International Research Journal of Public and Environmental Health Vol.3 (9),pp. 201-208, September 2016
Available online at http://www.journalissues.org/IRJPEH/
http://dx.doi.org/10.15739/irjpeh.16.026

ISSN 2360-8803

Original Research Article

Organizational factors affecting data quality of routine health management information system quality: Case of Uasin Gishu County Referral Hospital, Kenya

Received 7 June, 2016 Revised 12 August, 2016 Accepted 18 August, 2016 Published 26 September, 2016

[1]Samuel Kiprono Cheburet* and [2]George W. Odhiambo-Otieno

[1]Ministry of Health, Nairobi, Kenya, P. O. Box 30016-00202 Nairobi Kenya.
[2]Kenya Methodist University, Department of Health System Management, P.O. Box 45240 - 00100, Nairobi, Kenya.

*Corresponding Author
E-mail: samuelcheburet@gmail.com

Tel: +254-721624338

Globally, dynamics on health system are underpinned by a well-functioning health management information system. The absence of institutional frameworks, financing, leadership and dissemination of information affect organization processes. Strong government documentation to guide the operation is a key foundation in the delivery of health services. The study was carried out to establish the organizational factors influencing data quality of routine health management information system. A cross-sectional design was employed in this study. Quantitative measures were used in collecting data from health workers on the availability of institutional document, leadership, financing and data sharing while qualitative measures were employed to generate more in-depth information of the subject matter. The results reveal that thirty two (39.5%) of the respondents said there is availability of standard operating procedures while none of the respondents indicated lack of data quality protocol. A strong association was found between support supervision and the frequency of support supervision with chi square X^2 = (1)=37.913, n=81, p<.05. Finally, institutional documentation was rarely available especially standard operating procedures, data quality protocol, strategic plan, operation plans and policy to enhance data quality through alignment of organization manageability, efficiency, effectiveness and agility of health institutions.

Key words: Organizational factors, data quality, health management information system.

Abbreviations: Country Health System, (CHS);German Academic Exchange Service, (DAAD); Government of Kenya, (GoK);Health Information System, (HIS); Health Management Information System, (HMIS);Health Metrix Network, (HMN);Ministry of Health,(MoH);Routine Health Information System,(RHIS); World Health Organisation,(WHO).

INTRODUCTION

The World Health Organisation (WHO) in 2007 acknowledged Health Management Information System (HMIS) as a key building block of health systems. Effective and efficient management of today's health system depends on well-functioning Health Management Information System (HMIS) in design and implementation. The emphasis on proper collection, collation, transmission, storage and retrieval of health data depend heavily on the availability of organization, documentation, frameworks, orientation on use, financing, leadership and dissemination of information. The availability of policy document reflects a commitment to achieve the highest standard of data as the foundation of health systems in generating information for policy-making, planning, monitoring of health outcomes and evidence-based decision making (MoH, 2009a; 2009b; 2015). Moreover, Ledikwe et al. (2014) noted that health policy does not spell out the duration on how long data

should be stored or how often it should be backed up to protect against data loss.

Emphasis is placed on the need to reinforce accountability through evidence-based annual operational plans with relevant strategic plans. Planning and oversight of implementation of the plan are key management processes that must be supported by reliable, timely, and well-defined information (MoH, 2009a; 2011). it is noted that organizational strategic planning process is relevant depending on the unit's size, its complexity and the differentiation of the service provided (Peiro and Rodrı, 2012). Hence, many organisation been run without any action plan as a road map in improving data quality. Health leaders are encouraged to focus on ways of developing strategy and action plan to maximise the value of scarce resources and finding ways to make health systems operate as efficiently as possible. On the other hand, Çeken (2014) took cognizance ofhow the generation of timely, accurate, credible, and complete information underpin good decision making. Therefore, the health industry is changing swiftly and health organizations need to have a desire for data-driven insight with ambition. Organizations are still dealing with a high degree of inaccurate data because there are a number of challenges to maintain both external and internal forces.

Good quality data are the foundation of health systems in generating information for policy-making, planning, monitoring of health outcomes and evidence based decision-making. Taking cognizance of deficiencies in data quality, vital health decision often depends on political speculation, donor demand and studies which are insensitive to changes over time. Kenya's vision for the health sector is "to provide equitable and affordable quality health services to all Kenyans". To accomplish this, the first Medium Term Plan 2008-2012 of the Vision 2030 identified the need to 'strengthen the national health information systems to enable them provide adequate information for monitoring health goals and empowering individuals and communities with timely and understandable information on health (GoK, 2012).

Healthcare decision making cannot be over-emphasized. Therefore, good quality routine HMIS data delivered in a complete and timely manner can enhance synthesis into meaningful information under various disease programs(MoH, 2015). However, the collection, collation, compilation, analysis and reporting of health data in most developing countries is faced with major problems resulting in incomplete, inaccurate and untimely data which are not useful for health management decision-making at any level(Karuri et al., 2014).

The success of any organization requires quality information to run its operations. This is rarely in place and it is attributed to lack of involvement of information users or customer focus in the design of these systems. Information is crucial at all management levels of the health services; from the periphery to the centre. Not only do policymakers and managers need to make use of information in evidence-based decision-making, but also care providers such as doctors, nurses, health technicians and community health workers and individuals and all health system personnel(Odhiambo-Otieno, 2005b).

The determination of information needs informs the tool to be used in collecting data to be generated into information required. Information system managers must answer questions on: What information is needed at what level? How much of it is needed? How, when, by whom, how it will be used and in what form is it needed? The design and implementation of HMIS must recognize the need for a country itself to determine the users of the system where it focuses on the needs of health information users. It is important that implementation takes into account what can be achieved within available resources and capacities (HMN, 2008).

The goal of a health information system (HIS) is to provide information (Consulting, 2009). Furthermore, implementation takes into account what can be achieved within available resources and capacities. Consequently, good planning and effective implementation is highly dependent on high quality information derived from appropriate data quality assessments, projected population structure, local determinants of health, health status, health inequalities, deprivation, remoteness, priority needs and the quality of service provision (MoH, 2011;WHO, 2008). The Ministry of Health are serious about data quality, with a need to develop a plan aimed at improving and maintaining the quality of data by putting in place a team with a commitment by top-level management to support and make the appointment of a quality improvement team to act upon recommendations in a timely manner. The mechanism of detecting and resolving data issues in a timely manner is not obvious as some wait until there are explicit problems with their data and fix them in a reactive manner by front-runners on internal and external glitches (WHO, 2003).

Additionally, the existence of a standard operating procedure is a challenge in many organizations, as progress is been made in addressing data quality by reporting entities, lack of mutually agreed upon standards with regards to routine data collection, compilation, analysis and use, reporting, dissemination and overall security which provide trust and use of information in the health sector (MoH, 2016a; b). Ledikwe et al. (2014) revealed that data collection tools were generally available and staff at the district and facility levels frequently receive changes which create a challenge in filling without training. Hence WHO(2003) placed more emphasis (with standards in place)on. procedures relating to data collection and monitoring data quality which should be carried out on a routine basis.

Accordingly, Xu (2010) stresses that data generated by the health facility should be based on protocols and procedures that do not change according to who is using them and when or how often they are used. The data are reliable because they are measured and collected consistently, which is not the case. Additionally, Jennifer et al. (2016) reported that most system lacks quality controls,

including data entry verification, a protocol for addressing errors, and written processes for data collection, entry, analysis and management. In data verification process, gaps in completeness and consistency have been identified. Staff at all levels would like to be trained in data management especially on protocols to improve data quality. Nyamtema (2010) identified gaps in the current HMIS where there was no trainning on institutional documentation, lengthy and laborious nature of the system were also problematic in massive reporting and lack of adequate knowledge and practice among the health workers.

Needham et al. (2009) recognized that given the lack of funding for data collection, it was not feasible to collect data regarding patient characteristics and little attempt was made in data collection which was narrow to maximize accuracy and completeness of the essential data elements. The Kenyan Ministry of Health indicates that 5% of funding to Health should be allocated to Health information system (MoH, 2009a). In most organizations, leadership is the key which unlocks or blocks change from various departments. Charles et al. (2003) stated that health workers require data collection instrument as stipulated in the guideline and standard operating procedures with support from their leadership. Furthermore, Nyamtema (2010) reported that poor leadership performance results in performing activities, as usual, with no supervision. Emphasis on the success of the health sector in the delivery of high-quality data depends on the leadership as a champion. Consulting (2009) also emphases that effective leadership at all levels of the health system will be a breakthrough.

Abouzahr and Boerma (2005) underline that policy and practice of health information results inquality data which depend heavily on good leadership. It emphasises leadership, safeguards the guidance and enforcement of policies and guidelines within the institution to achieve desired information. In the report from the Ministry of Health, the Uganda investment plan (2014) envisaged comprehensive Monitoring and Evaluation plan to which all health partners subscribe to in order to improve the quality of RHMIS. Poor leadership results in the lack of coordination in data collection which leads to duplication of effort and competition from various data collecting units and then cilminates in poor quality data in terms of incompleteness, inconsistency and timeliness of data being generated by the HMIS (MoH, 2009a; Odhiambo-Otieno, 2005).

Ahanhanzo et al.(2014) stress that the terms of employment for staff in health systems play a key role in ensuring that they are motivated and their job security guaranteed. The role of quality data cannot be over-emphasized in thev management and delivery of service under various disease programs (MoH, 2015). Ancker et al. (2011) proposed that supportive supervision was critical in providing the mechanism for strengthening data quality. Hamre and Kaasbøll (2008) on the other hand, viewed that lack of remedial feedback during supervision was mentioned as frustrating staff. Therefore, lack of regular systems support on supervision was viewed to negatively affect the perceived importance and quality of data being collected as seen objective on present data quality where, if support supervision were done regular basis then there could not be a data gap. Similarly, WHO (2008b) ensured that special efforts were placed on information sharing as it was critical and needed to ensure adequate coordination and sharing of information between health ministries and other sectors using various forums so as to strengthen the quality of data been used to generate information for decision making.

MATERIALS AND METHODS

The study was a cross-sectional study design with the combination of quantitative and qualitative research methods. Quantitative measures were used in collating data on how many respondents represented the criteria when analysed through the organizational factors like availability of institutional documentation, orientation on the institutional document, leadership, financing and data sharing while qualitative measures were employed to generate more in-depth information on the subject matter.

In identifying the number of respondents to represent the total population, non-probability sampling, specifically purposive sampling was utilized to elicit data from the health facility while quantitative sampling, particularly census method was used to obtain data from health workers participating in data processing on a daily basis. The entire health workforce from each department was assigned numbers with a target population of 82 participants and a response rate of 81(98.8%).

The researcher's made questionnaire whose development was guided by the research questions and literature review was subjected to correction and validity. A structured questionnaire was utilized for the purpose of meeting the objectives of the study. Both the questionnaire and quantitative tools were used to analyse the variables. The questionnaire containing both closed and open-ended questions was administered to assess the organizational factors such as availability of institutional documents, leadership, financial, and data sharing in relation to data quality of data routine Health Management Information System. Since the study population was heterogeneous, key informant interview guide was used to obtain more in-depth information on the subject matter based on the research objectives. Key informant interview guide was used on 2 key focal managers who were purposively selected by virtue of their positions (Facility In-charge and Information Managers) to shed light on present data quality status and factors affecting data quality. Key informant interview guide was used as a follow-up to the questionnaire administered to various respondents at various departments to elicit more information.

Data obtained from the responses were treated and thoroughly analyzed using Stata SE 13 and SPPS Version 22. Each data collection instrument and answers were coded to facilitate easier analyses. Categorical data was used for

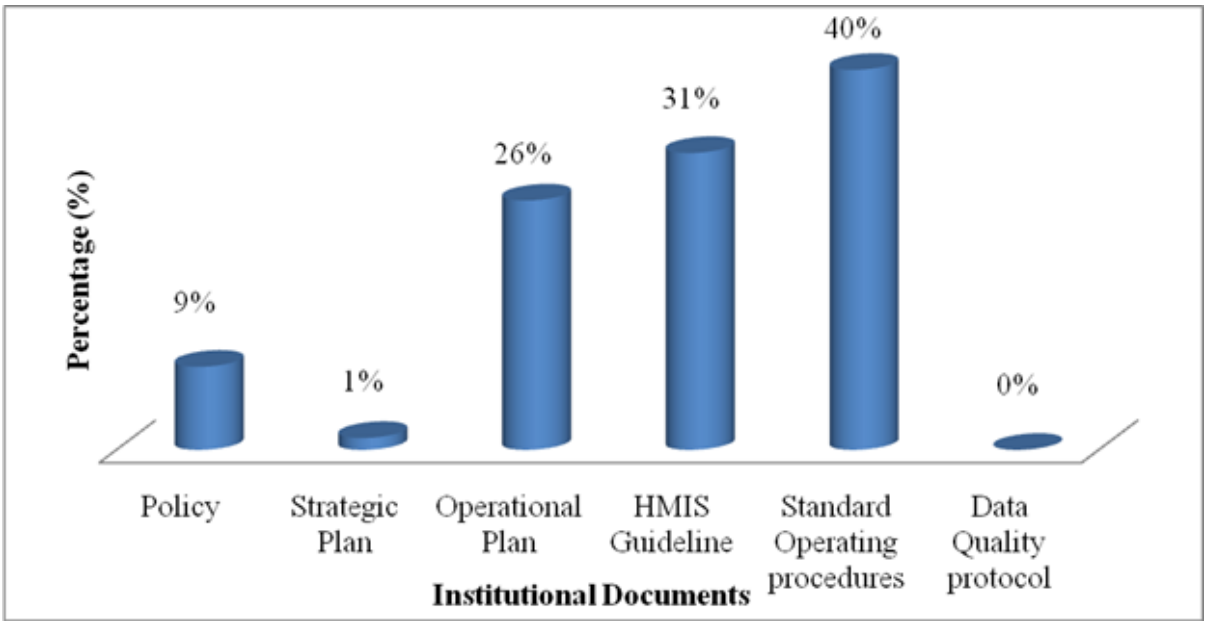

Figure 1: Availability of institution document

cross tabulation and to test the association among variables using the chi-square test. The results were displayed in frequencies, bivariate and multivariate analyses were used to relate data quality and factors influencing data quality. The results of data analyses were presented using tables and graphs.

RESULTS AND DISCUSSION

Figure 1 shows that 32 (39.5%) of the respondents reported the availability of standard operating procedures while none of the respondents indicated lack of data quality protocol. One of the key informants pointed out that:

"The available document does not address data quality comprehensively. Some of the training done through the programme is partially taught with no clear techniques mentioned" (Key informant,001).

Odhiambo-Otieno (2005a)identified that Country Health System (CHS) was being implemented without institutional documentation like the HMIS policy or guideline where CHS were designed without any user in mind or customer focus. Therefore, Country Health System (CHS) was implemented without institutional documentation like the HMIS policy, guideline and DHS which were designed without any user in mind/customer focus. On the other hand, WHO (2007)underscores the need for a framework which gives prominence to countries to setup governance on RHMIS. Emphasis necessitated countries to develop HMIS policy and strategic plan in ensuring generation, analysis and use of information in order to strengthen efficiency and effectiveness in health systems. As a result, Kenya developed its first HMIS policy and strategic plan (2009) which were to address a weak institutional regulatory framework. The policy was also envisaged to guidethe health sector in developing and implementing information systems across the health system. It is noted that the available policy document reflects a commitment in achieving the highest standard quality data as the foundation in generating information for policy-making, planning, monitoring of health ;outcomes and evidence-based decision making (MoH, 2009a;b; 2015). One of the key informant informed that:

" There are existing HMIS policies, but only one is available and the staff are not trained to understand what are expected of them. Other documents like data quality protocol does not exist, guidelines are disease specific; strategic and operation plans exit however, strategic plan is initiated from the national level" (Key informant, 001).

Moreover, Ledikwe et al., (2014) noted that the document in health institutions on government policy does not report how long data should be stored or how often it should be backed up to protect against data loss and ways of addressing discrepancies in data. Organizational strategic planning process is relevant depending on the unit's size, its complexity and the differentiation of the service provided (Peiro and Rodrı, 2012). Jennifer et al. (2016) reported that most systems lack quality controls including data entry verification, a protocol for addressing errors, and written processes for data collection, entry, analyses and management.

Figure 2 shows that 20 (25 %) of the respondents reported to have been oriented on some of the documents while 61(75 %) had no orientation. One of the key informant emphasised that:

"*The available document within the health facility was*

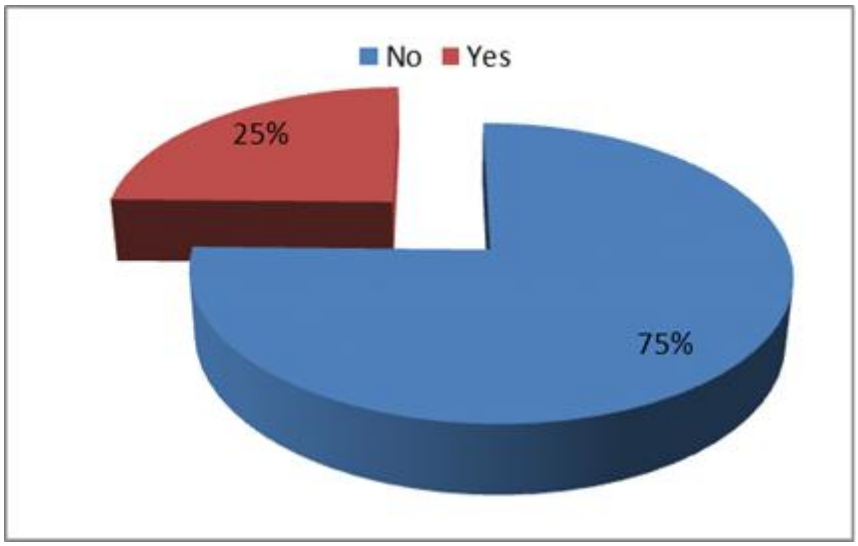

Figure 2: Orientation on the use of existing HMIS documents

distributed without any orientation up to service level. Most of the orientation were carried out for those in management, especially at high level and most a times, there is no downward orientation or on-the-job training" (Key informant, 001).

Data verification process identified gaps in completeness and consistency. Staff at all levels would like to be trained in data management, especially on protocols to improve data quality. Nyamtema (2010)concurred with the results of lack of training on the use of existing institutional documentation and lengthy and laborious nature of the system. Moreover, one of the key key informant emphasises that:

"*there is no formal training on the document developed from the national level and once finalized, it is distributed except in cases where it is supported by partners and if the training is carried out for only programme managers, no training will be conducted for staff at the operational level*" (Key informant, 001).

Table 1 shows that 63(79%) of the respondents indicated to have received supportive supervision while 18(22) indicated to have not received any supervision. However, 27 (33%) of the supervision occurred quarterly, twenty four(30%) yearly, twelve(15 %) monthly while eighteen (22%) did not receive any form of support supervision. The implication of the results promotes motivation factors in the implementation of a successful health information system. A strong association was found between support supervision and the frequency of support supervision with chi square $X2 = (1)=37.913$, $n=81$, $p<.05$ ($p=0.000$). There is some relationship between support supervision and the frequency of offering support supervision on overall data quality. The management team at various levels of care, especially those directly or indirectly at strategic and tactic allevels more often do not adequately provide support to improve RHMIS data quality. This results coincides with Ancker et al. (2011) who argued that supportive supervision was critical in providing mechanisms for strengthening health systems. Hamre and Kaasbøll (2008) on the other hand, pointed out that lack of remedial feedback during supervision was mentioned as a factor frustrating staff. Therefore, the lack of regular system-support on supervision was viewed to negatively affect the perceived importance and quality of data being collected as seen on the present data quality where, if support supervision were done on regular bases, then there could be no data gap. One of the key informants indicated that:

"*Occasionally,supervision is done with no written communication on observations made, especially on areas which need improvement. Also, most supervision is not integrated and most a times, supervision is done to programme with partner support*.(Key informant, 001).

The result also shows that the frequency of supervision was focused mostly on the public sector and not the private sector. The results concur with Hamre and Kaasbøll (2008)who showed that lack of remedial feedback during supervision had an effect on staff motivation and was viewed to frustrate staff performance. However, HMN (2008) recognizes RHMIS to have evolved in a haphazard and fragmented way as a result of administrative, economic, legal or donor pressures. It noted that the responsibility for health data was often divided among different ministries or institutions, and coordination may have been difficult due to financial and administrative constraints. These constraints, as noted affects the overall operation of ensuring quality data and overall quality of information.

Table 2 shows that 76(94%) of the respondents did not know any source of finance for HMIS activities, 4 (5%) of the respondents reported dependent on donors and partners while 1(1%) of the respondent reported government support. Moreover, 5(6%) of the respondents

Table 1. Crosstab between supervision received and frequency of supervision

Receive support supervision	Frequency of support supervision (%)						
	None	Daily	Weekly	Monthly	Quarterly	Yearly	Total
No	18(22)	0(0)	0(0)	0(0)	0(0)	0(0)	18(22)
Yes	0(0)	0(0)	0(0)	12(15)	27(33)	24(30)	63(79)
Total	18(22)	0(0)	0(0)	12(15)	27(33)	24(30)	81(100)

stated availability of HMIS action plans, while seventy six(94%) of the respondents stated non-existence of any HMIS action plans. The results agreed with Needham et al.(2009)who reported that lack of funding for data collection did not allow for the collection of data regarding patient characteristics and little attempt wasmade for data collection which was narrowly to maximize accuracy and completeness of the essential data elements. Additionally, the Ministry of Health, under the Kenya Health information policy does not ensure that the 5% commitment of its funding to be channelled towards health to be allocated to health information systems (MoH, 2009a). One of the key informants reported that:

"*there is no funding allocated towards RHMIS activities, even what the facility collects in terms of facility improvement fund is channelled to the Uasin Gishu county government and does not flow back to the health facility. Even in areas where there is commitment, the funds are not foreseen and disclosed*." (Key Informant,001).

Figure 3 shows the respondents' rating of their leader. The results concur with Charles worth et al. (2003)study where health workers needed data collection instrument as stipulated in the guidelines and standard operating procedures with support from their leadership. Furthermore Nyamtema (2010) reported poor leadership performance in undertaking activities, as usual, with no supervision thus resulting in poor performance. Emphasis on the success of the health sector in delivery of high quality data depends on the leadership as a champion.

The results agreed with Consulting (2009)where emphasis on effective leadership at all levels of the health system will be a breakthrough. On the other hand, respondents understating of the consequence of not reporting which affects planning, purchasing and supplies of materials needed to run the health facility. One of the key informants reported that:

The management team do follow-up sometimes to find out why the reports have not been submitted. The personnel In-charge is called and informed of the missing reports and feedback to those collecting is done but this depends on who is requesting the data and what type of data, upon which nothing will happen. Regular feedback or reminders are sent from the sub-county and even partners supporting some programmes. or reminder(Key Informant, 001).

Health workers are motivated in ensuring that data been generated meets required standards as the staff are encouraged to come up with better innovation on improving data quality. Ahanhanzo et al.(2014) underscore that the terms of employment for staff in health systems play a key role in ensuring they are motivated and their job security guaranteed. one of the key informant indicated that:

"Health care management requires strong leadership where information influences decision making. Data sharing is not a priority when discussing hospital matters and the decision is not guided by the information generated by the data collected everyday. There isa large training gap in dealing with data quality hence with good leadership, there is need for monthly, quarterly or even annual review of data within various departments generating data to ensure that health facility staff within the health facility become champions and exchange capability in dealing with data. Such reviews have the perspective of improving data quality and therefore through good leadership, drive the process which will lead to great output in generating high-quality information." (Key informant, 001).

Emphasis is placed on good leadership facilitating coordination in data collection which aids in avoiding duplication of effort and competition from various data collecting units. Poor leadership results in the lack of coordination in data collection which results in duplication of effort and competition from various data collecting units thus leading to poor data quality in terms of incompleteness, inconsistency and timeliness of data generated by HMIS (MoH, 2009a; Odhiambo-Otieno, 2005).

Abouzahr and Boerma (2005)in their study on Policy and Practice on Health information stated that the success of having quality data depend heavily on good leadership. It emphasises that leadership safeguards the guidance and enforcement of policies and guideline within the institution to achieve the desired information. In the report from the Ministry of Health, Uganda investment plan (2014) envisaged comprehensive monitoring and evaluation plan to which all health partners subscribe in order to improve the quality of RHMIS. Motivation of health workers in ensuring data generated meet the required standard occurs where the staff are encouraged to come up with better innovation on improving data quality. Data quality on the other hand was linked to staff motivation to carry out task with self-efficacy which shows that 18% of the participants had higher education backgrounds; less than a quarter (22%) had been trained or retrained in the RHMIS in the last 12 months. Ahanhanzo et al. (2014) underscore that the terms of employment for staff in health systems play a

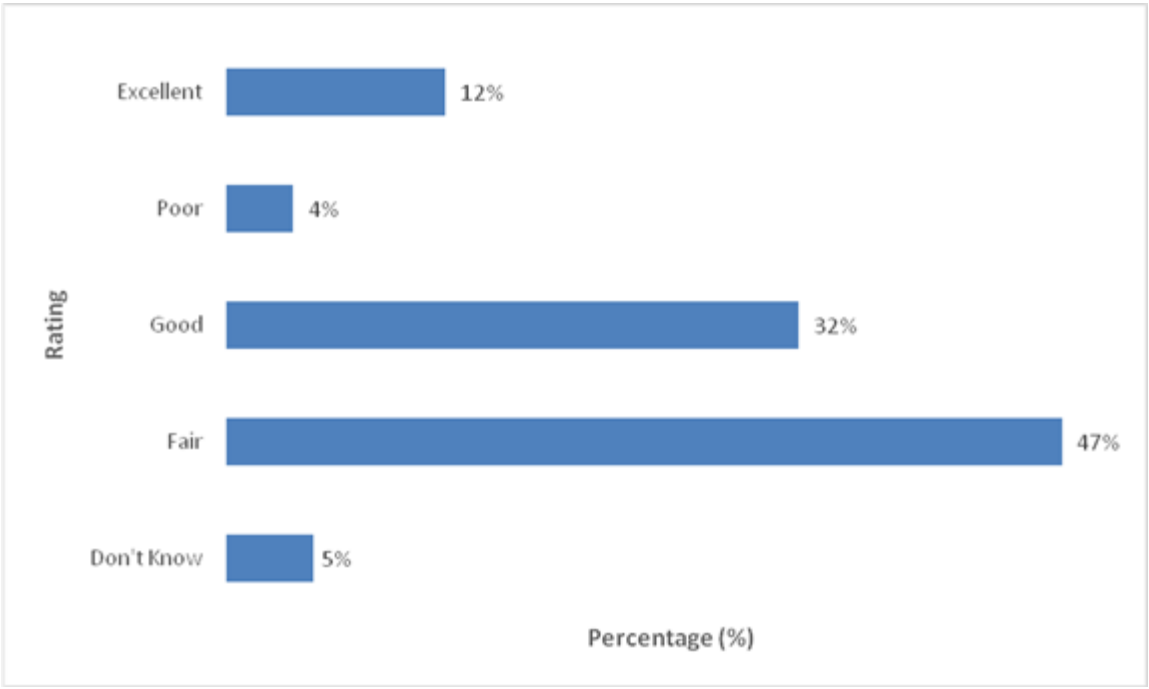

Figure 3: Respondent perception on leadership on supporting RHMIS

Table 2. Crosstab showing data sharing and frequency of data sharing

Data sharing	Frequency of meeting held (%)				
	None	Monthly	Quarterly	Yearly	Total
No	44(54)	0(0)	0(0)	0(0)	44(54)
Yes	0(36)	12(15)	11(14)	14(17)	37(46)
Total	44(54)	12(15)	11(14)	14(17)	81(100)

key role in ensuring they are motivated and their job security is guaranteed.

Table 3 shows that 46% of the respondents share the data they collected while 15% reported that the data collected were used to generate information to address data quality in a timely manner. Nonetheless, the respondents were asked on the frequency of meeting to discuss data sharing. Fourteen reported to meet annually, 12meet monthly,11meet quarterly while 44 reported the non-existence of meeting to discuss data shared. There is statistical significance between data sharing and the frequency of sharing (x 2 = 81.000, df=3, p=0.000). These results have implications on timeline of data collected and collated on a monthly basis and overall decision making process in enhancing data quality of RHMIS. Equally, Ancker et al. (2011)view supportive supervision as critical in providing the mechanism for strengthening data quality. On the other hand, Hamre and Kaasbøll (2008)opined that lack of remedial feedback during supervision was mentioned as frustrating staff. Similarly, HMN (2008) places special efforts where information sharing were critical and this was needed to ensure adequate coordination. Sharing of information between health ministries and other sectors are institutionalized through various forums so as to strengthen the quality of data being used to generate information for decision making. Therefore, the lack of regular system-support on supervision was viewed to negatively affect the perceived importance and quality of data being collected where, if support supervision were done on a regular basis then there could be not data gap.

RECOMMENDATIONS

Health organizations across the globe recognize the importance of quality data and having a more cultured methodology for handling health data is imperative. There is the need to build a strong institutional improvement to renew and change data management practices through proactive and better institutional documentation. The ability to use high-quality data to make critical health industry decisions and identifying the bottlenecks affecting data quality from routine HMIS is a collective responsibility for all stakeholders. Data is the most treasured asset which should be put to the right human resource, processes and

technologies to help ensure it is fit for purpose. In order to strengthen data quality of routine HMIS, the Ministry of Health and other stakeholders require strengthening institutional documentation especially development of health information policies, standard operating procedures, guidelines and data quality protocol through alignment of organization manageability, efficiency, effectiveness and agility of health institutions.

ACKNOWLEDGEMENTS

Sincere appreciation to all who assisted with this research. Professor George Odhiambo-Otieno for supporting and inspiring this study. The German Academic Exchange Service (DAAD) and Federal Ministry of Education and Research, Kenya are appreciated for their financial support. The participants (health workers) in UasinGishu County Hospital are thus recognized for their invaluable time and support.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of the paper

REFERENCES

Abouzahr C, Boerma T (2005). Health information systems : the foundations of public health.

Ahanhanzo Y, Ouedraogo TL, Kpozèhouen A, Coppieters Y, Makoutodé M, Wilmet-Dramaix M (2014). Factors associated with data quality in the routine health information system of Benin

Ancker JS, Shih S, Singh MP (2011). Root Causes Underlying Challenges to Secondary Use of Data. In AMIA Annual Symposium proceedings Archive, pp. 57–62.

Çeken C (2014). A Framework Study for Healthcare Information Systems. J. Computer and Communications, 2(9):61–67.

Charlesworth K, Cook P, Crozier G (2003). Leading change in the public sector: making the difference.

Consulting (2009). Health Information Systems in Developing Countries.

GoU (2014). Monitoring& Evaluation plan for Health Sector Strategic and Investment plans 2010/11 – 2014/15Government of Uganda, Ministry of Health: Monitoring & Evaluation Plan for the Health Sector Strategic and Investment Plan, 2010/11 –2014/15.

Hamre GA, Kaasbøll J (2008). Motivation and Demotivation : a Case Study of the Malawian Health Management Information System. Electronic J. Health Informatics, 3(2):1–11.

Jennifer Y, Kirsten Z, Debra PML (2016). How do we know_ An assessment of integrated community case management data quality in four districts of Malawi. Health Policy Plan.

Ledikwe JH, Grignon J, Lebelonyane R, Ludick S, Matshediso E, Sento BW, Semo B (2014). Improving the quality of health information: a qualitative assessment of data management and reporting systems in Botswana. Health Research Policy and Systems / BioMed Central, 12, 7.

MoH (2009a). Kenya Health Sector Health Information System Policy. Nairobi , Kenya.

MoH (2009b). Kenya Health Sector Strategic Plan for Health Information System. Nairobi , Kenya.

MoH (2011). Government of the republic of fuji Health Information Policy.

MoH (2015). Kenya Health Sector Monitoring and Evaluation Framework:- Accelerating attainment of universal coverage. Nairobi, Kenya.

MoH (2016a). Republic of Rwanda Ministry of Health data quality assessment Version 2016.

MoH (2016b). Republic of Rwanda Standard Operating Procedures for Management of Routine Health Information.

Needham DM, Sinopoli DJ, Dinglas VD, Berenholtz SM, Korupolu R, Watson SAMR, Pronovost PJ (2009). Improving data quality control in quality improvement projects. Int. J. Quality in Health Care, 21(2):145–150.

Nyamtema A (2010). Bridging the gaps in the Health Management Information System in the context of a changing health sector. BMC Medical Informatics and Decision Making, pp.10-36.

Odhiambo-Otieno GW (2005). Evaluation criteria for district health management information systems : lessons from the Ministry of Health, Kenya. International J. Med. Informatics, 74:31–33.

Peiro M, Rodrı FDP (2012). Strategic Planning in Healthcare Organizations. Elsevier, 65(8):749–754.

WHO (2003). A Guide for Developing Countries Improving Data Quality : a Guide for Developing Countries World Health Organization, 12.

WHO (2007). Everybody's Business: Strengthening Health systems to improve Health outcomes WHO's Framework for Action.

WHO (2008a). Framework and Standards for Country Health Information Systems (Vol. 2nd Editio). Geneva.

WHO (2008b). Toolkit on monitoring health systems strengthening, June 2008. Health San Francisco, 304(June), 85–92.

WHO (2011). Governance for health in the 21st century : a study conducted for the WHO Regional Office for Europe (Vol. 6).

Xu H (2010). Data quality issues for accounting information systems' implementation: Systems, stakeholders, and organizational factors. J. Technol Res., pp. 1–11.