
TOWARDS A DIGITAL HEALTH INFORMATION FRAMEWORK FOR MANAGING ESSENTIAL MEDICINE SUPPLY CHAIN IN PUBLIC HEALTHCARE FACILITIES IN KENYA

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ABSTRACT

Health information systems technology is an enabler of real time dissemination of information for decision making that supports health service delivery including medicine stock management in hospitals. However essential medicine stock out in public healthcare facilities in Kenya persist due to poor information processing and delayed information flow. The study sought to create a digital health information framework for management of essential medicine supply chain in Kenya's public healthcare facilities. The researcher used a mixed method approach involving both qualitative and quantitative techniques. Purposive sampling was used to select 14 key informants (medical superintendents) while simple random sampling was used to select 150 healthcare workers. An interview schedule was used to collect data from the key informants while a semi-structured questionnaire from the rest of the respondents through an ArcGIS enterprise platform. The average Cronbach Alpha for all the variables was 0.839, which means that the research instrument was reliable. Linear regression analysis was used to analyse data. The study was conducted between August and October 2023 Kajiado, Makueni and Mombasa counties. Study findings indicated that most public healthcare facilities do not have complete DHIS, thereby processing information through a mixture of paper and fragmented electronic systems. The findings also show that the current systems were unreliable, inaccurate, incomplete. Most of the public health facilities did not have adequate functional computers, an adequate number of skilled personnel and internet connection, which affected information dissemination. The study concludes that the study concludes that although most public healthcare facilities in Kenya do not have complete DHIS, the quality of digitized health information, digitized health information processing strategy, ICT infrastructure support, workforce skills and policy framework have a positive and significant effect on essential medicine supply chain management in public healthcare facilities.

Keywords: Digital Health Information Framework, ICT Infrastructure, Workforce Skills, Supply Chain Management, Essential Medicine, Public Healthcare Facilities, Kenya.

I. INTRODUCTION

Health information systems are critical for management of medical products and vaccines supply chain (World Health Organization [WHO], 2007; World Health Organization [WHO], 2021; Oreni et al., 2021; Aila & Kithuka, 2021). Availability of safe and effective essential medicines is considered by World Health Organization as a basic human right and a priority under Kenya vision 2030 (Adebisi et al., 2022; MOH Kenya, 2020; WHO, 2019). However, stock out of critical essential medicines are still a critical concern globally (MOH Kenya, 2020; WHO, 2019). Diseases treatable with medicines still are the main causes of disabilities and death in developing countries (Management Science for Health, 2012).

Health information systems digitalization is among innovations influencing health sector performance including the management of essential medicines and medical products (European Union, 2019). Digital health technologies offer opportunities to address concerns about essential medicines (WHO, 2019). In 2017 the

European stakeholders on medicine supply chain advocated for early detection of shortages of essential medicines through improved essential medicine data infrastructure, access to essential medicines information, consistency in reporting and collaboration (European Association of Hospital Pharmacists, 2022). Unfortunately, often, health sector decisions on the management of essential medicine supply chain in most low- and middle-income countries (LMICs) are rarely based on information from facility information system (HIS) (Karijo et al., 2021). Slovenia, Estonia, the Netherlands, Denmark, Sweden, Norway, Finland, the United Kingdom, Scotland, and Wales are just a few of the nations that have successfully implemented digital health information systems that have the capacity to collect, process and dissemination information across other information systems (Connected Health Alliance, 2021). In Africa, Governments in developing countries have also put efforts in developing digital health information systems (HISs), however poor planning and fragmentation have hampered successful implementation of the majority of HISs more specifically for managing essential medicines at the facility (Bagayoko et al., 2020). In Africa, due to poor leadership, inadequate technical infrastructure, low levels of digital skill, lack of trained personnel, poor data quality and weak information analysis at facility level, information systems are incapable to produce information that can effectively support the management of essential medicine supply chain.

In 2017 and 2018 millions of patients in Kenya were faced with delays or cancellation of care, longer hospitalization, disabilities, and death due to essential medicine stockout in 44 percent of public healthcare facilities (Kenya MOH Supply Chain Strategy 2020-2025, Hellen et al, 2021 and Ogollah et al, 2022). Priority gaps causing essential medicine stockout in public healthcare facilities in Kenya include lack of or inadequate use of digital health information systems, poor data quality in public facilities, inaccurate information on essential medicines consumption, inadequate essential medicine data analysis at facility, poor quantification of essential medicines and lack of or inadequate supervision of staff charged with quantification and sharing of information on supply chain (MoH, Kenya Supply Chain Strategy, 2020-2025).

Theoretical Framework

To assess the influence of digitized health information on management of essential medicine supply chain at the level 4 and 5 public health facilities in Kenya, the study employed two (2) complementary theories of Unified theory of acceptance and use of technology (UTAUT), developed by Venkatesh et al. (2003), and Knowledge based view of the firm model, formulated by Grant (1996). The nature of the study required the use of the two theories in the sense that Unified theory of acceptance and use of technology (UTAUT) address acceptance and the behavioral intension for use of technology and since it does not strictly focus on organizational learning (identity, employees, culture, policies and systems), human capital in organizational performance, strategy, goals, and transfer of knowledge ,the Knowledge based view of firm model was used to address health workforce skills, training and policy on digital health information influence on essential medicine supply chain management.

In their research, Bunyali, Njoroge, and Kimemia (2023) discovered that healthcare professionals lack adequate skills in managing health logistics systems, leading to reduced availability of medical supplies. Effective management of order processes, inventory, and information flow systems in public health facilities within Kajiado County positively correlates with and significantly improves the availability of medical commodities.

However, the study used a self-administered questionnaire to collect data. While this form of data collection saves time and resources, it might result in hastily provided responses as respondents just fill the questionnaire for the purpose of completing it. Such an approach might easily result in invalid responses that do not reflect the true picture of the phenomena under study. To cover this gap, this study used an ArcGIS enterprise platform whereby the researcher and the research assistants collected data in real time, making sure that the respondents understood the questions and provided honest and knowledge-based responses.

Kanda and Iravo (2015) identified that the absence of fully integrated digital health information systems in public healthcare facilities impacts the efficiency of drug supply chains. Most respondents reported delays in receiving supplies, while some expressed dissatisfaction with the lengthy procurement process, and a few found the process to be excessively tedious. The study adopted a qualitative study design. Relying on this design only was insufficient because it fails to consider the numerical and statistical aspects involved in the medicine stocks supply chain. Besides, qualitative research design is based on subjective responses, which

might lead to biased conclusions. The current study covered these gaps by using mixed methods research design.

II. METHODOLOGY

The research employed a nested mixed-method approach, integrating qualitative and quantitative methods to complement each other and provide a comprehensive understanding of the multifaceted phenomena under investigation. A multistage sampling was applied to sample level 4 and 5 public healthcare facilities. The probability sampling method was applied to a sample frame of 20 level 4 public healthcare facilities (sub county hospitals). Since there are only 3 level 5 public healthcare facilities (County referral hospitals) in each of the three counties, purposive sampling was used to enroll all the 3 public healthcare facilities into the study. Simple random sampling was used to select participating level 4 public healthcare facilities (County Referral hospitals) in the 3 counties. Probability sampling was also be applied on a sample frame of 437 human resource for health (pharmacists, clinical officers, medical officers and health records and information officers) from 4 and 5 public healthcare facilities to select respondents to the semi structured interview. Purposive sampling was used to identify key informants. Sample size calculation formulae was obtained from Nasiurma, D. K. (2000); in the formulae N is the population, C is the coefficient of variation (0.5), e the level of precision (0.05) and n is the sample size.

$$n = \frac{NC^2}{1 + (N - 1) e^2}$$

From a sample frame of 437 (17 health records and information Officers, 134 medical officers, 46 pharmacist and 240 clinical officers) Nasiurma D.K. (2000) formula for calculating the sample size was applied to arrive at the probability sample of health workforce from public healthcare facilities to take part in the study. 164 respondents (150 semi structured questionnaire and 14 key informants) from 14 sampled public healthcare facilities were sampled. To ensure that information collected fitted into the aim of the study, purposive sampling was used to enroll an adequate number of respondents in relation to the roles in health information and essential medicine supply chain management at the facility level. Interview schedules were used to collect data from key informants while semi-structured questionnaires were used to collect data from the other healthcare professions. A Questionnaire designed in survey 123 on ArcGIS enterprise platform (web page and operational dashboard) was accessed by the interviewer on the chosen mobile phones. A mixed mode electronic data collection approach including web app and analysis platform was employed to fasten data collection, entry, and analysis. Data collection and processing took place between 1st August and 10th October 2023

Linear regression analysis was used to analyse data. Ordinal regression model ordered logit and ordinary least squares are the two methods that were used to conduct regression analysis (Nageri et al, 2023). In this case regression analysis was applied to broaden the insight into the relationships between variables. A logistic regression was used to investigate the influence of digital health information system on essential medicine supply chain management in the public hospital in selected counties in Kenya. Correlation coefficient, Spearman's rho was applied to assess the null hypothesis. The t- test applied at 95% confidence level and n-2 degrees of freedom was used to decide whether independent and dependent variables are correlated significantly. The internal consistency reliability coefficients (Cronbach's alpha) were measured at above 0.7 acceptance level (acceptable and good). Bivariate Pearson Correlation was used to evaluate if there was a significant relationship between the independent and dependent variables in the hypothesis. Only those who consented and signed the consent form were included in the study. No personal details (names, phone numbers, email address, photos, and videos) of the respondents were collected. In adherence to data privacy protocol, raw data from the participating health facility was kept confidential. Ethical approval was granted by Kenya Methodist University Institutional Scientific Ethics and Review Committee vide KeMU/ISERC/HSM/17/2023, National Commission for Science, Technology, and innovation (NACOSTI) License no. NACOST/P/23/28760 and Coast General Teaching & Referral Hospital Ethics Review Committee Ref. ERC-CGH/MSc/Vol 1.

III. RESULTS AND DISCUSSION

Table 1: Demographic characteristics

		No.	%
	Level 5	3	
	Level 4	11	
	Total	14	
Public healthcare facilities	Mombasa level 5 &4	4	
	Makueni level 5 & 4	6	
	Kajiado level 5 & 4	4	
	Total	14	
Sampled Participants per County	Mombasa	57	38%
	Makueni	57	38%
	Kajiado	36	24%
	Total	150	100%
Semi structured interview	Completed interview	143	95.3%
Respondents designated title	HRO	16	11.19%
	Clinical officer	30	20.93%
	Pharmacist	34	23.78%
	Nurse	10	7%
	Pharmaceutical technologist	8	5.6%
	Medical Officer	20	14%
	Medical Stores Officer	5	3.5%
	Procurement officer	20	14%
Sampled Key Informants	Per facility	14	
KII designated title	Medical Superintendent of Health	14	
	Completed KII	12	85.72%
	Mombasa	3	21.42%
	Makueni	5	35.7%
	Kajiado	4	28.6%

Out of 150 sampled semi-structured interview participants, 143 (95.3%) (16 Health Records and Information Officers, 30 Clinical Officers, 34 Pharmacists, 10 Nurses, 8 Pharmaceutical technologists, 20 Medical Officers, 5 Medical Stores Officers and 20 Procurement Officers) completed semi-structured questionnaires. Out of 14 sampled Key Informant interview participants 12 (85.72%) Medical Superintendent of Health successfully completed the interview. In total, 155 interviews out of the 164 planned interviews were successfully completed.

Table 2: Descriptive statistics: Health information for Management of essential medicine supply chain

	Strongly disagree	disagree	Neutral	agree	Strongly agree	Mean	Std. Dev
Information for management of supply chain is reliable	24.5%	23,5%	5.5%	36.5%	10%	1.21	0.114
Information for management of supply chain is timely	35.3%	36.5%	5.9%	22.4%	0%	1.89	0.163
Information for management of supply chain is complete	30.6%	44.7%	7.1%	17.6%	0%	1.55	0.108
Data collection has improved information	38.8%	48.2%	5.9%	3.5%	3.5%	3.26	0.160
Data extraction has improved information	44.7%	42.4%	5.9%	7.1%	0%	2.88	0.115
Data analysis has improved information	35.3%	5.6%	7.1%	2.4%	4.7%	3.20	0.340
Facility has enough computers	11.8%	52.9%	10.6%	18.8%	5.9%	2.39	1.082
Facility has electricity connection	1.2%	15.3%	1.2%	49.4%	32.9%	2.21	0.497
Facility has reliable internet	10.6%	45.9%	14.1%	17.6%	11.6%	2.52	0.762
Adequate number of trained in digital health information	3.5%	47.1%	17.6%	21.2%	10.6%	2.28	1.031
Regular supervision on digital health has improved supply chain	8.2%	16.5%	41.1%	49.4%	11.8%	2.13	1.361
There is a regulatory framework on digital health for management of supply chain	23.5%	47.1%	8.2%	17.6%	3.5%	2.81	1.405
There are guidelines (set of rules) on digital information	28.2%	52.9%	10.6%	1.2%	7.1%	1.76	1.452

Influence of Quality of Digitized Health Information

Table 2 show that information from the existing forms of digital health information system in public healthcare facilities in Kajiado, Makueni and Mombasa is a mixture of both paper-based recording or reporting and electronic system hence subject to errors, incomplete data, inaccuracies, and delays in relation to timely and correct information to support timely management of essential medicine supply chain process.

A Key responded stated “most public health facilities operate different forms of digital health information systems which is proving difficult to synchronize or combine information from different units or departments to quality and complete information to support specific function like management of essential medicine supply chain process.”

Findings support those of Faridi and Malik (2020) who argue that a mixture of information systems can easily result in inaccuracies and inconsistencies, especially when it comes to the management of essential medicine supply chain management. Ngusie et al. (2022) and Kanfe et al. (2021) allude that incomplete, inaccurate, and erratic information affects the confidence in managers to use the information produced from non-digital information systems for planning and service delivery. The findings support WHO (2021), which states that

reliability of health facility information is greatly reliant upon the consistency and completeness of reports generated from facilities.

Influence of Digitized Health Information Processing Strategy

Table 2 indicate that in most public hospitals in the counties of Kajiado, Makueni and Mombasa, data collection, data extraction and processing for essential medicine supply chain management is conducted either through paper-based method or a mixture of paper based and electronic format.

One respondent corroborated this by postulating that “Data extraction is not done through the digital health systems because of lack of knowledge on how to extract. Staff are not fully trained in digital health information. Currently we don’t have a digital health information system installed in the facility. KHIS is not available in this facility.”

The findings are consistent with the MoH Kenya Supply Chain Strategy (2020-2025), states that health facilities in Kenya have a problem of inadequate essential medicine data processing (extraction) and visualization of essential medicines at the facility to support the management of essential medicine supply chain. Concerns were raised by World Health Organization (2021) that over 40% of health facilities globally cannot provide evidence of analysis on data quality and process.

Influence of ICT Infrastructure Support

Table 2 indicates that most public hospitals in the counties of Kajiado, Makueni and Mombasa do not have sufficient functional computers, outdated computers, and reliable internet connection to support processing of digital information for managing essential medicine supply chain. The findings also reveal that health facility management acknowledges that timely essential medicine information processing and management of essential medicine supply chain in their facilities rely upon reliable internet and functional ICT infrastructure.

One Key Informant averred that “ ICT infrastructure for digitizing health information system in essential medicine supply chain has not been installed in the facility. Essential medicine supply chain processing is still paper based due to among other reasons the limited ICT infrastructure in public healthcare facilities. For the integrated end to end digital health system to be installed in public health facility and run efficiently, there is need to have ICT infrastructure including as computers, internet access and intranet at all departments to enable end-to-end communication.”

The findings support Aila and Kithuka (2021), who postulate that unreliable internet connections affect production, transmission, and efficient use of health information for planning and service delivery.

Influence of Workforce Skills

Table 2 reveal that slightly more than half of the public healthcare facilities in Kajiado, Makueni and Mombasa do not have an adequate number of trained staff with skill on digital health information System and medical supplies and products to support management of essential medicine supply chain process.

As one respondent stated, “Inadequate number of staff with knowledge and skills on digital health information for management of essential medicine supply chain has caused delays in service delivery and patient complaints. It has also caused inaccurate information and untimely procurement of essential medicines”.

The findings concur with Lugada et al (2022) observation that stock outs in hospitals are occasioned by ineffective supervision and oversight, inadequate skills in supply chain system management and poor inventory management. Relatedly, Laukka et al (2020) also note that some healthcare leaders lack understanding about health information technology and therefore lack understanding on how to provide management support to subordinates.

Influence of Policy Framework

Table 2 reveals that health facility personnel in Kajiado, Makueni and Mombasa use neither a regulatory framework nor guidelines (set of rules) on digital health information to guide on management of essential health medicine supply chain process in healthcare facilities.

As one participant stated, “The National Health policy 2016 - 2030 is perhaps applied at the County Health Department level not at this facility”. Another key informant postulated, “We are not familiar with the Kenya National Health policy 2016 -2030, National information communication and technology policy.”

The findings reflect concerns raised by MoH Kenya Supply chain strategy (2020-2025) that despite availability of regulations on the use of information systems for monitoring essential medicine supply chain, utilization of quality and timely information to support supply chain management is still inadequate to mitigate against the perennial essential medicine stockout.

Multiple Linea Regression Analysis

Multiple regression was used to investigate the relationship between the use of quality of digitized health information, digitized health information processing, ICT infrastructure support and workforce skills (independent variables) and policy on digital health information (moderating variable) on essential medicine supply chain management (dependent variable) in public health facilities in Kenya. The aim was to use the independent variable to predict the value of the dependent variable by weighing the value of each predictor and its contribution to the prediction outcome (More et al, 2006).

Table 3: Multiple Linear Regression Analysis

	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
Quality of digitized health information	6.4E-05	2.59E-06	24.46	0.000	5.8E-05	6.9E-05
Digital health inform processing strategy	1.42E-06	3.34E-07	4.24	0.000	7.59E-07	2.07E-06
ICT infrastructural support	0.1627	0.08386	1.97	0.004	0.0023	0.32769
Workforce skills	0.0171	0.00269	6.37	0.000	0.0224	0.0118
Policy framework	0.8237	0.06617	12.45	0.000	0.9539	0.6936
_cons	9.98919	0.77488	12.89	0.000	8.46459	11.51
R Squared=85.72						
F (5,315) = 378.25						
P= 0.000						

The results revealed that quality of digitized health information has a positive and significant relationship with essential medicine supply chain management ($r=6.4E-05$, $p=0.000$). These findings also agree with that of Tshibanda (2019) who found a positive relationship between the quality of digitized health information and supply chain management. The results also showed that digital health information processing strategy has a positive and significant relationship with essential medicine supply chain management ($r=1.42E-06$, $p=0.000$). These findings agree with that of Muinga et al. (2021), who observed a positive relationship between information processing and medicine supply chain management. The results also revealed that ICT infrastructural support has a positive and significant relationship with essential medicine supply chain management ($r=1.1627$, $p=0.004$). These findings agree with that of Gemma (2019) who found a positive relationship between ICT and supply chain of medicine in Hospitals in Zambia. The results also revealed that workforce skills have a positive and significant relationship with essential medicine supply chain management ($r= -0.0171$, $p=0.000$). These findings agree with that of Duque-Urbe et al. (2019), who concluded that workforce skills impact medicine supply chain management. The results also revealed that the policy framework has a positive and significant relationship with essential medicine supply chain management ($r= 0.8237$, $p=0.000$). These findings agree with that of Newton (2019), who found that pharmaceutical product categorization framework taxonomy positively affects the South African public healthcare pharmaceutical supply chain.

Table 4: Null hypothesis acceptance/rejection criteria

Hypothesis	P - Value	Results
H ₀₁ : Quality of digitized health information does not have significant influence on essential medicine supply chain management in public healthcare facility in Kenya	0.000	Positive and significant (Reject H ₀₁)
H ₀₂ : There is no significant relationship between digitized	0.000	Positive and significant

health information processing strategy factor and essential medicine supply chain management in public healthcare facility in Kenya.		(Reject H_{02})
H_{03} : There is no significant relationship between ICT infrastructure support for health information and essential medicine supply chain in public healthcare facility in Kenya.	0.004	Positive and significant (Reject H_{03})
H_{04} : There is no significant relationship between Workforce skills and essential medicine supply chain management in public healthcare facility in Kenya.	0.000	Positive and significant (Reject H_{04})
H_{05} : There is no significant relationship between policy framework and essential medicine supply chain management in public healthcare facility in Kenya.	0.000	Positive and significant (Reject H_{05})

Five Null hypotheses were tested by using multiple linear regression in table 3. The acceptance/rejection criteria were that, if the p value is greater than 0.05, the H_{02} is not rejected but if it's less than 0.05, the H_{02} fails to be accepted. The null hypothesis: 'Quality of digitized health information does not have significant influence on essential medicine supply chain management in public healthcare facility in Kenya' was tested by using multiple linear regression. Results in table 3. show that the p-value was 0.000 $p < 0.05$. This indicated that the null hypothesis was rejected hence there is significant relationship between quality of digitized health information and essential medicine supply chain management in public healthcare facility in Kenya. These findings agree with Nsaghurwe et al. (2021), who observed that the quality of digitized information impact medicine supply chain management. The null hypothesis: "there is no significant relationship between digitized health information processing strategy factor and essential medicine supply chain management in public healthcare facility in Kenya". Results in Table 3. show that the p-value was 0.000 < 0.05 . This indicated that the null hypothesis was rejected hence there is a significant relationship between digitized health information processing strategy and essential medicine supply chain management in public healthcare facilities in Kenya. These findings also agree with that of Muinga et al. (2021), who found that information processing has a positive impact on medicine supply chain management. The null hypothesis: "there is no significant relationship between ICT infrastructure support for health information and essential medicine supply chain in public healthcare facility in Kenya". Results in Table 3. show that the p-value was 0.000 < 0.05 . This indicated that the null hypothesis was rejected hence there is a significant relationship between ICT infrastructure support for health information and essential medicine supply chain in public healthcare facility in Kenya. These findings agree with that of Gemma (2019), who found a positive relationship between ICT and the supply chain of medicine in Hospitals in Zambia. The null hypothesis: "there is no significant relationship between workforce skills and essential medicine supply chain management in public healthcare facility in Kenya. Results in Table 3. show that the p-value was 0.001 < 0.05 . This indicated that the null hypothesis was rejected hence there is a significant relationship between workforce skills and essential medicine supply chain management in public healthcare facility in Kenya. These findings agree with that of Duque-Urbe et al. (2021), who concluded that workforce skills affect medicine supply chain management. The null hypothesis was that there is no significant relationship between policy framework for health information and essential medicine supply chain management in public healthcare facility in Kenya. Results in Table 3. above show that the p-value was 0.001 < 0.05 , which shows that there is a significant relationship between policy framework and essential medicine supply chain management. These findings agree with that of Newton (2019), who found that pharmaceutical product categorization framework taxonomy positively affects the South African public healthcare pharmaceutical supply chain.

Framework for Management of Essential Medicine Supply Chain in Public Healthcare Facilities

From the study findings and conclusions, table 5 below presents the framework for management of essential medicine supply chain in public healthcare facilities in Kenya.

Table 5: A Framework for Management of Essential Medicine Supply Chain in Public Healthcare Facilities

Institutional Digital Health Information Capabilities	Implementation strategies	Policies on Digital Health Information	Capacity Building Strategies
- Functional Digital health Information Systems Infrastructure - Functional Digital Health Information processing technology infrastructure - Functional adequate ICT Infrastructure - Institutionalized Digitized Health Commodities supply chain. - Adequate county government and donor Funding for Digitalization - Adequate Skilled Health Workforce	- Set up a functional digital end to end health information infrastructure integrated across departments (data collection, processing, sharing) - Computerize all departments and workstations. - Hardware (servers, computer, networking equipment) installations - Software (KHIS, Data processing solutions) installation - Integration of KHIS with existing electronic information systems - Systems Maintenance (hardware, software, networking) - Digitize medicine consumption data, quantification, and forecasting	- Health facility-based policies on digital health information - Health facility strategies on Digital health information for supply chain management - Health Facility digital health information plans - Digital health information framework for health commodities supply chain - Health facility digital health information supply chain performance monitoring	- Staff skills development (health commodities supply chain, digital health information, commodities monitoring) - Supervision/feedback mechanism - Medicine stores/inventory management

IV. CONCLUSION

The study concludes the development of a digital health information framework for management of essential medicine supply chain in public healthcare facilities in Kenya. Application of the digital health information framework in public hospitals requires that the Ministry of Health and County Governments need to make deliberate decisions to install adequate ICT infrastructure, internet connectivity, train adequate digital literate personnel, circulate digital health policy and guidelines, and promoting end to end digital health information system in public hospitals to address the recurrent problems of medicine stockout in public hospitals. This will improve quality and timely information flow for planning and management of medical products supply chain and service delivery at public health facilities in Kenya.

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