

Behavioral Factors as a Determinant in Electronic Medical Record System Information Use: A Case of Kakamega County Referral Hospital Outpatient Department

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Abstract: *The Kenyan Health information policy 2010-2030 envisions availability of reliable and relevant health information for use by all in order to make evidence-based decisions to allocate resources effectively and improve quality of health services in the country. Just like other parts of the world, EMR implementation in Kenya is still low coupled with numerous challenges. Despite vast amounts of resources spent in development and implementation of EMR in the outpatient department, anecdotal evidence suggests slowed service delivery in reference to service delivery charter and electronic health data generated was barely used by health care workers for service delivery and decision making. This study therefore sought to answer key research questions derived from the study objectives which include the influence of behavioral factors on information use of electronic medical records technology in a public health institution. The study was guided by technology acceptance model as its theoretical framework. The study adopted a cross-sectional survey design with a target population of 80 respondents working in Kakamega county referral hospital. A descriptive survey research design was used. Stratified random sampling was embraced to divide the population into homogeneous subgroups as per the professional cadres then do simple random in proportion to their number in the population. A questionnaire with a 5-point Likert scale was constructed and used. Data was collected using structured questionnaires and analyzed using SPSS version 23. Both content and construct validity were used to ensure validity of the research instrument's while reliability was determined by using the Cronbach-Alpha Coefficient. Pilot testing to pre-test and validate the research instruments was done prior to the main study. Results on behavioral factors revealed that half of the respondents 38 (51.3%) agreed that the EMR disrupts the way they interact with their patients. The results also revealed 54 (72.9%) of the respondents pointed out that the use of EMR had enhanced data management in their respective stations and 34 (50%) of respondents agreed that EMR had enhanced data confidentiality management. Results on information use showed that 58.1% of the 74 respondents agreed that they use EMR to seek specific information on patient care and 60.8% of the respondents agreed that it was easy to access or retrieve information in the EMR system to guide clinical decision making in real time. Results from Pearson's correlation coefficient showed that there was a significant correlation between the behavioral factors and Information use $r = 0.660, p < 0.001$ and results from linear regression showed that behavioral factors unstandardized coefficient was a significant contributor in the prediction model $t(70) = 7.295, p < 0.01$. Since effective EMR implementation is a lengthy process that evolves over time, the study recommends stakeholders to engage in on-going assessment in order to investigate the nature and direction of impacts and put prompt and well-timed actions in place to address gaps and barriers*

Keywords: Electronic medical record (EMR), Technology Acceptance Model, Hospital Information, Kenya, Healthcare professionals

1. Background

EMR system implementation and use also envisaged better data analysis and trends projection. Despite vast amounts of resources and time invested in development and implementation of EMR, health data generated is barely used by health care providers for service delivery and decision-making. Anecdotal evidence suggests selective application/use of EMR and failure of adoption of EMR system in consultant outpatient clinics after initial infrastructural set up in the entire outpatient unit. Behavioral factors have been noted to be a contributing factor to implementation of EMR. These are individual determinants in terms of actions, attitudes and motivation towards EMR implementation which in turn influence information use. Comprehending the attitudes among different users in multiple aspects is crucial to user acceptance (Wang et al., 2015). Mucee, Odhiambo-Otieno, Kaburi and Kinyamu (2016) asserts that lack of recognition systems, lack of staff motivation to generate data as behavioral factors do influence information use. According to Aqil, Lippeveld, and Hozumi (2009), data collection forms are intricate to fill coupled with computer software which is not user friendly,

does affect the confidence level and motivation for EMR use. He further asserts if the software does not process data well and in a timely manner, the resulting analyses do not give meaningful conclusions for health management decision making thus influencing use of information. Kawale (2011) Indicates that staff attitude towards health Information management determines their use of the data for service delivery at the point of care (Hasanain et al., 2014), concurs with a few literatures that human factor should always be taken into consideration during EMR implementation, that is attitudes, nature and needs of end users. Simon et al. (2013) in his study on lessons learned from the implementation of provider electronic/digital order in five community hospitals pointed out that clinical staff's attitude played a key role in the EMR implementation. According to several studies, it is notable that slow rate of EMR use could be linked to resistance from frontline EMR users who include doctors, nurses, and clinical officer (Lakbala & Dindarloo, 2014). Although a lot of research has been done on the factors that affect the healthcare professional's intention to adopt a new system and technology, the past studies have only been theoretical and do not evaluate the factors that directly affect the use of

Volume 9 Issue 11, November 2020

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information. As a developing country, Kenya is trying to cope up with the developments and technologies in order to improve the health and quality of care of its citizens. In this study we hypothesize that behavioral factors will be associated with information use. The purpose of the current study was to examine the influence of behavioral factors on information use.

2. Methods

The study was conducted as part of a M.Sc. and ethics approval was obtained from Kenya Methodist University ethics board, National commission for science and technology, the Kakamega county commissioner and from Kakamega county referral hospital (KCRH). No further approval was needed since the project did not require access to patients or personal data.

3. Research Design

The study employed the descriptive cross-sectional research design. According to Mugenda and Mugenda (2003), the purpose of descriptive research is to determine and report the way things are and it helps in establishing the status of the population under study. The specific focus of this study, i.e. technical factors affecting electronic medical record system information use, in a setting where paper-based records were previously used, and which can have huge consequences in terms of relations among key health providers within the hospital (Bowers, 1995). Sociotechnical approaches favor a central role of both the health providers and technologies throughout the development process (Faber, 2003). The approach proposed by Bergen and Berg (2004) identified user-involvement as being important to foster ownership of systems that will actually match work processes. Furthermore, successfully introducing such systems into complex healthcare organizations requires a mix of good technical and organizational skills (Lorenzi, 1997). For all these reasons, a sociotechnical perspective has been adopted in this study in order to explain the mobilization of health care professionals and the emergence of this innovation within a major hospital.

Study setting

The study was carried out in KCRH outpatient/Casualty department the hospital is a county General referral hospital in western Kenya and it serves five sub county hospitals providing acute care and surgical services to patients, primary care and community services. It offers a complete range of medical services and its medical faculty has a National reputation for cutting edge research. It is a 500-bed capacity hospital. The scale and complexity of the hospital makes it a particularly appropriate study setting. The choice of this hospital also reflected its suitability for a wider comparative study examining the implementation of the same vendor's EMR system at other hospitals.

Participants

The target population in this study were 80 individuals working in the public (government) hospital. Stratified random sampling was embraced to divide the population into homogeneous subgroups as per the professional cadres

then do simple random in proportion to their number in the population.

Questionnaire

This study utilized a questionnaire as a tool for data collection. The questionnaire contained five sections containing structured questions which involved use of closed-ended questions. Section A captured questions on demographic characteristics of respondents; Section B had questions on behavioral factors specifically Motivation aspects, confidence level to perform EMR tasks and Nature of the attitudes. Lastly, section C entailed questions on (EMR) electronic medical records technology information use in the public health institution. A five-point Likert scale was used with meanings as shown: (1) Strongly Agree (SA), (2) Agree (A), (3) Uncertain (U) (4) Disagree (DA) and (5) Strongly Disagree (SD). The strongly agreed responses were scored at 5 for direct positive responses while those of strongly disagreed responses were scored at 1. Questionnaire items were influenced by items used in the AAP survey (Leu et al. 2012; Lehrman et al. 2015) and the researcher pretested in the KCRH comprehensive care center and modified in light of their comments.

Data Analysis

Data analysis was done using the statistical program for social sciences (SPSS) version 22. Inferential and descriptive statistics were used to analyze data. Descriptive analysis of data will be done using the mean, frequencies and percentages. In this study association between the study variables were assessed by a two-tailed probability value of $p < 0.05$ for significance using Pearson's correlation coefficient. Predictability of information use using behavioral factors was assessed using linear regression. Results were considered significant at a $p < 0.01$.

4. Results

Out of the 80 questionnaires distributed, 74 were correctly filled and returned which represents a response rate of 92.5 percent. According to Mugenda and Mugenda (2003) a response rate of 70 percent is very good. Therefore, the 92.5 percent response rate reported for this study formed an acceptable basis for drawing conclusions. Out of the 74 questionnaires 4 were incomplete in some of the survey questions. The results indicate that the questionnaire used in this study had a high level of reliability (Cronbach = 0.845). According to (Gliem, 2003) a reliability coefficient over 0.65 is acceptable.

Table 1 shows the descriptive analysis of the demographics of the study participants. Among the respondents, majorities were female nurses (64.9%) and only 35.1% were male. The age of the participants was widely distributed which ranged from 20 to 30 years (60.8%) to more than 50 years (5.4%). Analysis of the health professional's educational level revealed that, 54.1% had completed diploma, 12.2% had a certificate, 28.4% had a bachelor's degree and 5.4% had attained a post graduate degree. Work experience in among the healthcare providers ranged from less than five to more than 20 years.

Table 1: Demographic characteristics

Characteristic	N	%
Gender (N=74)		
Male	26	35.1
Female	48	64.9
Age group (N=74)		
20-30 years	45	60.8
31-40 years	16	21.6
41-50 years	9	12.2
Over 50 years	4	5.4
Level of education (N=74)		
Certificate	9	12.2
Diploma	40	54.1
Graduate	21	28.4
Post Graduate	4	5.4
Professional cadre (N=74)		
Nursing	10	13.5
Laboratory Technologist	5	6.8
Pharmacist	4	5.4
Pharmaceutical Technologist	3	4.1
Nutritionist	10	13.5
Medical Officer	2	2.7
Clinical Officer	24	32.4
Physiotherapist	3	4.1
Health Records Officer	12	16.2

Consultant	1	1.4
Years of experience (N=74)		
Less than 5 years	58	78.4
6-10 years	12	16.2
11-15 years	1	1.4
16-20 years	2	2.7
Over 20 years	1	1.4

The largest proportion of the health professionals (78.4%) had practiced less than 5 years followed by 6-10 years of experience (16.2%). The health profession with the largest proportion (32.4%) was clinical officers, 16.2% was health records officers, 13.5% was nutritionists followed by laboratory technologists at 6.8%. Consultants were the lowest with 1.4%.

Health professionals’ perception on level of ICT skills

The descriptive analysis of the nurses perceived usefulness factor of EMR acceptance as mean and standard deviation is shown in Table 2. In this section the respondents were asked questions addressing aspects related to motivation aspects, confidence level to perform EMR tasks, Nature of the attitudes.

Table 2: Behavioral factors in the implementation of EMR

Statement	Strongly Disagree	Disagree	Uncertain	Agree	Strongly agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
a) I always feel very confident using the EMR system	3(4.0)	13(18.0)	6(8.0)	39(53.0)	13(18.0)	74(100.0)
b) I always use the EMR system for all my work	8(11.0)	28(38.0)	6(8.0)	21(28.0)	11(15.0)	74(100.0)
c) The EMR allows me to deliver better patient care	7(10.0)	16(22.0)	9(12.0)	31(42.0)	11(15.0)	74(100.0)
d) The EMR enables records readily available at the point of care	4(5.0)	12(16.0)	12(16.0)	37(50.0)	9(12.0)	74(100.0)
e) The EMR has enhanced data confidentiality	7(10.0)	14(19.0)	16(22.0)	25(34.0)	12(16.0)	74(100.0)
f) The EMR disrupts the way i interact with my patients	8(11.0)	24(32.0)	4(5.0)	20(27.0)	18(24.0)	74(100.0)
g) I prefer an EMR system for my day to day operation than using paper-based record	6(8.0)	12(16.0)	1(1.0)	30(41.0)	24(32.0)	74(100.0)
h) The use of EMR has enhanced data management	7(9.0)	6(8.0)	7(9.0)	36(49.0)	18(24.0)	74(100.0)
i) The use of EMR always reduces workload and saves time	6(8.10%)	12(16.2)	5(6.8)	36(48.6)	15(20.3)	74(100.0)
j) Am satisfied with current EMR practice in the outpatient department	7(9.45)	21(28.4)	6(8.10)	27(36.5)	13(17.6)	74(100.0)
k) Using the EMR increases the quality and accuracy of my work	9(12.2)	13(17.6)	6(8.10)	33(44.6)	12(16.2)	74(100.0)

Half of the respondents 38 (51.3%) agreed that the EMR disrupts the way they interact with their patients while 32 (43.2%) disagreed on the same while (4) 5.4% of the respondents were uncertain. Findings in Table 2 revealed 54 (72.9%) of the respondents pointed out that the use of EMR had enhanced data management in their respective stations, while 20 (27.1%) of the respondents disagreed or were uncertain. Findings on the question EMR has enhanced data

confidentiality revealed 34 (50%) of respondents agreed that EMR had enhanced data confidentiality management while the other 34 (50%) either disagreed or were uncertain.

EMR Information use by healthcare providers

In this section the respondents were asked questions addressing aspects related to their ability to key data into the system, reports generation, Data retrieval, Interoperability.

Table 3: EMR Information use by healthcare providers

Items	SA	D	U	A	SA
I use EMR to seek specific information on patient care	9(12.2%)	11(14.9%)	11(14.9%)	34(45.9%)	9(12.2%)
The EMR allows me to always follow patients’ management plan	6(8.1%)	16(21.6%)	10(13.5%)	33(44.6%)	9(12.2%)
Using EMR I can always order relevant tests/give relevant support to the patient.	4(5.4%)	10(13.5%)	13(17.6%)	36(48.6%)	10(13.5%)
I am able to generate reports from electronic medical reports system	7(9.5%)	12(16.2%)	12(16.2%)	32(43.2%)	11(14.9%)
It is easy to access or retrieve information in the EMR system to guide clinical decision making in real time	5(6.8%)	11(14.9%)	12(16.2%)	33(44.6%)	13(17.6%)
EMR data is able to guide in establishing costs of health care	6(8.1%)	8(10.8%)	11(14.9%)	38(51.4%)	11(14.9%)
EMR is used as a reference to order supplies, medicines and health products	4(5.4%)	5(6.8%)	12(16.2%)	34(45.9%)	18(24.3%)
EMR data generated is used to establish health trends of clients and ensure continuity of care	4(5.4%)	8(10.8%)	14(18.9%)	35(47.3%)	13(17.6%)

EMR data captured is used in making decisions about staffing and infrastructure	5(6.8%)	12(16.2%)	17(23%)	30(40.5%)	10(13.5%)
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The results from the study found that 58.1% of the 74 respondents agreed that they use EMR to seek specific information on patient care while 27.1% disagreed, 56.8% agreed that the EMR allows them to always follow patients management plan while 29.7% disagreed, 63% agreed that using EMR they can always order relevant tests/give relevant support to the patient while 19.2% disagreed, 58.1% agreed that they are able to generate reports from electronic medical reports system while 25.7% disagreed, 60.8% of the respondents agreed that it was easy to access or retrieve information in the EMR system to guide clinical decision making in real time while 21.7% disagreed, 66.3% agreed that EMR data is able to guide in establishing costs of health care while 18.9% disagreed on the same, 63% of the healthcare providers agreed that EMR is used as a reference to order supplies, medicines and health products, while 12.3% disagreed, 66.2% agreed that EMR data generated is used to establish health trends of clients and ensure continuity of care, while only 16.2% disagreed, in addition, 63.5% agreed that EMR data captured is used in making decisions about staffing and infrastructure, while 23% disagreed.

Influence of behavioral factors on Information use

Pearson’s correlation analysis was used to examine the association between professionals’ perceptions of behavioral factors and Information use of EMR. Results showed that there was a significant correlation between the behavioral factors and Information use $r = 0.660$, $p < 0.001$. The coefficient of determination showed that 43.5% of the variability in the Information use could be explained by technical factors $r^2 = 0.435$. According to Cohen’s guidelines of an $r = 0.660$ is a moderate relationship (Valentine & Cooper, 2003).

Linear regression was used to determine if behavioral factors predicted information use. The coefficient of determination showed that 43.5% of the variability in the Information use could be explained by behavioral factors $r^2 = 0.435$. The ANOVA table which tests the null hypothesis that the slope is equals to zero showed that the prediction model was significant $F(1,70) = 53.22$, $p < 0.01$.

Table 4: ANOVA Model Summary Table

	Sum of Squares	df	Mean Square	F	Sig.	R	R ²
Regression	3091.531	1	3091.531	53.218	.000 ^b	.660	.435
Residual	4008.367	69	58.092				
Total	7099.897	70					

The coefficients table showed that behavioral factors unstandardized coefficient was a significant contributor in the prediction model $t(70) = 7.295$, $p < 0.01$ as shown in the table 5 below.

Table 5: Regression Table of influence of behavioral factors on information use

	Regression Coefficients	Std. Error	Pearson correlation Coefficient	t	Sig.
Constant	17.006	4.613		3.687	.000
Technical factors	.660	.090	.660	7.295	.000

5. Discussion

This study has been developed with the aim of exploring behavioral factors influence on use of EMR in Kakamega county referral hospital. Our results showed a remarkable positive correlation between healthcare providers’ behaviour and information use. These findings were inconsistent with earlier findings from other scholars who indicated that one reason attributing to the low adoption of eHealth among developing countries is attitude amongst the clinicians as asserted by (Omary et al, 2010). Half of the respondents 38 (51.3%) agreed that the EMR disrupts the way they interact with their patients while 32 (43.2%) disagreed on the same while (4) 5.4% of the respondents were uncertain. Despite indications that the EMR might prove advantageous, the question intended to find out how respondents felt with regard to EMR –client /patient communication. Majority of respondents felt EMR interferes with the way they interact with clients. This was consistent with study findings carried out on the Use of Electronic Medical Records: Communication Patterns in Outpatient Encounters (Makoul, Curry, & Tang, 2001). However, these findings disagree with (Chan, Stevenson, & McGlade, 2008) research findings where they pointed out that physicians exercised ability to appropriately tailor their use of the computer during consultations. Findings in Table 2 revealed 54 (72.9%) of the respondents pointed out that the use of EMR had enhanced data management in their respective stations, while 20 (27.1%) of the respondents disagreed or were uncertain. Study findings depict current trend where most health care workers prefer simple technology that will enable them provide quality health care services at ease, guarantee patient safety and bring about patient/client satisfaction. These findings concur with most studies where EMRs have been found to improve the quality of patient care, as they enable storage of large amounts of data and also facilitate quick data retrieval, which reduces time pressure on health workers (Msiska et al., 2017) study findings highlight a similar picture. From the findings, a significant proportion of respondents appreciated EMR’s contribution to enhanced data management. (Bain, 2015) in his study concurs with the findings EMR helps simplify management of patient information which in turn improves productivity and lowers costs associated with patient information management. Findings on the question EMR has enhanced data confidentiality revealed 34 (50%) of respondents agreed that EMR had enhanced data confidentiality management while the other 34 (50%) either disagreed or were uncertain. The response depicted a disagreement among respondents’ where there was an equal split on their thoughts about EMR data confidentiality. Health institutions with elaborate and functional EMR

policies on data confidentiality have navigated through this challenge successfully. (Grimson, Grimson, & Hasselbring, 2000) argues that implementation of Information systems in health care settings has fair share of challenges which included security, data entry problems and data confidentiality issues. In a (Khalifa, 2013) he further reiterates that lack of confidentiality is one of the barriers to successful adoption of EMR in Saudi Arabian countries.

6. Conclusion

This study identified and established that health providers had a positive attitude towards information use of EMR. Study on behavioral factors did reveal more than half of respondents felt confident to use EMR system though less than half of them indicated less routine use of EMR in their daily operation. Issue of EMR improving or enhancing data confidentiality elicited an equal split among the participants with some arguing for, while others against. There was general preference EMR system use among respondents. Since effective EMR implementation is a lengthy process that evolves over time, it is also important to engage in ongoing assessment in order to investigate the nature and direction of impacts and put prompt and well-timed actions in place to address gaps and barriers (Cucciniello et al., 2015).

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