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Relationship between effective drug inventory control management and stock-outs in Kenya's public hospitals: a case study of Kenyatta National Hospital and Defence Forces Memorial Hospital

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RELATIONSHIP BETWEEN EFFECTIVE DRUG INVENTORY CONTROL MANAGEMENT AND STOCK-OUTS IN KENYA'S PUBLIC HOSPITALS: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL AND DEFENCE FORCES MEMORIAL HOSPITAL

By

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of degree by this or any other university. To the best of my knowledge and belief, the thesis contains no material previously published or written by any other person except where due reference is made in the thesis itself.

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ABSTRACT

The purpose of the study is to evaluate the relationship between effective drug inventory control management and Stock outs in two leading Kenya public hospitals: Kenyatta National Hospital and Defence Forces Memorial Hospital. The study objectives were: a) to determine how policies, systems, staff capacity affect drug inventory control management in Kenya's public hospital; and b)to establish association between inventory management and stock outs in the two hospitals. Descriptive survey design involving a mix of qualitative and quantitative research methods was used. The instruments used were self - administered questionnaires, one on one in - depth interviews and observations. The main conclusion from the study was that the relationship between stock out and determinants of drug inventory management were non-significant in both hospitals. The main recommendation from this study is that more determinants other than the ones in this study need to be evaluated to establish the real causes of drug stock outs in public hospitals.

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My special gratitude goes to the Almighty God for giving me the strength to do this course. Special thanks go to Strathmore University for giving me a chance to study this course. Many thanks go to my committed supervisor Prof Kokwaro for his guidance, genuine support and professional corrections.

DEDICATION

I dedicate this research project to my family for their emotional support, inspiration prayers and love during the entire course period and for understanding while I was in class for long hours. I could not have done it without you!

ACRONYMS

AIDS	Acquired Immune-Deficiency Syndrome
ANOVA	Analysis of Variance
ARV	Anti retro viral
DFMH	Defence Forces Memorial Hospital
EML	Essential Medicine list
GDP	Good Distribution Practices
IDS	Information Drug Service
KNH	Kenyatta National Hospital
MTRH	Moi Teaching and Referral Hospital

DEFINITION OF KEY TERMS

ABCclassification: A close check on items that have different levels of importance or impact and should be handled or controlled differently.

Essential drugs: Drugs that satisfy the healthcare needs of majority population and needs to be stocked all the time in a healthcare facility.

Leadtime: Number of days expected for the completion of an operation or process.

Stockouts: A situation where the demand of an item cannot be fulfilled because the item is not in the current inventory.

VENclassification: Item categorization based on the importance of the item or health impact of the item due to prevailing diseases.

Vitaldrugs: They potentially involve lifesaving with significant withdrawal side effects.

CHAPTER ONE: INTRODUCTION

1.1Background information

Inventory management is the overseeing and controlling of the ordering, storage and use of components that a company will use in the production of the items it will sell as well as the overseeing and controlling of quantities of finished products for sale. A business's inventory is one of its major assets and represents an investment that is tied up until the item is sold or used in the production of an item that is sold. It also costs money to store, track and insure inventory. Inventories that are mismanaged can create significant financial problems for a business, whether the mismanagement results in an inventory glut or an inventory shortage. The cost of maintaining inventory is included in the final price paid by the consumer. Inventory management in its broadest perspective is to keep the most economical amount of one kind of asset in order to facilitate an increase in the total value of all assets of the organization; human and material resources (Kotler, 2002).

A hospital supply system should ensure adequate stock of all the required items to maintain uninterrupted supply. This necessitates the effective and efficient inventory management of pharmacy store by keeping a close supervision on important drugs, prevention of pilferage, and priority setting in purchase and distribution of drugs. Poor inventory management in health institutions, especially the public health facilities, results in wastage of financial resources, poor availability of some essential medicines, stock outs, and stock losses. This has been experienced in many countries and has contributed to failure to attain better health outcomes (MSH, 2012).

Poor inventory management can be inferred from inaccurate stock records, inadequate and unsystematic monitoring of medical stock, and indefinite procedures in terms of frequency and quantity. These incidences can be traced to inadequate know-how of inventory management and its actual management (MSH, 2012). Lloyd*et al*(2008) revealed that despite initiatives to increase the availability and access to ARV's in East African countries through the Global Fund to Fight AIDS, the medical supply management in the region's countries was found to be deficient. This was attributed to inadequate capacity to quantify needs, place orders and adequately keep records.

Ultimately, the principal goal of inventory management involves having to balance the conflicting economics of not wanting to hold too much stock. In fact, inventory management can bring out significant improvement not only in patient care but also in the optimal use of resources (Kagashe&Massawe, 2012). Continuous management can therefore, provide the value added services to health stakeholders. Inventory management is, therefore, a key measure in ensuring a continuous and consistent supply of drugs in a hospital set-up. It is crucial to know the levels of medicines in a pharmaceutical set-up in order to maintain the availability of essential drugs, to avoid stock outs, overstocking and expiries. As such, there is need to assess and improve inventory management to attain optimization of the medical supply system in terms of its efficiency. This can be supported through linking product selection decisions to patient needs; basing financing and procurement decisions on established quantification methodology; and improving information system that provides feedback for tracking stock movements (Chandani*et al*., 2009; Kagashe&Massawe, 2012; Roy *et al*., 2009). Inventory management can,therefore,

be defined as the continuing "process of planning, organizing and controlling inventory" that aims at "minimizing the investment in inventory while balancing supply and demand" (Dessell & Zgarrick,pg 383, 2009).

1.1.1 *Pharmaceutical procurement in Kenya*

Kenya's pharmaceutical procurement is divided into two classes; public and private sector procurement. Public sector procurement in Kenya is both centralized and decentralized. Centralized procurement falls under the responsibility of a semi-autonomous procurement agency, the Kenya Medical Supplies Agency (KEMSA) which is the primary public procurement agency for pharmaceutical and related products. Public sector tender bids are not made publicly available; however bid documents are available to bidders who purchase them. Details regarding public sector tender awards are publicly available. Procurements are based on prequalification of suppliers, although prequalification is only carried out where items are procured by quotation (Government of Kenya, 2010).

Further, the government pharmaceutical supply system has a central medical store at the national level and there are 8 public regional warehouses. National guidelines on Good Distribution Practices (GDP) have been produced, but there is no licensing authority that issues GDP licenses. Hence, a list of GDP certified wholesalers and distributors in the public sector do not exist. On the other hand, legal provisions exist for licensing wholesalers and distributors in the private pharmaceutical procurement sector of Kenya. However, a list of GDP-certified private sector wholesalers and distributors does not exist (Government of Kenya, 2010).

1.1.*2 Overview of Public Hospitals in Kenya*

Health facilities or hospitals in Kenya are either public or private. Public hospitals and healthcare facilities are owned and run by the government while the private hospitals are owned and run by non–governmental organizations (NGO), religious institutions, private individuals and commercial enterprises. In Kenya, services offered by public hospitals are cheaper and more accessible than the ones offered by the private hospitals (Gabriel, 2012). According to a report by the Ministry of health (2013), as compared to faith-based and private based health facilities, government owned health systems have a huge network of facilities, hence accessibility.

Public health care system in Kenya is currently organized in four levels. The first level of the system is the community units which are run by community health workers and volunteers who are supervised by the community health extension workers employed by the Ministry of Health. The second level is the dispensaries and health centerswhich are run by nurses and clinical officers. Dispensaries offer outpatient services and antenatal monitoring while health centers offer basic inpatient services such as maternity services. The third level consists of the former (before promulgation of the new constitution) primary and secondary hospitals which offer both the inpatient and outpatient services. They are staffed with doctors, clinical officers and nurses. Some secondary hospitals serve as training centers to nurses, clinical officers and offer medical internships to medicalstudents. The highest level is the national referral facilities that offer highly specialized care which are used for training and to support research (M.O.H, 2013)

1.2Statement of the Problem

Health care organizations all over the world are looking for ways to improve operational efficiencies and reduce costs without affecting patients care and services. Effective inventory management in health care is one of the key factors for success. The challenge in managing inventory is to balance the supply of inventory with demand. All health care organizations would ideally want to have enough inventories to satisfy the demands of their patients and wouldn't want to inconvenience clients due to inventory stock-outs. On the other hand, due to financial constraints, they do not want to have too much inventory staying on hand because of the cost of carrying inventory. Enough but not too much is the ultimate objective according to Coyle, Bard and Langley, (2003).

At Kenyatta National Hospital (KNH), the Office of the Auditor General, (2012) states that, "although the Hospital has established re-order levels for all types of drugs that it stocks, it occasionally experiences shortages of vital and essential drugs. For example, an analysis of the stock of drugs maintained at the pharmacy that serves the Accident and Emergency Centre indicated that the pharmacy did not have in store some vital and essential drugs for several periods lasting up to three months.

At Defence Forces Memorial Hospital (DFMH), despite reasonable funding and existence of maximum and minimum order levels, stock outs have been experienced. There are many instances where cash purchases are resorted to in order to avert crisis of missing stocks. Moreover, the quarterly patient feedback reports have repeatedly shown dissatisfaction with the stock-out that they encounter.

The value of this study is to establish whether there exists a relationship between effective drug inventory management and stock outs. A positive finding will help health managers in addressing the stock outs problem by improving on the inventory management.

1.3 Research objectives

The study's main objective was to establish relationship between effective drug inventory management practices and stock outs and identify potential ways of strengthening the systems. The specific objectives were as follows:

1. To determine the effects of systems (distribution channels and use of ICT) on drug inventory control management in Kenya's public hospitals
2. To find out the effects of staff capacity and competence on drug inventory control management in Kenya's public hospitals
3. To describe the policy, legal and regulatory framework governing drug inventory control management in Kenya's public hospitals

1.4 Research questions

In line with the research objectives, the following research questions guided the study:

1. How do systems (distribution channels and use of ICT) affect inventory control management in Kenya's public hospitals?

2. How does staff capacity and competence affect inventory control management in Kenya's public hospitals?

3. What are the policies and regulations guiding drug inventory control management in Kenya's public hospitals?

1.5Justification of the study

The findings of the study will benefit various groups of people involved in management of drugs in public health facilities. The study is expected to contribute new knowledge relating to relationship between drug inventory control management and stock outs in public hospitals.

The study findings are also expected to aid the policy formulation by the ministry of health both at the national and the county level on issues relating to drug inventory control management. Findings will also inform pharmaceutical managers, consultants and medical managers on the factors to consider while implementing a drug inventory control management system.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents relevant literature on the determinants of effective drug inventory management in healthcare facilities. The chapter also presents a theoretical and a conceptual framework upon which the research is based.

2.2Overview of Drug Inventory Management

According to Katie (2015), in a pharmacy environment inventory refers to medications and medical supplies used in the daily operation of a pharmacy. Inventory management in a pharmacy involves to a large extend the input of the pharmacy technicians'. The main work involved in the inventory management operations of a pharmacy is the balance of stock used for medication to ensure that the needs of patients are adequately addressed.

The other reasons for having an inventory management system in a pharmacy is to ensure that there are no unexpected drug stock outs, there is a frequent costing and maintaining of inventory, the cost of ordering of drugs from wholesaler is minimized. Inventory system also ensures that the time taken in ordering and purchasing drugs is reduced. It also prevents costs associated with damages and expiration of inventory and it reduces the total cost to the pharmacy and hence the entire health care facility (Katie, 2015).

A critical component of pharmaceutical services in a hospital set up relates to drug supply and management. Jitta, *et al.* (2003) consider the availability of medicines as a key indicator of healthcare in African settings. This is because medicine provision acts as a key link between patients and health service providers, especially for treatment-seeking

patients. As noted by Clark and Barraclough (2010), sustained medical supply in terms of drug provision contributes to beneficial health outcomes of patients. Many studies have been carried out in the field of drug inventory management, particularly in developing countries (Chandani *et al*., 2006; Jitta *et al*., 2003; Pharasi, 2007). Harries, *et al*. (2007) stated that inadequate provision of drugs in many health facilities in Africa is reportedly due to poor procurement processes and distribution practices. This finding is supported by Schouten *et al.* (2011) whose descriptive study carried out in Malawi showed that maintaining an uninterrupted supply has been a challenge in many African public health care facilities and as a result, drug stock-outs have been recorded. Stock outs lead to treatment disruption, which increases the risk of treatment failure and the development of drug resistance –scenarios that have been observed in sub-Saharan public health care facilities (Harries, 2005).

Drug inventory management is part of the general inventory management in a health facility, whether private or public. It enables optimal availability of drugs within the facility to ensure quality service delivery. Decision making within public health care facilities which includes hospitals is not determined so much by profit making; the important thing is stocking essential drugs. The management should be cautious of what to stock at any given time to ensure that there is neither overstocking nor under stocking of drugs within the hospital (Simon, 2013).

The public view of the effectiveness of Kenya's health system is frequently linked to the availability of essential medicines. Public health condition such as HIV/AIDS, TB and

Malaria are associated with the availability of essential drugs. Medicines have also become trading commodities in Kenya. It is the duty of the government to ensure that there is a proper medicine environment and policies (World Health Organization, 2010).

Inventory management practices have an effect on organizational performances. Esther & Elizabeth (2015) undertook a study on inventory management practices within public institutions in Kenya and reported that inventory records accuracy has a positive impact on the organizational performance. To ensure inventory records accuracy, there is need for effective use of computerized systems. According to Abel & George (2014) there is need for ERP implementation to not only provide accuracy in inventory records management but it also increases the efficiency of inventory management by improving its speed and reducing the cost.

According to the World Health Organization (2010), human resource is still a challenge in the pharmaceutical sector. As the sector grows, there is need to have a mix of skills as opposed to the traditional pharmacy skills. Apart from the pharmacy skills, the personnel are also expected to be equipped with other skills such as regulatory, quality assurance and public policy issues. A study by Codeliver and Terevael (2012) in Tanzania cited poor logistic skills as one of the factors contributing to drug stock outs in hospitals.

In Kenya, drug stock outs in public hospitals had dire consequences on the health care of a large population. According to W.H.O (2010), "Medicines have become major sources of revenue generation and profit incentives for providers, especially in the private sector".

This irrational use of medicine has made medicine unaffordable to a large population in Kenya.

2.3 Drug Inventory Analysis

According to Geethe *et al*., (2014) when drug inventory analysis is classified based on its priority and access by different managerial levels in a healthcare facility, the outcome is an effective drug inventory management with minimal use of money and less drug supply shortages. An effective drug inventory control management leads to quality provision of healthcare to patients. The two mostly used classifications in inventory management are; ABC classification and the VEN classification.

2.3.1*ABC Classification*

ABC analysis is one the most widely used tool for materials management. It is also known as Pareto's Law or "80–20 Rule" (Coyle *et al*., 2003). This classification was developed by Wilfred Pareto, an Italian philosopher and economist. He observed that a very large percentage of total national income and wealth was concentrated on a small percentage of population. This rule of thumb expresses that 80 % of total value is accounted by 20 % of items. This analysis is considered a universal principle. It is therefore widely used in many situations of businesses namely: Class A represents 20 % of materials in inventory and 75 % of the inventory value; Class B represents 30 % of materials in inventory and 15 % of the inventory value and; Class C represents 50 % of material in inventory and only 10 % of inventory value.

According to ABC classification, it suggests that more analysis should be applied to materials with high inventory value. Class A should be most extensively handled and Class C is analyzed little (Gaither &Grazer, 1999). Advantage of ABC classification is

that controlling small numbers of items amounting to 10-20 % will result in the control of 75-80 % of the monetary value of the inventory held.

If items in the inventory are not classified, managing and handling materials would be very expensive since equal attention is given to all items. Having classified the inventory, different levels of control can be assigned to items in the different classes. Srinivasan (2008) has explained the selective control procedures for ABC classification used in hospital pharmacy as follows.

Very strict control procedures should be used with Class A items and the controller should have great authority. Inventory held in safety stock should be very low or none compensated with more frequent order placements. Consumption control and product movement should be reviewed regularly – weekly or daily. Number of sources for high valued items should be increased in order to ensure good supplier performance and reduction in lead time. Purchases of items should be centralized. Class B can be controlled by middle management. Low safety stock policy is applied to this class with quarterly or monthly orders. Past consumption can be used as a basis for calculating order quantity. There should be two or four reliable suppliers to ensure that lead time is reduced.

Power can be delegated to user department to determine stock level. Class C items do not need to be highly controlled. Since the items have the lowest value compared to the class A and B, orders can be placed at a greater volume to take advantage of quantity discount. Rough estimates are sufficient to manage class C materials.

Although ABC analysis suggests putting great clerical effort on class A items, importance of class B and C however should not be overlooked. Especially in hospital pharmacy, there might be medicines from A, B and C in one prescription. Shortage of class C drug can lead to a failure in medical treatment if it is vital for the illness.

2.3.2 VEN *Classification*

VEN classification is a method that pays attention to criticality of drugs. Drugs are categorized into three groups based on basis of priority and importance to patients' health.

-V: Vital drugs potentially involve lifesaving. They have significant withdrawal side effects. Drugs that are crucial to providing basic health services are included in this group as well.

- E: Essential drugs: An effectiveness of this group is less severe when compared to vital drugs but they are significant for illnesses.

-N: Nonessential drugs: They are used for minor or self – limited illness. Drugs that are still questionable about their efficacy also belong to this class. High cost drugs for marginal therapeutic advantage are also an addition.

To identify drugs by using this approach, a panel of pharmacists, doctors with different specializations should be set up since opinions can differ. Drugs which appear in all categories are identified as vital. Items which fall into vital and essential are marked as vital and the ones which appear in essential and nonessential are classified as essential. This technique allows staff to be able to manage different degree of management to

control inventory. The degree of importance of procurement and control procedures reduces from vital to nonessential drugs.

2.4 Systems for Inventory Management

2.4.1*Information technology*

A study done in the United States of America (USA) by Burgunda (2008) on the development of a computerized system in a hospital set up where Investigational drug service (IDS) worked with the health – system pharmacy's information technology staff and informatics pharmacists observed work flow and the efficiency of the system found out that Web IDS improves day to day operations within a health care organization. It also found that it helped efficiency and meets regulatory requirements for investigational drugs.

Toshio *et al*. (2005) also undertook a study on automation in drug inventory management and found out that improved inventory management due to a developed computerized system with the help of pharmacists makes inventory functions easier in real time. The system can easily search a huge database and efficiently find out the dates when dugs will expire in records containing purchases and deliveries. There is also reduced workload in the part of the management of the health facility.

According to Katie (2015), computer based inventory management system is used both in the hospital and retail pharmacies. The computer – aided drug inventory system to a large extend assist in the maintenance of inventory and at the same time eases the processing of prescription of orders and management of patients files. Some wholesalers have computer

programs that allow pharmacies to access the wholesalers' information and they (pharmacies) can go ahead and order for the drugs on the wholesalers' website.

2.4.2*Distribution channels*

Distribution Channels in drug inventory control refers to the means through which drugs are distributed from the wholesaler to the pharmacy. Pharmaceutical services are among the most devolved functions in the Kenya's government as mandated by the constitution; Among the pharmaceutical services is the distribution of medicine but there has been a series of strikes by the medical personal in various hospitals across the country due to poor service delivery which is aggravated by among other complains the lack of medical supplies in the hospitals. According to W.H.O (2007) distribution of pharmaceutical drugs is critical in ensuring efficiency in any healthcare facility. The availability of the right drugs in the right quantities at the right time is facilitated by an efficient drug distribution system which subsequently improves the quality of healthcare services to the patients.

Kenya Medical Supplies Agency (KEMSA) is the main provider of drugs to public hospitals in Kenya and the agency is supposed to provide drugs depending on the demand of the hospitals but there are stock outs within the hospitals with one of the reasons being poor distribution. According to Mwathi& Ben (2014), poor distribution of drugs contributed to essential drug stock outs by 91.2%. The other factors such as funding and inappropriate selection of drugs contributed to the stock outs by 58% while irrational uses of drugs contributed by 56%.

A study on the effects of procurement process on the distribution of pharmaceutical drugs in public hospitals of Kenya found out three components that contribute to the

distribution of pharmaceutical drugs. The three contributing factors are, contracting, specification design and procurement planning (Evelyne & David, 2014).

2.5 Staff capacity for Inventory Management

A study carried out in Zimbabwean public health facilities, where drug supply management is carried out by nurses under the supervision of pharmacy technicians, showed that the introduction of a record keeping system allowed for improved quantification resulting in more readily available pharmaceuticals. The study reported that inventory management improved with on-the-job training and with more frequent supervisory visits by pharmacy technicians who assisted with stock management, checking of stock records and help in setting stock levels (Moloto, 2005).

According to Dorothy, Esther & Elizabeth (2015) poor performance of Kenyatta National Hospital (KNH) is contributed by the fact that there is inadequate trained staff in the inventory department. In hospitals both in the private and the public sector in Kenya, pharmacists are employed to run the pharmacy department and as Dorothy, Esther & Elizabeth (2015) recommend, there is need to take the staff in the pharmacy department through inventory management training for quality service delivery in the hospital and hence improved performance. A study on availability of essential medicines in Kenya's public hospitals by Mwathi& Ben (2014) found out that among the factors that contribute to stock outs is the irrational use of drugs which is caused by lack of sufficient training of the prescribers.

2.6 Policies on drug inventory management

The Kenya Health policy strategic plan (2014 – 2030) states that the government of Kenya through the ministry of health works closely with the public health facilities in Kenya to ensure that there is timely delivery of goods and services which in turn results into quality health care provision. Though the county government is responsible for the provision of health care within the counties, the Kenya's constitution (2010) mandates the ministry of health with the task of formulating policies, setting standards, provide health services and create and establish an enabling environment while also regulating service delivery provision (Margaret, 2015).

The Kenya National Pharmaceutical Policy (2008) outlines the relevant product, personnel for provision of pharmaceutical services and the key institutional framework and processes required to ensure access to medicines for the population (Ministry of Medical Services, 2008).

Public hospitals in Kenya are compelled to follow government procedures in every undertaking. According to Dorothy, Esther and Elizabeth (2015) these long procurement procedures have a negative effect on drug inventory management since it slows down the process. The study suggests that there is need for public hospitals to do away with these procurement procedures to minimize delays in the inventory management.

2.7 Stock Levels

An efficient inventory system is one that ensures that there is sufficient stock at all times. Quality health care services in hospitals is realized when patients get the medication they

need. This implies that for quality health care services, availability of essential drugs is essential. According to Mungu (2015) drug inventory management is influenced by the nature of the demand; "For product characterized by erratic demand, a short life cycle or product proliferation, a more responsive supply chain and larger buffer inventories may be needed to meet a desired customer service level".

There is need to have enough stock of essential drugs all the time. W.H.O defines essential drugs as the medicines that cater for the primary needs of the population which are selected carefully and systematically based on evidence based process. Not only should these essential drugs be available but in appropriate dosage forms with an assurance of quality and adequate information (Mungu, 2015).

2.8 Theoretical Framework on Determinants of Effective Drug Inventory Management

The following theories, key concepts and ideas exist in relation to determinants of effective drug inventory management.

2.8.1 *Theory of Economic Order Quantity (EOQ)*

EOQ model was developed by F.W.Haris in 1913 and is also known as "Wilson EOQ" model(Arsham, 2006).The EOQ model considers the tradeoff between ordering cost and storage cost in choosing the quantity to use in replenishing item inventories. A larger order-quantity reduces ordering frequency, and, hence ordering cost/month, but requires holding a larger average inventory, which increases storage (holding) cost/month. On the other hand, a smaller order-quantity reduces average inventory but requires more frequent ordering and higher ordering cost/month.

Determining the optimal order-quantity will require two things that are in short supply in most public hospital in Kenya. First, is the knowledge about costs and demands; For example, in the general supplies area, in order to use the 'EOQ model, 'you need to know what it costs to place an order, and how much it costs to hold an item in inventory. Given enough time and effort, we can find out what those numbers are, but, at best, they would be estimates. Now, let's suppose it costs, say, $100 a year to get those estimates for each of the 2,000 general-supply items we are talking about, and to keep those numbers up to date. Once we plug those numbers into this formula and determine the 'optimal' order-quantity, will using that order-quantity save us atleast the $100/year that it is costing us to feed that formula? In other words, if we save $90/year by making better decisions, but it costs us $100/year to make those better decisions, then we have lost $10/year!"

Another thing that's in short supply is enough expertise to know which inventory-management system we should use to manage the different inventories we manage. For example, some ofthese items are expensive, others are very inexpensive; someperish,some don't, some become obsolete quickly, others don't. There are lots of differentsystems available—EOQ, just in time (JIT), stockless inventory, vendor managed inventory (VMI), to name just a few—but each of these has overhead connected with it. It is logical that the more sophisticated the model, the 'better' the order-quantity decision, but it also makes common sense that the more sophisticated model will be more expensive to install and keep up to date.

2.8.2 *Information Communication Technology (ICT)*

ICT can be described as a technical instrument to communicate information between the users (Allal-Cherif&Babai, 2012). The importance of ICT is that it can help the

organization to grow and remain competitive in the market (Juma, 2006). Even though the intention of ICT is to achieve economic growth, but a relationship between ICT and financial performance is still in question. For example, an empirical study conducted byKoellinger (2006) found a positive impact of ICT on production output, but not on financial performance while labourpositively contributed on financial performance. There can be different attitudes of people in using ICT and can be a result of four factors such as: convinced user, forced user, frustrated user, and unconvinced user. However, ICT cannot function without commitment of staff (Allal-Cherif&Babai, 2012). Therefore, it is of paramount importance for the organization to motivate, educate and train or even force the members of staff to commit themselves in ICT (Garaca, 2011). But without measuring how ICT contributes to optimize performances, a resistance to change by staff cannot be overcome (Ruankaew& Williams, 2013). On the other hand, Francesco (2013) mentioned that there are three main goals of ICTwhich include: to rationalize expenditure, reducing administrative confusion and costs, and fostering operational efficiency. Even though the literature makes it clear that ICT is so important, Ruankaew& Williams (2013) exposed that the use of ICT is still new and there is a lot to be done to improve its efficiency in most of the organizations. Likewise, Garaca (2011) indicated that a retiring workforce in government sectors still need to be convinced of the usefulness ofICT for their business transactions.

2.8.3 *Staff Capacity*

Human capital can be described as a combination of skills, knowledge, and experience by people or population viewed in terms of their value or cost to an organization (Nikbin, Saad, &Ismai, 2010). Human capital plays an integral role to achieve desired goals of the organization (Gottschalk *et al*., 2010). A qualitative study by Naidoo &Wu (2011)

indicated a remarkable result from an interviewed manager who explained that "without human capital, there is no future in the organization". Similarly, authors (Nikbin *et al.*, 2010; Naidoo & Wu, 2011; Gottschalk &Gudmundsen, 2010) have highlighted that human capital can improve the image of the organization. A study conducted by Nikbin *et al.* (2010) using a survey data collection from 102 managers in various public sectors of the northern region of Malaysia indicated that accessing the ability and trustworthy of individuals in very much important in the language of human capital. Failure to achieve desired goals can be a cause of poor evaluation and unavailability of resources which include talents, skills, commitments, and willingness of people to work (Aldehayyat& Anchor, 2010). Correspondingly, a study conducted byNaidoo & Wu (2011) using a mixed method in UK, US Australia, and New Zealand with questionnaires distributed to 570mid-level international business managers indicated that a good organizational performance can be attained if dimensions of commitment, strategy, experience, and people's role factors are taken into account. In this respect, it is imperative for the executive management to give support that is necessary for employees to cope with difficulties during their work (Ramanigopal, 2012). Normally, the difficulties of attaining good performance require management support, and if not, an organization needs to hire experts. But since labour cost is too high, Pryor, Anderson, Toombs &Humphreys (2007) promote that the workforce should assist each other by sharing ideas in their respective fields

2.8.4*Inventory Strategy*

The amount of inventory that should be kept depends on various factors and upon the activity that is defining the stock (Wild, 2002). Different perspectives on inventory management also cause the ideal stock levels to be ambiguous. From a sales perspective

high service levels are important. The sales department wants to offer their clients the best service. Running out of stock is thus not desirable, and therefore seen from this perspective, high safety stocks seem a perfect solution and not a problem. The management on the other hand needs to satisfy several different objectives: where customer service is being just one of them. Management often wants to reduce costs as much as possible in order to generate more profit or be more competitive. Maintaining large inventories costs money and consumes working capital that can also be applied for other means. Additionally an inventory manager also has another perspective on the matter. The inventory manager responsible for purchasing raw materials might for instance be evaluated by his superiors on the prices he pays for purchased goods. In that case buying large quantity is more beneficial, but additional stock might be the result. From his own perspective he might judge that the purchases are done perfectly, but the stock levels might become too high and in the end cost more money. There will always be tensions between different perspectives and therefore a universal answer to the question 'what is the correct amount of stock?' cannot be given.

2.9 Summary of the Literature Review

This chapter has presented relevant literature on the determinants of effective drug inventory management. An overview of ABC and VEN classifications which are commonly used in inventory management is highlighted in this chapter. The challenge of inadequate drugs in health facilities in Africa is due to poor procurement processes and distribution practices. The literature indicates that the use of ICT in Inventory control management increases efficiency due to the ease of communication between different distribution channels. KEMSA is the only agency mandated with the distribution of drugs

to public hospitals in Kenya depending on demand. All the staff within an health facility that are mandated with handling of drugs need to be empowered on policy and procurement skills to reduce stock outs and ensure efficiency in drug inventory management in hospitals. Public hospitals have no other choice other than to follow government procedures in every undertaking which includes drug inventory management.

2.10 Conceptual Framework

The conceptual framework below presents the relationships between the study variables. The independent variables for the study were: Information Technology, Distribution channels, Staff skills and competency and the government policies while the dependent variable is the effective drug inventory management. The conceptual framework is shown on figure 2.1.

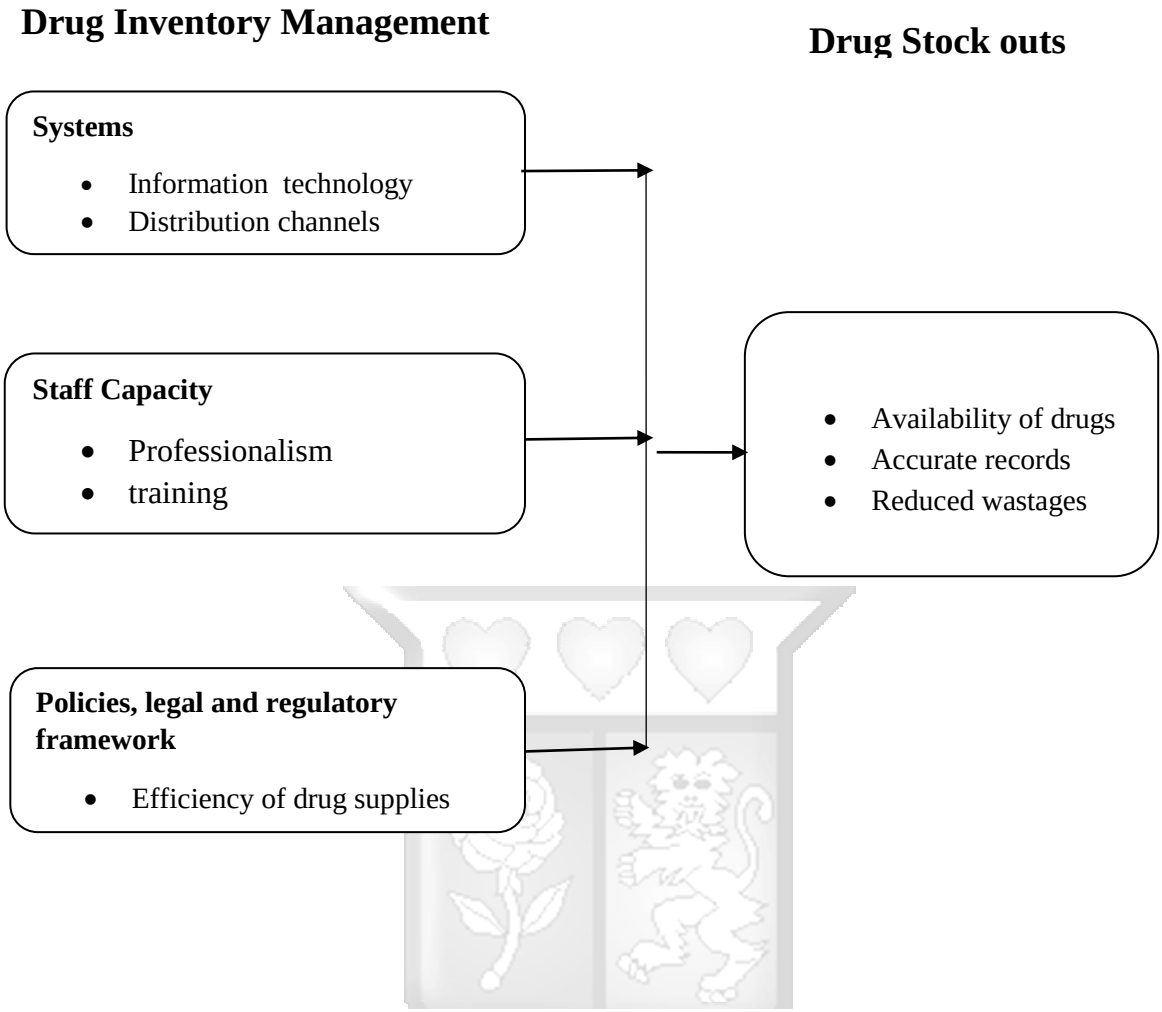

Figure 2.1 Conceptual Framework

2.9.1 Drug Inventory management (*Independent variables)*

Systems: This will explain the extent to which ICT is utilized in drug inventory management within the health facilities. It will also explain the flow of drugs from procurement to dispensing to the patients.

Staff Capacity: The number of employees dealing with drug inventory management compared to the work load. The professionalism of the staff handling drugs, training opportunities and training needs. Employee satisfaction and retention will also be assessed

Policies, legal and regulatory framework: This will describe the standard operating procedures in handling of drug within the facilities under study, to find out the procurement procedures adopted and the efficiency of the public procurement act 2005 in drug inventory management

2.9.2 Drug Stock outs (*Dependent variable)*

This will measure how the independent variables lead to availability of essential drugs, accurate data and reduced drug wastages.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes research design, study population, data collection instruments, data collection and data analysis.

3.2 Research Design

The study was descriptive survey design. According to Kothari (2003), the main advantage of this design is that it enables the researcher to assess the situation in the study site during the study period. The selected design is appropriate as it involves collecting data to answer the research questions which involves a description of drug inventory control management in the selected hospitals. Both quantitative and qualitative approaches were used to balance strengths and weakness of each approach and for in depth analysis.

The quantitative approach involved the use of self-administered questionnaires (appendix II) by staffs who are involved in drug inventory management within the facility. Another quantitative approach technique is the use of a drug checklist (appendix IV). This will show stock outs of essential drugs in the previous year.

For qualitative approach, in-depth interview was done using an in-depth interview guide (appendix III), and observations. Observation was important especially when checking if there are computers in the offices and if they are actually utilized by the staff. Observation was also be used to check on the flow of the drugs. There was need also to

see if there are well documented records which guided the filling of the drug checklist (Appendix IV).

3.3 Sampling

3.3.1Study Site –KNH and DFMH

The two institutions where the study was undertaken are two of the top most referral hospitals in the country. Kenyatta national hospital serves the general public while Defence Forces Memorial Hospital serves the discipline forces and their dependence. The two hospitals were chosen because of being among the three public hospitals in the country that do independent drug procurement. The study involved personnel who deal with drug inventory control management; the pharmacy and the procurement / administration departments.

3.3.2 Population and Sampling

According to Borg and Gall (2003), a population is all members of a real or hypothetical set of people, events or objects to which we wish to generalize results of the research. The study targeted stakeholders of the sampled hospitals who are tasked with the responsibilities of drug inventory management. According to Best and Kahn (2006), "a sample is a small proportion of the population selected for observation and analysis. By observing the characteristics of a carefully selected and representative sample, one can make certain inferences about the characteristics of the population from which sample is selected. To be considered valid, there has to be an acceptable procedure for selecting the sample."

The study was purposive. A census of eligible respondents was done. The sampling method was purposive in that it specifically targeted eligible personnel who are involved in drug inventory management. In each of the departments involved in the study, the respondents were people who had worked within the facility for at least one year. The respondents targeted for the in-depth interviews were people who are involved in decision making within the facility.

Inclusion Criteria: All the personnel who had been working in the pharmacy or the administration / procurement department for the last one year and above.

Exclusion Criteria: Personnel who had worked within the departments for a period less than one year.

3.4 Data Collection Methods

The study was undertaken between the months of January and March 2016. The quantitative questionnaires (Appendix II) were administered purposively to the personnel in the pharmacy and the administration/procurement departments. The respondents answered the questions with the guidance of a research assistant. In-depth interview were done with the staff involved in decision making within the organization. The interviews were guided by the in-depth interview guide in Appendix III. There is a checklist in appendix IV which was filled by the staff who keeps drug ledgers. Observations were also done while doing the data collection. While undertaking data collection the researcher also checked if there were computers within departments visited within the facility and if they were utilized. In addition the researcher also checked how the person filling in the checklist would be retrieving data (either manually or electronically).

3.5 Data Analysis

The quantitative data analysis was done using Statistical Package for Social Packages (SPSS). This involved both descriptive and inferential statistics. Descriptive statistics was presented in tabular and chart forms. Inferential statistics was used to show the relationship between effectiveness of drug inventory control management and stock outs.

3.6 Ethical Considerations

The research was approved by Strathmore University ethics committee (Appendix V) before data collection commenced. The information so obtained was treated with utmost confidentially and used only for the intended MBA-HCM dissertation and the respondents were assured of the same. The healthcare workers participating in the study were required to sign an informed consent (see Appendix 1) which clearly stipulated the benefits and challenges to the respondents. The Informed consent was vetted and cleared by the Ethics Committee of Strathmore University Business School.

CHAPTER FOUR: RESEARCH FINDINGS

4.0 Introduction

This chapter presents the research findings using descriptive statistics and inferential analysis. Also a comparison of the two institutions of study is presented.

A total of 40 respondents were targeted by the study out of which 32 responded giving a response rate of 80%. Out of the 32 respondents, 15 were from Defence Forces Memorial Hospital, while 17 were from Kenyatta National Hospital. The respondents were people who had worked for more than one year in the respective organization.

4.1 General Information

This section presents the general information of the respondents including: gender, level of education, the role of the respondent in drug inventory management and how often a physical drug inventory is done in the organization.

4.1.1 *Distribution of the Respondents by Gender*

41.9% were female while 58.1% were male. At DFMH 33.3% were female while 66.7% were male. At KNH 50% were female and 50% were male (chart 4.1.)

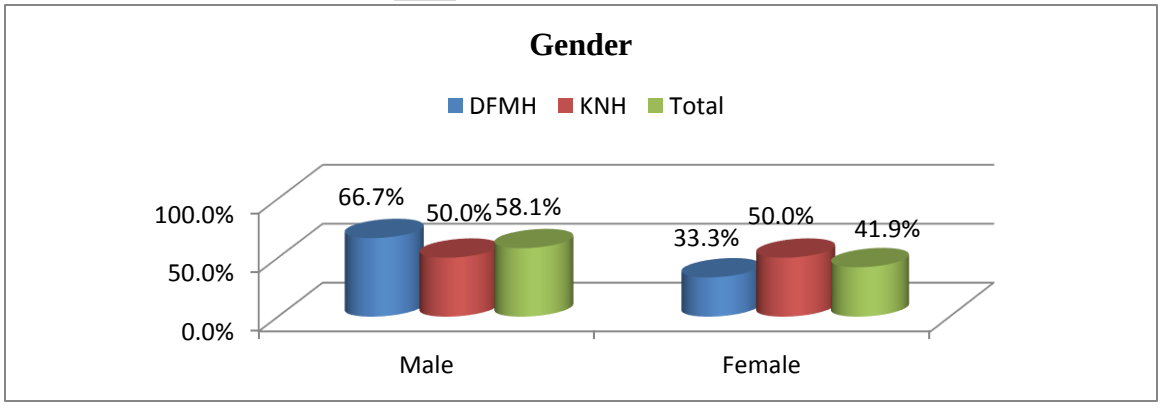

Chart 4.1: Distribution of Respondents by Gender

4.1.2 *Distribution of the Respondents by Level of Education*

!2.5% of the respondents were Master's Degree holders, 18.8% had Bachelor's degree, 59.4% had diplomas and 9.4% had a certificate (chart 4.2.).

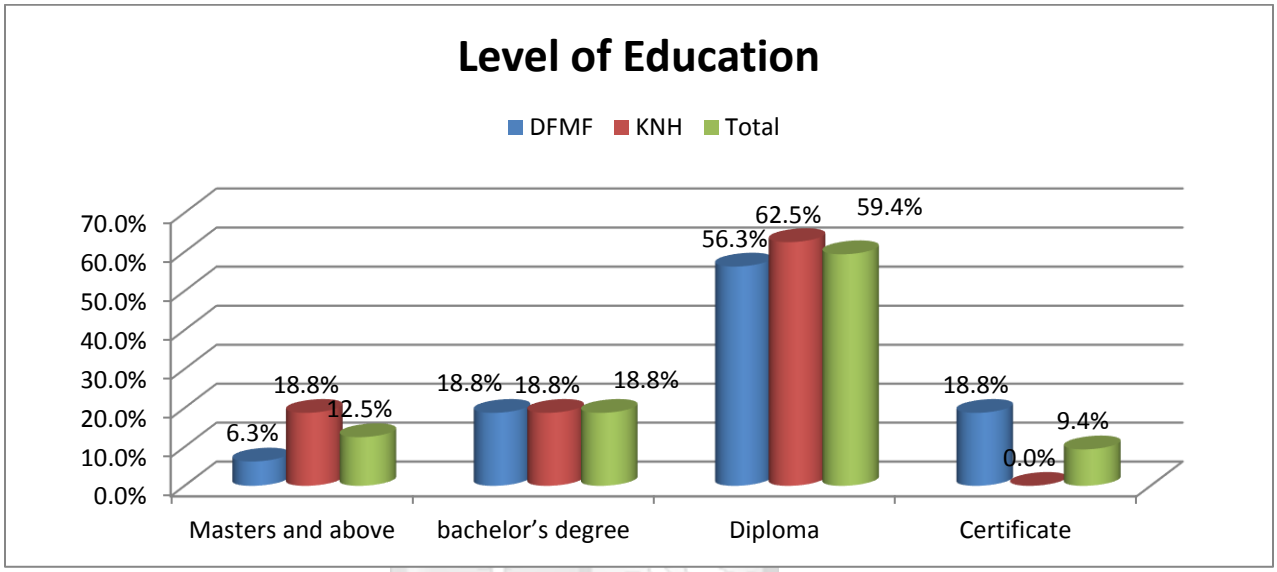

Chart 4.2: Distribution of Respondents by Level of Education

4.1.3 *Distribution of the Respondents by Profession*

21.9% of the respondents were Nurses, 28.1% were Pharmacist Assistants, 28.1% were Pharmacist, 3.1% were senior Supply Chain officers, 12.5% Were Assistant Supply Chain Officers and 6.3% were Pharmaceutical technologists (chart 4.3)

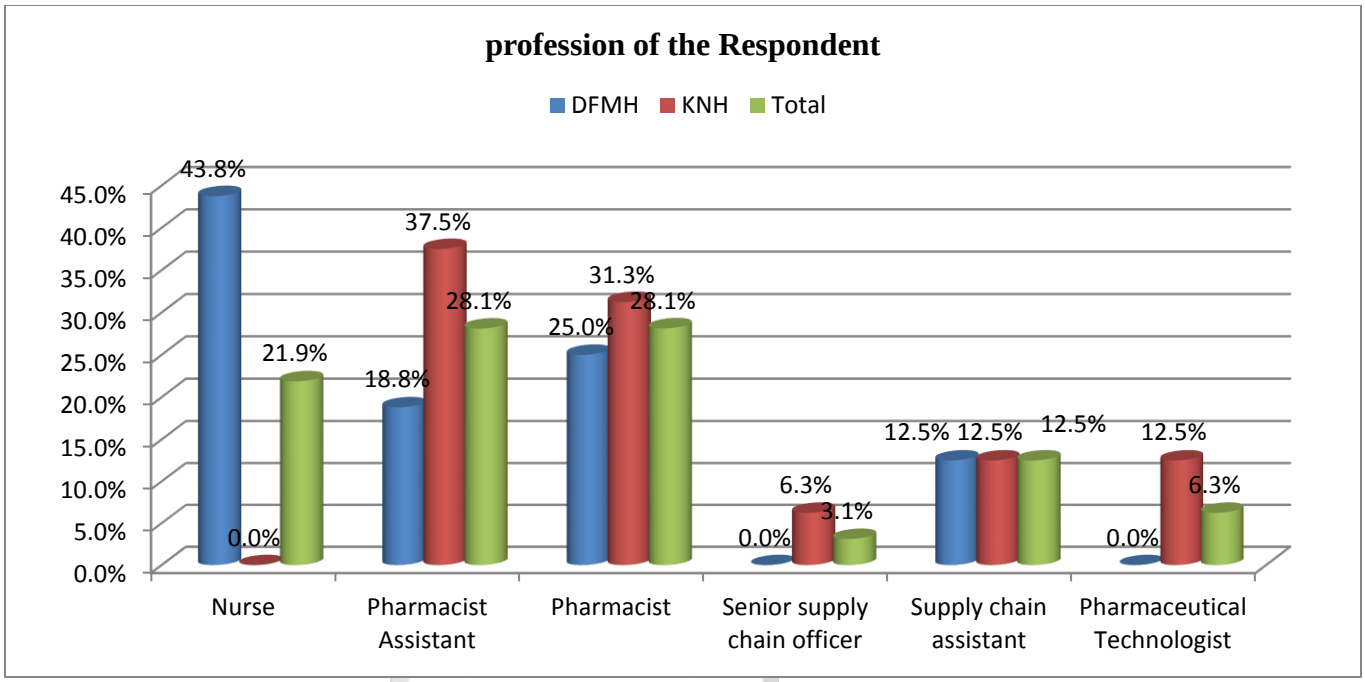

Chart 4.3: Distribution of Respondents by Role Played in Drug Inventory Management

4.1.4 *Frequency of Carrying out Physical Inventory*

40.6% of the respondents indicated that physical inventory was done once in every six months, 21.9% indicated that it was done once per month, 12.5% indicated that it was done once a year and 15.6% indicated that it was done quarterly.3.1% of the respondents indicated that it was done weekly, impromptu and during a daily handover (chart 4.4)

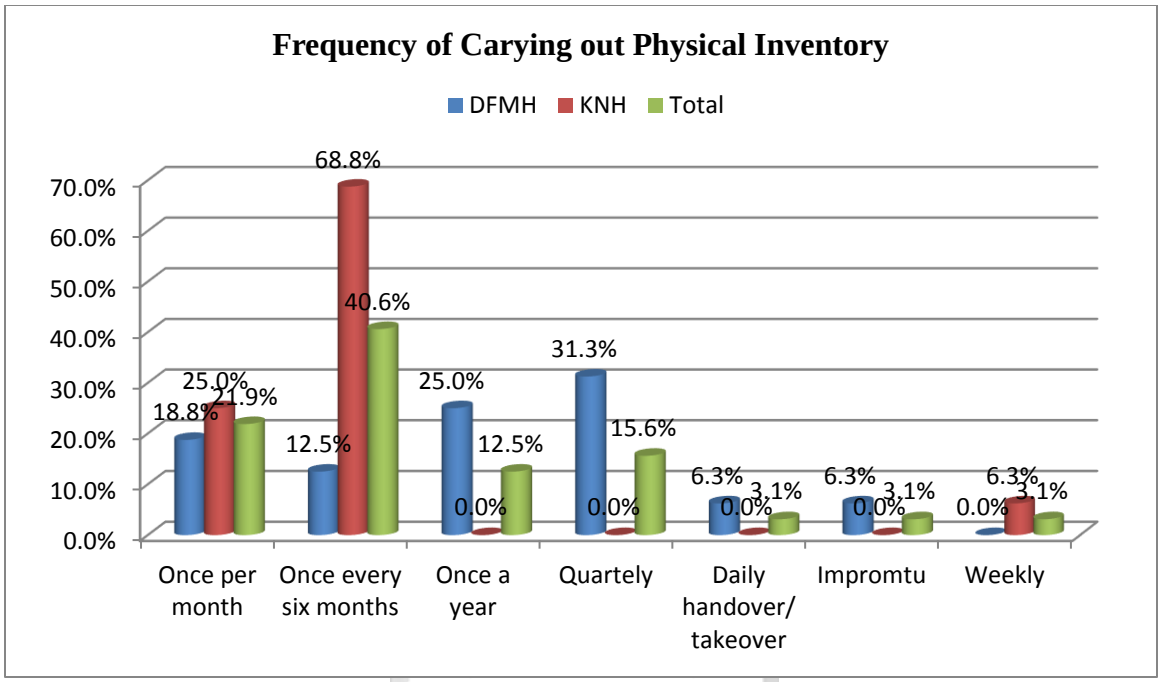

Chart 4.4: Distribution of Respondents by Frequency of Carrying out Physical Inventory

4.2 Use of Systems in Drug Inventory Management

The respondents were asked to indicate whether certain aspects involving systems were used for drug inventory management in the facilities. Systems in this case involved distribution channels and the use of ICT (Table 4.1)

Table 4.1 Systems

		Hospital					
		DFMH		KNH		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Do you use computer software for drug inventory control?	Yes	13	86.7%	15	88.2%	28	87.5%
	No	2	13.3%	2	11.8%	4	12.5%
	Total	15	100.0%	17	100.0%	32	100.0%
Is the software updated regularly?	Yes	10	66.7%	12	70.6%	22	68.8%
	No	5	33.3%	5	29.4%	10	31.3%
	Total	15	100.0%	17	100.0%	32	100.0%
Were you trained on the use of the software?	Yes	11	73.3%	16	94.1%	27	84.4%
	No	4	26.7%	1	5.9%	5	15.6%
	Total	15	100.0%	17	100.0%	32	100.0%
Is the software used regularly	Yes	8	53.3%	9	52.9%	17	53.1%
	No	7	46.7%	8	47.1%	15	46.9%
	Total	15	100.0%	17	100.0%	32	100.0%
Are stock cards, bin cards and monthly consumption records used to manage drugs?	Yes	13	86.7%	16	94.1%	29	90.6%
	No	2	13.3%	1	5.9%	3	9.4%
	Total	15	100.0%	17	100.0%	32	100.0%
Are stocks cards are filled with generic names?	Yes	12	80.0%	17	100.0%	29	90.6%
	No	3	20.0%	0	0.0%	3	9.4%
	Total	15	100.0%	17	100.0%	32	100.0%
Are stock cards filled with the form of dosage	Yes	8	53.3%	14	82.4%	22	68.8%
	No	7	46.7%	3	17.6%	10	31.3%
	Total	15	100.0%	17	100.0%	32	100.0%
Do you always implement the FIFO (First In First Out) system in your store	Yes	13	86.7%	15	88.2%	28	87.5%
	No	2	13.3%	2	11.8%	4	12.5%
	Total	15	100.0%	17	100.0%	32	100.0%
Does your facility use expiry date tracking chart to monitor expiry of drugs?	Yes	10	66.7%	10	58.8%	20	62.5%
	No	5	33.3%	7	41.2%	12	37.5%
	Total	15	100.0%	17	100.0%	32	100.0%

Table 4.2 Chi square test between systems and stock outs for both KNH and DFMH

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.457[a]	15	.944
Likelihood Ratio	8.935	15	.881
Linear-by-Linear Association	.251	1	.617
N of Valid Cases	32		
a. 23 cells (95.8%) have expected count less than 5. The minimum expected count is .09.			

Table 4.3 Chi square test between systems and stock outs for KNH

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.606[a]	12	.650
Likelihood Ratio	11.349	12	.499
Linear-by-Linear Association	.057	1	.811
N of Valid Cases	17		
a. 20 cells (100.0%) have expected count less than 5. The minimum expected count is .06.			

Table 4.4 Chi square test between systems and stock out for DFMH

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.568[a]	10	.671
Likelihood Ratio	8.574	10	.573
Linear-by-Linear Association	.016	1	.899
N of Valid Cases	15		
a. 18 cells (100.0%) have expected count less than 5. The minimum expected count is .13.			

Table 4.1 shows responses on two important questions i.e. regular updating of software and tracking of expiries pointing to drug inventory management inefficiency. The overall inferential analysis (Tables 4.2, 4.3 and 4.4) finds this to be statistically non-significant. The two hospitals have the same results of statistical insignificance for systems against drug stock outs

4.3 Staff Capacity

Responses on staff capacity are summarised in table 4.2.

Table 4.5 Staff Capacity

		Hospital					
		DFMH		KNH		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Is your primary profession in line with what you are doing?	Yes	15	100.0%	17	100.0%	32	100.0%
	No	0	0.0%	0	0.0%	0	0.0%
	Total	15	100.0%	17	100.0%	32	100.0%
Have you been trained for the job you are doing?	Yes	14	93.3%	17	100.0%	31	96.9%
	No	1	6.7%	0	0.0%	1	3.1%
	Total	15	100.0%	17	100.0%	32	100.0%
Do you need any other training on any field related to drug inventory management?	Yes	12	80.0%	10	58.8%	22	68.8%
	No	3	20.0%	7	41.2%	10	31.3%
	Total	15	100.0%	17	100.0%	32	100.0%
Are there adequate staff working on drug inventory management	Yes	6	40.0%	6	35.3%	12	37.5%
	No	9	60.0%	11	64.7%	20	62.5%
	Total	15	100.0%	17	100.0%	32	100.0%
Did you primary training have anything to do with drug inventory management	Yes	11	73.3%	15	88.2%	26	81.3%
	No	4	26.7%	2	11.8%	6	18.8%
	Total	15	100.0%	17	100.0%	32	100.0%
Are you compensated adequately (wages and salaries)	Yes	6	40.0%	9	52.9%	15	46.9%
	No	9	60.0%	8	47.1%	17	53.1%
	Total	15	100.0%	17	100.0%	32	100.0%
Are the working conditions within the facility favorable?	Yes	12	80.0%	14	82.4%	26	81.3%
	No	3	20.0%	3	17.6%	6	18.8%
	Total	15	100.0%	17	100.0%	32	100.0%
Are you happy with what you are doing?	Yes	13	86.7%	17	100.0%	30	93.8%
	No	2	13.3%	0	0.0%	2	6.3%
	Total	15	100.0%	17	100.0%	32	100.0%

Table 4.6 Chi square test between staff capacity and stock outs for both KNH and DFMH

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.305[a]	12	.589
Likelihood Ratio	14.347	12	.279
Linear-by-Linear Association	1.648	1	.199
N of Valid Cases	32		
a. 19 cells (95.0%) have expected count less than 5. The minimum expected count is .19.			

Table 4.7 Chi square test between staff capacity and stock outs for KNH

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.285[a]	12	.678
Likelihood Ratio	10.160	12	.602
Linear-by-Linear Association	2.124	1	.145
N of Valid Cases	17		
a. 20 cells (100.0%) have expected count less than 5. The minimum expected count is .06.			

Table 4.8 Chi square test between staff capacity and stock outs for DFMH

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.695[a]	8	.464
Likelihood Ratio	9.022	8	.340
Linear-by-Linear Association	.632	1	.427
N of Valid Cases	15		
a. 14 cells (93.3%) have expected count less than 5. The minimum expected count is .13.			

In Table 4.5, over 60% of the respondents in both hospitals report on inadequate staff numbers working in the inventory management. Although this can be viewed as a pointer to inefficiency in inventory management, the inferential analysis at Tables 4.6, 4.7 and 4.8 find the determinant staff capacity as a statistically insignificant against drug stock outs.

3.4 Policies and Legal frameworks

The responses on aspects pertaining policies and legal frameworks on drug inventory existed in their organization are summarised in table 4.3.

Table 4.9 Policies

		Hospital					
		DFMH		KNH		Total	
		Count	Column N %	Count	Column N %	Count	Column N %
Do you have standard operating procedures (SOPs) in your hospital?	Yes	14	93.3%	17	100.0%	31	96.9%
	No	1	6.7%	0	0.0%	1	3.1%
	Total	15	100.0%	17	100.0%	32	100.0%
Are all the members who are involved in handling drugs aware of these SOPs?	Yes	11	73.3%	16	94.1%	27	84.4%
	No	4	26.7%	1	5.9%	5	15.6%
	Total	15	100.0%	17	100.0%	32	100.0%
Are the set SOPs strictly adhered to?	Yes	11	73.3%	11	64.7%	22	68.8%
	No	4	26.7%	6	35.3%	10	31.3%
	Total	15	100.0%	17	100.0%	32	100.0%
Does your hospital use drug formulary?	Yes	14	93.3%	17	100.0%	31	96.9%
	No	1	6.7%	0	0.0%	1	3.1%
	Total	15	100.0%	17	100.0%	32	100.0%
Is the drug formulary strictly adhered to?	Yes	9	60.0%	5	29.4%	14	43.8%
	No	6	40.0%	12	70.6%	18	56.3%
	Total	15	100.0%	17	100.0%	32	100.0%
Do you use public procurement	Yes	13	86.7%	17	100.0%	30	93.8%
	No	2	13.3%	0	0.0%	2	6.3%
	Total	15	100.0%	17	100.0%	32	100.0%
If yes in 4.6 above, does the act lead to stock outs?	Yes	9	60.0%	10	58.8%	19	59.4%
	No	6	40.0%	7	41.2%	13	40.6%
	Total	15	100.0%	17	100.0%	32	100.0%

Table 4.10 Chi square test between policies and stock outs for both DFMH and KNH

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.037[a]	15	.449
Likelihood Ratio	17.396	15	.296
Linear-by-Linear Association	.039	1	.844
N of Valid Cases	32		
a. 22 cells (91.7%) have expected count less than 5. The minimum expected count is .09.			

Table 4.11 Chi square between policies and stock outs for KNH

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.457[a]	9	.189
Likelihood Ratio	14.118	9	.118
Linear-by-Linear Association	1.813	1	.178
N of Valid Cases	17		
a. 16 cells (100.0%) have expected count less than 5. The minimum expected count is .06.			

Table 4.12 Chi square test between policies and stock outs for DFMH

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.091[a]	10	.943
Likelihood Ratio	5.628	10	.846
Linear-by-Linear Association	.091	1	.763
N of Valid Cases	15		
a. 18 cells (100.0%) have expected count less than 5. The minimum expected count is .13.			

From Table 4.9, over 70% of respondents in KNH think that the drug formulary isn't adhered to while about 60% of the respondents in both institutions think that the public procurement policies lead to drug stock outs. Inferential analysis of policies against drug stock found that this drug inventory determinant is not statistically significant.

CHAPTER FIVE: DISCUSSIONS

5.1 Introduction

This section discusses the finding presented in chapter 4.

The study aimed at establishing the relationship between effective drug inventory management and drug stock outs that are very common in public hospitals in Kenya. The study has identified three variables that are documented in many studies as the determinants of drug inventory management. The discussion will concentrate on effective drug inventory determinants which are Systems, staff and policy in relation to drug stock outs

5.2 Systems

Based on the findings in chapter 4, it's clear that both institutions believe in the importance of ICT in drug inventory management. This is evident from the user of computers in the pharmacy departments, 87.5% of the respondents confirm that they utilize computers for their inventory management practices.

Although over 50% of the respondents had misgivings on the robustness of software they used and frequency of updating, systems were not statistically significant when analyzed against drug stock outs. This finding is not in tandem with the conceptualized and theorized frameworks. Many studies, including Toshio et al. (2005) show improved efficiency with the use of computer and reduced stock outs among other benefits to organizations.

In this study the number of respondents may have been few leading to a statistical insignificance, although this may not negate completely the hypothesis.

5.3 Staff Capacity

From table 4.2 the respondents indicated inadequacies in numbers of staff required and also training gaps in the tools for effective drug inventory management. Theoretically the level of training of staff managing drug inventories are expected to impact positively and produce desired goals of the organization, like availability of drugs in hospitals.

Inadequate numbers with poor tools in terms of systems which are personnel multipliers, the expected outcome theoretically is inefficient inventory management which will not be able to sustain drug availability.

Statistical analysis of staff capacity against drug stock outs was found to be insignificant. Other studies show significant relationship between staff and availability of drugs. Moloto study (2005) shows the improvement in quantification of supplies and availability of pharmaceuticals when drug inventory is managed by skilled staff.

The numbers of staff working in the study hospitals may have been few to be able to produce results that were in line with other studies on the subject matter.

5.4 Policies and Legal Frameworks

From table 4.3, the respondents indicated that they had in place all the right policies that will promote availability of drugs expect in two cases where they talked of public procurement policies that were not addressing the need to procure drugs urgently and non-adherence to formulary by the hospital staff. The factors on policies and legal framework highlighted by the respondents are very weighty practically and documented

in other studies as contributor to drug stock outs. Statistically the policies were insignificant against drug stock out in both study sites.

A study by Dorothy et al (2015) in public hospitals showed how the availability of drugs was affected by the long procurement procedures that are a requirement in public procurement laws.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary of the study, conclusion and recommendation.

6.2 Summary of the Study

The purpose of this study was to find out the relationship between drug inventory management and stock outs. The study was guided by the following objectives: to determine how policies, systems, staff capacity affect drug inventory control management in Kenya's public hospital; and to establish association between inventory management and stock outs in the two hospitals

6.2.1 *The effects of systems in drug inventory management*

On systems, both the use of ICT and the distribution channels used in the hospitals was evaluated.

The findings show that ICT is used in public hospitals though it is not utilized fully. 87.5 % of the respondents indicated that there is use of computer software in drug inventory management. The software though is underutilized because it does not address all the needs of drug inventory management. The computerized system used for drug inventory management has challenges. Among the challenges is the system malfunction which leads to the system doing abnormal data manipulation consequently compromising data quality.

The flow of the drugs from the suppliers to the end users is satisfactory and transparent in Kenya's public hospitals. On reception of the drugs there is verification, then storage and

then distributing to the user departments. The procurement process is through competitive bidding. Procurement is strictly done using the public procurement and disposal act 2015 though in cases of emergencies cash ordering is used.

6.2.2 *Staff Capacity*

Both hospitals have shortage of personnel managing drug inventory. Recruitment of staff in the two hospitals is based on academic qualification. The staffs are doing what is in line with their profession. The personnel also have training gaps, some staffs working on drug inventory management require training on effective use of computerized system to manage drug inventory. Though the members of staff feel that the wages and salaries are not sufficient, they are satisfied with the work environment. There is a good retention of staff unless for dismissal in cases of pilferages. Public hospitals offer a chance to personnel to further their careers.

6.2.3 *Policies and Legal framework*

All public hospitals have Standard Operating Procedures governing them. There are procedures which govern the entire hospital while departments also have their own SOPs. All the members of staff are supposed to follow the laid down SOPs though some members of staff are not aware of them. 15.63% of the respondents indicated there are some members of staff who are not aware of the SOPs. The formulary is available in public hospitals as indicated by 96.88% of the respondents though 56.25% of the respondents indicated that the formulary is not strictly adhered to. The reason for not strictly adhering to the formulary is because of the changes in consumption trends. The public procurement act 2015 is adhered to by all the public hospitals but 59.38% indicated that this procurement process contributes to stock outs in the hospitals.

6.3 Conclusion

From the study, it was concluded that the three drug inventory determinants namely: systems, staff capacity and policies which were studied were found to be statistically insignificant against drug stock outs.

Although the studied determinants may have effect on stock outs, this study empowers us to conclude that their effect on stock outs isn't statistically significant

6.4 Recommendations

The following were the recommendations of the study:

The study recommends that more determinants other than the ones in this study need to be evaluated to establish the real causes of stock outs in public hospitals.

6.6 Areas of Further Research

The study was done in two centers, there is need to further the study to include more sites. Secondly more determinants like financing of public institutions need to be considered in further studies to give us more understanding of stock out in public hospitals.

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APPENDICES

APPENDIX I: INFORMED CONSENT FORM

January 2016

Dear Sir/ Madam

RE: REQUEST FOR DATA COLLECTION

I am a Master of Business Administration student at Strathmore University. I am required to submit as part of my course work assessment a research project report on "DETERMINANTS OF EFFECTIVE INVENTORY CONTROL MANAGEMENT IN KNH and DFMH". Your organization has been selected to participate in the study. I would appreciate you corporation in filling the questionnaires.

You do not have to participate at all, or, even if you agree now, you can terminate your participation at any time without prejudice. You also do not have to answer individual questions you don't want to answer. Your name will not be attached to the questionnaire and I will ensure that your participation remains confidential. (This consent form will be kept separate from the questionnaire for all participants).

A benefit you may experience by participating in this study is greater knowledge of your perceptions/feelings about the determinants of effective inventory control management systems in public health care facilities in Kenya.

_____ _____

Participant signature Date

_____ _____

Researcher Signature Date

APPENDIX II: SELF ADMINISTERD QUESTIONNAIRE

CASE STUDY: DETERMINANTS OF DRUG INVENTORY CONTROL MANAGEMENT IN KNH AND DMFH

Survey Questionnaire

Your organization has been selected to participate in the study. Any information given by you will be confidential. The information also will be used for academic purposes. Your participation will be highly appreciated.

Target Participants: *Staff*

	QUESTIONS	RESPONSES	INSTRUCTIONS
	Socio – Demographics		
1.1	Gender	□ Male □ Female	TICK THE MOST APPROPRIATE BOX
1.2	How long have you been working in the hospital	□Less than one year (*Close the interview*) □one year and above	
1.3	What is your highest level of education	□Masters and above □bachelor's degree □Diploma □Certificate □Others (*Specify*)	
1.4	What role do you play in drug inventory management in your hospital?	□Nurse □Clinical Officer □Pharmacist Assistant (basic) □Pharmacist Assistant (post basic) □Pharmacist □Chief supply chain officer □Senior supply chain officer □Supply chain assistant □Medical Assistant □Other (*Specify*)	
1.5	Who does inventory management of drugs?	□Nurse □Clinical Officer □Pharmacist Assistant (basic) □Pharmacist Assistant (post basic) □Pharmacist □Chief supply chain officer □Senior supply chain officer □Supply chain assistant □Medical Assistant □Other (*Specify*)	
1.6	How often is a physical inventory carried out?	□Once per month □Once every six months □Once a year □Other (*Specify*)	

QUESTIONS PERTAINING DRUG INVENTORY CONTROL MANAGEMENT

2.0	SYSTEM (Use of ICT and Distribution channels)			
	Indicate whether the following statements pertaining use of ICT and distribution channels in drug inventory management is done in your hospital; indicate if it is either "Yes" or "No"			
		Yes	No	

2.1	Do you use computer software for drug inventory control?	1	2	Circle the appropriate code Circle 1 for Yes and 2 for No
2.2	Is the software updated regularly?	1	2	
2.3	Were you trained on the use of the software?	1	2	
2.4	Is the software used regularly (is the data up to date)?	1	2	
2.5	Are stock cards, bin cards and monthly consumption records used to manage drugs?	1	2	
2.6	Are stocks cards are filled with generic names?	1	2	
2.7	Are stock cards filled with the form of dosage	1	2	
2.8	Do you always implement the FIFO *(First In First Out)*system in your store	1	2	
2.9	Does your facility use expiry date tracking chart to monitor expiry of drugs?	1	2	

3.0	STAFF CAPACITY			
	Below are questions relating to staff capacity within your facility kindly indicate whether it is a "Yes" or "No"			
		Yes	No	Circle the appropriate code Circle 1 for Yes and 2 for No
3.1	Is your primary profession in line with what you are doing?	1	2	
3.2	Have you been trained for the job you are doing?	1	2	
3.3	Do you need any other training on any field related to drug inventory management?	1	2	
3.4	If yes in Q3.3 above specify..... ……			
3.6	Are there adequate staff working on drug inventory management	1	2	
3.7	Did you primary training have anything to do with drug inventory management	1	2	
3.8	Are you compensated	1	2	

	adequately *(wages and salaries)*			
3.9	Are the working conditions within the facility favorable?	1	2	
3.10	Are you happy with what you are doing?	1	2	

4.0	POLICIES ON DRUG INVENTORY CONTROL MANAGEMENT			
	The following are questions on policies and legal frameworks within your hospital. Please indicate whether the answer is a "Yes" or a "No"			
		Yes	No	Circle the appropriate code Circle 1 for Yes and 2 for No
4.1	Do you have standard operating procedures *(SOPs)* in your hospital?	1	2	
4.2	Are all the members who are involved in handling drugs aware of these SOPs?	1	2	
4.3	Are the set SOPs strictly adhered to?			
4.4	Does your hospital use drug formulary?	1	2	
4.5	Is the drug formulary strictly adhered to?	1	2	
4.6	Do you use public procurement and disposal act 2005 in tendering for drugs?	1	2	
4.7	If yes in 4.6 above, does the act lead to stock outs?	1	2	

5.0	STOCK OUTS			
	The following are questions on stock outs. Kindly indicate whether the answer to the question is a "Yes" or a "No"			
		Yes	No	
5.1	Do you run out of stock on essential drugs	1	2	Circle the appropriate code Circle 1 for Yes and 2 for No
5.2	Does your facility have an	1	2	

	established maximum – minimum stock quantity?			
5.3	Do you place emergency orders sometimes?	1	2	
5.4	Is there a resupply quantity need set by the facility?	1	2	
5.5	Does the facility have a way to track the expiry dates of drugs	1	2	

6.0	EFFECTIVE DRUG INVENTORY CONTROL MANAGEMENT							
	Rate the following statements pertaining Stock levels of drugs in Your hospital. 1- Strongly agree, 2- Agree, 3- Agree in part, 4-Disagree and 5. Strongly disagree							
		1	2	3	4	5		
6.1	Drugs are available when needed	1	2	3	4	5	Circle the appropriate code	
6.2	There is accurate and up – to – date data on drug inventory control management	1	2	3	4	5		
6.3	Drugs expiry are reduced	1	2	3	4	5		
	THANK YOU							

APPENDIX III: IN – DEPTH INTERVIEW GUIDE QUESTIONNAIRE

In – depth Interview guide questions

Use of ICT and distribution channels within the hospital

1. Is there computerized information systems used for drug inventory control within the facility? (*Yes or no*)
2. If yes, how adequate is the current software useful for drug inventory control use? Does it address all the needs of the hospital in drug inventory?
3. Is the software used for all drug transactions from drug order, distribution, distribution and use?
4. How often is the software updated *(By updating of the software mean making the software up-to-date and updating the data)?*
5. Is all the staff in the drug inventory control chain conversant with the use of the system?
6. What are the challenges for the computerized system for drug inventory management?
7. How are the suppliers of drugs chosen in your facility (*Tendering process*)?
8. How is the coordination of the drugs from awarding the supplies contract to when it is administered to the patient *(Flow of drugs from the supplier to the patient/coordination of tasks related to drug inventory management)?*

Staff Capacity

1. How is the recruitment of staff who are tasked with drug inventory management done *(checking on the trained skills and the experiences)*
2. Is there any aptitude test for staff joining the department?
3. Do you have a standard orientation programme for new staff?
4. Are there structured courses to promote efficiency in drug inventory management?
5. Does the institution have a clear career progression for staff in drug inventory management?
6. Challenges in staff capacity, retention and motivation

Legal framework and regulations

1. As a public hospital do you use public procurement and disposal act and regulation 2005 for drug procurement *(if it is not used then what is being used)*
2. Are there set SOPs in your facility and are they strictly adhered to? (*when there are emergencies are you sometimes forced to break some regulations?*)
3. Does your facility use formulary to guide drug procurement?

Stock – outs

1. How severe is the issue of stock outs in your facility?
2. What causes stock outs in this facility?
3. Is there a strategy in place to curb the problem of drug stock – outs?
4. What suggestion could you recommend to reduce or eliminate stock – outs?

Effective drug inventory management

1. What are your proposals for having in place an effective drug inventory management *(by effective drug inventory management I mean a. drugs are available when need. b. there are reduced drug shortages, c. very low expiry/wastage of drugs)*

APPENDIX IV: STOCKOUTS CHECKLIST

Instruction: Kindly indicate by √ if the below mentioned essential drug was available throughout the month and use × there was a stock out of the drug at some point of the month.

For example if say Halothane was available throughout the year but was out of stock in May 2015, fill the checklist as follows

Drug	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
Halothane	√	√	√	√	×	√	√	√	√	√	√	√

Drug	Jan -15	Feb -15	Mar -15	Apr -15	May -15	Jun -15	Jul -15	Aug -15	Sep -15	Oct -15	Nov -15	Dec -15
Halothane												
Ketamine Inj 50mg (10ml)												
Lidocaine inj 2% (2ml)												
Atropine Inj (1mg)												
Ibuprofen tablets 200mg												
Morphine Inj												
dexamethasone Inj												
NaloxonInj 400microgramyg)												
Carbamezapine Tablets 200 mg												
Albendazole 200mg												
Amoxycillin + Clavulanic Acid Syrup 625 mg												
Gentamycin inj 80mg												
ClotrimazoleCream												

Artimetaer + lumefantrine 20mg												
Ferrous sulphate tablet 60mg												
Warfarin tabs 5mg												
Digoxin tablets 62.5mg												
Amlodipine 5 mg												
Terbinafine 250mg tabs												
Furosemide 20mg												

APPENDIX V: ETHICAL APPROVAL LETTER

Strathmore Business School

Monday, 27 June 2016

To whom it may concern

Dear Sir/Madam

INTRODUCTION – ISMAIL A. AWLE

This is to introduce Ismail A. Awle, admission number MBA HCM/79050/13who is an MBA HCM student at Strathmore Business School. As part of our SBS MBA HCMMaster'sProgram, Ismailis expected to do applied research and to undertake a project. This is in partial fulfilment of the requirements of the Master of Business Administration. He would like to request for appropriate data from your organization to help him finalize his research.

Ismailis undertaking a research project on **'DETERMINANTS OF EFFECTIVE DRUG INVENTORY CONTROL MANAGEMENT IN KENYA'S PUBLIC HOSPITALS: A CASE STUDY OF KENYATTA NATIONAL HOSPITAL AND DEFENCE FORCES MEMORIAL HOSPITAL.'** The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

Our MBA seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct usefulness to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest, if not of practical value to your organization.

We very much appreciate your support and we shall be willing to provide any further information if required.

Yours sincerely,

Prof. Gilbert Kokwaro

Director, Institute of Healthcare Management and
Academic Director, MBA in Healthcare Management