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ENABLERS OF VENDOR MANAGED INVENTORY IN PUBLIC HEALTHCARE SECTOR; ADDRESSING PHARMACEUTICALS STOCK-OUTS IN KENYA AND TANZANIA: A SYSTEMATIC REVIEW

Kennedy Otemba Odongo
Postgraduate Student
Department of Marketing, Procurement and Supply Management
Moshi Co-operative University
Email: kennedyodongo15@gmail.com

Faustine Peter Panga
Department of Marketing, Procurement and Supply Management
Moshi Co-operative University
Email: faustine.panga@gamil.com

Abstract
Pharmaceutical stock-outs are major challenge facing public healthcare sector in Kenya and Tanzania. Many preventable deaths especially in rural communities have been witnessed due to lack of essential medicines for high-risk diseases such as Malaria in public healthcare facilities. The stock-outs of medicines continues to occur even as central medical stores in East African countries at the end of each financial year report billions of financial losses resulting from expired drugs at their central warehouses. An effective inventory replenishment strategy such as Vendor Managed Inventory (VMI) by central medical stores applied at each public healthcare facility is capable of preventing pharmaceutical stock-outs in government hospitals. This paper, basing on Principal Agent Theory conducted a systematic review of VMI enablers in public healthcare sector. The study was driven by the motivation to recommend a solution that can increase the continuous availability of drugs in public health facilities in East African countries. To this end, the study used a group of six key words to search through Science Direct, PubMed bibliographic databases, and Google scholar search engine for peer reviewed articles on VMI implementation in public healthcare sector. The results found by keywords were reviewed, non-relevant articles excluded, and eight articles were selected, analysed, leading to finding of 11 key enablers of VMI relating to supplier capability, supplier-buyer relationship, information technology, top management support, education programmes, continuous improvement, size of hospital among others in public health sector. This study recommends that Kenya and Tanzania should implement VMI since it is possible to create the enablers in public healthcare sector. Theoretically, these findings implies that central medical stores (CMS), as the main government agent of procuring and distributing pharmaceutical products should lead in efforts to adopt and implement VMI in public hospitals.

Keywords: *Vendor Managed Inventory, Public healthcare sector, collaborative supply chain, pharmaceutical stock-outs, hospital.*
Paper type*: Research paper*
Type of Review: *Peer Review*

1. INTRODUCTION

Public healthcare sector is considered as the main avenue to ensure that patient-centred care is timely accessed by all who need it. One of the United Nations sustainable development goals is good health and well-being where all people access right healthcare services when and where they need it (UNDP, 2019). The realisation of this goal largely depends on the effectiveness and efficiency of public healthcare system across the world to deliver right healthcare services. Most developed and OECD countries have shown their commitment to the universal healthcare coverage within their borders, not only increasing budgetary allocation to public health sector, but also driving pertinent reforms to make the sector affordable and accessible. For instance, the Obama care Act, also called the Affordable Care Act in the United States incentivize primary healthcare providers in rural communities to continue providing the service and pay physicians as per the quality of care they provide rather than volume to encourage high quality care (HealthCare.gov, 2019). Similar reforms are witnessed in other developed countries like Japan, United Kingdom and France among others, and primarily focus on increasing accessibility and affordability (NHS, 2019). The results of such reforms are increased life expectancy, with UNDP (2019) revealing that there is 31 years life expectancy gap between developed nations and low-income countries.

While there are reforms in public healthcare sector within the East African region, most of these reforms lean towards increasing funding without seeking to improve the efficiency of the system. Accessibility to right healthcare services remains a major challenge in most of the East African countries (Chojenta, Kibret, Loxton, Tegegne & Smith, 2018). Illnesses such as Malaria, Dysentery, Tuberculosis and Diarrhoea and other communicable diseases that can be easily prevented by timely access to right medication and medical services account for more than 56 percent of deaths in sub-Saharan Africa (WHO, 2018). Communicable diseases such as Pneumonia, Diarrhoea, Tuberculosis and Malaria are among the top ten leading causes of deaths in Kenya, Uganda, Tanzania, Rwanda and Burundi (WHO, 2018; Institute of Economic Affairs, 2018; CDC, 2019; Osano, Were & Mathews, 2017; Challe, Kamugisha, Mmbando & Ishengoma, 2018; Shumbusho, 2016; IHME, 2019).

One of the key causes of preventable deaths in East Africa is stock-out of drugs in public healthcare facilities (Masters, Burstein, DeCenso & Njuguna, 2014; Masters, 2013). Though countries like Kenya, Tanzania and Rwanda have increased the number of community healthcare centres, oftentimes these facilities do not have the required medicines. To some extent, even large public hospitals turn away patients because of lack of drugs for easily preventable communicable diseases. Some hospitals direct patients to buy the drugs from private pharmacies. A study by Masters (2013) and colleagues revealed that 30 percent of essential medicines are usually lacking in public health care facilities in Kenya and Uganda. With almost 98 percent of healthcare system devolved in Kenya, pharmaceutical stock-outs in county-government hospitals are rampant (Omulo, 2019; Atieno, 2019; Omulo, 2019) either because of delay in delivery by Kenya Medical Supply Authority (KEMSA) or failure to order on time by county health administrators (Omulo, 2019). Another study shows that 87 percent of community health care centres in remote rural areas in Kenya experience drug stock-outs monthly (Davis, 2013).

More than 80 percent of the population in East African countries relay on public healthcare sector for their primary care. That is why Chisholm and Evans (2010) emphasize that an efficient and effective public healthcare sector is highly indispensable for low income populace who cannot afford private health insurance policies. Stock out of medicine in public healthcare facilitates therefore deteriorates the health outcomes of the majority, low-income populations (Masters et al. 2014). Patients may also shun visiting public healthcare facility due to negative perception caused by pharmaceutical stock-outs (Masters, 2013). This contributes to high mortality rate from easily treatable illnesses witnessed in the region.

Whereas they could be various causes of the drug stock-outs in public health sector, various studies have shown that poor replenishment of drugs by central medical stores in East African countries is a major root cause (Israel, Kazungu and Mchopa, 2019; Yadav, 2015; Masters et al., 2014; Masters, 2013). Given that more than 70 percent of drugs consumed in Africa are imported, streamlining the supply chain of drugs from the main importer; central medical stores, to healthcare facilities are indispensable. In Kenya, Kenya Medical Supplies Authority (KEMSA) operates a centralized distribution strategy where all distribution is done from Nairobi Embakasi warehouse directly to hospitals. For KEMSA to supply medicine, big hospitals particularly those located in Nairobi, a purchase order highlighting the quantity they need and when it is required is done, then KEMSA supply directly to them at their doorstep using third-party logistics (KEMSA, 2019). However, for hospitals and community health centres located far away from Nairobi, KEMSA supplies medicine after every three months as per the agreement with the hospitals. Most rural hospitals in Kenya are unable to place purchase requisitions that reflect their actual demand due to understaffing. As such, they prefer to operate a predetermined quantity that is delivered by KEMSA after every three months (KEMSA, 2019). This scheduled delivery does not take into consideration local information concerning variation in demand.

In Tanzania, delivery by Central Medical Department (CMD) occurs monthly but only up to regional level health headquarters which then have the mandate of organising for the transportation of the medicine to local health facilities in the region through zonal medical stores (Yadav, 2015). Like Kenya, pull system where local health facilities place purchase orders in liaison with District Health Medical Teams, which then liaise with zonal medical store to replenish stock levels at each health facility (Yadav, 2015). CMS cannot influence the lead-time for distributing the medicine from regional health department to local health facilities and hospitals that actually needs them (Yadav, 2015), since they deliver through regional and zonal medical stores. This creates opportunity for CMS to easily shift the blame of poor performance to other players in the supply chain (Yadav, 2015). It also erodes the ability of CMS to track the flow of material in its supply chain. It is this diffusion of accountability that leads to diversion of medicine meant for public healthcare facilities to private healthcare centres (Bateman, 2013).

With these inefficiencies in delivery and replenishment of medicine in public hospitals, stock-outs of essential medicines and other critical medical supplies is rampant within East African region. A study by Twaweza (2017) revealed that 94% of public hospitals in Tanzania face stock-outs of more than one essential medicine. The average length of stock-outs according to a study in 2009 was about 25.3 days and 28 days in Kenya and Uganda respectively (The East African, 2009). The study pointed out that only 50 percent of community health facility and 65 percent of major public hospitals in Kenya have continuous supply of essential medicine such as those for TB and Malaria (The East African, 2009). Certainly, a study by Masters (2013) still revealed that 30 percent of essential medicines are usually lacking in public health care facilities within the East Africa region, which was later confirmed by World Bank (2016) report that only 60% of medicine is available within public hospitals compared to 80% in private hospitals in Tanzania.

Vendor Managed Inventory (VMI) is retail-based inventory management technique that completely eliminates the risk of stock-outs. According to Beheshti, Clelland and Harrington (2020), Vendor Managed Inventory refers to the practice of outsourcing the decision of determining order size and timing of delivery by the retailer to vendor or supplier. The appeal to implement VMI in public health sector stems from its success in the private retail industry. VMI in the public health sector is defined as "an approach that leverages the interest and capability of an external party to assume responsibility for managing commodity inventory at a public-health facility," (Watson, Serumaga, & McCord, 2012, p.1).

Application of VMI in public health sector shifts the responsibility of restocking inventories from the hospital to the vendor or supplier (Watson et al., 2012). According to Watson and colleagues (2012), VMI drifts from a pull inventory control system towards allocation inventory control system, where the vendor uses point of sale data to determine quantity and timing of restocking. The hospital therefore concentrates on providing services while the vendor ensures that optimal stock levels are maintained. Various models of VMI customized for healthcare sector such as Vendor Replenished Inventory (VRI), Vendor Managed Inventory Services (VMIS), Third Party Inventory (3RI), Third Party Managed Inventory Services (3MIS), Inventory Management Technical Assistance (IMTA) (Watson et al., 2012) can be applied. Given the centralization of procurement of medicine in East African countries, central medical stores, such as KEMSA in Kenya and Medical Stores Department in Tanzania can assume this role at each hospital and health facility. The adoption of VMI in public health sector can result into immediate and contingent benefits (Watson et al., 2012), as summarized in the table 1.

Table 1: Benefits of VMI in Public Healthcare Sector

Benefits of VMI in Public Healthcare Sector	
Immediate Benefits	**Contingent Benefits**
Increase in availability of medicine at hospital level.	Hospital staff can focus on service delivery instead of inventory management.
Elimination of pharmaceutical stock-outs.	Improved access to information by VMI partners can lead to optimization of operations leading to cost savings passed on to the public.
Improved service delivery in public hospitals.	
Reduction in distribution costs.	
Reduction in inventory levels at various level of supply chain.	VMI strengthens interdependence between hospitals and vendors (CMS) ensuring that it is long-lasting and creates a platform for further improvements.
Reduced quantity of expired drugs.	

Source: Watson *et al.,* (2012).

Various studies have been conducted on VMI in retail sector. A few studies have also viwed at the implementation of VMI in public healthcare sector in developed countries. However, there are no systematic reviews on the enabling factors of VMI in public healthcare sector. The purpose of this study is to conduct a systematic review of the enablers of VMI technique in public healthcare sector and make recommendations on how East African Countries particularly Kenya and Tanzania can address the perennial pharmaceutical stock-outs in public hospitals.

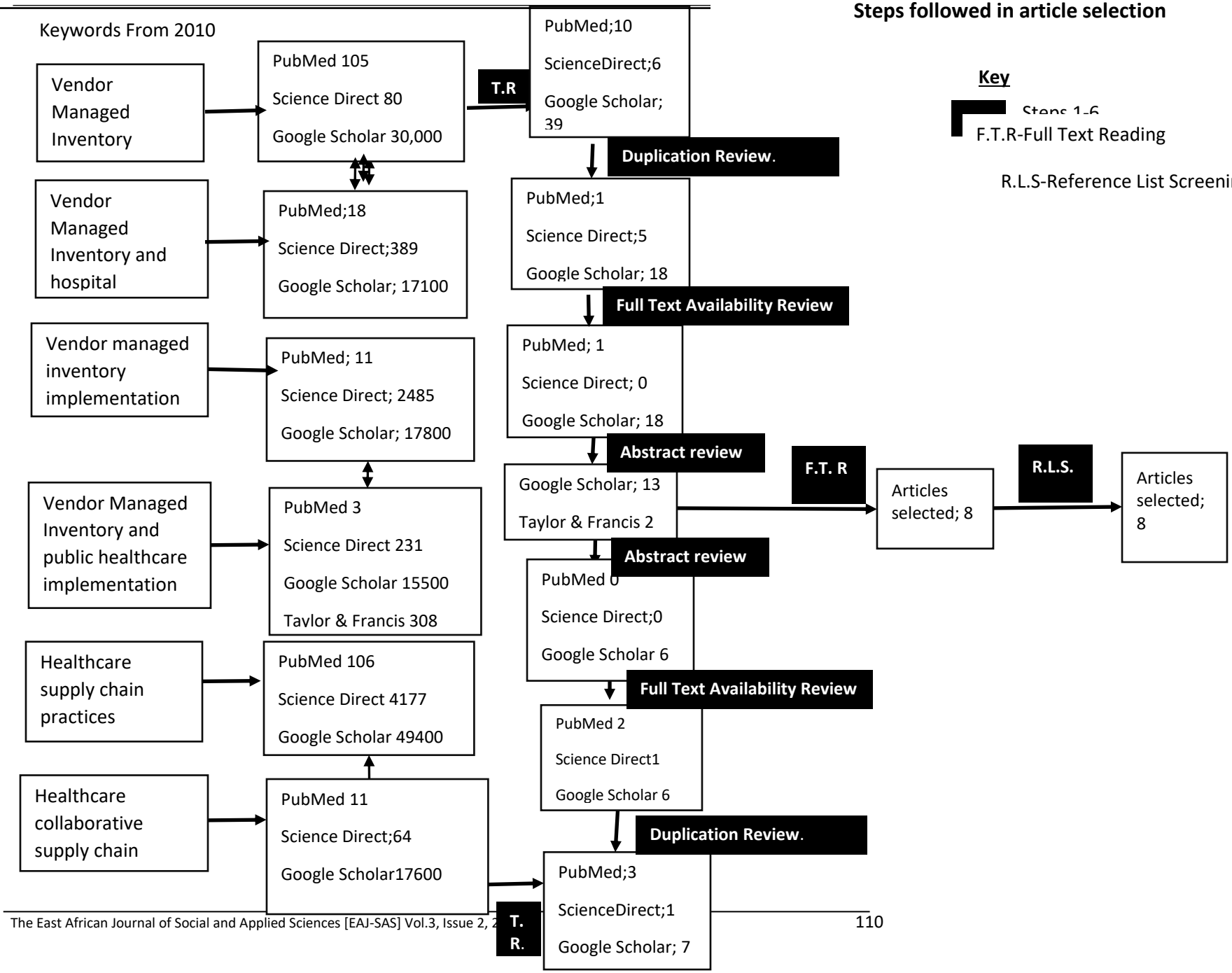
2. THEORETICAL BACKGROUND

The systematic literature review was guided by the principal agent theory (Mitnick, 1975). The procurement and distribution of pharmaceutical products in public hospitals in Kenya and Tanzania is done by central medical stores (agent) which act on behalf of the government (principal). The delegation of these duties to CMS; Kenya Medical Supplies Authority in Kenya and Medical Stores Department in Tanzania; is intended to improve healthcare service delivery to the public. Consequently, acting on behalf of the government, CMS have the authority to introduce any innovation that enhances the realisation of principal's goals. With frequent medical shortages in public hospitals in Kenya and Tanzania, it is CMS incumbent to find a solution. This systematic literature review pursues the possibility of implementing vendor managed inventory in public hospitals using CMS as the main vendor.

3. METHODOLOGY

PubMed, Science Direct, and Google scholar scientific search engines were used to locate empirical studies in English on the enablers of VMI implementation in the public healthcare sector. The search was

conducted using a group of eight keywords; Vendor Managed Inventory, Vendor Managed Inventory and Hospitals, Vendor Managed Inventory Implementation, Vendor Managed Inventory Implementation and public healthcare, Healthcare supply chain practices and collaborative healthcare supply chain. Searching techniques were tailored to the unique characteristics of each database. The search was conducted for empirical articles that were published from 2010. The choice of ten years range was to identify any evolving trends in the enablers of VMI in public health sector. The results found by keywords were reviewed and all irrelevant articles to the study were excluded depending on the objective and the scope of the study through the following steps: (i) All results titles were reviewed and articles found to be irrelevant were excluded basing on the objective and scope of the study; (ii) Since some articles were duplicated across databases and were found with different group of key words, all duplicated articles were excluded; (iii) Articles were checked for their availability in full text and those which were not available in full text were excluded; (iv) The abstracts of the remaining articles were read and those found irrelevant basing on the scope of the study were excluded; (v) Full texts of the remained articles were read and those which did not match the interest of the study were excluded; (vi) Finally, the research manually searched the reference list of the selected articles for more articles and those found relevant were selected. The steps followed are shown in the following figure.


Steps followed in article selection
Keywords From 2010
Vendor Managed Inventory
PubMed 105
Science Direct 80
Google Scholar 30,000
T.R
PubMed;10
ScienceDirect;6
Google Scholar; 39
Duplication Review.
Vendor Managed Inventory and hospital
PubMed;18
Science Direct;389
Google Scholar; 17100
PubMed;1
Science Direct;5
Google Scholar; 18
Full Text Availability Review
Vendor managed inventory implementation
PubMed; 11
Science Direct; 2485
Google Scholar; 17800
PubMed; 1
Science Direct; 0
Google Scholar; 18
Abstract review
Vendor Managed Inventory and public healthcare implementation
PubMed 3
Science Direct 231
Google Scholar 15500
Taylor & Francis 308
Google Scholar; 13
Taylor & Francis 2
F.T. R
Articles selected; 8
R.L.S.
Articles selected; 8
Abstract review
PubMed 0
Science Direct;0
Google Scholar 6
Healthcare supply chain practices
PubMed 106
Science Direct 4177
Google Scholar 49400
Full Text Availability Review
PubMed 2
Science Direct1
Google Scholar 6
Healthcare collaborative supply chain
PubMed 11
Science Direct;64
Google Scholar17600
Duplication Review.
T. R.
PubMed;3
ScienceDirect;1
Google Scholar; 7
Key
Steps 1-6
F.T.R-Full Text Reading
R.L.S-Reference List Screening

4. FINDINGS AND DISCUSSIONS

The steps followed led to 13 articles being selected for full text reading. After reading all the 13 articles, 5 articles were excluded remaining with eight that were included in this study. Manual screening of reference list did not result to any articles since most of the articles in the reference lists had been discovered during the initial stages of searching. A number of challenges were encountered during the selection stages. First, only one article was found that comprehensively addressed the topic and outcome of interest of this study. Second, none of the articles examined had all the objects the study was interested in finding. Thirdly, some articles just identified but offered brief or no explanation at all on VMI in public health sector. Another challenge was full text availability since most articles were conference papers contain only abstract. Fourthly, some studies were carried out in different disciplines such as electronic, hence making it difficult to relate with the healthcare industry. Some articles were also excluded since they had not been published, for instance, dissertations for PhD. From the analysis of the selected articles, 14 enablers of VMI adoption in public healthcare sector were identified. However, since some of the articles had the same theme but with different names, this study harmonized them into 11 factors.

Table 4: Enablers of VMI in Public Healthcare Sector

Enabler	Studies	Studies Reviewed
Supplier resources and capabilities	3	8
Type of supplier	1	8
Size of the hospital	2	8
Top management support	5	8
Willingness to share information	7	8
Quality information	2	8
Predictable demand	2	8
Integrated Information System	5	8
Trust/Relationship	5	8
Shorter Purchasing Cycle	2	8
Automation	1	8
Educational Program	1	8
Elimination of waste	2	8
Continuous improvement	1	8

3.1 Size of the hospital

With regard to the size of hospital, Krichanchai and MacCarthy (2016), who examined VMI in two public hospitals, one private hospital and two distributors, noted that private pharmaceutical distributors favoured a large hospital to enjoy economies of scale in transportation and inventory management costs. Sumrit (2019) added that a hospital needed to be large enough to invest enough resources in VMI system. However, the size of hospital has no effect in the implementation of VMI with public (CMS) distributors since the goal is to increase accessibility to medicine. In addition, central medical departments are large enough to invest required resources in the system. This implies that East African countries can implement VMI even in small rural dispensaries that serve marginalized population that cannot afford private health insurance cover.

3.2 Vendor capability

The vendors to be engaged in VMI must have sufficient resources to implement and sustain VMI. Implementation of VMI may increase the transportation cost of the vendor in the short-run. Vendors should therefore have the financial capacity to meet such costs. Furthermore, in most studies reviewed, vendors were required to collaborate with the hospital to set up an IT system for sharing information. Sumrit (2019) describe vendor capability in terms of adaptive capability and reliability. The vendor must

have the capacity to consistently supply the required medicine at the hospitals at the required time. Similarly, Sumrit (2019) argues that the vendor must have adaptive capability to quickly adjust processes and structures of VMI to effectively respond to unexpected increase or decrease in demand at the hospital. While this factor is only identified by three out of the eight studies, Krichanchai and MacCarthy, (2016), and Krichanchai and Krichanchai (2010); and Sumrit (2019) it is very impactful in the public sector, where CMS is the only vendor supplying to various hospitals countrywide. Sufficient funding by the government and flexibility of CMS in their sourcing practices are critical to enable central medical stores implement VMI in all the hospital across the country.

3.3 Top management support

Four studies (Krichanchai & MacCarthy, 2016; Krichanchai & Krichanchai, 2010; Jarial & Khatri, 2013; Matopoulos and Michailidou 2013; Sumrit, 2019) found top management support a key enabler in implementation of VMI in both private and public selector. In the private sector, top management can approve or disapprove the VMI technique, while in public sector they are required to mobilize and incentivize pharmacists, IT staff, physicians' nurses and other hospital workers to support the program. Top management commitment also helps to moderate other enablers of VMI to ensure that it is implemented successfully (Sumrit, 2019). Matopoulos and Michailidou (2013) found that the ability of top management to recognise the perceived benefits of implementing VMI acts as impetus for initiation of the program between the hospital and supplier. Top management support therefore emerges as key enabler of VMI adoption in public hospitals in Kenya and Tanzania. Top political leadership must recognise the benefits of VMI in public healthcare sector; enact healthcare policies enabling its adoption and effective implementation. Their role may span beyond mere policy enaction to direct involvement in allocating resources and supervising the implementation of the process.

3.4 Willingness to share information

This enabler was discovered in seven out of the eight studies reviewed signifying its importance. Krichanchai and MacCarthy (2016), study found willingness by the hospital to share information is a critical enabler of VMI implementation. The study identified that hospital may not be willing to share sensitive information with private distributors who might use the information adversely. However, VMI between public distributor and public hospitals pose no risks at all when sharing confidential and sensitive information since they are all government entities. Therefore, it is much easier to implement VMI in public healthcare sector using KEMSA and MSD than private vendors. Jarial and Khatri, (2013), also found that faster sharing of information was critical for the success of VMI in health sector, whether public or private. Matopoulos & Michailidou (2013) study revealed that trust between the hospital and the vendor was required to eliminate the risk associated with sharing sensitive information. On another hand, Lang and Chahal (2018) and Radzuan et al., (2014), studies reported that sharing information between the hospital and the vendor helps to increase the efficiency of the system, particularly in preventing the expiration of drugs either at the hospital's pharmacy or vendors' warehouse. Sumrit (2019) concluded that information sharing was one of the critical success factors having the ability to create other VMI enablers in healthcare sector. Therefore, East African countries should develop the information sharing capacity of all its public healthcare facilities. Healthcare practitioners and pharmacists must be able to share information on drugs with CMS without increasing their workload. A point of sales data should be utilized to directly share information with CMS whenever each drug is issued by pharmacists.

3.5 Quality Information

According to Radzuan et al. (2014), willingness to share information in VMI relationship is not enough. Parties in VMI must be willing to share quality information with each other to enable the success of the

program. Accuracy and timeliness of information were found to be key ingredients of quality information shared by the hospital to the vendor (Radzuan et al., 2014). Radzuan and colleagues (2014) reported that quality of information shared improves service performance of VMI. Therefore, hospitals must be willing to timely share accurate demand forecasts with the vendors to enable quick response by the vendor in case of increased volatility in demand. East African governments can increase quality of information shared by incentivising doctors and implementing ICT system that eliminates paperwork and transmits real-time data to CMS.

3.6 Predictable Demand Products

It was found to be easy to implement VMI with products whose demand can be accurately predicted (Krichanchai & MacCarthy, 2016). Krichanchai & MacCarthy (2016) found that providing accurate demand information to suppliers improved the effectiveness of the process. This implies that VMI does well when the demand of the products can be accurately forecasted and shared with the supplier. Since public healthcare facilities serve the common public, forecasting of the demand can be cantered around essential medicine products. These include products such as HIV antiretrovirals, malarial drugs and vaccines among others. Predictability of demand in public hospitals can also be enhanced through adoption of appropriate information system for collecting demand data.

3.7 Integrated Information Management

Four out of seven studies found out that information technology system was needed to facilitate sharing of information from the hospital to the vendor. Jarial & Khatri, (2013) study also found that automation of the VMI process especially feeding of information freed employees from manual repetitive tasks enabling them to pursue meaningful duties in the organization. The studies found that IT system enabled distributors to receive real-time information on actual stock level and demand of the products under VMI. Internally the hospital requires having an IT system that will enable it collect information on actual usage of medicine when it is prescribed and issued to patients. This point of sale data is passed to vendor to identify quick moving products, slow moving products and plan their replenishment as early as possible. Using standard product identification across all hospitals in public health sector was found to enable efficient communication with the vendor. An important finding by Radzuan and colleagues (2014) was that suppliers do not need to invest in complicated IT system for VMI to work. With a moderate IT system capability, VMI system could still be implemented. For instance, some public hospitals and CMS in Kenya and Tanzania can use Web portal and EDI to share information.

3.8 Trust and Partnership Relationship

Trust between the hospital and supplier was found to make VMI technique more sustainable in the public sector (Krichanchai & MacCarthy, 2016; Krichanchai & Krichanchai, 2010; Jarial & Khatri, 2013, Sumrit, 2019). According to Huoy and colleagues (2018), trust is important in VMI relationship since hospitals share sensitive information with vendors. Trust was needed to build quality relationships between the vendor and the hospital (Huoy et al., 2018). Beheshti and colleagues in their study in the retail sector explained that openness, trust, commitment, frequency of interaction and mutual interdependency between vendors influenced their quality of relationship. Jarial and Khatri, (2013) identified that establishing long-term relationship based on trust and mutual interest was needful for successful VMI program. Trust between hospitals and centrals medical stores can be enhanced by providing opportunities for hospitals to periodically review the system and provide their insights on improvement since the CMS will be the primary initiator of the program. The Ministry of Health in East African countries should also seek the support of other stakeholders such as labour unions of healthcare practitioners before implementing the program.

3.9 Shorter Purchasing Process

This factor was identified by Krichanchai and Krichanchai (2010) study in Thailand. Given that VMI aims to be more responsive to customer demand, shorter purchasing processes in public sector will enable the supplier to meet customers' demand better. This particularly applies to CMS who purchase on behalf of public hospitals. To meet unexpected demand, CMS may be required to shorten their purchasing process to ensure there are no shortages of drugs at hospitals due to long purchasing process. This can be done through continuous improvement of CMS purchasing process through establishing strategic long-relationship with suppliers of essential medicine.

3.10 Education Program

Jarial and Khatri (2013) found that having education program in place to create awareness, and provide information on the application of VMI program, its objectives, the advantages of the having the program and how they could contribute its success is unavoidable enabler. The study's findings also reported that the main goal of education program should be to reduce fear and uncertainty. This is very crucial in public sector which is not used to and can be resistant to drastic changes.

4.0 CONCLUSION

Pharmaceutical stock-outs in public healthcare facilities have been a cause of many preventable deaths within the East African communities. Stemming from various causes such as delay in delivery by central medical stores, failure by hospitals to pay central medical stores, diversion of public medicine to private healthcare clinics among other factors have denied essential medical services to taxpayers, and vulnerable population whose public healthcare sector is their primary source of healthcare. As East African governments such as Kenya focus on providing universal healthcare coverage, addressing drug shortages in the public hospitals is a top-priority issue. This paper conducted a systematic review to understand the enabling factors to the adoption of vendor managed inventory in public healthcare sector. The systematic literature review identified eleven enablers of VMI in public healthcare sectors. These findings have varying implications on public healthcare policy and practice. In terms of policy, to implement VMI, the government must act as the guarantor of payment to the vendor for all medical supplies consumed at public hospitals. In practice, the ownership of medicine and medical supplies should be transferred to CMS should it be given the responsibility of implementing VMI.

One of the key lessons learnt is that, it is easier to implement VMI in public healthcare sector using central medical stores than in the private sector due to elimination of opportunistic risks arising from the private vendors and the small size of some public healthcare facilities hence not be attractive to private vendors. Secondly, while studies reviewed identified that key enablers of VMI in public healthcare sector are top management support, information technology system, partnership relationship and trust between the vendor and hospitals, sharing of quality information, vendor capacity and educational program, these factors need not to be in place all at once for VMI to be implemented. Top management support and vendor capability are quintessential for initiating VMI in public hospitals using CMS as the main vendor. This systematic review provides theoretical foundation for further research on VMI implementation in public healthcare sector. Having identified various VMI enablers, it is possible to carry out empirical studies on each enabler under different methodological, contextual and theoretical approaches. Despite of its usefulness, this study has a number of limitations. First, most of the studies reviewed were done in Asian countries, with a different contextual structure to those in East African community. Secondly, only two databases PubMed and Science Direct and one search engine, Google Scholar were used, hence providing a limited number of articles to be reviewed. Consequently, this study recommends for further systematic reviews that will involve expanded databases and empirical studies done in Africa.

5.0 RECOMMENDATIONS

This study generally recommends that Kenya and Tanzania and other East African countries should adopt VMI technique in distributing and replenishing drug stock levels in all public hospitals. This system eliminates drug stock-outs, which have continuously contributed to preventable deaths. In seeking to implement VMI, the study suggests that central medical stores such as KEMSA in Kenya, MSD in Tanzania and other CMS in East African Community should be financed to initiate VMI in all public hospitals. The financing should aim at recruiting pharmaceutical personnel to be deployed in all public hospitals to manage drugs and timely liaise with regional or centralized distribution centres to replenish according to the rate of consumption. The financing should also be aimed at building information system capacity to be used in VMI. Secondly, this study recommends that CMS should own drugs at hospital level. Implementation of VMI will ensure continuous supply of medicine to hospitals. Without proper measures this medicine could be diverted to private hospitals and clinics without any money being paid to the government. To mitigate this, In-consignment VMI, where the vendor owns inventory at the customer premises and only paid for the portion consumed or sold should be implemented. This will ensure that CMS are solely held responsible for any medicines stolen, and for the millions of dollars of drugs that expire at national warehouses.

Thirdly, the government should provide guarantee of payment to central medical stores. Delay in payment by hospitals, and a regional government has been one of the major causes of drug stock-outs in hospitals. When VMI is implemented, central medical stores will be required to supply drugs regardless of hospitals' payment. Therefore, the government should provide guarantee of payment in case the hospitals and regional governments fail to pay CMS on time, it should pay to ensure that civilians do not suffer from drug stock-outs. This will also enable CMS to pay its suppliers in time. Lastly, implementation of VMI should solicit the support of all stakeholders, ranging from the ministry of health, regional governments, hospitals leaders and healthcare staff to civil society organisations. Investing in educational program at the ministry and organisational level is therefore critical for realizing the support and engaging civil society to inspect the availability of medicines at hospitals provides cost-effective way of evaluating the success of the program.

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