Journal of International Business, Innovation and Strategic Management
Vol 1 Issue (2), 81- 100
ISSN: 2617-1805 (Print)

Effect of Logistics Management Practices on Lead Time in the Public Healthcare Sector in Kenya: A Case of Kenya Medical Supplies Authority

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To cite this article:

Jepkosgei, L. (2018). Effect of Logistics Management Practices on Lead Time in the Public Healthcare Sector in Kenya: A Case of Kenya Medical Supplies Authority. *Journal of International Business, Innovation and Strategic Management*, 1(2), 81-100

Abstract: The healthcare system in Kenya faces a number of challenges that makes it difficult for its supply chain to operate efficiently and effectively. The inability to access essential medicines is a key barrier to commodity security which is a right of every person to obtain and use health commodities when and where they need them. The need to have better logistic management practices which plays a very important role in ensuring that drugs and medical equipment are sourced and delivered within reasonable time in order to serve their purpose is often overlooked. The study sought to find out on the effects of logistics management practices on lead time in the public healthcare sector in Kenya. The study specifically looked at the inventory management practices, transport management practices, warehousing practices and transportation management practices. A descriptive research design was used. The target population of the study included 451 staff from all positions in the procurement, warehousing as well as transport and logistics department. A multiple regression model was used. The findings of correlation and regression analysis showed that there was a negative and significant association between warehousing management practices, inventory management practices, order management practices, transportation management practices and lead time in the public health sector in Kenya. The study recommends that the organization should outsource transport services during urgency. The study further recommends that the public health sector should establish effective order processing practices. The study also recommends the organization to automate inventory management. There is also need for a functioning warehouse planning system and functioning packaging system in the organization.

Keywords: *Warehousing Practices, Inventory Management Practices, Order Management Practices, Transportation Management Practices, Lead time*

Introduction

Logistics management is regarded as a subsystem of the larger enterprise or a system of which purchasing, manufacturing, storage and transportation are subsystems. It is the way of thinking about planning and synchronizing related activities (Lysons & Farrington, 2012). Some of the logistical practices that firms will regard in its related integration processes are: warehousing, inventory management and the transportation flow. All of these logistical related practices must be managed effectively and efficiently in order for said logistics management practices to contribute to the performance (Wisner, Tan & Leong, 2014). The global world medical industry expenses are estimated to be over $4.5 trillion (Beeny, 2010). Companies purchase raw materials for bulk combination of active and inactive ingredients. Dosages are formulated and packaged. These Products flow through manufacturing warehouses, wholesale distributors, third Part logistics providers, retail Pharmacies, medical institutions and finally to the patient. Some products make their way back to their manufacturers due to recalls and returns (Beeny, 2010).

With the ever increasing expenditure in healthcare sector, there is need to curb this challenge while ensuring that available resources are used to provide essentials medications to the ever increasing population. Pharmacy department is one of the most consumers of the hospital budget and one of the few areas where a large amount of money is spent on buying medicines and drugs. It is therefore important that hospitals ensure smooth supply of the required stock to ensure uninterrupted supply. This calls for the effective and efficient inventory management of pharmacy stock by keeping a close supervision on important drugs, prevention of pilferage, and priority setting in purchase and distribution of drugs (Oballah, Waiganjo and Wachiuri, 2015). Supply chain management in public sector health systems has received increasing attention in recent years, as both a priority and a challenge for many countries since governments find themselves stressed with an increasing number of products, programs, and patients to manage. Due to major increases in funding and donor support for a multiplicity of health programs, supply chain managers may be responsible for a larger number and volume of products, but with limited additional resources to expand their capacity to manage, store, and distribute these products. Often, staff already working in this area receives extra pressure to build up internal capacity to meet the service delivery targets.

However, many countries, faced with this type of challenge, recognize that these functions, that were once auxiliary to their primary function of service delivery to patients, could tie up a significant portion of their budgets should they scale up appropriately (USAID, 2010). The Kenyan health sector comprises the public sector which is made up of the Ministry of Health and Parastatals organizations, and the private sector, which includes private for-profit, Non-Governmental Organizations, and Faith Based Organizations facilities (RoK, 2010).In order to ensure regular availability of consumables in healthcare facilities, it is important to integrate all the logistical functions, since and well-coordinated logistical activities can create value for money, (Annan, 2013). Supply chain integration is a normal means of channeling resources towards the development of operational competencies and to reduce inefficiencies. Healthcare organizations in all countries are finding ways to improve operational efficiencies and reduce costs without affecting patient care (Msimangira, 2010).

Statement of the Problem

The healthcare system in Kenya faces a number of challenges that makes it difficult for its supply chain to operate efficiently and effectively (Tarty, 2011). The inability to access essential medicines is a key barrier to commodity security—the right of every person to obtain and use health commodities when and where they need them (Rao, Mellon & Sarley, 2009). Often overlooked, however, is the need to have better logistic management practices (Rao, Mellon & Sarley, 2009). Logistics plays a very important role in ensuring that drugs and medical equipment are sourced and delivered within reasonable time in order to serve their purpose. Despite well outlined roles of Kenya medical supplies Authority, there are cases where health facilities run short of drugs and it takes long durations before replenishment is done.

Part of this delay may be caused by poor logistics that leads to high lead time. Infrastructure may also affect the efficiency with which a healthcare logistics network operates. When the logistics network is inefficient, healthcare facilities will experience longer lead times as well as stock out (Bakker, 2010). In Kenya, there have been numerous complaints from the public health facilities regarding erratic supplies of drugs (Kazi, 2012). The Ministry of Health in an attempt to solve these challenges at KEMSA transferred 360 million Kenya shillings to improve the capacity of the personnel and other operations and maintenance requirements as well as logistical support for delivery of medical commodities to public health facilities. Despite the increased expenditure; the inefficiency of KEMSA in its mandate in terms of long lead times was experienced in the year 2008 for instance, where the average lead time from awarding of tender to time of initial delivery was 6 months. According to KEMSA reports 2015/2016 there was numerous complaints on delay of delivery of drugs to facilities which led to loss of lives.

Ngetich (2014) also argues that previous assessments of KEMSA have established that KEMSA warehouses do not meet good distribution practices recommended by World Health Organization (WHO). The repercussions for shortfalls in supply of essential drugs cannot be comprehended. Proper and effective logistics management practices need to be put in place by KEMSA. But this has not been adequately addressed as Kazi (2012) puts it. There is hence a need to establish the influence of some logistics management practices on lead time with an aim of providing policy recommendations to improve the situation at KEMSA. Knowledge gaps are presented in the previous studies that have focused on the same theme as the current study. The literature review further reveals scarcity of studies linking various logistic management practices on lead time both globally and locally. A study by Mensah (2015) looked at the effects of logistics management practices on quality of service delivery in health centers in Ghana. The study focused on quality of service delivery while this study focuses on lead time. Furthermore, the study was carried out in Ghana. Tarty (2012) focused on logistics management specifically, inventory management practices only.

The current study focuses on more variables other than inventory practices. Mungu (2013) looked at how the application of the logistics management practices affects the stock levels of essential drugs in the public health institution focusing on Kenyatta national hospital. This study investigates the role of logistics management on lead time. The study also looked at KNH while this study looks at KEMSA. There is scarcity of studies that have taken into consideration other practices such as order management, warehousing and transportation which are key and play a role in lead time variability as argued by Piroird and Dale (2010). Furthermore, the study was motivated by knowledge gaps presented in previous studies on the same theme. Other previous studies present contextual gaps due to sectoral differences.

Lead time variability in the healthcare sector has significant outcome and it's important to focus on this sector. For comparison of findings across sectors, there is a need to look at a different sector other than what has been researched on and hence a need to focus on logistic management practices and lead time in the health care sector in Kenya.

Research Objectives

i. To establish the effect of warehousing practices on lead time in the Public Healthcare sector in Kenya
ii. To determine the effect of inventory management practices on lead time in the Public Healthcare sector in Kenya
iii. To find out the effect of order management practices on lead time in the Public Healthcare sector in Kenya
iv. To investigate the effect of transportation practices on lead time in the Public Healthcare sector in Kenya

Literature Review

Theoretical Review

Supply Chain Management Theory

Lavassani *et al.* (2009) explain supply chain management as a cross-function approach including: managing the movement of raw materials into an organization, certain aspects of the internal processing of materials into finished goods, and the movement of finished goods out of the organization and towards the end-customers. As organizations strive to focus on core competencies and becoming more flexible, they reduce their ownership of raw materials sources and distribution channels. These functions are increasingly being outsourced to other entities that can perform the activities better or more cost effectively. The effect is to increase the number of organizations involved in satisfying customer demand, while reducing management control of daily logistics operations. Less control and more supply chain partners lead to the creation of supply chain management concept. The purpose of supply chain management is to improve trust and collaboration among supply chain partners, thus improving inventory visibility and the velocity of inventory movement (Lavassani et al., 2009).

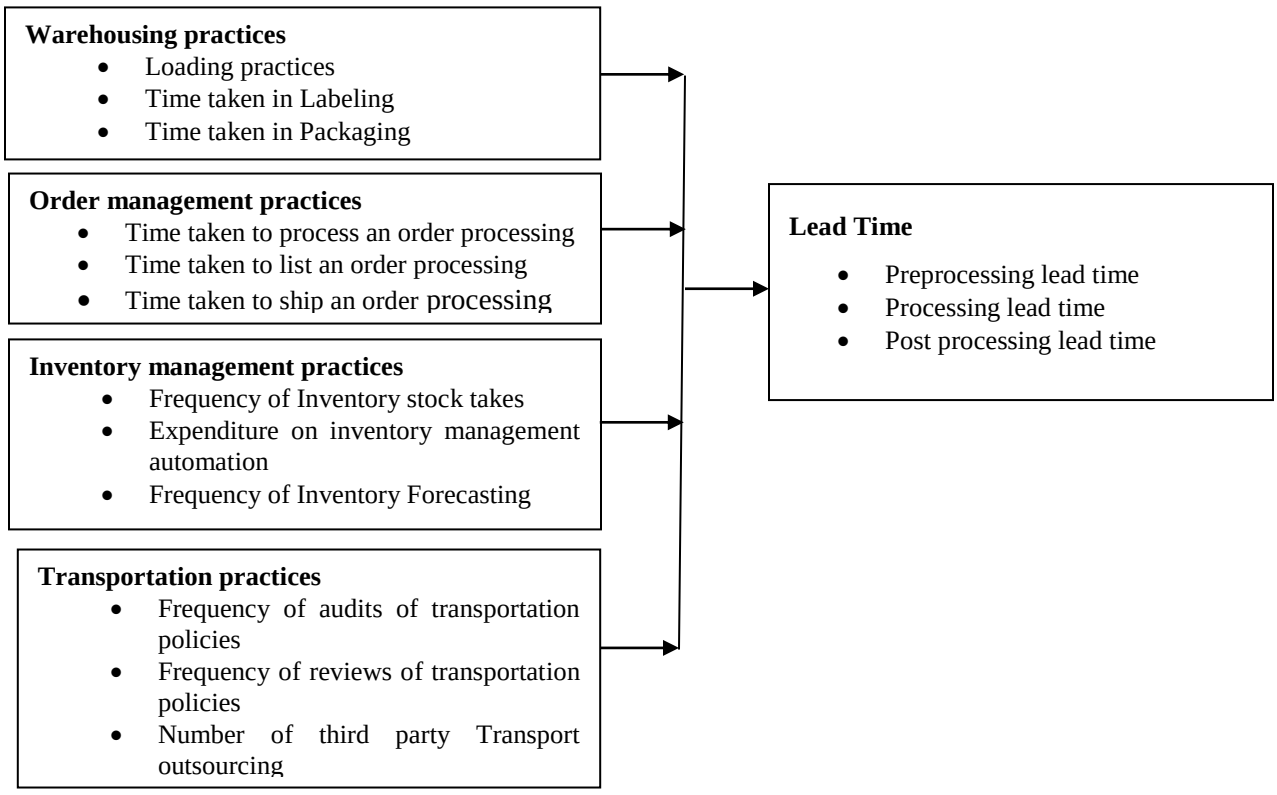
Distribution Resource Planning (DRP) Theory

Distribution Resource planning theory is concerned with the inventory control scheduling technique that applies material requirements planning principles to distribution inventories (Lysons and Gillingham, 2003). It may also be regarded as a method of handling stock replenishment in a multi-echelon environment. Vollman et al (1988) observed that Distribution resource Planning (DRP) theory is applicable especially in the coordination and the flow of commodities inside the industry with the system components that place goods in the hands of the customers, and provides the basis for integrating the manufacturing resource planning (MRP II) system from the firm to the field. According to Coyle et al (2003), Distribution resource planning is a widely used and potentially powerful technique for outbound logistics systems to help determine the appropriate level of inventory.

Theory of Constraints

The theory of constraints (TOC) is an overall management philosophy introduced by Eliyahu M. Goldratt in his 1984 book titled The Goal that is geared to help organizations continually achieve their goals (Cox, Jeff; Goldratt & Eliyahu, 1986). Goldratt adapted the concept to project management with his book Critical Chain, published in 1997. The theory of constraints (TOC) views any manageable system as being limited in achieving more of its goals by a very small number of constraints. There is always at least one constraint, and TOC uses a focusing process to identify the constraint and restructure the rest of the organization around it. TOC adopts the common idiom "a chain is no stronger than its weakest link." This means that processes and organizations are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome (Goldratt, 2004).

Conceptual Framework



Independent Variables **Dependent Variable**

Figure 1: Conceptual Framework

Research Methodology

The study adopted descriptive research design. The study was conducted at the Kenya Medical Supplies Authority with a specific focus on procurement, warehousing and transport departments. The target population for the study was 450 employees. Yamane (1967) formula was used to determine the sample size of 211. The formula is n = (N/ (1+N (e) ^2)

Where: n = sample size, N = Population size, e = margin of error set at 5%. Primary data was collected using structured questionnaires and captured using a 5-point Likert scale. Descriptive and inferential statistics was used to analyze the primary data. Descriptive statistics includes mean, frequencies and standard deviation. Inferential statistics on the other hand includes correlation and regression analysis. To determine the extent to which logistics management practices affect lead time in the public health sector in Kenya, the following regression equation was adopted:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Lead time, X_1 = Warehousing practices, X_2= Inventory management practices, X_3= Order management practices, X_4= Transportation management practices, β_0 = represents the constant term , β_ii= 1….4 are the coefficients of the independent variables and ε is the error term

Results

The study targeted 211 employees from the warehousing and storage department, procurement as well as transport and logistics departments. A total of 165 questionnaires were filled and returned. This represented an overall successful response rate of 78.2%.

Demographic Information

This section presents the description of the general information regarding the respondents in terms of their level of education, the department they work in and the number of years they had been in their positions. The section also gives the implications of these findings to the study.

Table 1: Demographic Information

Demographic Characteristic	Category	Percentage
Education	Secondary	9.1%
	College	42.2%
	University	48.5%
Department	Transport and Logistics	8.5%
	Warehousing and Stores	84.5%
	Procurement	6.7%
Experience	Less than 1 Year	24.2%

Demographic Characteristic	Category	Percentage
	1- 5 Years	24.2%
	6-10 Years	28.5%
	Over 10 Years	23%

Warehousing Management practices

The study sought to establish the budgetary allocations towards improving the KEMSA warehouses for the last five years. As had earlier been reported by Ngetich (2014) that the warehouses at KEMSA don't meet the WHO standards, these findings reveal an increase in the budgetary allocations towards improving the warehouse. The increase is steady.

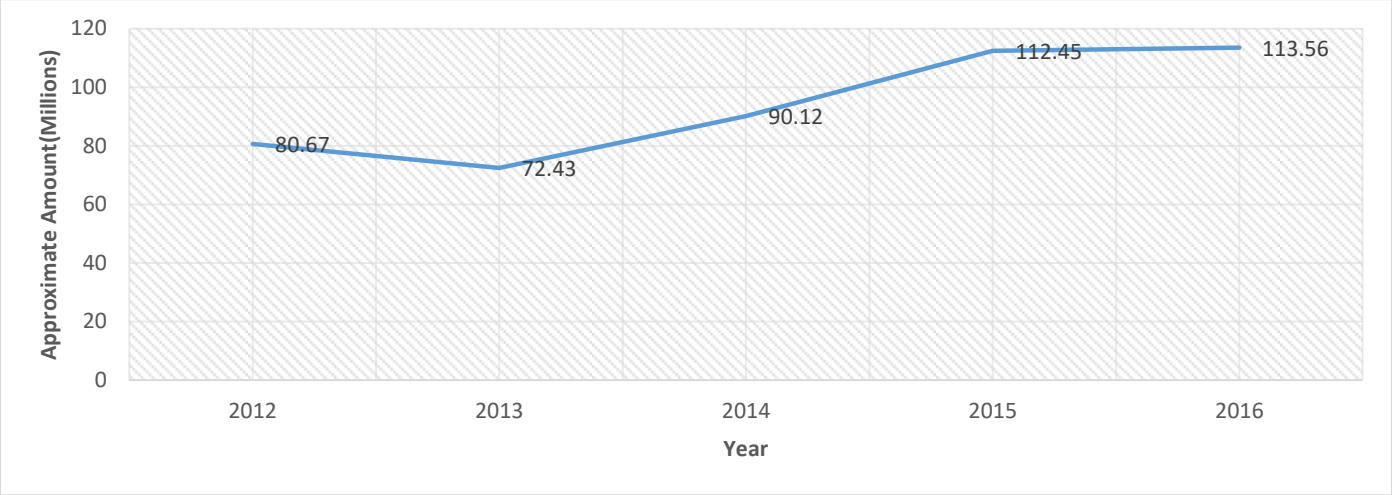


Figure 2 Budgetary allocations towards improving the warehouse

The study also sought to establish the effect of warehousing practices on lead time in the Public Healthcare sector at KEMSA. The results of the study were as indicated in table 2. The findings revealed that majority, 58.2% of the respondents strongly agreed that the organization has well established loading practiced while 41.8% of them strongly disagreed. Moreover, those who strongly agreed that there is a fully functioning labeling system in the organization were 18.8%, 27.3% agreed, those who neither disagreed nor agreed were 14.5% while 19.4% of them disagreed and 20% of them also strongly disagreed. The findings also revealed that 21.2% of the respondents agreed with the statement that there is a well specified procedure for handling goods in the warehouse, 30.9% agreed, 17.6% of them neither agreed nor disagreed while 17% disagreed and only 13.3% of the respondents strongly disagreed. Furthermore, the results revealed that 27.9% of the respondents strongly agreed that the organization has a well-functioning warehouse planning system, 15.2% agreed, 18.2% of the respondents neither agreed nor disagreed while 20% of them disagreed and 18.8% of the respondents strongly disagreed.

Lastly, those who strongly agreed that there are regular reviews of warehousing practices were 21.2%, 27.3% agreed, 24.8% neither agreed nor disagreed while 12.7% of the respondents disagreed and 13.9% of them strongly disagreed. The findings revealed that majority of the respondents neither agreed nor disagreed with the statements on the effect of warehousing management practices on lead time as indicated by a mean of 3.22. The responses given by the respondents were varied as indicated by a standard deviation of 1.51. The findings are consistent with the findings of study by Tarty (2012) who revealed that logistics management is positively influenced by 10 factors that impact on lead time among healthcare facilities in Nairobi. They included: Equipment failures; poor warehouse management; poor flow of information; poor order shipping, poor order listing; poor order sorting; ordering costs; bureaucracy in government; order packaging challenges and poor warehouse planning.

Table 2 Descriptive results of Warehousing Management practices

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Dev
The organization has well established loading practiced	41.8%	0.0%	0.0%	0.0%	58.2%	3.33	1.98
There is a fully functioning labeling system in the organization	20.0%	19.4%	14.5%	27.3%	18.8%	3.05	1.42
There is a well specified procedure for handling goods in the warehouse	13.3%	17.0%	17.6%	30.9%	21.2%	3.30	1.34
The organization has a well-functioning warehouse planning system	18.8%	20.0%	18.2%	15.2%	27.9%	3.13	1.49
There is regular reviews of warehousing practices	13.9%	12.7%	24.8%	27.3%	21.2%	3.29	1.32
Average						**3.22**	**1.51**

Inventory Management practices

The study also sought to establish the trends in the amount allocated towards improvement of the inventory management systems for the last five years. Inventory being a key component of effective procurement performance, the findings reveals that KEMSA recognizes the importance of having a working inventory system through increased investment in improving the structures. The trend has been steady, a clear indicator of the will by KEMSA to solve the procurement issues it has through improvement of the inventory systems.

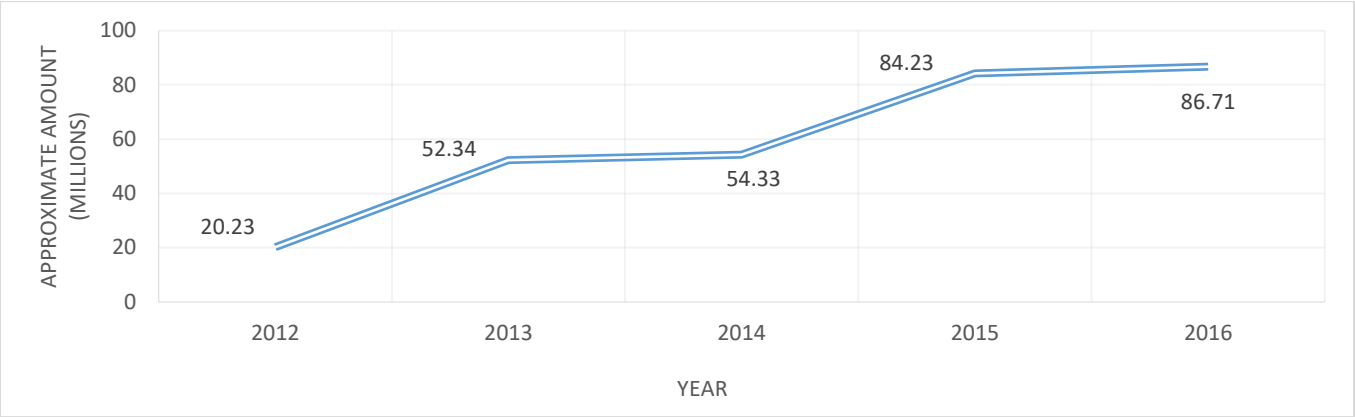


Figure 3 Budgetary allocations towards improving the inventory Systems

The study further sought to determine the effect of inventory management practices on lead time in the Public Healthcare sector in Kenya. The results of the study revealed that 20% of the respondents strongly agreed that there is a consistent inventory stock taking system in the organization, 20.6% of them agreed, 17.6% neither agreed nor disagreed while only 17% disagreed and 24.8% strongly disagreed. Moreover, the findings revealed that 25.5% of the respondents strongly agreed that Inventory management automation has been adopted in the organization, 12.7% of them agreed, 10.3% neither agreed nor disagreed while 13.3% disagreed and 38.2% strongly disagreed. Furthermore, 15.8% of the respondents strongly agreed that Proper inventory forecasting is being done in the organization, 26.1% of them agreed, those who neither agreed nor disagreed were 17.6% while 22.4% of them disagreed and 18.2% of them strongly disagreed.

Additionally, those who strongly agreed that there is a well-developed and functioning practice of development of succession registers were 18.8%, those who agreed were 18.2%, those who neither agreed nor disagreed were 17.6% while 21.8% disagreed and 23.6% strongly disagreed. Lastly, those who agreed that the organization makes use of enterprise resource planning to manage inventories were 21.2%, those who agreed were 24.2%, those who neither disagreed nor agreed were 17.6% while those who disagreed were 21.2% and those who strongly disagreed were 15.8%. The implication of the results is that majority of the respondents neither agreed nor disagreed with the statements on the effect of inventory management practices on lead time as shown by a mean of 2.93. The findings also showed that the responses given by the respondents were varied as indicated by a standard deviation of 1.47. The results are consistent with the findings of a study by Osei-Mensah (2016) which indicated that hospital ensures agreements with supplier for short cycle deliveries ensures accurate prediction of supplier delivery dates and operate Materials Requirements Planning system (MRP). The study also revealed that the hospital ensures Strategic Supplier Partnerships as an Inventory management practice and strictly uses Information Technology in its inventory management practices.

Table 3 Descriptive results of Inventory Management practices

Statements	Strongly Disagree	Dis agree	Neutral	Agree	Strongly Agree	Mean	Std Dev
There is a consistent inventory stock taking system in the organization	24.8%	17.0%	17.6%	20.6%	20.0%	2.94	1.48
Inventory management automation has been adopted in the organization	38.2%	13.3%	10.3%	12.7%	25.5%	2.74	1.66
Proper inventory forecasting is being done in the organization	18.2%	22.4%	17.6%	26.1%	15.8%	2.99	1.36
There is a well-developed and functioning practice of development of succession registers	23.6%	21.8%	17.6%	18.2%	18.8%	2.87	1.45
The organization makes use of enterprise resource planning to manage inventories	15.8%	21.2%	17.6%	24.2%	21.2%	3.14	1.39
Average						**2.93**	**1.47**

Order Management practices

The study also sought to establish the approximate budgetary allocations to IT infrastructure to improve order handling in the organization for the last five years. The results indicate an increasing trend in investment towards improving the order processing time. This shows the importance of having an effective IT infrastructure to improve the lead time.

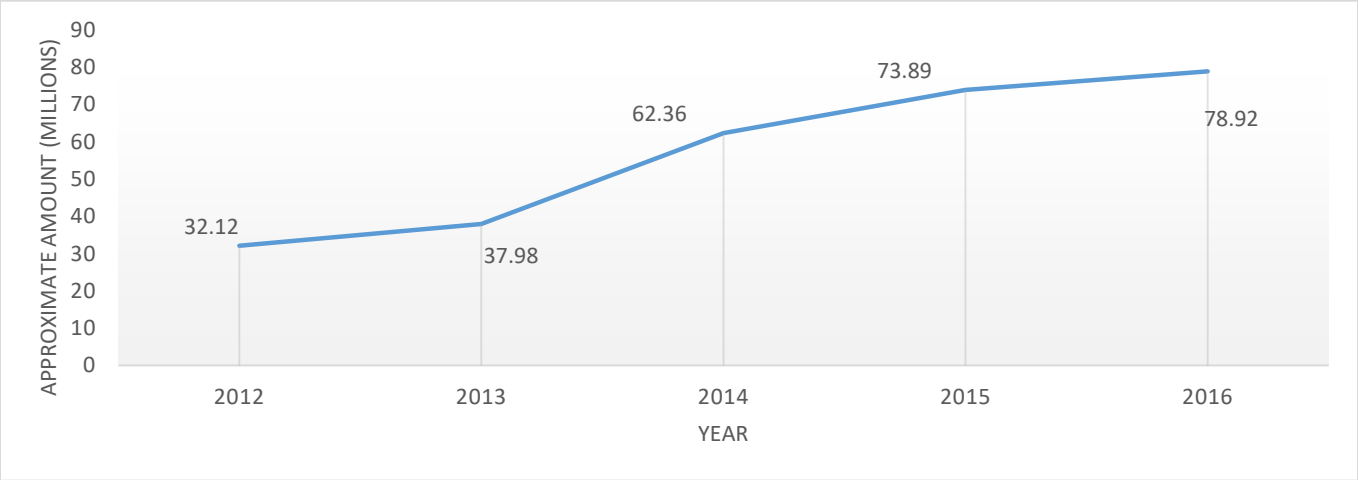


Figure 4 Budgetary allocations towards improving the IT infrastructure

The study also sought to find out the effect of order management practices on lead time in the Public Healthcare sector in Kenya. The results of the study are as in table 4. The findings of the study revealed that those who strongly agreed that Effective order processing practices have been established at KEMSA were 21.2%, those who agreed were 18.8%, those who neither agreed nor disagreed were 24.2% while 17.6% disagreed and 18.2% strongly disagreed. Moreover, those who strongly agreed that there is an efficient order picking system in the organization were 24.2%, those who agreed were 20%, those who neither disagreed nor agreed were 21.8% while 17.6% disagreed and only 16.4% of the respondents strongly disagreed. Further, the findings indicated that those who strongly agreed that Order listing is being practiced to manage orders were 19.4%, those who agreed and those who neither agreed nor disagreed were both 20.6% while those who disagreed were 15.8% and those who strongly disagreed were 23.6%.

In addition, those who strongly agreed that there is a well-established order shipping practice in the organization were 18.8%, those who agreed were 21.8%, those who neither agreed nor disagreed were 17.6% while those who disagreed were 23.6% and those who strongly disagreed were 18.2%. Finally, those who strongly agreed that there is an effective system to manage order packaging in the organization were 58.2% and 41.8% agreed. The implication of the findings is that the majority of the respondents neither agreed nor disagreed with the statements on order management practices and its effect on lead time at KEMSA as indicated by a mean of 3.11. The responses given by the respondents were varied as indicated by a standard deviation of 1.52. The findings are consistent with the findings of a study by Duran and Yavuz (2015) who revealed that that competitive strategies influenced the supply chain strategies positively and significantly; cost leadership strategy, order management strategy and lean supply chain strategy had a significant impact on the firm performance under the conditions of high uncertainty; whereas, differentiation strategy and agile supply chain strategy had a significant impact on the firm performance under the low uncertainty.

Table 4 Descriptive results of Order Management practices

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Dev
Effective order processing practices have been established at KEMSA	18.2%	17.6%	24.2%	18.8%	21.2%	3.07	1.39
There is an efficient order picking system in the organization	16.4%	17.6%	21.8%	20.0%	24.2%	3.18	1.41
Order listing is being practiced to manage orders	23.6%	15.8%	20.6%	20.6%	19.4%	2.96	1.45
There is a well-established order shipping practice in the organization	18.2%	23.6%	17.6%	21.8%	18.8%	2.99	1.39
There is an effective system to manage order packaging in the organization	41.8%	0.0%	0.0%	0.0%	58.2%	3.33	1.98
Average						**3.11**	**1.52**

Transportation management Practices

The study sought to establish the frequency of reviewing and auditing the organization's transport and loading policies for the last three years. There has been increasing but unsteady increase in the frequency of reviewing the transport policies at KEMSA for the last five years as indicated below. The implication is that there has been an effort to improve the lead time at KEMSA by increasing the frequency of reviewing the transport policies per year.

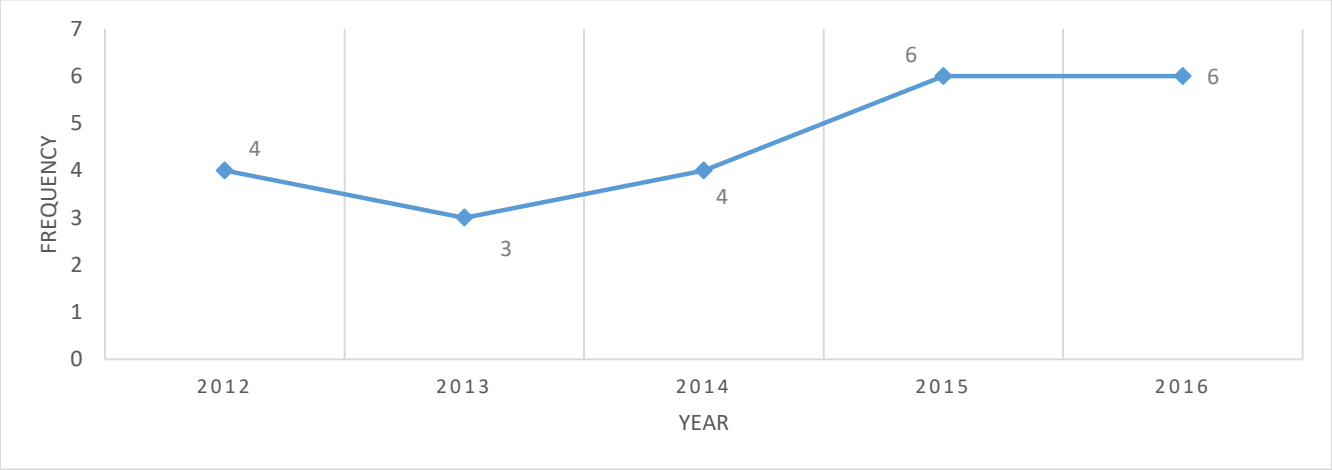


Figure 5 Frequency reviewing Transport Policies

The study also sought to establish the effect of transportation practices on lead time in the Public Healthcare sector in Kenya. The results of the study are as shown in table 5. The findings of the study revealed that 20% of the respondents strongly agreed that the organization outsources transport services when there is urgency, those who agreed were 20%, those who neither agreed nor disagreed were 23% while those who disagreed were 19.4% and only 17.4% strongly disagreed. Also the study findings indicated that those who strongly agreed that the organization practices consolidation of shipment were 14.5%, those who agreed were 19.4%, those who neither agreed nor disagreed were 21.2% while those who disagreed were 22.4% and finally those who strongly disagreed were 22.4%.

Furthermore, those who strongly agreed that outbound logistics in the organization is well managed were 58.2% while 41.8% agreed. Moreover, 19.4% of the respondents strongly agreed that the organization practices multi modal transportation so as to manage lead time, 21.2% agreed, 20% neither agreed nor disagreed while 21.2% of them disagreed and finally 18.2% strongly disagreed. Lastly, those who strongly agreed that Scheduling of pickups does not significantly affect arrangement of transport were 16.4%, those who agreed were 20%, those who neither agreed nor disagreed were 19.4% while those who disagreed were 20.6% and those who strongly disagreed were 23.6%. The implication of the findings is that majority of the respondents neither agreed nor disagreed with the statements on transportation management practices as shown by a mean of 3.01.

The responses given by the respondents were varied as indicated by a standard deviation of 1.51. The findings are consistent with the findings of a study by Mäe and Ohno (2012) which indicated that the most influential factors related to the lead time changes. For production these are costs of ownership and flexibility.

Table 5 Descriptive results of Transportation Management Practices

Statements	Strongly Disagree	Dis agree	Neutral	Agree	Strongly Agree	Mean	Std Dev
The organization outsources transport services when there is urgency	17.6%	19.4%	23.0%	20.0%	20.0%	3.05	1.38
The organization practices consolidation of shipment	22.4%	22.4%	21.2%	19.4%	14.5%	2.81	1.37
Outbound logistics in the organization is well managed	41.8%	0.0%	0.0%	0.0%	58.2%	3.33	1.98
The organization practices multi modal transportation so as to manage lead time	18.2%	21.2%	20.0%	21.2%	19.4%	3.02	1.39
Scheduling of pickups does not significantly affect arrangement of transport	23.6%	20.6%	19.4%	20.0%	16.4%	2.85	1.41
Average						**3.01**	**1.51**

Lead time

The study sought to establish the changes in the various types of lead time cycle for the last one year as presented in Table 6. The findings revealed that majority of the respondents, 60.15% revealed a decrease in preprocessing lead time by less than 50%, 53.32% also indicated a decrease in processing lead time by less than 50% while a further 49.27% of the respondents showed that post processing lead time decreased by less than 50% also. Those who revealed that preprocessing, processing and post processing lead time increased by over 50% were only 1.2%, 2.2% and 8.26% respectively. The findings reveal that investment in inventory, transport management, warehouse management and order management has led to a significant decrease in lead time at KEMSA since the year 2008 when a USAID report revealed that the average lead time from advertisement to time of initial delivery was 6 months (USAID, 2009).

Table 6 Changes in Lead time in the year 2016

Indicator/ Year	Increased by over 50%	Increased by less than 50%	Decreased by less than 50%	Decreased by over 50%
Preprocessing lead time	1.20%	34.12%	60.15%	4.53%
Processing lead time	2.20%	33.08%	53.32%	11.40%
Post processing lead time	8.26%	27.06%	49.27%	15.41%

The respondents were also asked the respondents to indicate whether they agree or disagree with the statements on lead time. The results of the study are as shown in table 7. The summary of the results indicated that 13.9% of the respondents strongly agreed that There is coordinated order shipping hence preprocessing lead time is well managed, 24.2% agreed, 27.9% neither agreed nor disagreed while 17.6% disagreed and 16.4% of them strongly disagreed. Moreover, those who strongly agreed that Post processing lead time is well managed in the organization were 22.4%, those who agreed were 21.2%, those neither agreed nor disagreed were 20% while those who disagreed were 22.4% and those who strongly disagreed were 13.9%.

Furthermore, 17% of the respondents strongly agreed that the organization has a well-structured system to manage post processing lead time, those who agreed were 17.6%, those who neither agreed nor disagreed were 25.5% while those who disagreed were 22.4% and only 17.6% strongly disagreed. Additionally, those who strongly agreed that Demand variability does not affect lead time in the organization were 18.8%, those who agreed were 20.6%, and those who neither agreed nor disagreed were 20.6% while those who disagreed were 18.2% and 21.8% of the respondents strongly disagreed. Finally, the findings of the study revealed that 18.2% of the respondents strongly agreed that there are regular reviews and audits of logistic procedures thus managing lead time, those who agreed were 24.2%, 17.6% of them neither agreed nor disagreed, 21.2% of them disagreed and 18.8% strongly disagreed. The implication of the findings is that majority of the respondents neither agreed nor disagreed with the statements on lead time as shown by a mean of 3.02. The responses given by the respondents were varied as indicated by a standard deviation of 1.36.

Table 7 Descriptive results of Lead time

Statements	Strongly Disagree	Dis agree	Neutral	Agree	Strongly Agree	Mean	Std Dev
There is coordinated order shipping hence preprocessing lead time is well managed	16.4%	17.6%	27.9%	24.2%	13.9%	3.02	1.28
Post processing lead time is well managed in the organization	13.9%	22.4%	20.0%	21.2%	22.4%	3.16	1.37
The organization has a well-structured system to manage post processing lead time	17.6%	22.4%	25.5%	17.6%	17.0%	2.94	1.34
Demand variability does not affect lead time in the organization	21.8%	18.2%	20.6%	20.6%	18.8%	2.96	1.42
There is regular reviews and audits of logistic procedures thus managing lead time	18.8%	21.2%	17.6%	24.2%	18.2%	3.02	1.39
Average						**3.02**	**1.36**

Correlations Analysis

The study used a Pearson correlation to establish the strength of the relationship between the variables. The results of the study revealed that there was a negative and significant correlation between warehousing management practices and lead time as shown by a Pearson coefficient of -0.326 and significance level of 0.000. This shows that an increase in warehousing management practices such as established loading practices, fully functioning labeling system in the organization, specified procedure for handling goods in the warehouse, functioning warehouse planning system and a functioning packaging system in the organization leads to a negative and significant effect on lead time. The study findings are consistent with the findings of a study by Tarty (2012) who revealed that logistics management is positively influenced by 10 factors that impact on lead time among healthcare facilities in Nairobi. They included: Equipment failures; poor warehouse management; poor flow of information; poor order shipping, poor order listing; poor order sorting; ordering costs; bureaucracy in government; order packaging challenges and poor warehouse planning. The study findings also showed a negative and significant correlation between inventory management practices and lead time as indicated by a Pearson coefficient = -0.339 and a significance level of 0.000. This shows that an increase in inventory management practices such as consistent inventory stock taking system in the organization, automation of inventory management in the organization, proper inventory forecasting, developed and functioning practice of development of succession registers, and the use of enterprise resource planning to manage inventories leads to a negative and significant effect on lead time. The study findings are consistent with the findings of a study by Osei-Mensah (2016) which indicated that hospital ensures agreements with supplier for short cycle deliveries ensures accurate prediction of supplier delivery dates and operate Materials Requirements Planning system (MRP).

The study also revealed that the hospital ensures Strategic Supplier Partnerships as an Inventory management practice and strictly uses Information Technology in its inventory management practices. Furthermore, the results also revealed that there was a negative and significant correlation between order management practices and lead time as shown by a person correlation value of -0.419 and a significance of 0.000. The findings implies that an increase in order management practices such as establishing effective order processing practices at KEMSA, efficient order picking system in the organization, use of order listing to manage orders, establishing an order shipping practice in the organization and the use of an effective system to manage order packaging in the organization leads to a negative and significant effect on lead time.

The findings are consistent with the results of a study Ralston (2013) which established that order consolidation, use of ERP systems in in purchase orders significantly speeds the transaction time between supplier and manufacturer exchange. Finally, the results also showed that there was a negative and significant correlation between transportation management practices and lead time as shown by a person correlation value of -0.419 and a significance of 0.000. The findings implies that an increase in transportation management practices such as outsourcing of transport services when there is urgency, consolidation of shipment by the organization, management of outbound logistics in the organization, use of multi modal transportation, and scheduling of pickups does not significantly affect arrangement of transport leads to a negative and significant effect on lead time. The findings are consistent with the results of a study Mubarik *et al* (2012) which confirmed that transportation outsourcing by outlined industry do not only improve SCM performance but also provide a significant influence on supply chain effectiveness and efficiency for the Pharmaceutical sector of Pakistan.

Table 8 Correlation Analysis

Correlations		Warehousing management practices	Inventory management practices	Order management practices	Transportation management practices	Lead time
Warehousing management practices	Pearson Correlation	1				
Inventory management practices	Pearson Correlation	0.079	1			
Order management practices	Pearson Correlation	.230**	.234**	1		
Transportation management practices	Pearson Correlation	.294**	0.133	.261**	1	
Lead time	Pearson Correlation	-.326**	-.339**	-.419**	-.419**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	165	165	165	165	

**** Correlation is significant at the 0.01 level (2-tailed).**

Multivariate Regression Analysis

The study used a multivariate regression model to determine the effect of logistics management practices on lead time in the public healthcare sector at the Kenya Medical Supplies Authority. The overall regression model of the study was $Y= \beta 0+ \beta\ 1X1+ \beta\ 2X2+ \beta\ 3X3+ \beta\ 4X4+ \varepsilon$ Where; Y = lead time, X1 = warehousing management practices, X2= inventory management practices, X3= order management practices, X4= transportation management practices, and ε = Error term. The results for model summary are presented in Table 9. The regression results show that R was 0.595 which shows that the correlation between the independent variables and the dependent variable is negative. It implies that an improvement in all the studies logistics management practices leads to a decrease in lead time. The study findings indicated that logistics management practices account for 35.4% of the variation in the in lead time. This implies that warehousing management practices, inventory management practices, order management practices and transportation management practices jointly account for up to 35.4% of the variation in lead time. This is shown by a by an R-square value of 0.354. The remaining 64.6% of the variation I lead time is accounted for by other variables other than the four logistics management practices studied in this study.

Table 9 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	-.595	0.354	0.338	0.462841

Predictors: (Constant), transportation management practices, Inventory management practices, warehousing management practices, order management practices

The findings of the study revealed that the overall regression model linking the logistics management practices and their effects on lead time at KEMSA was significant as indicated by a significant F (4, 160) statistic as indicated by (0.000) significance level which was less than 0.05 at 5% level of significance. F calculated is 21.919 while f critical is 2.428. F calculated is greater than the F critical (21.919 > 2.428), this showed that the overall model was statistically significant at 5% significance level. The results of the study are as shown in table 10.

Table 10 Analysis of Variance (Model Significance)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.782	4	4.696	21.919	.000
	Residual	34.276	160	0.214		
	Total	53.058	164			

Dependent Variable: lead time
Predictors: (Constant), transportation management practices, Inventory management practices, warehousing management practices, order management practices

The final results revealed the coefficients of the relationship between the four logistics management practices and lead time. The significance of the beta coefficients is also given. The results are presented in Table 11.

Table 11 Regression Coefficients Results

Independent Variable	B	Std. Error	t	Sig.
(Constant)	5.338	0.254	21.01	0.000
Warehousing management practices	-0.136	0.054	-2.508	0.013
Inventory management practices	-0.187	0.053	-3.502	0.001
Order management practices	-0.201	0.054	-3.741	0.000
Transportation management practices	-0.234	0.059	-3.996	0.000

The results of the study shows that warehousing management practices affect lead time negatively and significantly (Beta = -0.136, Sig = 0.013). This implies that an increase in warehousing management practices such as established loading practices, fully functioning labeling system in the organization, specified procedure for handling goods in the warehouse, functioning warehouse planning system and a functioning packaging system in the organization will lead to 0.136 decreases in lead time in the public healthcare sector at the Kenya Medical Supplies Authority. The findings agree with the findings of a study by Mungu (2013) which revealed that inventory management, transportation management, storage management practices such as quality control, clear specialization, labelling as well as pricing positively affects the stock levels essential drugs in Health institutions.

Moreover, the findings of the study also indicate that inventory management practices negatively and significantly affect lead time (Beta = -0.187, Sig = 0.001). This implies that an increase in inventory management practices such as consistent inventory stock taking system in the organization, automation of inventory management in the organization, proper inventory forecasting, developed and functioning practice of development of succession registers, and the use of enterprise resource planning to manage inventories leads to 0.187 decrease in lead time in the public healthcare sector at the Kenya Medical Supplies Authority. The findings agree with the findings of a study by Mensah (2015) which revealed insufficient drugs and medical supplies, lack of modern medical facilities and equipment, lack of modern storage facilities for medical supplies, irregular flow of medical supplies from suppliers and lack of qualified logistics officers as the major challenges to quality health service delivery in the various health centers.

Further, the findings of the study revealed that order management practices negatively and significantly affect lead time (Beta = -0.201, Sig = 0.000). This implies that an increase in order management practices such as establishing effective order processing practices at KEMSA, efficient order picking system in the organization, use of order listing to manage orders, establishing an order shipping practice in the organization and the use of an effective system to manage order packaging in the organization leads to 0.201 decrease in lead time in the public healthcare sector at the Kenya Medical Supplies Authority. The findings of the study are consistent with the findings of a study by Ugur and Erman (2013) which indicated that using either BPR or ERP strategies has positive effects on SCMs overall performance where it has been found that successful implementation of ERP has more improvement chance on performance. Furthermore, the results indicated that the use of ERP systems in purchasing orders significantly improved the transaction time.

Finally, the findings of the study showed that transportation management practices negatively and significantly affect lead time (Beta = -0.234, Sig = 0.000).This implies that an increase in transportation management practices such as outsourcing of transport services when there is urgency, consolidation of shipment by the organization, management of outbound logistics in the organization, use of multi modal transportation, and scheduling of pickups does not significantly affect arrangement of transport leads to 0.234 decrease in the public healthcare sector at the Kenya Medical Supplies Authority. The results are consistent with the findings of a study by Kihia (2017) which revealed that organizations needed to establish a sound, tightly controlled logistical process such as transportation to facilitate smooth flow of goods.

Conclusion

The study concluded that warehousing management practices negatively and significantly affect lead time implying that an increase in warehousing management practices leads to a negative and significant effect on lead time. An increase in warehousing management practice include established loading practices, fully functioning labeling system in the organization, specified procedure for handling goods in the warehouse, functioning warehouse planning system and a functioning packaging system in the organization leads to a significant decrease in lead time. The study also concluded that inventory management practices have a negative and significant on lead time. An increase in inventory management practices such as consistent inventory stock taking system in the organization, automation of inventory management in the organization, proper inventory forecasting, developed and functioning practice of development of succession registers, and the use of enterprise resource planning to manage inventories leads to significant decrease in lead time.

The study concluded that order management practices have a negative significant effect on lead time. An increase in order management practices such as establishing effective order processing practices at KEMSA, efficient order picking system in the organization, use of order listing to manage orders, establishing an order shipping practice in the organization and the use of an effective system to manage order packaging in the organization leads to a significant decrease in lead time. The study concluded that Transportation management practices negatively and significantly affect lead time which implies that an increase in Transportation management practices leads to a negative and significant influence on lead time. Therefore, an increase in transportation management practices such as outsourcing of transport services when there is urgency, consolidation of shipment by the organization, management of outbound logistics in the organization, use of multi modal transportation leads to a significant reduction in lead time.

Recommendations of the Study

The study recommends the public healthcare sector at the Kenya Medical Supplies Authority to adopt the logistics management practices such as warehousing management practices so as to reduce lead time. Some of the warehousing management practices include well established loading practiced by the organization, a fully functioning labeling system in the organization, specified procedure for handling goods in the warehouse, functioning warehouse planning system and functioning packaging system in the organization. Moreover, the study recommends the public healthcare sector at the Kenya Medical Supplies Authority to adopt the logistics management practices such as inventory management practices so as to reduce lead time. Some of the inventory management practices are consistent inventory stock taking system in the organization, automation of inventory management in the organization, proper inventory forecasting, developed and functioning practice of development of succession registers, and the use of enterprise resource planning to manage inventories.

Further, the study recommends the public healthcare sector at the Kenya Medical Supplies Authority to adopt the logistics management practices such as order management practices so as to reduce lead time. Some of the order management practices are establishing effective order processing practices at KEMSA, efficient order picking system in the organization, use of order listing to manage orders, establishing an order shipping practice in the organization and the use of an effective system to manage order packaging in the organization. Lastly, the study recommends the public healthcare sector at the Kenya Medical Supplies Authority to adopt the logistics management practices such as transportation management so as to reduce lead time. Some of the transportation management practices are outsourcing of transport services when there is urgency, consolidation of shipment by the organization, management of outbound logistics in the organization, use of multi modal transportation.

Conflict of Interest

No potential conflict of interest was reported by the authors.

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