RESEARCH ARTICLE

FACTORS INFLUENCING THE ADOPTION AND IMPLEMENTATION OF THE EMR AMONG HEALTH CARE PROVIDERS AT HOMABAY COUNTY TEACHING AND REFERRAL HOSPITAL

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ABSTRACT

In Kenya, many public hospitals continue to use paper-based health records(PBHR), associated with several challenges. Adoption and implementation of the EMR are necessary for the advancement of the quality of patient care. Despite the efforts by the government by providing subsidies, there has been low uptake of the EMR by public facilities. Thus the need to study the factors influencing the adoption and implementation of EMR among healthcare providers in HCTRH. The study focused on identifying the different EMRs available at HCTRH, identifying the areas of application of the EMR at HCTRH, determining the challenges associated with EMR compared to the PBHR, and determining the benefits of EMR at HCTRH. A cross sectional study design was employed, with a sample of 38 of the healthcare providers using EMR. A structured questionnaire was the tool for data collection while analysis was done using excel. There were 5 EMR systems available at HCTRH, Elephant, Funsoft, KenyaEMR, and Laboratory Information and Management systems (LIMS). Areas of application included Clinical, Ordering tests, imaging, drugs, and Health information exchange to be 89%. Billing and administrative that had 15.79% and 26.31% in use. Both technological and organizational factors contribute to challenges affecting the adoption and implementation of EMR. The lack of general infrastructure, 78.95% agreed while funding, 57.89% of the respondents agreed. Other factors, power interference was reported at 63.16%. However, on the positive side, 60.53% of the respondents reported that the hardware and software available are compatible. 57.89% agreed that HCTRH lacks the technical personnel to install and maintain the EMR system. It was apparent that the factors affecting the adoption and implementation of EMR are mainly insufficient funds and lack of the general infrastructure. There is need to increase the supply of infrastructure and budget allocation to address the technological and organizational factors at HCTRH.

INTRODUCTION

Electronic Medical Records (EMR) refer to the digital storage of health-related patient information, created, managed, and accessed by authorized healthcare providers within a healthcare organization. EMRs play a crucial role in patient care by facilitating quality care delivery, improving information sharing across departments, enabling easy data retrieval, and ensuring the accuracy and longevity of collected data. Despite these benefits, the widespread use of EMRs remains low in the United States. Over the past 40-50 years, EMRs have evolved from paper-based systems to advanced IT infrastructures, marking significant progress in healthcare technology.

This shift has been critical for those who recognize the value of information technology in enhancing patient care quality (Carter, 2006). EMRs serve as foundational elements of any national health information system (Castro, 2009). Government policies have significantly influenced the adoption of new technologies, particularly in health systems, by promoting the diffusion and advancement of these technologies (Hall & Khan, 2002). This diffusion is key to determining the rate at which healthcare technologies improve.Various studies have highlighted disparities in the implementation of health information systems between developed and developing countries (Grimm & Shaw, 2007; Williams & Boren, 2008; Chepkwony, 2015). However, no prior research has been conducted at HCTRH, leaving a gap in understanding the factors affecting EMR adoption and

implementation at the facility. This research aimed to fill that gap by analyzing the EMR systems at HCTRH. It focused on identifying the different EMRs in use, exploring their areas of application, comparing EMR with paper-based health records (PBHR), and evaluating the challenges and benefits of EMR implementation at HCTRH.

MATERIALS AND METHODS

This research was conducted at Homa Bay County Teaching and Referral Hospital (HCTRH), a level 4 government health facility in Homa Bay County, Kenya. The hospital has a bed capacity of 350 and employs approximately 400 staff members. It offers a wide range of services, including outpatient and inpatient care, surgical procedures, renal care, radiology, and eye care, among others.A cross-sectional study design utilizing qualitative methods was employed, targeting healthcare workers involved in patient care and using Electronic Medical Records (EMRs) during the study period. The healthcare workers came from departments such as casualty, pharmacy, laboratory, and the Comprehensive Care Clinic (CCC). Healthcare providers who consented to participate and complete the questionnaires were included, while those who declined were excluded from the study.

The sampling process involved two stages. First, purposive sampling was used to identify the healthcare providers to participate in the study based on their involvement with EMR systems. Second, convenient sampling was employed to select healthcare workers who were available during the study period. The casualty department had 12 healthcare providers, the pharmacy had 2, the CCC had 8, and the laboratory had 16, making a total of 42 healthcare workers in the target population.To calculate the appropriate sample size, Slovin's formula was applied, which is given as:

Sample size calculation was done using sloven's formula:

$$n = N / (1 + N (e)^2)$$

Where n is the sample size
N is the study population
The study population was 42
e is the margin of error of 5%(Kothari *et al*., 2005)
$n = 42 / (1 + 42 (0.05)^2)$
n= 38

Data were collected using a structured questionnaire divided into four sections. The first section captured the demographic information of the participants, while the second section explored the extent of EMR utilization among healthcare workers. The third section assessed the perceived benefits of EMR use in patient care, and the final section examined the technological and institutional factors influencing EMR adoption. The questionnaires were designed to gain a comprehensive understanding of EMR usage and the challenges associated with its implementation.Microsoft Excel 2013 was utilized for data analysis. The data were presented in the form of charts, summary notes, tables, and bar graphs, allowing for clear visualization of the findings. Ethical considerations were central to the study's conduct. Confidentiality, anonymity, informed consent, and voluntary participation were all ensured throughout the research process. Each participant received a consent letter and was informed of their right to withdraw from the study at any time or refuse to answer specific questions. These measures were in line with ethical research practices and aimed to protect the rights and dignity of the participants (Hall & Earle, 2021; Nyatanga *et al*., 2022).This study provided valuable insights into EMR adoption at HCTRH, offering a foundation for further research in this area, particularly within similar health facilities in Kenya.

RESULTS

The study involved 38 respondents and there was 100% response rate.

Demographics: Majority of the study respondents were male 68.4%(26), mostly aged 30-40 years 47.4% (18) , most of the respondents 55.3%(21) had diploma education and majority 47.37%(18) had 2-5years of working experiences as shown in the figure below.

Table 1. Distribution of Gender, age, level of education, and work experience

Demographics	Items	Frequecy	Percentage
Gender	Male	26	68.42%
	Female	12	31.58%
Age	<30	13	34.12%
	30-40	18	47.37%
	40-50	7	18.42%
	>50	0	0%
Education level	Certificate	0	0%
	Diploma	21	55.26%
	Undergraduate	15	3.47%
	Postgraduate	2	5.26%
Years of work experience	<1year	1	2.63%
	2-5years	18	47.37%
	6-10years	11	28.95%
	>10years	8	21.05%

Extent of use of EMR

Systems used for medical records: Out of the 38 respondents, 65.79% (25) use both paper and electronic records, 21.05%(8) use electronics only and 13.16%(5) uses paper-based medical records.

Table 2. Distribution of systems used for medical records

CATEGORY N=38	No of cases(%)
Both paper and electronic records	25(65.79)
electronics only	8(21.05)
paper-based medical records	5(13.16)

Frequency of computer use: 92.11% of the respondents use computers daily, 5.26% use computers once a week and 2.63% use them only once a month.

Table 3. Distribution of frequency of computer

CATEGORY N=38	No of cases(%)
Daily	35(92.11)
Once a week	2(5.26)
Once a month	1(2.63)
Never	0(0.00)

Areas of application of EMR at HBCTRH: Activities such as Clinical (patient history, examination, diagnosis, and

management), Order tests, imaging, drugs, and Health information exchange were at 89%. There were other important tasks such as billing and administrative that had 15.79 and 26.31% in use which can be explained in that the health care providers are not involved in these services directly.

Table 4. Distribution of tasks performed using the computers

CATEGORY N=38	No of cases Percentage(%)
Clinical	30(78.89)
Order tests, imaging, drugs	30(78.89)
Administrative	10(26.31)
Biling	6(15.79)
Health information Exchange	30(78.89)
Reports	28(73.69)
Others	3(7.89)

Benefits of EMR use

Institutional and Technoligical factors hindering EMR Adoption. On the benefits related to EMR use the respondents could agree or disagree on the benefits, majority of the respondent agree that EMR is associated with benefits as shown in the table.

Table 5. Distribution of benefits of EMR

CATEGORY N=38	Agree No of cases(%)	Disagree No of cases(%)
EMR improves the quality of work life	35(92.11)	3(7.89)
Allows better decision-making	35(92.11)	3(7.89)
Increases productivity	32(84.21)	6(15.79)
Easy access to patient information	35(92.11)	3(7.89)
EMR decreases the workload	32(92.11)	6(15.79)
EMR enhances communication between healthcare providers and patients	27	11(28.95)
EMR improves the comprehensiveness of patient care	32	6(15.79)

Technological factors: *Lack of general infrastructure for use of EMR.* Out of the 38 respondents, 78.95%(30) agreed that the institution lacks the general infrastructure for EMR use while 21.05%(8) disagreed.

Hardware and software compatibility: 60.53%(23) of the respondents said yes that IT hardware and software are compatible while 39.47%(15) denied it.

Power interference as a challenge: 63.16%(24) of the 38 respondents agreed that power supply is a challenge while 36.84% (14)denied it.

Table 6. Technological factors hindering EMR Adoption

CATEGORY N=38	AGREE No of cases(%)	DISAGREE No of cases(%)
lack of general infrastructure for use of EMR.	30(78.95)	8(21.05)
Hardware and software compatibility.	23(60.53)	15(36.84)
power interference as a challenge.	24(63.16)	14(36.84)

Time taken to procure IT hardware and software.

Out of the 38 respondents, 36.84%(14) said it takes 3 months to procure IT hardware and software, 13.16%(5) it takes 6 months, 7.89% (3)takes 1 year while 42.11%(16) takes indefinite.

Table 7. Distribution of time taken to procure IT hardware and software

CATEGORY N=38	No of cases(%)
3 months	14(36.84)
6 months	5(13.16)
1 year	3(7.89)
Indefinite	16(42.11)

Speed of internet connectivity.

Out of 38 respondents, 36.84%(14) said the internet connectivity is slow, 42.11%(16) said the connectivity is moderate, 7.89%(3) said it was okay while 13.11%(5) said it was fast.

Table 8. Distribution of speed of internet connectivity

CATEGORY N=38	No of cases (%)
Slow	14(36.84)
Moderate	16(42.11)
Okay	3(7.89)
Fast	5(13.11

Organizational factors affecting the adoption of EMR

Supply of IT consumables: 86.84% (33) of the respondent said that the supply of IT consumables is problematic, 13.16% (5)said it was immediate and no respondent said the consumables were never supplied.

Table 9. Distribution of supply of IT consumables

CATEGORY N=38	No of cases(%)
Problematic	33(86.84)
immediate	5(13.16)
Never supplied	0(0.00)

Funding as a challenge: 57.89%(22) of the respondents said that funding is a problem while 42.11%(16) said funding is not a problem.

Does the institution offer EMR training: 63.11%(24) said the institution offers training on EMR while 36.84%(14) denied that the hospital offer training.

Does legal concepts limit EMR use: 76.69%(28) agreed that legal concepts limit EMR use while 26.32%(10) disagreed that legal concept limit EMR use.

The institution lacks adequate technical personnel: 57.89%(22) agreed that the institution lacks the technical personnel; while 42.11%(16) disagreed

Table 10. Organizational factors hindering EMR Adoption

CATEGORY N=38	No of cases (%) AGREE	DISAGREE
funding as a challenge	22(57.89)	16(42.11)
Does the institution offer EMR training	24(63.11)	14(36.84)
Does legal concepts limit EMR use.	28(76.69)	10(26.32)
The institution lacks adequate technical personnel.	22(57.89)	16(42.11)

DISCUSSION

CONCLUSION AND RECOMMENDATIONS

DISCUSSION

The study revealed that the majority of respondents (65.79%) used both paper and electronic medical record (EMR) systems, while 21.05% used electronic systems exclusively, and 13.16% relied on paper-based records. This finding is consistent with studies conducted in other low-resource settings, where hybrid systems (combining paper and electronic records) were commonly used due to the slow pace of EMR adoption (Muinga *et al.*, 2018). However, this contrasts with findings from studies in developed countries, where the exclusive use of electronic systems is more prevalent, owing to stronger infrastructural and technological support (Amatayakul, 2017). The use of both systems highlights the ongoing transition from paper to digital systems in developing settings, but it also suggests inefficiencies, as healthcare providers may face challenges in managing dual record-keeping processes.

Regarding the frequency of computer use, the study found that 92.11% of respondents used computers daily, while 5.26% used them once a week, and 2.63% only once a month. This high frequency of daily use indicates a strong reliance on technology in daily healthcare operations, consistent with findings from studies in urban hospitals in Kenya, where healthcare workers reported frequent use of computers for clinical tasks (Boore *et al.*, 2010). However, this contrasts with studies from rural healthcare settings in sub-Saharan Africa, where access to computers and digital literacy were identified as major barriers to daily use (Kipturgo *et al.*, 2014). The high daily use observed in this study could reflect the relatively urban location of HBCTRH, where access to basic digital infrastructure is more feasible. The findings also showed that EMR systems were primarily used for clinical tasks (78.89%), including patient history, diagnosis, and management, as well as for ordering tests and medications. This is in line with previous studies that found EMR use to be most beneficial in clinical processes that require real-time access to patient information (Waithera *et al.*, 2017). However, administrative tasks and billing were less frequently performed using EMR systems, with only 26.31% and 15.79% of respondents, respectively, using EMRs for these purposes. This suggests a gap in the full integration of EMR into hospital-wide operations, as was also noted in a study by Vishwanath and Scamurra (2007), where financial and administrative tasks were less digitized due to resource limitations. The study highlighted several benefits of EMR, with 92.11% of respondents agreeing that EMR improved the quality of work life and allowed for better decision-making. This is consistent with findings from similar studies, where EMR was shown to enhance clinical efficiency, reduce medical errors, and facilitate better patient outcomes (Boonstra & Broekhuis, 2010). Moreover, the majority (84.21%) also agreed that EMR increased productivity and reduced workload, aligning with previous research that identified time savings and streamlined workflows as key advantages of EMR systems (Waithera *et al.*, 2017). However, a minority (15.79%) disagreed with this view, reflecting findings from studies that highlighted the challenges of adjusting to EMR systems, especially among older or less digitally literate staff (Amatayakul, 2017). The study identified

several technological factors hindering EMR adoption at HBCTRH. A lack of general infrastructure for EMR use was reported by 78.95% of respondents, which is consistent with research by Vishwanath and Scamurra (2007) that identified insufficient infrastructure as a major barrier to EMR implementation. Power supply challenges were also cited by 63.16% of respondents, which is a recurring issue in low-resource settings, where unstable electricity hampers the continuous use of electronic systems (Muinga *et al.*, 2018). Additionally, 42.11% of respondents reported moderate internet connectivity, while 36.84% reported slow speeds, underscoring the importance of reliable internet for effective EMR use. These findings align with previous studies that highlight the need for stable internet connectivity as a critical component of successful EMR implementation (Kipturgo *et al.*, 2014).

The study also revealed organizational barriers, with 57.89% of respondents citing inadequate funding as a major challenge to EMR adoption. This finding is consistent with previous research that emphasized the need for substantial financial investment to support EMR infrastructure, training, and system maintenance (Amekuedee, 2005). Inadequate technical personnel was another key challenge, with 57.89% of respondents agreeing that there were insufficient IT staff to support EMR systems. This aligns with the study by Alexandria *et al.* (2011), which identified a shortage of skilled technical staff as a common issue in healthcare facilities attempting to adopt EMR. The study also highlighted legal concerns, with 76.69% of respondents agreeing that legal concepts limited EMR use. This is in line with Boonstra and Broekhuis (2010), who found that unclear legal frameworks around data privacy and security can create apprehension among healthcare providers regarding the use of EMRs.

CONCLUSION

In conclusion, the study revealed that while healthcare providers at HBCTRH recognized the benefits of EMR systems in improving clinical decision-making, productivity, and patient care, several technological and organizational barriers hindered their full adoption and implementation. The lack of adequate infrastructure, unstable power supply, slow internet connectivity, and insufficient funding were major challenges that limited the effective use of EMR systems. Furthermore, the shortage of technical personnel and concerns over legal frameworks contributed to the slow adoption process. Despite these challenges, the study underscored the importance of EMR in enhancing healthcare delivery, particularly in clinical tasks. However, to maximize the potential of EMR, these barriers must be addressed through targeted interventions.

RECOMMENDATIONS

Infrastructure Development: The hospital should prioritize the improvement of its technological infrastructure by ensuring reliable power supply and stable internet connectivity. This can be achieved through collaboration with the county government to provide alternative power sources, such as generators or solar energy, and improve internet service quality at the facility.

Financial Investment: Adequate funding should be allocated to support the continuous upgrade of EMR systems and ensure the procurement of the necessary hardware and software. Government agencies and international donors should be engaged to provide financial assistance to cover the costs of system upgrades and maintenance.

Training and Capacity Building: Regular training programs should be implemented to enhance the digital literacy of healthcare providers and increase their proficiency in using EMR systems. Additionally, the hospital should hire more technical personnel with specialized skills in managing and maintaining EMR systems.

Legal and Policy Frameworks: The government should develop clear legal policies and regulations concerning the use of EMR systems, addressing issues of data privacy, security, and liability. This will help reduce healthcare providers' apprehension and encourage the broader adoption of EMR systems.

System Integration: Efforts should be made to fully integrate EMR systems into all hospital departments, including administrative and billing sections. This will ensure that the entire hospital operates on a unified electronic system, leading to better coordination, efficiency, and overall healthcare delivery.

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