



Original Research Article

State of data quality of routing Health Management Information System: Case of Uasin Gishu County Referral Hospital, Kenya

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Effective and efficient management of health system depend on well-functioning Health Management Information System. Massive data are continuously generated without clear understanding of its status in terms of data quality that affects overall quality for policy-making, planning and monitoring of health outcomes. Lack of data and information use culture with inadequate capacity to monitor present data being generated, limited technical skills, poor data handling, unclear processes eventually affect delivery of health services. Poor data quality may have adverse effects on decision-making. The study was conducted to assess the present state of data quality for routine health management information system. Cross-sectional study design was employed. Use of quantitative tools to collate data from all existing reporting tools focused on data availability, completeness, timeliness and accuracy from source documents. While qualitative tools were employed to generate more in-depth information of the subject matter. Results showed that 13 official forms were in use every month with expected 156 annual reports. A total of 74,460 data element existed in the same tools with reliability analysis using Cronbach's Alpha .729 acceptable value and 48(16%) marginal error. The key informant interview confirmed a healing state of data quality with limited culture for information use. In conclusion, data and information use culture is a cornerstone for better data quality for prudent management of resources and better health outcomes.

Key words: State, data, quality, routine, health management information system.

Abbreviations: German Academic Exchange Service, (DAAD); Government of Kenya, (GoK); Health Information System (HIS), Health Management Information System, (HMIS); Ministry of Health, (MoH); Routine Health Information System, (RHIS); Voluntary Counselling and Testing, (VCT); 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. The running of organizations in the contemporary world has much more focus on systematic, factual and quick response to issues than was previously required. Effective and efficient management of today's health system depends on well-functioning Health Management Information System (HMIS) in design and implementation. Though, the health industry is data intensive which require continuous improvement on the state of data quality which may affect the overall quality in policy-making, planning and monitoring of health outcomes. Lack of data and information culture with inadequate capacity to monitor

present data being generated, limited technical skills, poor data handling, unclear processes eventually affect overall delivery of health services. 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 into cognizance the deficiencies in data quality, where vital health decision often depends on political speculation, donor demand and studies 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).

The demand for quality data and the interest in HMIS have increased due to the need for country-level progress reporting towards attainment of the United Nations Millennium Development Goals and global health initiatives (Karuri et al., 2014; Mpofu et al., 2014). As pointed by Measure Evaluation, (2012), global decision makers require timely and accurate information from routine health activities for the formulation of policies, resource allocation and day-to-day management decisions. HIS Hub, (2013) noted an ever-increasing global recognition of the importance of health information systems for strengthening health systems, developing public health policy and improving accountability and transparency.

The role of quality data to generate quality information in enabling informed healthcare decision making cannot be over-emphasized. For instance, good quality routine HMIS data delivered in a complete and timely manner can be synthesized into meaningful information used in surveillance of diseases of public health importance to prevent or control outbreaks, as well to strategize on adequacy of service delivery under the 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).

Simba (2005) in his study argued that data that are accurate, complete and delivered on time to users as information are an important aspect in health planning, management and decision-making. Evidence-based plans and decisions must, of necessity, be based on accurate, complete and timely data. This was also supported by WHO, (2011) on study carried out in Uganda where a number of services provided in health care settings is likely to vary from month to month, large fluctuations are improbable.

Nevertheless, In 2009, the World Health Organization

(WHO) shared a framework for assessing data quality of HMIS through checks of completeness, internal consistency and external consistency based on ten indicators (WHO, 2014). In the same breath, it emphasis need to identify outliers from the expected values, as these can severely distort coverage rates. Inaccuracies realized from various service deliveries within the health facility are not only costly to health systems but also affect the quality of health care provision. While inaccuracies in RHMIS data are common and hence they can easily be rectified. Emphasis also in the study that if data are grossly inaccurate then managers, supervisors and staff was not use the information generated from the data. If people do not use the information, then all the effort and time that large numbers of people spent collecting the data and developing the information system was have been wasted. Therefore, producing inaccurate data is a huge waste of time, effort and money and in addition it destroys the morale of staff that is involved with collecting data and generating information.

Lippeveld et al. (2000) acknowledged that it is unfortunate that there could be percept error detection which is boring, as it actually requires good detective skills; it is usually exciting tracking down errors. Nevertheless, a study by Garrib et al. (2008) and Sharma et al. (2016) reveal disparities where data are grossly inaccurate, but people do not realize this and they use the information for planning and general decision-making, then it is likely that the plans will be flawed and poor decisions made. The techniques for detecting errors and eventual correction are not in practice. Therefore, data inaccuracies is realized as very harmful, giving rise to unnecessary problems if there is not staff competencies to check for any errors on data being produced.

In another study on data quality and systematic review in Ethiopia, the Completion of reporting forms received were 77% from all sites. However, regarding the dates for reporting, 68% fell within agreed National reporting period (Mesfin, 2014).

Aqil et al. (2009) viewed timeliness as submission of reports within an accepted deadline and noted that timeliness is used for assessing processes of data collection and transmission from various unit of data generation in RHMIS processes. With the occurrence of evidence-based medicine, the call to uphold quality of data by health care institutions is becoming a critical factor in the delivery of healthcare. This has demanded the need for reliable data collection and conservation methods. Similarly, the Kenya National AIDS and STI Control Program is the arm of government tasked with coordinating the Health Sector and HIV activities (2011) of the Kenya National AIDS Strategic Plan III (KNASP), 2009/10 – 2013/14. The mandate is to provide relevant Health Sector HIV data in response to the various national and international desires in an effort to define the level of success towards mitigating the Human

Table 1. The availability of Routine Health Management Information System data

Summary forms	% Completeness in reporting (n=12)
TB Case Findings Summary	0(0)
MOH 705A OPD Summary for Under 5 yrs. Summary	11(92)
MOH 705B OPD Summary for Over 5 yrs. Summary	11(92)
MOH 710 Immunization Services Uptake Summary	7(58)
MOH 711 Integrated RH, CH, etc. Summary	10(83)
MOH 717 Workload Summary	6(50)
MOH 731-1 HIV Counselling and Testing	11(92)
MOH 731-2 PMTCT Summary	10(83)
MOH 731-3 Care and Treatment	10(83)
MOH 731-4 Voluntary Male Circumcision	1(8)
MOH 731-5 Post-Exposure Prophylaxis	1(8)
MOH 731-6 Blood Safety Summary	0(0)
MOH 713 Nutrition Monthly Reporting	10(83)
Average Report available	88 (56)

Immunodeficiency Virus (HIV) pandemic. However, despite the fact that the majority of indicators informing the KNASP are derived from the health sector, huge challenges have been noted in ensuring timeliness, accuracy and completeness of data. Therefore, the actionable areas were to ensure data collection are to ensure completion of all sections of the tools and registers to achieve accuracy and timeliness.

In order to establish data quality, there is the need for proper analysis. This paper examines the current status of data quality. It examines data using a select set of indicators and data elements.

MATERIALS AND METHODS

The study uses a cross-sectional study design with the combination of quantitative and qualitative approaches. Quantitative method was used in collating data on how many reporting forms and data elements existed. The state of data quality focused on data availability, completeness, timeliness and accuracy from source documents while qualitative methods were employed to generate more in-depth information on the subject matter. In identifying the number of official reporting forms to represent the total population, non-probability sampling, specifically purposive sampling was utilized to gather data from the health facility while quantitative sampling, particularly census method was used to obtain data from all the data reporting form from January 2014 to December 2014 in data processing on a monthly basis. Data elements used to assess the present data quality were based on the Kenya health sector reporting forms which were used to generate indicators cutting across various programme areas.

The study used a data extraction tool whose development was guided by the research objectives, questions and literature review. The validity of the instrument was tested. Based on the fact that the study population was heterogeneous, the key informant interview guide was used in this study to obtain more in-depth information on the subject matter based on the research objective. Key informant interview guide was used on two (2) key focal managers who were purposively selected by virtue of their positions (Facility In-charge and Information Manager) to shed light on present data quality status and factors affecting data quality. Key informant interview guide was used as a follow-up on the data extracted from the various data reporting forms at various departments to elicit more information.

Data obtained from the responses were analysed with Microsoft excel, Stata SE 13 and SPSS version 22. Each data collection instrument and answers were coded to facilitate easier analyses.

RESULTS AND DISCUSSION

The availability of Routine Health Management Information System data

Table 1 below shows the summary of the form assessed on the availability of data for the period covering January 2014 to December 2014. The data collected was assessed based on the availability of services and its service points. The data were extracted from health facility checklist and physical counting of the summary forms. The available data summary form showed that 88 (56%) of all expected reports (from January 2014 to December 2014) were

available. Some of the reporting summaries were missing like TB Case findings 0 (0%). One of the key informants pointed out that:

"The sub-county TB co-coordinator extracts the data from the register but no summary is generated at the health facility on a monthly basis and if need be for data, one has to contact the coordinator which a time has a contradicting information from those generated from the register" (Key Informant, 001).

Furthermore, the informant mentioned that:

"The health facility is expected to report on monthly basis on blood safety while health facility does not offer blood safety services hence the design of data collection and summary forms never conform with available service been offered" (Key Informant, 001).

The health facility refers patient to the nearby Moi Teaching and Referral Hospital. There is need to design data tools which meet the need of the health facility". He further indicated that:

".....there was lack of financial support, lack of support from authorities in the production and reproduction of data collection tools leading donors or partners to strengthen their area of support. They further reiterated that, the National and County governments have not taken-up very seriously, the issue of ensuring the availability of primary tools (Registers) and summary forms at all service points to achieve the availability of data" (Key Informant, 001).

These were echoed by MoH (2009a) report that stated that the current HMIS by then were experiencing broad problems such as existence of overlapping data collection tools. Odhiambo-Otieno, (2005a) alluded that varied numbers of data collection tools which were being used by already overburdened health care staff with lack of coordination in data collection resulted in duplication of effort and competition from various data collecting units leading to poor quality.

On other hand, one of the key informants also pointed out that;

"The repetition of data elements in other data collection tools like ophthalmology reporting tool is not filled and with no MoH number but MoH717 is filled. The summary and registers tools are not well introduced to various departments thus it is difficult for them to know expected reports/ tools available. More often, when staff are asked to compile other reports, they become hesitant" (Key Informant, 001).

One of the key informants also pointed out that:

"the finding of the report is not surprising on the current situation because there is no information shared and nobody takes interest in competing priorities by staff collecting data resulting to more priority for patient treatment than report compilation. Therefore, there exists lack of commitment and ownership in compilation and reporting. More often, December data is forgotten due to vacation and lack of follow-up of missing reports or uncompleted reports. Majority of the staff collecting the data are nurses in different service area and not trained on routine HMIS with a few orientated on the tools or none. Therefore, inadequate trained records officers to cover all departments" (Key Informant,001).

The study assessed the present data quality based on the accuracy and availability of official reporting forms with data on a monthly basis. The other dimension the researcher focused on was the extent to which same reporting forms were filled based on agreed data elements. The monthly data collated were assessed for completeness. The data elements in the columns and rows were checked for any incompleteness or use of unacceptable signs or symbols such as dash for zero. Figure 1 shows that the findings of this assessment was 56% (41838/74460) except MoH summary forms which had missing or incomplete data. The overall availability of complete summaries was 44% (32623/74460). However, the data clearly shows that completion of the forms was below average. One of the key informants informed the researcher that:

"There is a big knowledge gap in differentiating between dashes (-), blank space or indicating N/S for no service. Moreover, there is a limitation on available standard operating procedures in terms of comprehensiveness. Even job aids do not show what to indicate if services were not rendered. The other issue is the design of the summary which are integrated in nature like MOH 711 which contain nearly all program areas, hence the assumption exists that all hospitals must provide all services like blood safety service. Uasin Gishu County Hospital does not provide the service, but is expected to report thereby resulting to zero report on MOH 731-6 and MOH 711 on section K of the summary form. The duplication of data elements on various summary forms leads to the assumption that the reports have to be filled by others" (Key Informant, 001).

Timeliness of Routine Health Management Information System data

An assessment on the availability of data on time was done using all monthly summary forms and appropriate data extraction tools were utilized (Appendix VI). This study found that 88 (56%) of the monthly data was available on time and disappointingly, none of the missing reports

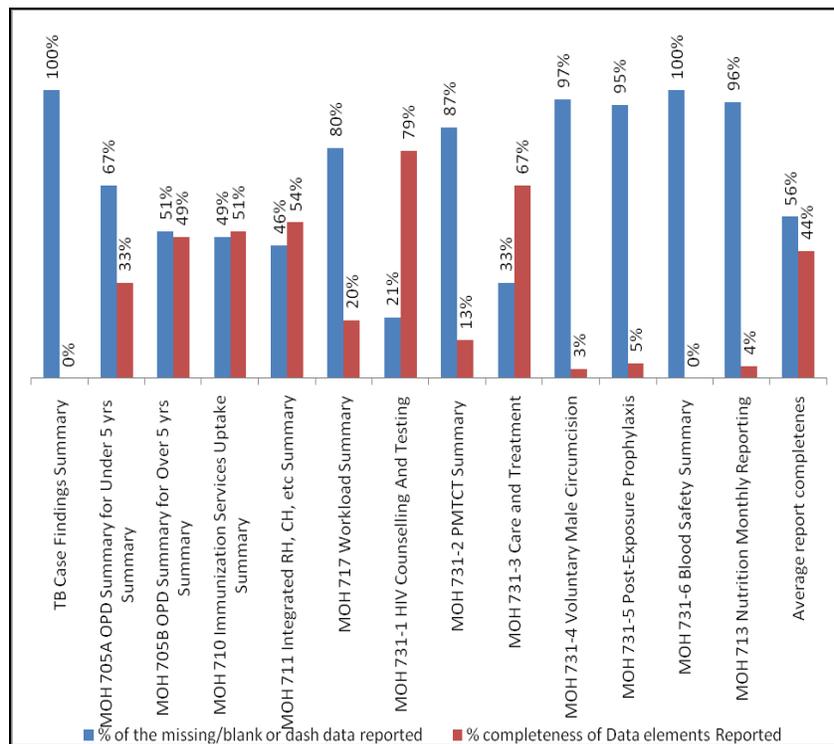


Figure 1: Completeness of Routine Health Management Information System data

preceding the study were available at Uasin Gishu County hospital. Hence, the availability of data on time is an essential aspect of data quality. Once data is available on time, it will be available for the generation of information for planning and decision making at any level and if it is untimely it is not useful for management (Karuri et al., 2014).

Simba (2005) also argued that data delivered on time to users as information is an important aspect in health planning, management and decision-making. Uasin Gishu County Hospital has 13 official which every department has to use to submit their data monthly. Cumulatively, 156 reports are expected to be available for the whole year. 68 (44%) of the reports were not available for timely generation of information for potential decision making and planning preceding this study. The goal of any HMIS is to deliver a timely reporting, however, the implication of the results shows that the extent to which timeliness of data was achieved by the hospital varied from one service area to another. Figure 2 shows the timeliness of data submitted from various departments within the health facility to the designated officer for onward reporting to the sub-county and hospital management for use. 50 (32%) of the reports were available as stipulated before the 5th of the preceding month, 34 (22%) were not available while 72(46%) of the reports were available. However, all missing reports could

not be traced from various departments because the various departments within the health facility do not keep copies of the submitted reports to the health information department.

The accuracy of Routine Health Management Information System data

The researcher assessed the present data quality based on accuracy of data to determine consistency. The other dimension the study focused on was the extent to which same reporting forms are filled based on data elements in each form. Two techniques were applied namely: time trend consistency and part and whole.

Time trend consistency

The findings were based on data extracted for patient attendance in Uasin Gishu County Hospital for the period January to December 2014. The results showed that data is not evenly distributed over the period. In this respect, the results show that most of the input errors can be suspected outliers. The findings show unexplained changes in trends in health service data over a period of time.

Based on the results, there was a change in date between June and December 2014 for under-five attendance while

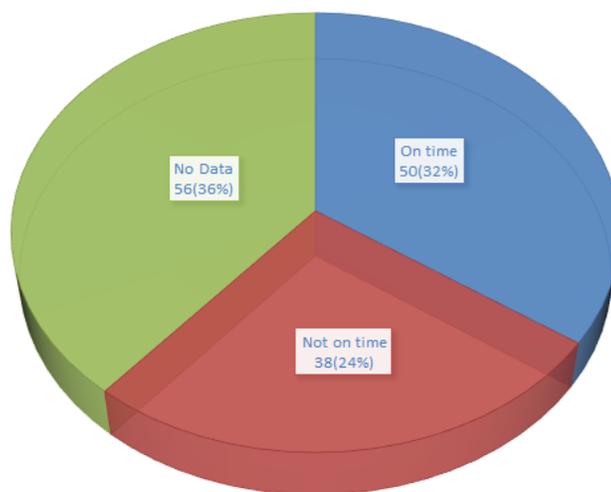


Figure 2: Timeliness of Routine Health Management Information System data (n=156)

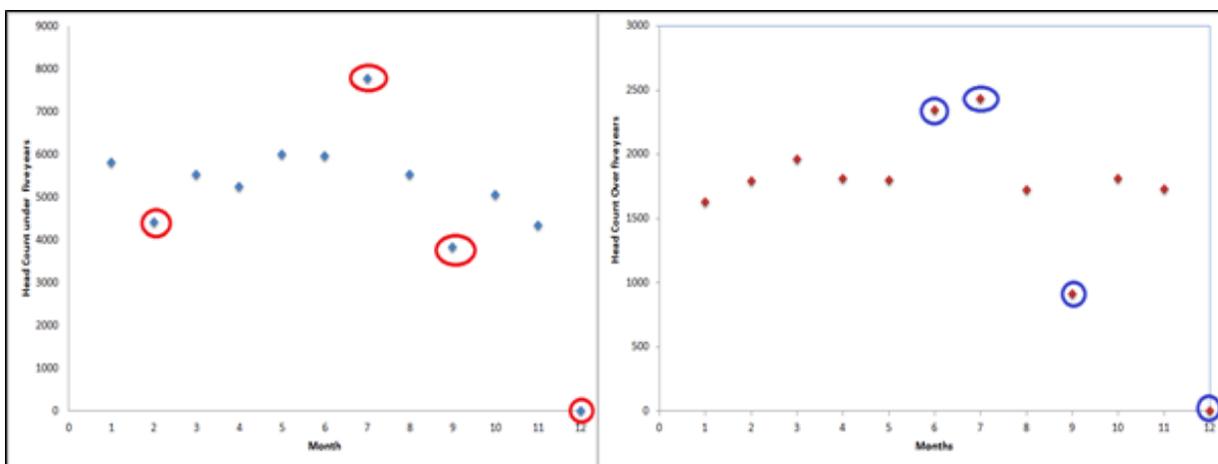


Figure 3: Time trend variation of under- and over-five years patient attendance in Uasin Gishu County Hospital
Source: MOH 705A&B (2014).

for over-five, abnormalities were identified in the month of July to December 2014. It is strange for the health facility to see a fast rise and drop which would should be an error requiring constant investigation. Cronbach’s alpha reliability coefficient was used to show deviation from normal range of between 0 and 1. The results showed that a reliability of 0.729 falls within the acceptable value. These inaccuracies are not only costly to health systems but also affect the quality of health care provision.

One of the key informants reported that:

“The process of extracting data from patient cards end up with missing data because diagnosis is entered into the register once the card is received from various service areas at the registration point in the records department. Double

count and/or errors of skipping pages may arise. Most times, cards left on various service areas get lost while some cards are locked in staff drawers. Nevertheless, the health facility is a training institution and we may not rule out the use of students to compile data which may result in errors due to lack of adequate experience which may also affect other staff not orientated on data collection tools” (Key Informant, 001).

The results agreed with WHO (2011) findings based on a study carried out in Uganda where a number of beneficiaries of a given service from month to month and large fluctuations were improbable(Figure 3). Nevertheless, the result therefore stress the need for constant assessment

Table 2. Part and Whole of RHMIS Data (2014)

Month	Currently on ART - below 1 year	Currently on ART - Male below 15 years	Currently on ART - Female Below 15 years	Currently on ART - Male above 15 years	Currently on ART - Female above 15 years	Total currently on ART	Actual Total Currently on ART	The variance (Missing figures)	Error Rate (%)
January	2	17	36	300	618	967	973	6	1
February	1	20	38	315	617	975	991	16	2
March	1	21	37	317	647	1,020	1,023	3	0
April	1	19	39	333	670	1,009	1,062	53	5
May	1	19	40	342	679	1,071	1,081	10	1
June	1	19	41	354	691	1,093	1,106	13	1
July	1	19	40	370	722	1,135	1,152	17	1
August	1	19	42		738	1,169	800	369	46
September							-	402	0
October				402			402	402	100
November	1	20	43	405	824	1,289	1,293	4	0
December	2	22	43		844	1,314	911	403	44
Total	12	195	399	3,138	7,050	11,042	10,794	1,698	16

on data quality of RHMIS to check the completeness, internal consistency and external consistency based on agreed indicators (WHO, 2014). In the same breath, it emphasizes the need for identification of outliers from the expected values, as these can severely distort coverage rates. Inaccuracies realized from various service deliveries within the health facility are not only costly to health systems but also affect the quality of health care provision. The result provides some breath by the study (Sharma et al., 2016) where despite its unequivocal importance for routine decisions, irregularities in reports generation, data duplication and data inconsistencies, at all levels of healthcare delivery.

Part and whole

The technique of using Part and whole for checking data accuracy was used to assess if segments (parts) of data from a facility does not add up to the larger category (whole). The parts of a whole should usually add up to the whole and a part should usually be smaller than the whole. If the parts do not add up to the whole, then there is a probable error. If any one part is larger than the whole, then there is an error.

Table 2 shows significant error rates (either positive or negative) which were noted especially in the monthly data. The most affected months with big variances were August, October and December, 2014. The total presented does not add up to the parts of ART per age group categories. According to key informant:

“The problem of having data not adding up is because of counting, hurrying when making report to meet timelines, arithmetic or transcription” (Key Informant, 001).

The results of the study agree with Lippeveld and Bodart (2000) who opined that it is unfortunate that there could be perception error detection which is boring, as it actually requires good detective skills and it is usually exciting tracking down errors. Notable also from Garrib et al., (2008) is that disparities where data are grossly inaccurate, people do not realize this and they use the information for planning and general decision-making, then it is likely that the plans will be flawed and poor decisions made.

RECOMMENDATION

In order to strengthen the data quality of routine HMIS activities at any level of healthcare, there is need for advocacy for continuous data and information use culture championed by the National and County governments and the Ministry of Health in Kenya. Quality data is one of the competitive rewards of an institute. Quality of the information generated from the data is imperative to the success of health systems. Therefore, there should be more emphasis by all the stakeholders to heighten the process, technical and organizational factors in order to strengthen systems for identifying and reporting concerns by establishing procedures and disseminating information about reporting mechanisms and reporting processes;

Ensure capacity building (training) by strengthening the health system, including the technical and operational capacities of its individual actors and organization; Build effective information management within data collation, analyses and dissemination that will contribute to improvement in other key areas and; Ensure rigorous program evaluation designs that are essential to determine effectiveness of data quality. The study recommends further evaluation which may also help better understanding of related issues such as the economy of health systems.

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Conflict of Interests

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

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