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Original Research Article

Leveraging Health Management and Information Systems among Healthcare Workers at Kenyatta National Hospital, Kenya

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Abstract: ***Objective*****:** The project aimed to call to mind the leveraging of health management and information systems among healthcare workers at Kenyatta National Hospital, Kenya. ***Design Setting*****:** The investigation deployed a cross-sectional study. ***Subjects or Participants*****:** A sample total of 263 respondents was calculated using the Krecie and Morgan formula for the quantitative study. A strict inclusion criterion was followed to select the respondents from all trained health personnel in Kenyatta National Hospital. The study utilized an interview schedule. Data were analyzed using SPSS version 21 while qualitative data was analyzed on themes developed. Data presentation was in the form of quantitative statistics such as frequency distribution, percentages and tables. Qualitative results were presented in verbatim form. ***Results*****:** A total of 263 respondents were engaged in the quantitative study. The study utilized a questionnaire and a key informant interview guide. Before processing quantitative data, data was cleaned, coded and keyed into MS Excel database computer and analyzed using SPSS version 21. Descriptive statistics were used to describe measures of central tendency and dispersion. Findings were presented using frequency distributions and summary tables. Associations between predictor and outcome variables were run through Correlational statistics. Of the 263 respondents, 199 (74.8%) had a positive attitude and 27 (10.2%) had a negative attitude while, 40 (15.0%) were neutral regarding the concept that change has brought about better, more effective and efficient healthcare services delivery at KNH. HMIS methods have been harmonized and standardized exhibited a strong positive correlation with HMIS implementation ($r = 0.6767$, $p < 0.01$), significantly indicating that the implementation success was associated with the harmonization and standardization of HMIS methods. ***Conclusion*****:** Given the massive return in terms of avoiding future economic and social losses, investing in a resilient health system that provides high-quality essential health services should not be considered a luxury anymore, but as the foundation of social, economic and political stability.

Keywords: Health Information, Health System, Health Management Information System, Interoperability, Universal Health Coverage, Implementation, Digital Transformation, Augmentation, Standardized.

INTRODUCTION

Diseases emerge and re-emerge within communities and eventually, they cease in the same communities. The foundation of a country's response to new disease threats and the improvement of public health lies in its health systems. Healthcare

organizations are investing heavily in Health Information Management Systems to improve healthcare services. Although the benefits of these innovations are undeniable, they come with a cost and require a thorough evaluation before adoption. It is crucial to emphasize the iterative nature of this process. Any alterations in mission, operations, functions, or information and data requirements must be thoroughly evaluated to understand their potential impact on previously conducted analyses. Such changes could significantly affect the health system being acquired [1].

In the 1970s, the Health Information Management (HIM) professional's role expanded to include interpretation of the record and translation of clinical documentation into standardized codes for diseases and surgical procedures using the International Classification of Diseases (ICD). With the arrival of computer technology to support electronic information capture, storage, and retrieval, coded data became easily searchable and accessible [2]. The landscape of information systems is in a perpetual state of evolution, adapting to the needs of the times. This ensures that they remain relevant and effective in their ability to provide valuable solutions for individuals and organizations alike [3], notes that interoperability of the health management Information is systems. For better and more effective interventions in dealing with tropical and infectious diseases we need improved and quality health systems. Health Information Management Systems (HIMS) serve a critical function in healthcare, including areas of public health, administration, research and education. Expectedly there are significant limitations to all healthcare administrative and public health data. Often this relates to the breadth of data collected, which is frequently determined by the expected HIMS.

According to [4], the healthcare sector requires new information systems and approaches to prevent security breaches and protect sensitive information. To effectively utilize big healthcare data, there must be a seamless integration of diverse technologies. This integration can lead to deeper insights into clinical and organizational processes, faster and safer patient throughput, greater efficiencies, and improved patient flow, safety, quality of care, and overall patient experience. Regardless of the cost, implementing these measures can significantly benefit the healthcare industry.

As assessed by the Kenya Health policy (2014-2030) definition of the Country's long term intent in health through strengthening of health information, the target of the policy is to attain a level and distribution of health at a level commensurate with that of a middle income country, with specific impact targets of attaining a 16% improvement in life expectancy; a 50% reduction in annual mortality from all causes; and a 25% reduction in time spent in ill health. Towards strengthening national capacitates for International Health Regulations (IHR), the country inaugurated the first Public Health Emergency Operations Centre (PHEOC) in 2016 to better coordinate activities of relevant stakeholders involved in prevention, detection and response to public health events (PHEs). It is expected that when PHEOC is fully operationalized, it will enhance public health emergency preparedness and response for PHEs in the country [5].

In conformity with [6], evaluation of a HMIS is one of the most neglected areas in the MOH Kenya and without the comprehensive evaluation criteria there is little justification of maintaining or implementing a HMIS. HMIS is a critical part when it comes to any health facility transition. It is imperative for health facilities to have a deep understanding of the system so they can create effective interventions and evaluations for strengthening the health system. Organizations should focus on the iterative nature of the process and carefully assess the impact of any changes they make. On this pedal the collaboration will ensure universal access to quality healthcare [6].

METHODS

The study was conducted at Kenyatta National Hospital in Nairobi County, Kenya. KNH is a National referral facility at the apex of the healthcare sector in Kenya both as a facility and a training center. As per the time of the study the facility had 50 wards, 22 outpatient clinics, 24 theatres (16 specialized) and an Accident and Emergency department it has a bed capacity of 1800 beds out of which 209 beds are for the private wing. The Hospital was built to fulfill the role of being a National Referral and Teaching Hospital, as well as to provide medical research environment. The study utilized a Cross-sectional research design. Cross-sectional studies portray an accurate profile of persons, events, or situations at that particular time. It allows the collection of large amounts of data from a sizable population in a highly economical way. As per the healthcare tiers in Kenya, KNH is at the apex of which is the National Teaching and Referral Hospital and thus was purposefully selected. These allowed the study to collect data which was analyzed quantitatively and quantitatively using descriptive and inferential statistics. These details corroborated the Cross-sectional survey as deemed the best strategy to fulfill the objectives of the study. The research design explored a case study of KNH. There were 4,490 accredited healthcare service delivery officers at Kenyatta National Hospital who would have in one way or another been

involved in implementing the HMIS. The study included all the 4,490 accredited healthcare service delivery officers in the three levels of management; top/managerial, middle/ and operational levels at Kenyatta National Hospital who would have in one way or another been involved in implementing the HMIS. All other persons not involved in the HMIS implementation were excluded. KNH has 46 departments in total. From the organogram respondents were sampled based on their relevance and phases of HMIS implementation, thus there were three cadres of respondents. Since a sample was selected from the KNH located in Nairobi, it was expected that selecting one healthcare worker/respondent was the same as selecting the other. In the determination of the target population to be surveyed, a qualitative and quantitative sample size was determined consequently, according to the Krecie and Morgan formula, three factors served as the basis for appropriate determination of the sample size. These factors were the projected frequency of the preferred respondent characteristic (p) from which an approximated 87.5% of the health professional officers surveyed were expected to persuade that the research was viable. The other factors used were the preferred level of confidence (t) which was set at 95% (gives a standard value of 1.96) and the acceptable margin of error (m) set at 4% (which gives a standard value of 0.04). Given the three factors, the sample size was thus calculated using the formula:

Total number of health workers = 4,490
19 departments are directly involved with HMIS
$N = \{t^2 \times p\ (1-p) \times 1\}/m^2$
$=1.96^2$ x 0.875 (1-0.875) $/0.04^2$
=0.420175 / 0.0016= 262.609375 and thus, 263 respondents at the operational level and thus 14 respondents in each stratum/department. A questionnaire and key informant interview schedule were used as data collection tools. The data collection method was through the use of questioning and interviewing. The data collection technique involved structured and unstructured questions combined with a key informant interview. Before processing the quantitative data collected from the field. it was cleaned, edited, coded then entered into a computer software and analyzed using SPSS version 21. Qualitative data which cannot be represented by a numerical statistic, was done through qualitative content analysis. The study proposal was submitted to the Kenyatta National Hospital/University of Nairobi ethical review committee for ethical approval. Subsequent approval was vindicated upon meeting the warranted KNH/UoN ERC threshold.

RESULTS

Out of 263 respondents, 133(50.6%) were males and 130(49.4%) were females. With regard to age category, 161 (60.5%) of the respondents were aged between 36-45 years while 102 (38.8%) were aged between 26-35 years. The study findings indicated that 34 (12.8%) of the participants had < 1 year of work experience at KNH, 66 (24.8%) had between 1-3 years of experience, 59 (22.2%) had between 4-7 years of work experience, while 74 (27.8%) had 13 years and above of work experience within the facility. Results indicated that out of the 263 respondents, 13 (4.9%) were in top-level management, 139 (52.3%) were in middle-level management while 114 (42.9%) were in operational-level management (Table 1).

Table 1: Frequency analysis of the social demographic characteristics of respondents

Variables	Category	Frequency	Percentage
Sex	Males	133	50.6
	Females	129	49.4
Age in years	26-35	6	2.3
	36-45	161	60.5
	46-55	99	37.2
Level of education	Diploma	126	47.4
	Degree	138	51.8
	Masters	2	0.8
Duration of work experience in KNH in years	<1	34	12.8
	1-3	66	24.8
	4-7	59	22.2
	8-12	33	12.4
	13 and above	74	27.8
Level of management	Top	13	4.9
	Middle	139	52.2
	Operational	114	42.9

Study findings indicated that 215 (80.8%) had a positive perception that KNH uses HMIS in its day-to-day activities in delivering healthcare services while, 30(11.3%) of the participants were uncertain and 21(7.9%) had a negative perception on the concept. From this analysis the study results therefore observed that KNH used HMIS in its day-to-day activities in delivering healthcare services. When participants were asked whether KNH management supports trainings in HMIS, 172(64.7%) of the participants had a positive attitude, while 61 (22.8%) were uncertain and 33(12.5%) had a negative attitude, hence it was concluded that there was a large support from KNH management on HMIS trainings. On the domain the Hospital Management Information System (HMIS) had been fully implemented, approximately 1/3 of the respondents 88(33.1%) had a positive perception, while an equal percentage 88(33.1%) had a negative perception, whereas, 50(18.8%) were neutral on the matter. Additionally, 199 (74.8%) had a positive attitude and 27 (10.2%) had a negative attitude while, 40 (15.0%) were neutral regarding the concept that change has brought about better, more effective and efficient healthcare services delivery at KNH (Table 2).

Table 2: Respondent's perceptions on Organizational factors influencing HMIS implementation at the Kenyatta National Hospital

Factors	Negative Perception, n (%)	Neutral	Positive Perception
HMIS utilization	21(7.9)	30 (11.3)	215 (80.8)
Trainings in HMIS	33(12.5)	61 (22.8)	172 (64.7)
Change management	27(10.2)	40 (15.0)	199 (74.8)
Availability of computers	79 (29.7)	63 (23.7)	124 (46.6)
HMIS implementation	108 (40.6)	50 (18.8)	108 (40.6)

Status of Responses on HMIS Implementation at Kenyatta National Hospital

The study findings indicated that 87(33.08%) of the respondents were enthusiastic that there was full implementation of the HMIS by the hospital and 51(18.80%) of the respondents were uncertain while 20 (7.52%) of the respondents were cynical that there was full implementation of the HMIS by the hospital. There was an equal percentage of those who were cynical to those who were enthusiastic 87(33.08%), on the concept: HMIS had been fully implemented by the hospital (Figure 1).

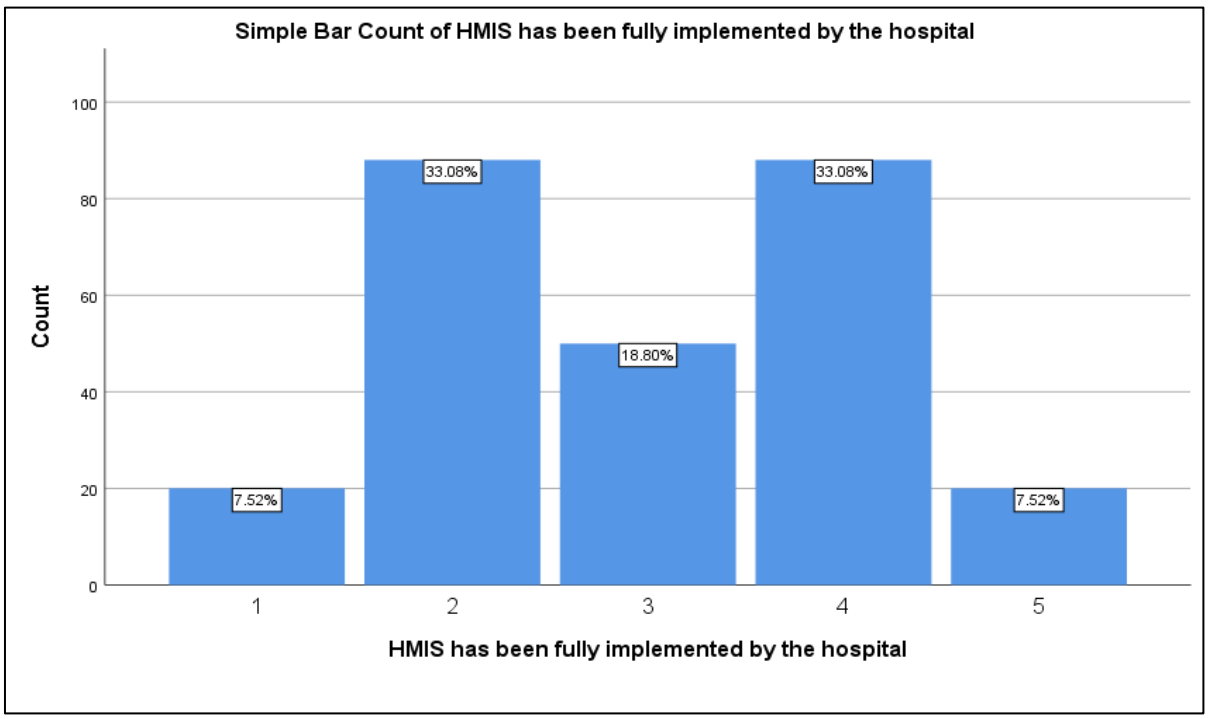

Figure 1: Respondent's Status of HMIS implementation at KNH

From the study findings, the correlation matrix revealed noteworthy associations between HMIS implementation and the examined factors. "HMIS methods have been harmonized and standardized" exhibited a strong positive correlation with HMIS implementation ($r = 0.6767$, $p < 0.01$),

indicating that the implementation success was closely linked to the harmonization and standardization of HMIS methods. This suggested that having standardized procedures contributes significantly to the successful adoption of HMIS.

Additionally, there was an effective and fair distribution of computers in the hospital demonstrated a moderate positive correlation with HMIS implementation (r = 0.4148, p < 0.01), emphasizing the importance of equitable computer distribution in the successful integration of HMIS. These findings suggested that ensuring fair access to computing resources significantly contributed positively to the implementation process.

However, KNH uses HMIS in its day-to-day activities and "KNH management supports training in HMIS exhibited a weak positive correlation with HMIS implementation (r = 0.3342 and r = 0.3528, respectively, both p < 0.01). These correlations highlighted the significance of routine use and managerial support for trainings in facilitating the successful implementation of HMIS (Table 3).

Table 3: Correlational matrix indicating Organizational factors and HMIS implementation at KNH

	HMIS_implemen	y-to-day_u	nt_suppor	act_of_cha	ir_distribu	harmonize	ocess_of_	ocacy_mai
HMIS_implementa	1	0.3342	0.3528	0.3967	0.4148	0.6767	0.4691	0.4439
day-to-day_use	0.3342	1	0.4016	0.2738	0.1112	0.3234	0.1981	0.2182
management_supp	0.3528	0.4016	1	0.4026	0.1835	0.3836	0.3521	0.3298
impact_of_change	0.3967	0.2738	0.4026	1	0.3414	0.4489	0.3929	0.3612
effective_and_fair_	0.4148	0.1112	0.1835	0.3414	1	0.3217	0.2566	0.3050
HMIS_methods_ha	0.6767	0.3234	0.3836	0.4489	0.3217	1	0.5055	0.4836
integrated_process	0.4691	0.1981	0.3521	0.3929	0.2566	0.5055	1	0.4420
HMIS_Advocacy_m	0.4439	0.2182	0.3298	0.3612	0.3050	0.4836	0.4420	1

DISCUSSIONS

From the study findings, the correlation matrix revealed noteworthy associations between HMIS implementation and the examined factors. Organizations need to target resource mobilization, research and development, and access to essential medicines and vaccines, health workforce, international health regulations and statistical capacity-building, further WHO stated that a qualified health workforce that is available, equitably distributed and accessible by the population is essential for a well-functioning health system [7]. These agreed with the study findings, whereby out of the 263 respondents, with regard to age category, 161 (60.5%) of the respondents were aged between 36-45 years while 102 (38.8%) were aged between 26-35 years indicating a good balance of human health resource. Study findings indicated that 215 (80.8%) had a positive perception that KNH uses HMIS in its day-to-day activities in delivering healthcare services, while 30(11.3%) of the participants were uncertain, and 21(7.9%) had a negative perception of the concept. From this analysis, the study concluded that KNH used HMIS in its day-to-day activities to deliver healthcare services. Further, study findings indicated that 87(33.08%) of the respondents were enthusiastic that there was full implementation of the HMIS by the hospital, while 51(18.80%) of the respondents were uncertain and 20 (7.52%) respondents were cynical that there was full implementation of the HMIS by the hospital. HMIS methods have been harmonized and standardized exhibited a strong positive correlation with HMIS implementation (r = 0.6767, p < 0.01), significantly indicating that the implementation success was associated to the harmonization and standardization of HMIS methods.

The SDGs highlight the need for robust health systems. The availability of resources was likely to expedite the implementation of a HMIS, whereas their absence was likely to be a constraint. The procurement of new computers, recruitment of records staff, and deployment of new statisticians in some hospitals helped implement the new systems. However, inconsistent internet connectivity, inadequate storage files and data security concerns were an impediment in the majority of developing countries [7]. Similarly, there was an effective and fair distribution of computers in the hospital" significantly demonstrated a moderate positive correlation with HMIS implementation (r = 0.4148, p < 0.01), emphasizing the importance of equitable computer distribution in the successful integration of HMIS. These findings suggested that ensuring fair

access to computing resources significantly contributed positively to the implementation process.

Regarding the concept that change has brought about better, more effective and efficient healthcare services delivery at KNH, the study findings indicated, 199 (74.8%) had a positive attitude and 27 (10.2%) had a negative attitude while, 40 (15.0%) were neutral on change management. These integrations of HIMS had a positive influence on the day-to-day affairs of KNH. The respondents reflected that adequate staff training and sufficient time spent by different experts in the field helped to ensure the appropriate design of the new system which will in return bear crucial fruits for evidence-based policy making. It was safe to say that the study highlighted that KNH's leadership and governance had developed changes in its structure into a more integrated process of management, especially when it comes to how products and services are adopted and implemented in the hospital. Making sure there is an all-inclusive consultative process across all cadre. The Information system development and implementation activities that were conducted in anticipation from manual to electronic at KNH include; Planning, designing, training of system users, revision of indicators, preparation of guidelines, staff training, benchmarking, self-assessment of the organization, evaluation of manual systems, conducting group discussions, integration of data collection process, disease surveillance, patient identification, deployment of trained staff, procurement of computers, installation and commissioning.

The study findings also pointed out the importance of training the users to have skills and knowledge on how to use the system, user-friendly software, and preparation of guidelines since they literally explain everything related to the system and contain change resistance. However, KNH uses HMIS in its day-to-day activities and KNH management supports training in HMIS exhibited a weak positive correlation with the HMIS implementation ($r = 0.3342$ and $r = 0.3528$, respectively, both $p < 0.01$). These correlations highlighted the significance of routine use and managerial support for trainings in facilitating the successful implementation of HMIS. The implementation phase was important as it determined how well the process rolled out, and self-assessment [8]. The PDCA cycle was effective and it brought about emphasis on continuous feedback that identifies major errors on the ongoing process. The needs analysis helped KNH management to identify the needs for implementing HMIS. Development of data capturing system using computers during patient's registration. The pre-implementation was important as they involved various departments and the involvement of other stakeholders. However, some respondents were uncertain of what they thought was critical during the adoption and implementation of HIMS at KNHS. According to [9], a people-centered approach means that, data should empower people or help their effort to actively participate in the development of a health management information system, from the design phase all the way to the implementation of the system [10], indicated that governance and leadership of countries is vital on how the health systems perform. Even where health systems are well developed and resourced, there is clear evidence that quality remains a serious concern, with expected outcomes not predictably achieved and with wide variations in standards of healthcare delivery within and between healthcare systems. This was in tandem with the study results that indicated a need to strengthen the health system through enhancing and in-syncing systems and human systems for the implementation and evaluation of health programs and appropriate use of resources.

CONCLUSIONS

The SDGs highlight the need for robust health systems. HIMS should be viewed as investments that recoup their costs and not expenses. KNH needs to invest wisely and utilize resources to build a strong healthcare system that can combat future healthcare challenges. Doing so will demonstrate that they have learnt from the past lessons: health is not a cost to be contained but an investment to be nurtured. Given the massive return in terms of avoiding future economic and social losses, investing in a resilient health system that provides high-quality essential health services should not be considered a luxury anymore, but as the foundation of social, economic and political stability. As the study has demonstrated, HIMS advent is not just about automation but about augmentation. A HIMS is a perpetual indispensable tool for providing safe, high quality and high-productivity healthcare.

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