The Implementation Criteria of a Health Management Information System: A Case of Kenyatta National Hospital

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Abstract- Embracing modern technology is one among very many ways of improving efficiency and reducing costs within healthcare organizations. While the integration of information and health services potential benefits cannot be disputed, there are many challenges which affect its adoption, in fact, majority of organizations have abandoned their newly acquired systems only to go back to their old manual systems.

Objective: The objective of this study was to determine the implementation phase of the implemented Health Management Information System at Kenyatta National Hospital.

Methods: This study was a cross-sectional descriptive study, the targeted population of the study were 263 healthcare workers who were involved in the implementation of the Health Management Information System at Kenyatta National Hospital, the sample technique used was stratified sampling. The study utilized structured questionnaires for 263 respondents in the implementation phase, analysis was done through use of univariete and bivariete statistics. Data presentation was in form of descriptive statistics such as frequency distribution, percentages, pie charts, bar graphs and tables.

Results and Discussions: The data from the implementation phase was summarized in three main evaluation areas targeting the organizational, technical and individual factors that influence HMIS implementation. From the findings, there was a balance in gender, age and cadre at KNH and thus an equilibrium that is anticipated towards HMIS implementation. Facilitating the staff with the necessary equipment for example personal computers is a challenge to KNH. These does not augur well with (Laudon and Laudon, 2008) who stated that the production of quality health-care delivery in a country is guided by the level of the ICT infrastructure possessed and used by that country. Comparison of health workers characteristics and their responses on influence of organizational factors on HMIS implementation showed that health workers' age and duration of employment in KNH were both significantly associated with perception of HMIS implementation. The health workers in the older age groups 36-45 years 31, (38.3%) P = 0.021 and 46-55 years 6, (20%) P = 0.001 were less likely to agree that organizational factors influenced implementation of HMIS compared to younger 18-25 years 28, (59.6%) health workers. (OR = 0.17, 0.06-0.49. for 46-55 years and OR = 0.42, 0.20-0.88 for 36-45 years). Similarly longer duration of employment was associated with less agreement that organizational factors influence implementation of HMIS.[0-12 months 26, (57.8%) vs 8-12 years 12,(29.3%) OR = 0.3. 0.12-0.74)]. Gender did not have a significant association with organizational factors influence of HMIS implantation (OR = 0.97, 0.59 – 1.59, P = 0.901).). Logistical regression analysis showed that participants' responses on the influence of technical factors on implementation of a HMIS were associated with level of management. Health workers in operational/technical level of management were significantly less likely to report an influence of individual factors on HMIS implementation compared to top/strategic level managers. (OR = 0.14, 0.04-0.52, P = 0.003), middle/tactical level management responses were not significantly different from top/strategic level managers (OR = 0.51, 0.16-0.52, P = 0.0257). Health worker's cadre, gender and duration of employment were not significantly associated with influence of individual factors on HMIS implementation (all P values > 0.05). To support these, Wickramasinghe *et al* (2005) stated that cultural and individual issues need to be addressed in terms of appropriate and relevant content. The findings indicated that two factors: level of management and duration of employment were significantly associated with technical and individual factors affecting HMIS implementation at KNH. The findings indicated that two factors: level of management and duration of employment were significantly associated with technical and individual factors affecting HMIS implementation at KNH.

Conclusions: Based on the results and discussions, Health management information systems can provide tools for managing complex health care challenges and addressing growing information needs, these was characterized in that, most health workers agreed 158 (59.4%) or strongly agreed 64 (24.1%) that KNH used HMIS in routine delivery of healthcare services. Similarly, health workers were more likely to agree that KNH management supports HMIS 177 (66.8%) and that change to electronic HMIS had brought better, effective and efficient healthcare delivery 170 (63.9%). Most respondents 159 (60%) agreed that KNH has developed changes in its structure into a more integrated process of management. In the implementation criterion, the findings indicated that while the other attributes had a significance, gender did not have a significant association with organizational factors influence of HMIS implementation and that two factors: level of management and duration of employment were significantly associated with technical and individual factors affecting HMIS implementation at KNH.

Recommendations: KNH needs to improve their current infrastructure, embrace technology and be updated with the new ways of managing health problems in order to attain international standards.

Index Terms- **HMIS**- Health Management Information Systems, **KNH**-Kenyatta National Hospital, **HSS**-Health Systems Strengthening **ICT**-Information Communication Technology **SDLC**-Software Development Life Cycle

I. Introduction

Health is at the heart of the Millennium Development Goals (MDGs) and Health information systems are critical for reaching universal health coverage. Health systems' strengthening is rising on political agendas worldwide. Precise and nuanced knowledge and understanding of what constitutes an effective health system is growing all the time. At its broadest, health system strengthening (HSS) can be defined as any array of initiatives and strategies that improves one or more of the functions of the health system and that leads to better health through improvements in access, coverage, quality, or efficiency (Health Systems Action Network 2006). The current WHO framework for action on Health systems describes six clearly defined health system building blocks that together constitute a complete health system (WHO, 2009).Many developed countries such as Singapore, Canada, United States of America and United Kingdom have invested huge amounts of money for stimulating Health Management Information System (HMIS) adoption while developing countries are still struggling to make do with the traditional healthcare setup.

Study Purpose: The aim of the study was to assess the implementation criteria in the implementation of Health Management Information System in Kenyatta National Hospital.

II. Methods

The study was conducted in Nairobi County at Kenyatta National Hospital and used a descriptive purposeful research design. Purposeful sampling, in contrast to probabilistic sampling, is "selecting information-rich cases for study in depth".In this case KNH being at the apex of the National Hospital Referral System was purposefully selected. These shall allow the study to collect data which will be analyzed quantitatively using descriptive and inferential statistics (Kothari, 2004). Therefore, the descriptive survey was deemed the best strategy to fulfill the objective of this study. The design took on a case study at KNH.

The targeted population were 263 accredited healthcare service delivery officers at Kenyatta National Hospital who were directly or indirectly involved in the implementation phase of implementing the HMIS. The scope was deemed appropriate due to the fact that with rise in technology, urban areas and cities in specific embrace it with ease. The scope was also significant to minimize expenses which would otherwise be incurred outside the researchers' residential city.

The researcher used stratified sampling, with stratified sampling; the population is divided into groups, based on some characteristic. Then, within each group, a probability sample (often a simple random sample) is selected. In stratified sampling, the groups are called strata. (Kothari, 2004). Then judgment is used to select the subjects or units from each segment based on a specified proportion, From the study the independent variables were the organizational, technical and individual factors in the implementation criteria when adopting a Health Management Information System at the Kenyatta National Hospital, since an *independent variable* refers to the status of the presumed cause whereas the *dependent variable* is the presumed effect. Effectual Implementation of Health Management Information System at the Kenyatta National Hospital due to the importance of the implementation criteria thus was the dependent variable.

These was a quantitative Data analysis and was done using SPSS, Ms Excel and Ms Word software's with univariate and bivariate statistics being utilized.Univariate statistics is taking one variable and analyzing it whereas, Bivariate analysis is one of the simplest forms of quantitative (statistical) analysis. It involves the analysis of two variables for the purpose of determining the empirical relationship between them in order to see if the variables are related to one another, it is common to measure how those two variables simultaneously change together. Bivariate analysis can be helpful in testing simple hypotheses of association.

Before data collection, a permit was sort from the Kenya Methodist University and the Kenyatta National Hospital/University of Nairobi ethics committee. On production of the research permit, consideration for permission to carry out the research was to be granted by the research and ethics board team. The Administrators, staff and the support staff of the departments selected were informed in advance concerning the visits and for data collection in their respective departments and offices. The researcher ensured that confidentiality was paramount and the information obtained used only for the purpose of these study.

III. Results and Discussions

A total of 263 questionnaires were administered to health workers using the HMIS system. Two health workers did not return the completed questionnaire, thus responses from a total of 261 health workers were available for evaluation of the operational criteria phase, representing a response rate of 99.2%.

Social demographics: Out of the 261 health workers who responded to the survey, a total of 152 (57.1%) were male giving a male-to-female ratio of approximately 4:3. The mean age of the health workers was 34.7 years with a SD of 9.3. The modal age group among the health workers was between 26-35 years with 101 (38%) of participants followed by age 36-45 at 82 (30.8%) and the age group aged 56 and above were the minority at 5 (1.9%), and majority 112 (42.9%) of the respondents were health information officers. Clinical staff accounted for 82 (31.4%) of respondents and administration and operation staff comprised 67 (25.7%) of participants. Individuals are among the users of HMIS and different users have different needs (WHO, 2013). The research sought to find out if there is a relationship between the socio-demographics characteristics of the respondents and the HMIS implementation in KNH. Findings indicated that there is a balance in gender, age and cadre at KNH and thus an equilibrium that is anticipated towards HMIS implementation.

In comparison to participant's age and participant's duration, there is a blend among young and older healthcare workers and change management should not be among the

impediments of adopting HMIS as KNH, (2008) puts it that healthcare providers in Kenyatta National Hospital have not reached the optimum for adopting electronic health records, it is unclear what the impediments are, although they want to adopt HIT there are still challenges that need to be contained.

a) **Organizational factors influencing HMIS implementation:**Despite the general lack of knowledge on HMIS policy the informants demonstrated adequate understanding of the objectives of the electronic HMIS in KNH. Based on the responses obtained during interviews there were multiple problems related to the manual system that existed in KNH during the pre-implementation stage and these issues served as the basis for objective setting for the current HMIS in the hospital. The main purposes of the HMIS system listed by key informants were to: improve efficiency, improve data quality, reduce loss of hospital data, reduce data archiving and storage requirements, and promote automation and integration of hospital processes and procedures and these indicated why KNH re-aligned its strategic focus and interventions for the Hospital to meet the challenges it faces in the implementation of its mandate and among the strategic plans was adoption of ICT to improve its performance to the expected international standards it intends to achieve (KNH SP, 2013). At least 50% of respondents agreed that more computers should be added to the department, the department collects, analyzes, interprets and stores data in its computers and KNH has a current and up to date ICT infrastructure. This blended well with (KNH SP, 2013) that documented, for KNH to achieve its mission and vision the hospital needs to embrace technology and be up to date with the new ways of managing Health care issues. Comparison of health workers characteristics and their responses on influence of organizational factors on HMIS implementation showed that health workers' age and duration of employment in KNH were both significantly associated with perception of HMIS implementation. The health workers in the older age groups 36-45 years 31, (38.3%) P = 0.021 and 46-55 years 6, (20%) P = 0.001 were less likely to agree that organizational factors influenced implementation of HMIS compared to younger 18-25 years 28, (59.6%) health workers. (OR = 0.17, 0.06-0.49. for 46-55 years and OR = 0.42, 0.20-0.88 for 36-45 years). Similarly longer duration of employment was associated with less agreement that organizational factors influence implementation of HMIS.[0-12 months 26, (57.8%) vs 8-12 years 12,(29.3%) OR = 0.3. 0.12-0.74)]. Gender did not have a significant association with organizational factors influence of HMIS implantation (OR = 0.97, 0.59 – 1.59, P = 0.901).

b) **Technical factors influencing HMIS implementation**. Study results showed that top management level were more likely to agree or strongly agree 13 (72.2%) that technical factors had influence on HMIS implementation compared to technical or tactical level management. Logistical regression analysis showed that participants' responses on the influence of technical factors on implementation of a HMIS were associated with level of management. Compared to top/strategic managers the middle/tactical level were less likely to agree that technical factors influence implementation of HMIS [42 (38.5%) vs 13 (72.2%), OR = 0.24, 0.08-0.74, P = 0.012]. The staff cadre was not associated with responses on whether technical factors influence HMIS implementation (health information OR = 1.6, 0.9-2.84, P = 0.113) administration and operation (OR = 1.36, 0.71-2.6, P = 0.358). Gender did not show a significance association with participant views on whether technical factors influenced HMIS implementation (OR = 1.23, 0.75-2.01, P = 0.415).

c) **Individual Factors Influence on HMIS** : Most health workers agreed that health care service delivery is faster with HMIS 167 (62.8%) and that HMIS has brought about better updating and expertise in healthcare service delivery 175 (65.8%). Health worker responses on the influence of remaining individual factors on HMIS were more variable, to support these, Wickramasinghe *et al* (2005) stated that cultural and individual issues need to be addressed in terms of appropriate and relevant content. Health workers in operational/technical level of management were significantly less likely to report an influence of individual factors on HMIS implementation compared to top/strategic level managers.(OR = 0.14, 0.04-0.52, P = 0.003), middle/tactical level management responses were not significantly different from top/strategic level managers (OR = 0.51, 0.16-0.52, P = 0.0257). Health worker's cadre, gender and duration of employment were not significantly associated with influence of individual factors on HMIS implementation (all P values > 0.05)

IV. Conclusions

Health management information systems can provide tools for managing complex health care challenges and addressing growing information needs, these was characterized in that, most health workers agreed 158 (59.4%) or strongly agreed 64 (24.1%) that KNH used HMIS in routine delivery of healthcare services. Similarly, health workers were more likely to agree that KNH management supports HMIS 177 (66.8%) and that change to electronic HMIS had brought better, effective and efficient healthcare delivery 170 (63.9%). Most respondents 159 (60%) agreed that KNH has developed changes in its structure into a more integrated process of management. These was in agreement in that many of the respondent were likely to agree (60%) or strongly agree (14.7%) that ICT structure is conducive for the growth and expansion of HMIS in KNH and that cost of ICT equipment and tools affects the application and implementation of HMIS (55.3% and 15.8%, respectively) An important approach to the design and implementation of any HIT and health programme is to identify the various stakeholders who need to be involved and find mechanisms for including their perspectives and concerns and to find ways to mobilize their skills, expertise and resources. In the implementation criterion, the findings indicated that while the other attributes had a

significance, gender did not have a significant association with organizational factors influence of HMIS implementation and that two factors: level of management and duration of employment were significantly associated with technical and individual factors affecting HMIS implementation at KNH.

V. Recommendations on Research Findings

The KNH and MOH need to have iterative process before implementing any health management information system.

Appendix

Appendixes, if needed, appear before the acknowledgment.

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References

[1] Aineruhanga, M., (2004). Focus on the Kenya ICT Week'. Chakula Newsletter.

[2] Ajuwon, G.A (2008). Use of the Internet for health information by physicians for patient care in a teaching hospital in Ibadan, Nigeria BMC Medical Informatics and Decision Making 2003, 3:10.

[3] AMREF(2010), Leadership and Management. Kijabe printing Press, Nairobi

[4] Bates, D. (2005). Computerized Physician Order entry and medication errors: finding a balance. Journal of Biomedical Informatics, 38(4): 250-261.

[5] Bhatnagar, S., (2003)-last update, Enabling E-Government in Developing Countries: From vision to implementation.

[6] Bhattacherjee, A., & Hikmet, N. (2008). Reconceptualizing Organizational Support and its Effect on Information Technology Usage: Evidence from the Health Care Sector. The Journal of Computer Information Systems, 48(4), 69-76.

[7] British Medical Journal(2003).Public Health Articles 17thedition.oxfordst

[8] Chaudhry, B. Wang, J., & Wu, S (2006). Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care, Annals of Internal Medicine, 144(10), 742–752.

[9] George W. Odhiambo-Otieno (2005). Evaluation criteria for district health management information system. International Journal of Medical Informatics (2005) 74, 31—38

[10] Gichoya D (2005) " Factors affecting the Successful Implementation of ICT Projects in Government" The Electronic Journal of e-Government Volume 3 Issue 4, pp 175-184, available online at www.ejeg.com

[11] Godden, W. (2004). Sample Size Formulas. Retrieved from http://williamgodden.com/samplesizeformula.pdf

[12] Health Systems Action1 (2006) International healthnetwork concerns. 316-334.

[13] Heeks, R., (2002). Information Systems and Developing countries: Failure, success, and local improvisations. http://www.fes.uwaterloo.ca/crs/plan674d/isysanddcountries

[14] http://www.apc.org/apps/img_upload/697261667269636164 6f63756d656e74/egov

[15] http://www.digitalhcp.com/2008/05/27/dc-rhio-sets-ambitious-plans.html, accessed June 25, 2014,

[16] http://www.iicd.org/articles/HMISOrganizationalDevelopment#sthash.AQdBx5rb.dpuf. html, accessed June 25, 2014,International Journal of Electronic Healthcare,

[17] Kenyatta National Hospital (2013).Performance Audit Report of the Auditor-General Specialized Healthcare Delivery at Kenyatta National Hospital .Nov 2013

[18] Kenyatta National Hospital Website. Strategic plan http://knh.or.ke/index.php?option=com_content&view=frontpage&Itemid=1Retrieved on Friday, 24th August, 2014.

[19] Kosomo, D., (2007). Research methods in Humanities and Education. Eldoret: Zapf Chancery.

[20] Kothari, C, R. (2004). Research Methodology; Methods and Techniques. New Age International Limited, Mumbai.

[21] Laudon,K, and Laudon, J, (2013).Management Information Systems, Managing the Digital Firm (13th Edition)

[22] Ministry of Health (2009). Strategic plan for Health Information System 2009-2014,Government printer

[23] Ministry of health (2009). Health Information System Policy (2010-2030). Health Sector Government printers

[24] Mugenda, A, G (2008). Social Science research; Theory and Principles. Applied Research and Training Services, Kijabe printing Press, Nairobi

[25] Government of Kenya (2008), Kenya Vision 2030, The Popular Version, Nairobi, Government Printer

[26] Sood, S. P., Nwabueze, S. N., Mbarika, V. W. A., Prakash, N., Chatterjee, S., Ray, P.(2008). Electronic medical record: A review comparing the challenges in developed and developing countries. In: Proceedings of the 41st Hawaii International Conference on System Sciences, 1-10.

[27] Wickramasinghe, N., Fadalla, A. M. A., Geisler, E., Schaffer, J. L. (2005). A framework for assessing e-health preparedness.

[28] World Health Organization (2008) Guide to producing national health accounts with special applications for low-income and middle-income countries20 Avenue Appia, 1211 Geneva 27, Switzerland.

[29] World Health Organization (2009) Systems thinking for health systems strengthening.20 Avenue Appia, 1211 Geneva 27, Switzerland.

[30] World Health Organization. (2000). World Health Report 2000; Health Systems: Improving Performance. Geneva, Switzerland.

[31] World Health Organization. (2004). Developing health management information systems: A practical guide for developing countries. Geneva: Switzerland

[32] World Health Organization. (2006). The World Health Report 2006: Working Together for Health. Geneva, Switzerland:

[33] World Health Organization. (2007). Everybody's Business: Strengthening Health Systems to Improve Health Outcomes: WHO framework for action. WHO Press, 20 Avenue Appia, 1211 Geneva 27, Switzerland.

[34] World Health Organization. (2012). Retrieved from WHO Website http://www.who.int/healthsystems/topics/delivery/en/index.html on Tuesday, 14th August, 2012

[35] World Health Organization. (2013).Research for universal health coverage. Retrieved from WHO Website http://www.who.int/healthsystems/topics/delivery/en/index.html on Thursday, 7th October, 2015

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