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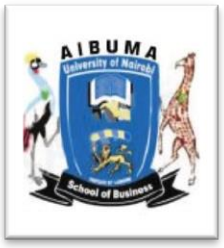

RISK MANAGEMENT IN HEALTH SUPPLY CHAIN IN KENYA

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Abstract

The actions, people, organization of resources, and information used to support the procurement and delivery of goods or services for use inside a healthcare institution are referred to as supply chain management in hospitals. Similar to this, one element of supply chain management is carrying out actions that transform natural resources and raw materials as well as other product components before providing them to particular users. A hospital's supply chain management team should ideally ensure the availability of medical supplies like defibrillators, hospital stretchers, patient monitoring equipment, sterilizers, electrocardiogram machines, surgical tables and equipment, units for performing electric surgery, and anesthesia machines. There may be various risks involved in the supply chain management department while ensuring the ongoing availability of such equipment in the medical institution. In this case, risk management will include looking into all potential ambiguities related to the hospital supply chain operations and choosing the best course of action for addressing the risks' effects on a certain department. There have been several reported incidents of medical malpractices that has led to death of innocent Kenyans and in some situations. Despite the efforts by government and other stakeholders like the World Health Organization (WHO) to streamline the health care sector operations and processes, there are still elements within the health care system that continue to interfere and compromise the health care service delivery. The main objective of this paper is to analyze and evaluate the healthcare supply chain aspects to eliminate unnecessary costs and factors that hinder the realization of the full potentials of the healthcare supply chain in Kenya.

Keywords: *Risk Management, Health Supply Chain, Kenya*

Background

Traditionally, the application of healthcare risk management practices has focused on promoting the safety of patients from medical errors but due to technology integration in promoting service delivery in healthcare, the scope of the associated risks have also broadened and hence requiring healthcare organizations and stakeholders to be proactive in seeking out sustainable risk mitigation measures (Kazi & Chirchir, 2012). Failure to strategize on how to deal with risks can often lead to jeopardizing of the organization's ability to offer healthcare services and in worst case scenarios, lead to financial liabilities and legal suits. Hospitals and other healthcare systems have to explore their options in order to develop, design and formulate risk management practices that will work for them against primary reactive risk causing factors and other elements that trigger sequence of risks to occur within the scope of healthcare supply chain.

Notably, every organization faces a unique set of risks and there is no one model that is known to work for all organizations. Challenges and risks faced by a particular healthcare organization should be handled individually through creation of an organization risk assessment plan that allows administrators to act on timely manner to address and mitigate potential risks. The costs of not preparing for risks in healthcare supply chain are catastrophic in nature and the resulting effects are long term with the potential of damaging the reputation of the organizations, brands or stakeholders permanently. Neglecting to have a proper and comprehensive risk mitigation policy in place increases the chances of failure of any organization or system. Therefore, it is paramount for potential risks have to be evaluated, monitored and measured in terms of their severity levels and actions taken to mitigate the risks from further spreading.

Problem Statement and Research Objectives

In Kenya, the health care sector over the years has been on the spotlight due to increased negative cases and controversies that keep denting the brand image of the medical/ health care institutions in Kenya. There have been several reported incidents of medical malpractices that has led to death of innocent Kenyans and in some situations, there have been reported cases of people acting and operating medical procedures/activities without permits and authorization from medical boards such as Pharmacy, Kenya Medical Supplies Authority and Poisons Board and Kenya Medical Practitioners and Dentists Council. It is worth noting that, a significant majority of the Kenyan population entirely depend on health care services provided by public sector. The range of services offered in most of these facilities includes preventive care, curative, rehabilitation and health promotion. Due to increased demand of the health care services, the private sector has stepped in bridging the gap by offering additional services (Muiya and Kamau, 2013).

Nevertheless, despite the efforts by government and other stakeholders like the World Health Organization (WHO) to streamline the health care sector operations and processes, there are still elements within

the health care system that continue to interfere and compromise the health care service delivery. In countries like Kenya, the modern healthcare supply chain is a critical component of the country's overall economic success. According to the Big Four Agenda of the current President, universal healthcare has been given top priority and therefore requiring the stakeholders involved to work around the clock in order to ensure that the people of Kenya are able to access and afford healthcare. Analyzing and evaluating of the healthcare supply chain is a key aspect in eliminating out the unnecessary costs and factors that hinder the realization of the full potentials of the healthcare supply chain in Kenya (Wang, 2018). Therefore, the objectives of this study were:

i. To identify healthcare supply chain risk mitigation practices in Kenya
ii. To examine the relationship between risk management in healthcare supply chain and healthcare service delivery in Kenya
iii. To identify challenges facing risk management in healthcare supply chain in Kenya.

Literature Review

The healthcare supply chain is broadening and the results of the rapid growth of the healthcare supply chain are increased complexities and potential risks for the stakeholders involved. This is because of onboarding controls, contracting, managing and free trading created by the forces of demand and supply. Risk management in healthcare supply chain is therefore a requirement for healthcare organizations, stakeholders and the government for the sole purposes of improving efficiency in service delivery and thus ensuring patient safety is guaranteed at all times (Iqbal, Geer, and Dar, 2017).

In healthcare supply chain, risk management revolves around the clinical and administrative processes, systems and reports employed to detect, monitor, control and mitigate potential risks that threaten to disrupt the normal routine of service delivery in healthcare facilities. Risk management in healthcare supply chain is critical because it ensures systematic protection of patients, businesses, organization assets and the brand reputation of the organizations. Risks that exist within a healthcare supply chain can be due to the unexpected events that normally interrupt the operation process and results negatively impacting the whole performance of the healthcare system. In most of the healthcare systems around the world, the supply chain costs have been ranked as the second highest costs after labor costs. Hospitals and other stakeholders have been engaged in long discussions and collaborative efforts in order to seek out ways that lead to overall efficiency in supply chain management in health care.

According to Njagi, et al. (2012), healthcare institutions, employees and patients interact with probably thousands of vendors on daily basis through either face-to face, social media or other available platforms. With the new era of advanced technology advancement, it is increasingly becoming challenging for state agencies, institutions and other stakeholders to maintain a

complete control on how the information flows. Consequently, misinformation or spreading of false information presents a huge risk with the potential of causing disruption of normal activities within healthcare system. To demonstrate this aspect, in recent years, the cases of cancers have increased drastically in Kenya. For majority of Kenyans, they lack the capability to determine the reliability and credibility of the facts and opinions presented in various mass media platforms. The end result of widespread information is confusion and this presents a huge risk to medical practitioners and other stakeholders because some patients refuse to take up medication arguing that the medicines will lead to cancer or other diseases. In other cases, some patients have resulted in taking other drugs that compromise their health status. Misinformation is one of the risks that need to be managed within the scope of healthcare supply chain.

According to Perea-Pérez, et al., (2011), healthcare organizations needs to have an established risk management plan and a risk manager in charge of the risk management department. The risk management plan is the guiding document that helps a hospital or healthcare facility to deal with different types of risks. In order to manage risks is healthcare supply chain, the risk managers employed by health care organizations should identify risks continuously; new risks keep emerging and it is the work of a risk manager to identify the risks on timely manner and hence offering a solution before the problem escalates to higher severity levels (Blos, et al., 2016). The risk manager should quantify and prioritize risk-once the risk is identified, priorities should be accorded in accordance to the threats presented by the risk. In order to achieve this, risks matrix and heat maps can be deployed to help in visualizing the severity levels of the risk. Investigate and report sentinel events- all risks should be investigated and reports forwarded to the relevant authorities for purposes of seeking preventive measures and creating awareness.

Methodology

This study adopted a deductive research approach which allowed triangulation of both primary and secondary data sources (Barratt, Choi and Li, 2011). This paper aimed at comprehensively exploring the risk management practices in healthcare supply chain in Kenya. It was paramount for an empirical study to be conducted in order to enhance and promote overhaul understanding of the risk management in healthcare supply chain. Both qualitative and quantitative research methodologies were critical for this study because, medical related information is very sensitive and in most cases scary for respondents who were supposed to provide real time data and information. This because, medical errors are very expensive and for most of the cases, people involved end up facing criminal charges and others losing licenses and permits to operate within the scope of healthcare. For this reason, most of the respondents shy away from giving the true state of affairs due to fear of implications. Relevant literature was used to provide information on risk mitigation practices and strategies.

Primary data was collected using a risk-factor questionnaire and semi-structured interviews. Respondents were drawn from wide range of healthcare related professionals and institutions. Purposive random sampling method was used to identify the respondents. 10 top managers of the various five core-Business sections/departments (Procurement, Warehousing, Distribution, Supply Chain Services, Sales and Marketing) of KEMSA from the Nairobi Warehouse Headquarters and Nairobi Embakasi Warehouse were targeted for interviews. This is due to the fact that KEMSA is a state corporation under the Ministry of Health established under the KEMSA Act 2013 whose mandate is: Procure, warehouse and distribute drugs and medical supplies for prescribed public health programs, the national strategic stock reserve, prescribed essential health packages and national referral hospitals. Due to the sensitivity of the information that was collected, not every respondent could manage to provide accurate and relevant information to the researcher. Therefore, in order to obtain credible and reliable information, the researcher decided the respondents involved in the study by considering the years of experience, managerial level, level of academic background and institution affiliation across the health sector. Academic experts and affiliated international bodies like UNICEF, WHO, USAID etc were also involved in the study in order to validate the risk mitigation strategies identified and their influence on healthcare supply chain management. Therefore an in-depth questionnaire was used to collect data from the various Regional Liaison Officers of the Customer Service Centres that are conveniently located in Nairobi, Mombasa, Kisumu, Nakuru, Eldoret, Kakamega, Nyeri and Garissa. An online survey monkey was utilized while a number of respondents were emailed the questionnaire while others were approached through the drop and pick later method. Modern technology of mobile phone calling and sending of structured questions was done to the respondents who were drawn from the various hospitals. A total of 120 questionnaires were sent to relevant respondents. Once the data was collected and validated, it was analyzed using SPSS tool and later presented in form of charts, frequency tables, ratios and graphs. The degree if of relationship between the various variables was established by use of a multiple regression analysis.

Results

As indicated in figure 1 below, out of the 10 interview guides that were proposed, 7 were successfully conducted translating to a return rate of 70%. Equally, out of the 120 questionnaires, 100 were dully filled and became relevant to the study translating to 83%. This return rate is considered excellent and can be used to make conclusions in this study. According to Mugenda and Mugenda (2008), a 50% response rate is adequate, 60% is good, and 70% is always rated as very good with anything above 70 being considered excellent.

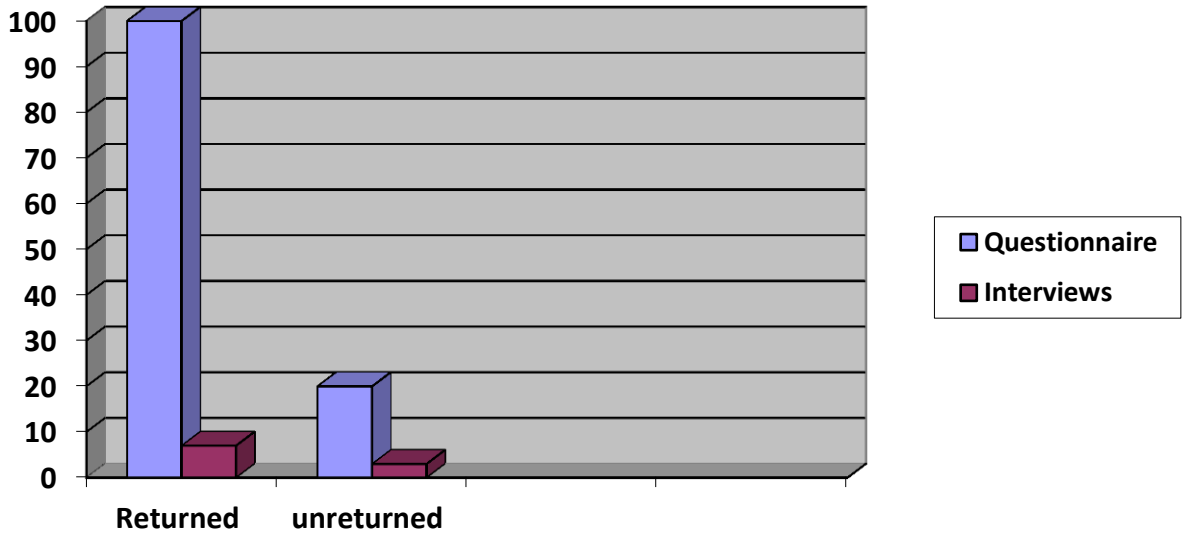

Figure 1: Response Rate

Reliability Analysis

Cronbach's alpha was used to determine the internal reliability of the questionnaire used in this study. Values range between 0 and 1.0; while 1.0 indicates perfect reliability, the value 0.70 is deemed to be the lower level of acceptability (Hair, Black, Barry, Anderson, & Tatham, 2006). The reliability statistic for each of the identified factors outlined in the objectives and contained in the research instrument is presented in Table 1.

Table 1 Reliability Statistics

Variables	Cronbach's Alpha	Comments
Risk Mitigation Practices	0.9	Accepted
Risk Management	0.8	Accepted
Challenges of Risk Management	0.85	Accepted

From the results in Table 1 above, it is evident that that Cronbach's alpha for each of the identified factors is well above the lower limit of acceptability of 0.70. The

findings indicated that risk mitigation practices component had a coefficient of 0.9, risk management had a coefficient of 0.8, and Challenges of risk management had a coefficient of 0.85. The results indicate that the questionnaire used in this study had a high level of reliability as recommended by Creswell (2015) and Simba (2015).

Validity of the Research Instruments

In the study, factor analysis was used to establish the validity of the constructs. Kaiser-Mayor Oklin measures of sampling adequacy (KMO) & Bartlett's Test of Sphericity is a measure of sampling adequacy that is recommended to check the case to variable ratio for the analysis being conducted. Normally, KMO ranges from 0 to 1, but the world-over accepted index is over 0.5. For Factor Analysis to be recommended suitable, the Bartlett's Test of Sphericity must be less than 0.05. The study applied the KMO measures of sampling adequacy and Bartlett's test of sphericity to test whether the relationship among the variables has been significant or not as shown in below in Table 2. The validity tests were carried out due to the fact that the risks surrounding medical procurement in Kenya are very numerous and their evolution has been intensified for the past 7 years.

Table 2 Factor analysis -KMO and Bart

KMO and Barthett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.548
Bartlett's Test of Sphericity	Approx. Chi-Square	70.336
	Df	10
	Sig.	.000

From the Table 2 presented above, the Kaiser-Mayor-Oklin measures of sampling adequacy shows the value of test statistic as 0.548, which is greater than 0.5 hence an acceptable index. While Bartlett's test of sphericity shows the value of test statistic as 0.000 which is less than 0.05 acceptable indexes. This result indicates a highly significant relationship among variables.

Descriptive and Inferential Statistics

Results from the questionnaire and the interview guide were analyzed and the results presented as discussed:

Table 3 Demographic Characteristics

Bio-information	Description	Frequency	Percentage
Gender	Male	77	72%

	Female	30	28%
Education status	Diploma	23	21.5%
	Degree	50	46.7%
	Masters	24	22.4%
	Phd	10	9.4%
Work experience	Below 5 years	55	51.4%
	6-10 years	25	23.4%
	Above 11 years	27	25.2%

On average as depicted in Table 3, majority of the participants in the study were men as indicated by a mean of 72%. On the other hand majority of the respondents had a degree level of education (46.7%) followed by the respondents with masters level of education (22.4%). Finally respondents with work experience of less than 5 years dominated the study as indicated by a mean of 51.4%. Such results are in agreement with the Ministry of Health of Kenya's Strategic Plan 2014-2018 which indicated that majority of the men country serve as medical practitioners, healthcare managers and procurement heads (MoH, 2014). Further the results are in agreement with the MOEST (2017) indicating that majority of the healthcare heads in Kenya have a degree or have enrolled for a postgraduate degree.

Healthcare Supply Chain Risk Mitigation

When asked whether they knew of any given risk mitigation measures applied in their various areas of operations, all the 7 interviewed managers who translated to 100 percent said yes while 95 respondents answered yes in their questionnaires; meaning that majority of the respondents were aware of the various laid down risk mitigation strategies in the country. Since the interviewed KEMSA managers gave relatively qualitative information, the first section was relatively analyzed based on 32 journals published at PubMed and 18 Journals at the University of Nairobi, 14 at Jomo Kenyatta University of Agriculture and Technology while 3 were published by KEMRI. The results employed all inclusive criterions and a cross sectional analysis was carried. Generally, on a ranking parameter, it was noted that majority of the interviewed respondents (almost all managers) supported that the below mitigation measures were favored over other due to a number of reasons:

Multiple sourcing strategies and development of contractual arrangements between health systems and multiple suppliers of selected essential products to avoid relying on a sole source has been rated as the first strategic mitigation measure used

since president Moi's error and is inherent. This risk mitigation strategy helps in risk prediction, risk identification, risk reduction, risk avoidance or acceptance. Another mitigation risk measure supported by 100% of the managers is the 7 managers as the second mitigation strategy is outsourcing; which basically means that in Kenya the non-core supply chain activities are passed to a third party like witnessed in the hiring of the medical equipment by the county governments in 2018/2019 in the 47 counties; leading to various crises (RoK, 2019). Further the managers indicated that collaboration with the manager of the care units, forecasting, ERP, involvement of doctors and nurses of the care units, communication and information sharing with suppliers, collaboration with FDA to develop guidelines for importing drugs in short supply, and affiliation with local healthcare systems for hospital inventory management are among the mitigation strategies conceptually implemented. Implement information system technology (RFID), traceability and information systems, and EDI has also been identified as one major mitigation component adopted since 2016 due to detrimental risks associated with social medial and other technologies. Inventory management and improving, just-in-time and other inventory management practices as recommended by Maryland (2012), Jurado et al., (2016), Zepeda et al., (2016) etc. can be said to be among the mitigation measures adopted by the healthcare facilities chain supply agencies. Design PSC systems to support a patient-centred model of healthcare delivery (integrate all drug distribution channels, implement electronic medical record technologies that support data exchange with multiple provider functional profiles, such as pharmacist–pharmacy provider electronic health records), standardize communication (eligibility for receipt of drugs with restricted distribution and file format for reports), develop a national standard for tracking and tracing medications that includes pricing information to deter price gouging, encourage greater manufacturer transparency and communication about the anticipated duration of shortages to allow practitioners to address the shortage, and encourage the FDA to compile and maintain a list of approved foreign sources of drugs in short supply in the country also featured. Despite the fact that there are a number of mitigation strategies put down on the medical HealthCare in Kenya, the least practiced among them is Periodic maintenance and statistical process control. Surely Kenyan systems have poor monitoring of the exact statistical information and at times even work against exact statics like counterfeit drugs in the country, substandard drugs, poor drugs' procedures etc. Based on the various projected views on health care risk mitigation on a likert scale rated measure, questions were asked and on average the questions were to indicate the extent to which all the respondents supported the various statements in relation to: risk reduction, risk transfer, risk acceptance and risk avoidance. Results were as indicated in Table 4

Table. 4 Rating of Various Risk Mitigation Strategies

Statement	n	Mean	SD
The organization has always relied on risk reduction as a strategic practice of mitigating the risk effects.	107	4.11	.661
The organization has always relied on risk avoidance as a strategic practice of mitigating the risk effects.	107	4.51	.577
The organization has always relied on risk transfer as a strategic practice of mitigating the risk effects.	107	4.26	.588
The organization has always relied on risk acceptance as a strategic practice of mitigating the risk effects.	107	3.44	.596
Risk sharing is among the strategic practices used to manage projected risks	107	4.17	.798

Majority of the respondents in their questionnaires and the interviewed managers in general strongly agreed with the idea that they have adopted the risk avoidance as one of the best strategies of risk mitigation as indicated by a mean of 4.51 and SD 0.661. Also majority of the respondents supported the idea that risk transfer is one strategy that has been adopted for risk mitigation (mean=4.26, SD=0.588). The same trend indicated that majority of the respondents have always relied on risk sharing as one of the strategic practices used to manage projected risks (M=4.17, SD=0.798). This also follows where risk reduction was supported as strategy of risk mitigation with a mean score of 4.11 and SD 0.662. Finally the concept of risk acceptance was supported as one of the strategies although it was ranked the last one (M=3.44, SD=0.596). Such findings are in agreement with over 95% of the reviewed journals. For example, Manuj

and Menzer (2018) argued that for each risk with an inherent score, the following response strategies could be applied: avoidance (through eliminating specific threat by eliminating cause), reduction (taking action to reduce the probability of the supply chain risk occurring), sharing (sharing risk with or shifting risk to others e.g. (outsourcing) and acceptance (accepting risk with low impact or deal with the consequences of the risk).

Risk Management in Healthcare Supply Chain and Healthcare Service Delivery

When asked to give their views on the influence of effective risk management in healthcare supply chain and healthcare service delivery in the country, majority of

managers interviewed (100%) were in agreement that when it is effectively adopted and implemented, the cost of health can be lowered since it helps in eliminating a number of expenses that are incurred in the process of healthcare chain supply. When asked to name the expenses; majority of the respondents argued that delays in medical equipment acquisition and supply, breakdown of infrastructure (both ICT and supply infrastructure), the loss of reputation, and loss of competitive market plus trust from the customers are just but a few components that can affect cost of healthcare supply in the country. In another question, majority (71%) of these managers for example argued that effective risk mitigation and management in KEMSA can be associated with reduced inventory costs, reduced medical expenses, reduced costs on legal battles, reduced conflicts with the law, geopolitical interference, breakdown of essential ICT infrastructure and many more.

Generally, all the managers (100%) of the major medical supplies in the country (KEMSA) argued that there are various benefits of risk management in the healthcare supply chain. First, effective risk management helps a firms or organizations in the Healthcare equipment supply achieve their supply chain objective. Further, risk management enables organisations to reduce the cost of enhancing efficiency in the healthcare supply chain operations. In the same footnote, risk management in the healthcare supply chain helps to improve the governance and leadership of the supply chain. In addition, risk management in the healthcare supply chain can help to improve the confidence and trust in the supply chain of various stakeholders and customers. Finally, effective risk management in the healthcare supply chain helps supply chain managers focus more on proactive risk management rather than reacting to unforeseen events.

A likert scale rated question which required the respondents to indicate the extent to which they supported a number of statements in relation to the influence of risk management on the performance of healthcare in the country was summarized as indicated in Table 5 below:

Table 5 Risk Management in Healthcare Supply Chain and Healthcare Service Delivery

Statement	n	Mean	SD
Risk management in healthcare can lead to increased medical equipment delivery in the country	107	4.02	.772
Risk management in healthcare can lead to reduced legal battles in the healthcare system in Kenya	107	4.46	.681
Risk management in healthcare can lead to reduced political interference	107	4.39	.762

Risk management in healthcare can lead to reduced shortage of medical care equipment supply	107	4.03	.992
Risk management in healthcare can lead to reduced medical costs in the country	107	3.54	1.066
Risk management in healthcare can lead improved workforce quality and talent management in the country	107	4.12	.952
Risk management in healthcare has a significant influence on improving the confidence and trust in the supply chain in Kenya	107	4.11	.798

Majority of the respondents supported the ideas that: Risk management in healthcare can lead to increased medical equipment delivery in the country (M=4.02, S=.772); Risk management in healthcare can lead to reduced legal battles in the healthcare system in Kenya (M=4.46, SD=.681); Risk management in healthcare can lead to reduced political interference (M=4.39, SD=.762); Risk management in healthcare can lead to reduced shortage of medical supply (M=4.03; SD=.992); Risk management in healthcare can lead improved workforce quality and talent management in the country (M=4.12; SD=0.952); and Risk management in healthcare has a significant influence on improving the confidence and trust in the supply chain in Kenya (M=4.11; SD=0.798). The findings are similar to 85% of the reviewed journals. For example, Haszlinna et al., (2009) asserts that risk management in the healthcare supply chain helps to improve the governance and leadership of the supply chain. In addition, Tummala and Schoenherr (2017) found out that risk management in the healthcare supply chain can help to improve the confidence and trust in the supply chain of various stakeholders and customers.

Challenges Facing Risk Management in the Healthcare

A general question subjected to the respondents indicated that 100% of these respondents faced and still face numerous challenges facing risk management in their organizations. For example, an open ended question that was asked, 86% of the interviewed KEMSA managers identified challenges like: lack of enough financial resources and poor cash flow; poor risk management planning, government interference and poor regulation policies, lack of proper supply chain visibility, prioritisation conflict between patients/profits, litigation challenges, drugs recall and counterfeits, unexpected increase in demand, fluctuation in customer demands, demand uncertainty for clinical requirements, commercially induced healthcare facilities shortage, contract problems with suppliers, delay by procurement staff, procurement hubs, unexpected disease outbreaks and external

influences-disaster recovery, high purchase price and high product and supplier/brand variety, lack of incentive mechanism, fragmentation of drug distribution processes and use of restricted drug distribution systems. Similarly, in an open ended qualitative question subjected to the respondents in the questionnaire, on average over 80% of the respondents constantly outlined challenges that cut across lack of sufficient financial resources, poor healthcare financing, delayed procurement processes due to poor flow of financial reasons, poor planning, poor visibility, corruption, uncontrolled rogue health care suppliers, overpricing, regulatory and legislation challenges, rigorous government intervention and interference etc.

Table 6 Challenges Facing Risk Management in the Healthcare in Kenya

Statement	n	Mean	SD
Financial resources scarcity has been a challenge in managing risks in healthcare medical equipment supply	107	4.66	.842
Poor financial resources flow has been a challenge in managing risks in healthcare medical equipment supply	107	4.48	.831
Government interference and poor legislation/laws have been challenges in managing risks in healthcare medical equipment supply	107	4.09	.965
Poor knowledge on risk management has been a challenge in managing risks in healthcare medical equipment supply	107	4.00	.982
Poor risk management visibility and planning have been challenges in managing risks in healthcare medical equipment supply	107	3.65	0.666
Poor technology integration and control has been a challenge in managing risks in healthcare medical equipment supply	107	3.98	.752
Poor prices control and quality standards have been a challenge in managing risks in healthcare medical equipment supply	107	3.97	.908
Unprepared and uncontrolled medical equipment supplied (counterfeits) has been a challenge in managing risks in healthcare medical equipment supply	107	4.03	.882

A general trend indicated that majority of the respondents were in agreement that: Financial resources (M=4.66 SD=.842); Poor financial resources flow (M=4.48, SD=.831); Government interference and poor legislation/laws (M=4.09, SD=.965); Poor knowledge on risk management (M=4.00,SD=.982); Poor risk management visibility and planning (M=3.65,SD=0.666); Poor technology integration and control (M=3.98,SD=.752); Poor prices control and quality standards (M= 3.97, SD=.908); and

Unprepared and uncontrolled medical equipment supplied (counterfeits) (M=4.03, SD=.882), have been challenges in managing risks in healthcare medical equipment supply. In agreement to such findings from the journals reviewed include 97% of the journals with Simpson et al., (2015) arguing that, although management in the healthcare supply chain has continued to improve there are numerous challenges with LDCs being the most hit.

Inferential Statistics

The various hypotheses were tested by use of inferential statistics. Omnibus Tests of Model Coefficients that integrate the chi-square values and p-values to explain the relationship between the various variables in a study were adopted. Hypothesis was test to ascertain whether the said components have an interrelated influence on the subject of examination.

Inferential Statistics

Basically this is the chi-square that integrates the chi-square values calculated at a given degree of freedom and the p-values as outlined in Table 7 below:

Variable	Measure	Chi-square	Df	Sig. (p-value)
Decision Making	Step	123.458	3	.000
	Block	123.458	3	.000
	Model	123.458	3	.000
Human Resource Mobilization	Step	98.091	3	.001
	Block	98.091	3	.001
	Model	98.091	3	.001
Conflicts Resolution	Step	122.1	3	.000
	Block	122.1	3	.000
	Model	122.1	3	.000

Explanation

Model chi-square tests whether the model as a whole predicts occurrence better than chance. In binary logistic regression, it is interpreted as a test of the capability of all predictors (independent variables) in the model jointly to predict the response (dependent) variable. The value given in the sig. column is the probability of obtaining this chi-square statistic (123.458, 98.091, 122.1,) if there is in fact no effect of the independent variables, taken together on the dependent variable. This is the p-value which is compared to a critical value (0.05) to determine if the overall model is statistically significant. The model is statistically significant because the predictors are less than 0.05. The chi-square statistics for step, model and block are the same because we have not used stepwise logistic regression or blocking.

Df: - This is the number of degrees of freedom for the model. There is one degree of freedom for each predictor in the model.

We have three predictors; risk mitigation practices, risk management, and challenges of risk management.

From the results in Table 7 above, it can be concluded that the hypotheses tested communicate the following:

i) First Hypothesis

Alternative hypothesis (H_I): there are a number of healthcare supply chain risk mitigation practices implemented in Kenya

Null Hypothesis (H_0): there are no significant healthcare supply chain risk mitigation practices implemented in Kenya.

Tested results indicate that the null (Ho) hypothesis is rejected and alternative hypothesis (H_1) is favored i.e there are a number of healthcare supply chain risk mitigation practices implemented in Kenya. This is due the fact that the sig. p-value obtained of 0.000 is less than the critical value (0.05) i.e $p<0.05$. In addition, at the 3 degree of freedom the Chi-square critical value is 7.815. Therefore a score that is more than the critical value (7.815) means that the alternative hypothesis (H_1) is favored. In the study a critical value of 123.458 was obtained meaning that there are a number of healthcare supply chain risk mitigation practices implemented in Kenya.

ii) Second Hypothesis

Alternative hypothesis (H_I): risk management in healthcare supply chain has a significant influence on healthcare service delivery in Kenya

Null Hypothesis (H_0): risk management in healthcare supply chain has no significant influence on healthcare service delivery in Kenya.

Tested results indicate that the null (Ho) hypothesis is rejected and alternative hypothesis (H_1) is favored i.e risk management in healthcare supply chain has a significant influence on healthcare service delivery in Kenya. This is due the fact that the sig. p-value obtained of 0.001 is less than the critical value (0.05) i.e $p<0.05$. In addition, at the 3 degree of freedom the Chi-square critical value is 7.815. Therefore a score that is more than the critical value (7.815) means that the alternative hypothesis (H_1) is favored. Since the calculated chi-square value of 98.091 is greater than the critical value, it can be confirmed that risk management in healthcare supply chain has a significant influence on healthcare service delivery in Kenya.

iii) Third hypothesis

Alternative hypothesis (H_I): there are challenges facing risk management in healthcare supply chain in Kenya

Null Hypothesis (H_0): there are no challenges facing risk management in healthcare supply chain in Kenya

Tested results indicate that the null (Ho) hypothesis is rejected and alternative hypothesis (H_1) is favored i.e there are challenges facing risk management in healthcare supply chain in Kenya. This is due the fact that the sig. p-value obtained of 0.000 is less than the critical value (0.05) i.e $p<0.05$. In addition, at the 3 degree of freedom the Chi-square critical value is 7.815. Therefore a score that is more than the critical value (7.815) means that the

alternative hypothesis (H_1) is favored. Since the calculated chi-square value of 122.1 is greater than the critical value, it can be confirmed that there are challenges facing risk management in healthcare supply chain in Kenya.

Conclusion

Based on the reviewed journals from the well-established medical digital repositories like PubMed and KEMRI, the data analyzed, the tested hypotheses and observations made, the researcher concludes that there has been an improvement in Healthcare supply chain risk management in Kenya since 2014. Based on these results, since the health ministry department was devolved in there have been a number of supply chain risk mitigation measures that have been adopted and implemented although challenges still exist. These measures have included: outsourcing, risk sharing, risk transfer, risk avoidance and many more. Such small acts of risk management have been associated with improved services delivery more specifically in the villages' health centers, reduced medical costs as witnessed in free healthcare in counties like Kisumu, the adoption of new medical experts in neglected areas like the Beyond Zero Campaign (BZC) with fully supplied medical equipment to take care of the ANC and MCHC. A number of challenges however have been put forward in Kenya to emphasize how bad the healthcare still is. Among them is lack of sufficient financial resources, counterfeits, corruption, poor government policies etc.

Limitations

The study was limited by time, financial resources and security threats. Time for data collection, analysis and even presentation was a big challenge. However this was solved by the researcher since the researcher used all the free times during the weekends, holidays and even sought for a compassionate leave to handle the issue. Financial resources for research assistants, money to travel to the field, money for the data analysis expert and even money to buy journals (some journals cost up to $15 was a challenge. However the researcher solved such by taking a loan from the various online lending agencies in Kenya like Tala, Branch, Mshwari due to the passion and intrinsic motivation aimed at achieving the best in life. The researcher finally faced security challenge when visiting various counties like Lamu, Garissa, Wajir, Mandera and many others due to the volatility of these areas due to Al-Shabaab and other militia groups. However the researcher used county based research assistants and at times requested for local security.

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