding. Sufficient funds, adequate budgeting and financial support are necessary for full system implementation. Pereira, B. M., & Silva, R. D. (2018) highlights that financial constraints, user involvement, training, and technical infrastructure as key determinants to EMR adoption.

In terms of adequate technological expertise, slightly more than half of the respondents(56.5%) stated that there was not enough technical expertise available for EMR implementation. Technical expertise are responsible for training and retraining staff on how to use the new system. This skill are important because they address system integration and compatibility which can cause delay in service provision. Wukocha et al., (2021) in his study identified technical support as one of the facilitators of EMR adoption. BMC Health Services Research (2020) documents lack of adequate technical expertise is a barrier to systems implementation. Hospitals need to employ enough technical expertise to achieve full implementation of systems.

V. Conclusion

It was apparent that the factors affecting adoption of EMR lack of training, insufficient funds, lack of user involvement and a lack of adequate technical expertise. We thus concluded that all aspects of organizational factors studied (training on EMR usage, financial support, user involvement and availability of technical personnel) are essential in enhancing EMR adoption. Regression analysis also showed an association between organizational factors and EMR adoption were statistically significant. Occupation and level of education were found to be statistically predictors of EMR adoption and use. Higher levels of education were found to be significantly associated with EMR adoption. These insights may guide future training and EMR system rollout strategies, focusing on roles and education levels that show higher engagement. Organizationally, user involvement—when not managed effectively can hinder EMR adoption.

Recommendations

- The hospital should invest in training of potential users of the system so as address employee competence and acceptance to usage of EMR technology.
- The management should increase EMR technical expertise to continually reorient workers in case of any adjustments to the system.
- For effective and seamless adoption, the hospital should source and allocate funds for complete EMR adoption.

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