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Full Length Research Paper

Information management for essential medicines supplies in public primary care facilities in Nairobi County, Kenya

Sarah Akoth Chuchu[1*], Maureen Adoyo[2] and Ben Onyango Osuga[2]

[1]Ministry of Health, Nairobi, Kenya.
[2]Kenya Methodist University, Nairobi, Kenya.

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Available pharmaceutical information is often characterized by inadequacy, and inaccuracy, which compromise its quality and usefulness. This study was carried out to examine staff characteristics, organizational and technical aspects that affect the quality of pharmaceutical information. A cross-sectional, descriptive study targeting pharmacy staff in public primary care facilities was carried out in Nairobi County. Thirty one facilities were surveyed and a pre-tested semi-structured questionnaire was administered to 31 pharmacy staff. Adequacy and accuracy of records and reports was assessed using a checklist. District pharmaceutical facilitators were interviewed as key informants. Quantitative data was analyzed using Predictive Analytics Software version 22. Qualitative data was analyzed through thematic content analysis. Staff characteristics obtained were in-service training in 9(29%), good knowledge and skills in data entry in 25(81%) and low levels of motivation in 13(42%) staff. Pearson's chi square tests revealed significant relationships between cadre of staff and knowledge and skills. Organizational aspects were low numbers of pharmaceutical technologists numbering 11(36%), supportive supervision feedback in only 4(15%) facilities, and lack of written roles and responsibilities in 21(68%) facilities. Significant relationships were found between having written roles and responsibilities and ability to enter data accurately. Technical aspects were high availability of computers and data management software in 30(97%) facilities, but use of data management software in only 6(20%) facilities. A significant relationship was found between use of data management software and accuracy of stock records. The study concluded that in-service training had weaknesses, management support was inadequate and use of information technology was low. Recommendations were made to improve in-service training, strengthen management support; and promote use of data management software.

Key words: Information, pharmaceutical, essential medicines, staff characteristics.

INTRODUCTION

Sound and reliable information is the foundation of decision-making across all levels of the health care system. Information is essential for health system policy development and implementation, governance and

*Corresponding author. E-mail: schuchu.pmo@gmail.com, Tel: +254 722 745 610.

regulation, health research, human resources development, health education and training, and service delivery and financing (Health Metrics Network, 2008). Information from different sources is used for several purposes at different levels of the health-care system. Individual level data about the patient's profile, health care needs and treatment, serve as the basis for clinical decision making. Health facility level information, both from aggregated facility level records and from administrative sources, such as medicines procurement and consumption records, enable health care managers to determine resource needs, and to guide purchasing decisions for medicines, equipment and other supplies.

Essential medicines play a critical in provision of health services and their constant availability is crucial in achieving positive treatment outcomes. Essential medicines are defined as those medicines that satisfy the priority health care needs of the population and are intended to be available within the context of functioning health systems in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price that the individual and the community can afford (World Health Organization (WHO), 2002). Ensuring availability of essential medicines is highly dependent on relevant, accurate and timely information. This information enables staff at all levels of the health system to make evidence based decisions on management of the whole spectrum of pharmaceutical services, which includes planning, estimating demand, allocating resources, and monitoring and evaluation of pharmaceutical operations. These decisions ultimately determine how well the pharmaceutical management system achieves its objectives of ensuring constant availability of essential medicines; thereby supporting the functioning of the whole health system. Available pharmaceutical information is often characterized by inaccuracy, inadequacy, incompleteness and lack of timeliness, which compromise its quality and usefulness (Luoma, 2010).

A study in Kenya revealed that, there have only been partial data on which to perform forecasting, quantification and procurement planning for most health commodities (Bunde, 2007). Other studies carried out on use of data for decision making in pharmaceutical management of HIV/AIDs and malaria reported that incomplete, delayed or no reporting, have limited the use of collected data for effective decision making (Owunna & Whitt, 2007). Findings of an assessment revealed that faith based health facilities had more adequate drug stock records than public health facilities. Additionally, there was a decline in adequacy of stock records in public health facilities from a baseline of 93% in 2003 to 77% in 2008 (Ministry of Medical Services (MoMs) and Ministry of Public Health and Sanitation (MoPHs), 2009). Machini, (2013), in a survey on availability and completeness of anti-malarial management records reported a decline in the updating of records from a baseline of 66.7% in 2010 to 45.9% in 2012, while completion of monthly summary reports declined from a baseline of 65.9 to 57.1 %. Anecdotal evidence points to characteristics of pharmacy staff, organizational and technical aspects as key determinants of pharmaceutical information management processes. This study sought to explore these three aspects with the aim of identifying and documenting the main factors that affect management of pharmaceutical information in the essential medicines supply chain, focusing on public primary care facilities in Nairobi County. The outcome is expected to add to the existing knowledge on pharmaceutical information management systems and contribute towards improving the availability of quality pharmaceutical information so as to inform decisions aimed at ensuring availability of essential medicines.

METHODOLOGY

Study site

The study was conducted in Nairobi County. Nairobi has a total of 496 health facilities, of which 248 are classified as primary care facilities. Out of the 248 primary care facilities, 36 are listed as public sector facilities (MoH, 2013), Nairobi City County, (2014).

Study design

A descriptive, cross-sectional research design was used, adopting a combination of quantitative and qualitative approaches of data collection.

Study Population

The primary target population was pharmacy staff in the sampled health facilities involved in management and supply of essential medicines.

Sampling technique for health facilities

Sample size for health facilities was computed using the Krejcie and Morgan (1970) formula where:

$$S = \frac{X^2NP\,(1 - P)}{d^2(N-1) + X^2P(1-P)}$$

s = required sample size
X^2 = the table value of chi-squared for one degree of freedom at the desired confidence level
N = the population size
P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size)
d = the degree of accuracy expressed as a proportion
From a population size of 36, using a confidence level of 95% (X= 1.96), and a degree of accuracy of 0.05 a sample size of 33 health facilities was computed as illustrated:

$$S = \frac{(1.96)^2 * 36 * 0.5 * 0.5}{(0.05)^2 * (36-1) + (1.96)^2 * 0.5 * 0.5} = 32.99 \sim 33$$

The calculated sample size constituted about 92% of the total population. The researcher therefore adopted census sampling to include all the 36 public primary care health facilities in the study.

Sampling for respondents

Pre-survey data revealed that the pharmacy departments in the facilities are staffed by one technical staff who is either a pharmaceutical technologist or a nursing officer. Census sampling technique was adopted to include all technical staff found working in the facility pharmacy, thereby targeting a total of 36 respondents.

Data collection instruments

A pre-tested semi-structured questionnaire was administered to pharmacy staff. It comprised both open and close ended questions and collected data on staff characteristics including knowledge and skills in pharmaceutical recording and reporting, in-service training, levels of motivation; organizational aspects including staffing levels and management support; and technical aspects including availability of data collection and reporting tools and equipment, information flow systems and availability and use of information technology. A pre-tested checklist was used to assess the quality of the outputs of the pharmaceutical information management processes in the facilities which included records, reports and registers. Data was collected on availability, adequacy and accuracy of stock control cards for a tracer list of 15 items from the Kenya Essential Medicines List (MoMs and MoPHs, 2010); and availability, accuracy and completeness of dispensing records over 30 days prior to the survey. The checklist was based on the WHO package for assessment, monitoring and evaluation of country pharmaceutical situations (WHO, 2007). Validity of the instruments was ascertained by pre-testing in an institutional public primary care facility with similar characteristics to the facilities in the study sites, and through review by three raters. Reliability was assured by collection of data using both qualitative and quantitative methods. An interview guide was used to collect information from district pharmaceutical facilitators purposively chosen as key informants, through recorded interviews. Information was collected on quality of pharmaceutical information, performance of pharmacy staff, provision of in-service training and supportive supervision.

Data analysis

All questionnaires and checklists were collected at the end of each visit. The researcher checked and confirmed all required fields were filled and all questions were answered. Quantitative data from the questionnaires was entered into Predictive Analytics Software Version 22 by a data analyst. Descriptive statistics were presented in terms of frequencies, proportions and mean. Pearson's chi square test of independence was performed to examine relationships between categorical variables. A significance level of < 0.05 was used. Key informant interview recordings were transcribed into Microsoft word, analyzed by thematic content analysis and presented as emerging themes and descriptions.

Legal and ethical considerations

Ethical approval and clearance was obtained from Kenya Methodist University. Administrative approval was obtained from the Nairobi County Department of Health, the District Health Management and individual facility managers. Additional ethical considerations included informed consent, privacy, confidentiality, anonymity, provision of adequate logistical facilitation where necessary, and assurance that the results of the research would be disseminated to the respondents and institutions for their benefit.

RESULTS

Of the targeted 36 facilities, access was granted to 31 facilities giving coverage of 86.1%. The questionnaire was administered to one pharmacy staff in each facility giving a total of 31 respondents. Respondents were pharmacy staff found working in the pharmacy on the day of the survey and included pharmaceutical technologists and nursing officers. Nineteen staff (61.3%) had worked in the pharmacy for more than one year and 12 (38.7%) had less than one year's experience in the pharmacy. Two district pharmaceutical facilitators were interviewed as key informants. Both were pharmaceutical professionals with at least 12 years experience in pharmaceutical service delivery in Nairobi County.

Staff characteristics

Characteristics of pharmacy staff were determined in terms of knowledge and skills in pharmaceutical information management, in- service training in medicines record keeping and reporting, and level of motivation to carry out pharmaceutical information management tasks.

Knowledge and skills

Knowledge and skills in pharmaceutical information management was determined by asking the respondents to rate their ability to carry out 7 key pharmaceutical information management tasks, using a Likkert scale. The 7 tasks were: entering data accurately and completing pharmacy records, using data to calculate order quantities, analyzing consumption records by months or years, calculating percentages/rates of medicines use, using data to forecast requirements, preparing inventory reports and preparing stock status reports. Results are summarized in Table 1. Pearson's chi square test of independence, at a significance level of < 0.05, showed statistically significant relationships between cadre of staff and ability to carry out 6 key pharmaceutical information management tasks. Pharmaceutical technologists were more likely to have good ability in the competencies than nursing officers (Table 2). Adequate knowledge and skills enable staff to carry out pharmaceutical information management tasks, and results in production of adequate and accurate records and reports. Adequacy and accuracy of stock records produced during the 12 months prior to the study

Table 1. Ability to carry out key pharmaceutical information management tasks (n=31)

Pharmaceutical information management task	Ability to perform tasks (%)				Total
	Good	Average	Poor	No response	
Entering data accurately and completing pharmacy records	80.7	12.8	6.5	0	100.0
Using data to calculate order quantities	64.5	16.1	19.4	0	100.0
Analyzing consumption records by months or years	64.5	16.1	19.4	0	100.0
Calculating percentages/rates of medicines use	38.8	9.7	48.3	3.2	100.0
Using data to forecast requirements	67.8	16.1	16.1	0	100.0
Preparing inventory reports	61.3	9.7	29.0	0	100.0
Preparing stock status reports	71.0	12.9	16.1	0	100.0

Table 2. Pearson's chi square test for Cadre vs. ability to carry out pharmaceutical information management tasks.

Variable 1	Variable 2	Chi square value	df	p-value
Cadre of staff	Enter data accurately	5.903[a]	1	0.015
Cadre of staff	Forecast order requirements	9.909[a]	1	0.002
Cadre of staff	Calculate percentage use rates	12.000[a]	1	0.001
Cadre of staff	Calculate order quantities	15.800[a]	1	0.000
Cadre of staff	Prepare inventory reports	8.316[a]	1	0.004
Cadre of staff	Prepare stock status reports	8.316[a]	1	0.004

was determined for 15 tracer items. Adequacy of records was determined by checking availability of stock cards and whether entries were completed according to requirements with regard to names, strengths and quantities of medicines received and issued expiries, losses, balances, dates and details of all transactions. The mean proportion of adequate stock records was 58.8%. Accuracy of stock records was determined by calculating the percentage of medicines which had discrepancies between the stock record count and physical count. The mean proportion of accurate stock records was 53.6 %. Dispensing registers were available and being used in 24 facilities (77.4 %.), but none of the facilities had registers meeting requirements in terms of completeness of data entry and calculation of daily medicines balances. Monthly and quarterly pharmaceutical reports were seen in 6 facilities (19.4%).

In- service training

In 9 facilities (29.3%) staff had attended in-service training on medicines stock record keeping and reporting. For staff who had attended training, no significant relationship was found between training attendance and ability to perform the key pharmaceutical information management tasks. Key informants expressed concern that the trainings are not adequate for essential medicines information management in terms of content and orientation.

Motivation

Respondents were asked to describe their level of motivation to keep pharmacy records and prepare pharmaceutical reports. Only 1 staff (3.2%) was highly motivated, 17(54.8%) had moderate levels of motivation, and 13(42.0%) had low levels of motivation. Staff indicated the main de-motivating factors were heavy workload, inadequate training, and doing work that they felt was not their profession (Table 3). Interview findings confirmed a common feeling amongst non-pharmaceutically trained staff that they are performing tasks that are not within their professional training. “Nurses deployed to the pharmacy often feel that “it is not their work” as they are not trained in pharmaceutical services delivery including record keeping and reporting.” DPF01. Chi square test revealed a significant relationship between level of motivation and the feeling that medicines record keeping is not part of routine work, with a chi square value of 9.439[a]; and a p - value of 0.002. The level of motivation was likely to be lower amongst staff who felt that medicines record keeping was not part of their routine work.

Organizational aspects

Organizational aspects were determined in terms of human resources for pharmacy, and management support functions specifically supportive supervision and

Table 3. De-motivating factors in keeping records and preparing reports (n=31).

De-motivating factor(s)	N	%
Heavy workload	7	22.6
Inadequate training	7	22.6
Doing work that is not my profession	4	12.9
Heavy workload and inadequate training	8	25.8
Heavy workload and doing work that is not my profession	2	6.4
Heavy workload, inadequate training and doing work that is not my profession	3	9.7
Total	31	100.0

roles and responsibilities.

Human resources for pharmacy

In the 31 health facilities surveyed, pharmacy staff comprised 11(35.5%) pharmaceutical technologists and 20(64.5%) nursing officers. Twenty eight staff (90.3%) indicated that the number of pharmaceutically trained staff available in the facilities was inadequate.

Supportive supervision

Supportive supervision (SS) was carried out in 26 (83.9%) facilities within the last one year with the number of supportive supervision visits ranging from 1 to 2 and > 6. In all the 26 facilities where supervisory visits were made, the supervisor checked pharmacy records; with 16(61.5%) stating that a checklist was used to assess accuracy and completeness of the records. In 25 facilities (96.2%) the supervisor discussed record keeping performance with staff. However, in only 4 facilities (15.4%) were there any written feedback from the supervisors. Interview findings indicated that the current joint supportive supervision visits do not adequately address the needs of pharmaceutical staff and much less data management, record keeping and reporting performance. Lack of resources needed to carry out SS for essential medicines and lack of training for the supervisors were cited as major constraints. “Although guidelines, training packages and tools were developed and disseminated several years ago, today none of these are available at the facilities or at the district level. Comprehensive training on SS for health commodities was carried out several years ago, but implementation of SS for health commodities, including pharmaceuticals failed to take off, and the current crop of supervisors has not been trained.” DPF02

Roles and responsibilities

Written roles and responsibilities pertaining to pharmaceutical record keeping and reporting were not available in 21 facilities (67.7%). Interview findings confirmed this observation. “When pharmaceutical staff is deployed to the pharmacy in the facilities, there is no documented instruction outlining roles and responsibilities, expectations, and deliverable” DPF01. Chi square test revealed a significant relationship between written roles and responsibilities and ability to enter data accurately, with a chi square value of 9.909[a] and a p - value of 0.002. Staffs whose roles and responsibilities were defined in writing were more likely to be good at entering data accurately. A significant relationship was also found between level of motivation and availability of written roles and responsibilities with a chi square value of 8.010[a]; and a p - value of 0.005. The level of motivation was likely to be higher amongst those staff with written roles and responsibilities.

Technical aspects

Technical aspects were described in terms of availability and use of data collection and reporting tools, and availability and use of information technologies.

Data collection and reporting tools

Availability and use of requisition/issue vouchers was good in 16(51.6%), stock control cards and anti- malarial register were available and in use in 30(96.8%) facilities; and dispensing registers were available and in use in 21(67.7%) facilities. However, only 3(9.7%) facilities reported availability and use of inventory, monthly status, quarterly status and annual status reporting forms.

Information and communication technology

Most facilities were well equipped with information and communication technology (ICT) equipment (Table 4). However, the level of maintenance of computer system and data management software was poor in 25 facilities (80.6%). Most staff was computer literate and found it easy to use the computer. However, only 8(26.7%) found it easy to use the data management software whilst

Table 4. Availability of information and communication equipment (n=31).

Equipment	Facilities where available	
	N	%
Computer	30	96.8
Data management software	30	96.8
Data backup facility	6	19.4
Printer	3	9.7
Modem	27	87.1
UPS	27	87.1
Telephone (landline)	1	3.2

12(40%) found it difficult to use. Of the 30 health facilities where a computer and data management software was available, only 6(20%) facilities were fully using the software to manage their stock records. Several reasons were cited for low use of data management software during key informant interviews including inadequate training, software functionality issues and staff attitudes. Chi square test revealed a significant relationship between use of data management software and accuracy of stock records with a chi square value of 7.936[a] and a p-value of 0.005. Facilities where data management software was in use were likely to have more accurate stock records (Table 4).

DISCUSSION

Staff characteristics

Results show variable levels of knowledge and skills, reflected in ability to perform 7 key information management tasks. Highest ability was recorded in entering data and completing pharmacy records with good ability in about 80% of the staff. The lowest level of competence was in calculating percentage rates of medicines use, where it was poor in about 50% of staff. Entering data is the first step of the information management process but subsequent steps are critical in processing data to produce accurate records and reports. More than 40% of the records were found to be inadequate and inaccurate. Decline in quality of stock records and was reported by MoMs and MoPHs (2009) and Machini (2013), whilst another related study carried out in 2010 also found prevalent inadequacy and inaccuracy of pharmaceutical records (Luoma, 2010).

Therefore, although knowledge and skills in data entry are good, there are notable deficiencies in the other areas which contribute to inaccuracy and inadequacy of records and reports. Pearson's chi square test revealed significant relationships between cadre of staff and ability to perform 6 key tasks with pharmaceutical technologists were more likely to have good ability in the competencies than nursing officers. This relationship is probably attributed to the fact that aspects of pharmaceutical stock and inventory management are covered in the pre-service training of pharmaceutical technologists, and practical experience is further gained during the internship period. The nursing officers, however rely mainly on the in-service training to gain required skills and knowledge in pharmaceutical information management. Thus, their ability to perform information tasks largely depends on the effectiveness of in-service training and other support mechanisms available. The results obtained indicate gaps in ensuring the effectiveness of deploying non-pharmaceutical staff in the pharmacy.

In-service training

In service training is a key factor in enhancing skills and knowledge of the staff, and developing key competencies for pharmaceutical information management. However, results show a weakness in the training function. A large percentage of facilities (71%) had staff who had not attended any in-service training on medicines stock record keeping and reporting. This could contribute to the deficiencies in knowledge and skills especially amongst the non-pharmaceutical staff. Furthermore, even for those with staff who had attended training, no significant relationship was found between their attendance in training and their ability to perform most of the key information tasks. This could mean that whatever little training is done may be having little impact. Related studies have previously indicated weaknesses in training in aspects of pharmaceutical management and suggested strengthening in service training of different cadres of health workers (Matowe et al., 2008; Waako et al., 2009).

Motivation

Levels of motivation to keep medicines records and prepare reports were notably low amongst staff. Key demotivating factors cited by over half of the respondents

were heavy workload and inadequate training whilst a number of nursing officers also felt de-motivated because they are doing work that they are not trained to do. The latter result could imply that mechanisms to ensure non-pharmaceutical staff in the pharmacy area are comfortable and confident carrying out their delegated functions are inadequate. This area requires further examination if task shifting is to be effective. Low motivation and morale, and work overload featured as significant challenges in related studies carried out in Kenya and Nigeria (Measure Evaluation, 2010).

Organizational aspects

Human resources for pharmacy

Results and interview findings showed a shortage of dedicated full time pharmaceutical staff in the health facilities. Staff working in the pharmacy mostly comprised nurses who were deployed on rotational basis. Amongst the few pharmaceutical technologists found in the facilities, most of doubled up as community health extension workers (CHEWs). This means that non-pharmaceutical trained staffs carry out the bulk of pharmaceutical information management tasks. Therefore, in order to optimally perform more emphasis is needed on regular and adequate in- service training and supportive supervision. Available literature indicate that inadequacy of pharmaceutically trained staff is an area of concern in many developing countries, and often necessitates deployment of nursing officers in the pharmacy areas, especially in primary care facilities (MSH, 2012).

Supportive supervision

Regular supportive supervision serves to enhance good practices, identify challenges and strategize improvement interventions. Although results reveal that about 84% of the facilities received supportive supervision visits, only about 15% got feedback from the supervisors. Feedback is the driving force behind supportive supervision and is important for planning for improvement and monitoring progress towards achievement of agreed objectives. Ultimately, supportive supervision should improve ability to perform key information management tasks and overall performance.

However, chi square tests did not reveal any significant relationships between supportive supervision and key competencies in information management. This implies that the current supportive supervision function, may not be achieving its intended objectives and outcomes. A related study carried out in Tanzania obtained similar results where lack of supervision and leadership, and low management support were found to affect information management performance (Nsubuga, 2002).

Roles and responsibilities

A clear definition of roles and responsibilities is important for staff to understand what is expected of them and for accountability for tasks and actions. Results show that about 68% of the facilities did not have written roles and responsibilities for pharmacy staff, and this could contribute to poor motivation and poor ability to carry out information management tasks. This was illustrated in the study by the significant relationship between level of motivation and having clear roles and responsibilities where those with written roles and responsibilities were more motivated. A significant relationship was also found between having defined roles and responsibilities and ability to enter data accurately and ability to prepare stock status reports indicating that written roles and responsibilities also enhance performance. These results further highlight how organizational aspects influence staff characteristics and ultimately affect pharmaceutical information management practices. The interplay between organizational and behavioral factors has been documented by Aqil et al. (2009) in related literature.

Technical aspects

Data collection and reporting tools

For effective production of pharmaceutical information data collection and reporting tools must be constantly available. Availability of data collection tools such as stock control cards and dispensing registers was fairly good. However, there was poor availability of requisition vouchers in about half of the facilities. Since this is a key document in the supply chain, its poor availability could be a contributing factor to gaps in data collection, manifested in discrepancies between stock record counts and physical stock counts. Availability and use of inventory reporting forms was poor in about 90% of the facilities. This could contribute to the poor levels of reporting and is consistent with findings in a related study by Bunde (2007), where poor availability of reports to perform forecasting, quantification and procurement planning in Kenya was described as a major challenge in the essential medicines supply chain.

Information and communication technology

Application of ICTs in pharmaceutical data and information management was low despite the fact that all facilities except one had computers, accessories and data management software for use in stock record management and inventory control. Out of the 30

facilities with data management software, only 6(20%) were using it to manage stock records. The reasons behind low usage imply inadequate preparation of staff to transition from paper based information systems to computerized information systems. The study showed there was a sizeable number of staff who was not fully competent or confident in using computers and data management software. Coupled with the low motivation levels, more effort is required to instill confidence in use of ICTs and to highlight the potential contribution to improved accuracy and completeness of records. A significant relationship was found between use of data management software and accuracy of stock records. Facilities where data management software was in use were likely to have more accurate stock records. This result is consistent with results found in a similar study in which facilities that adopted internet based systems achieved better medicines stock control (Muthoni and Okibo, 2014).

Conclusion

Deficiencies found in staff characteristics were inadequate knowledge and skills to perform pharmaceutical information management tasks, weaknesses in in-service training, and low levels of motivation amongst staff. Amongst the organizational aspects, pharmaceutical staff was inadequate; supportive supervision function was weak and there was inadequate definition of roles and responsibilities. Technical aspects that affect pharmaceutical information management included poor availability of reporting tools and limited use of information and communication technologies.

RECOMMENDATIONS

In-service training programs should be strengthened to address the information management needs of staff managing essential medicines. Management support, particularly supportive supervision and definition of roles and responsibilities should be strengthened. The use of pharmaceutical data management software should be promoted and staff should be adequately trained in its utilization.

Conflict of Interest

The authors have not declared any conflict of interest.

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