

**ORGANIZATIONAL PRACTICES INFLUENCING AVAILABILITY OF ESSENTIAL
MEDICINES AT HOSPITALS IN NAIROBI COUNTY**

DR ZIMBULU VICTOR (M.B.Ch.B)

H70/69478/2013

Telephone: 0704507823

Email: zimbuluv@gmail.com

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF MASTER OF
SCIENCE IN HEALTH SYSTEMS MANAGEMENT AT THE SCHOOL OF PUBLIC
HEALTH, UNIVERSITY OF NAIROBI.

DECEMBER 2016.

DECLARATION

This study is my original work and has not been presented for award of a degree in this or any other University. All resources contained herein have been duly acknowledged.

Signature _____ Date _____

Name: Dr. Zimbulu Victor Mudembei

Registration Number: H70/69478/2013

SUPERVISORS:

This research project has been submitted for review with our approval as University supervisors:

Signature _____ Date _____

Dr. Richard Ayah. M.B.Ch.B, M.Sc, Lecturer, School of Public Health University of Nairobi

Signature _____ Date _____

Dr. Peter Ndirangu Karimi. BPharm, MBA, MSc Micro, MPharmClin Pharm, Lecturer School of Pharmacy University of Nairobi

DIRECTOR'S APPROVAL

Signature _____ Date _____

Prof. Mutuku A. Mwanthi. BSc, MSEH, PhD, Director School of Public Health, University of Nairobi.

DEDICATION

This project is dedicated to my parents, and my sister Lillian for their endless love, support and encouragement throughout my study period.

ACKNOWLEDGEMENT

I sincerely thank my supervisors Dr. Richard Ayah and Dr. Peter Karimi for their invaluable guidance and input throughout this study notably; proposal development, data analysis and development of this submission. I am humbled by your expert advice, insight and unfailing patience.

I am grateful to the School of Public Health for the opportunity to pursue the course as part of the inaugural class.

I specially acknowledge my research assistants who tirelessly helped me in collecting data.

Last though not least, I wish to thank all staffs; Department of Health, Nairobi City County for allowing me to conduct the study in County hospitals.

Above all I am grateful to the almighty God for life and sound health.

LIST OF TABLES

Table 1: Demographic characteristics of respondents	18
Table 2: Selection and quantification of medicines	22
Table 3: Funding for medicines	24
Table 4: Ordering process for medicine supplies.....	26
Table 5: Inventory management	28

LIST OF FIGURES

Figure 1: Conceptual Framework	10
Figure 2: Proportion of medicines dispensed to patients	19
Figure 3: Availability of five essential medicines in hospitals	20
Figure 4: Composition of medicine selection and quantification team.....	21
Figure 5: Sources of information for quantification of medicines supplies	23
Figure 6: Procurement methods for non-listed medicines	23
Figure 7: Financing levels for medicines	25
Figure 8: Medicine order frequency.....	25
Figure 9: Tender methods used in purchase of medicines	27
Figure 10: Major challenges in procurement of medicines.....	27
Figure 11: Challenges in inventory management.....	29

ABBREVIATIONS/ACRONYMNS

ACT	Artemisinin Combination Therapy
AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Therapy
EML	Essential Medicines List
HAI	Health Action International
HIV	Human Immunodeficiency Virus
ICT	Information Communication Technology
KEMSA	Kenya Medical Supplies Agency
LMICs	Low and Middle Income Countries
MDG	Millennium Development Goal
NCDs	Non-Communicable Diseases
SARAM	Service Availability and Readiness Assessment Mapping
SDG	Sustainable Development Goals
UN	United Nations
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Availability

The association between the category and quantity of medicines or pharmaceutical services needed, and the category and quantity of medicines or pharmaceutical services provided.

Access

Access is defined as having medicines continuously available at health facilities in acceptable quantities, appropriate dosage and with assured quality for consumption by the population when needed.

Essential (basic) medicines

Essential medicines are those that address the priority health care needs of the population. They are intended to be easily accessible and affordable.

Essential Medicines List (EDL)

A list of most efficacious and affordable medicines prioritized as treatment choices for health care needs of majority population. The list ensures consistent and uninterrupted supply of effective medicines in a health care system.

Financing

The act of raising or providing funds, allocating the funds based on budget estimates and payment for purchase of medicines.

Forecasting

The process of approximating future consumption needs/demand of medicines based on past consumption, service provision reports, morbidity and/or demographic data or assumptions.

Inventory control

Inventory control is a function of inventory management concerned with issuance and use of commodities and application of information generated for stock management.

Lead time

The time interval needed to complete the procurement cycle. It entails the time between stock ordering and stock reception and availability for use.

Organizational practices

Refer to procedures, techniques, processes, or rules used in an organization or a profession; a set of which are considered as standard.

Pharmaceutical Management Information System (PMIS)

Refers to all activities related to data collection, processing and presentation of information that helps staff at all levels of a country's health system make evidence-based decisions to manage pharmaceutical services.

Procurement

Activities and processes involved in acquisition of goods and services. Procurement involves selection, quantification, supplier selection, purchase and distribution of goods and services.

Public hospital

Herein also referred to as 'organization'. Refers to a hospital owned by the government and receives government funding. Such facilities provide medical care free of charge or at subsidized rates, the cost of which is covered by the funding the hospital receives.

Quality

Quality reflects the extent to which a healthcare service or product produces a desired outcome to its intended consumers. It includes aspects such as effectiveness, efficiency, equity and safety.

Quantification

Quantification, a function of procurement process, refers to approximation of quantities of commodities needed based on available funds.

Safety stock

Herein also referred to as buffer stock. Refers to an amount of stock that is kept in reserve, calculated as the average amount required to cover a lead time period to prevent stock-outs arising from abrupt supply or demand fluctuations.

Supply chain

This refers to institutions, individuals, technology, processes, and information that are involved in transfer of pharmaceutical commodities from manufacturers to customers.

ABSTRACT

Background

Sub-optimal access to affordable essential medicines in developing countries is mainly attributable to poor availability of these medicines, mainly in the public health sector. Easy access to prescribed medicines is routinely cited by healthcare consumers as the most important measure of quality of care, the absence of which contributes significantly to the under-utilization of public health services. This study determined the organizational practices that influence supply and hence availability of essential medicines at public hospitals in Nairobi County.

Methods

A cross-sectional survey was conducted in three County referral hospitals in Nairobi City. Hospitals were selected purposively based on a multi-level variation approach. Consenting staff in pharmacy and procurement departments were recruited for participation. Information on availability of essential medicines, procurement, inventory management and management of pharmaceutical information was collected using structured interviewer- administered questionnaires and abstraction tools. Univariate data analysis was done using Microsoft Excel ® 2010 and STATA®14. Bivariate analysis for statistical correlation was also undertaken.

Results

The proportion of medicines dispensed in full to patients at the three hospitals was 42.22 %, 48.88% and 46.66% (Mean-46%; SD-0.2%) respectively. The median availability and stock-out duration for a cluster of five tracer medicines was 75.34% (Range: 0-98%) and 90 days respectively. Almost half of all orders were not exclusive to EMLs or formulary lists. The order frequency was significantly associated with supply lead times ($p=0.036$). Prescribers, suppliers and end-users were not involved in quantification of medicines. Lead time for hospital based orders was shorter (1-14 days) compared to purchases by the county government (2-3 months). Procurement was principally done in an open and competitive manner though direct purchases were done as well. Insufficient and delayed funding was significantly associated with delays in the procurement process ($p=0.033$). Refresher training of front-line staff on procurement

procedures was uncommon. Management of inventory and pharmaceutical information were predominantly done manually.

Conclusion

County referral hospitals failed to provide all prescribed medicines to a majority of its clients due to stock-shortages. One or more commodities were lacking in stock at any given time. For a cluster of five essential medicines; the median availability was marginally low whereas the stock-out duration was significantly high. Varied pharmaceutical procurement practices were established many of which were suboptimal compared to the WHO recommended practices.

TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
ABBREVIATIONS/ACRONYMNS	vii
DEFINITION OF OPERATIONAL TERMS	viii
ABSTRACT	x
TABLE OF CONTENTS	xii
CHAPTER ONE	1
1.1 Background of the study	1
1.2 Essential medicines List (EML)	2
1.3 Availability of essential medicines	2
CHAPTER TWO: LITERATURE REVIEW	4
2.1 Introduction	4
2.2 Variability in availability of essential medicines	4
2.3 Management of the procurement system	6
2.3.1 Selection and quantification of medicines	6
2.3.2 Financing for medicines	7
2.3.3 Inventory management	7
2.3.4 Management of pharmaceutical information	8
2.4 Problem statement	8
2.5 Purpose of the study	9
2.5.1 Main objective	9
2.5.2 Specific objectives	9
2.6 Research question	10
2.6 Conceptual Framework	10
2.7 Significance of the study	11
CHAPTER THREE: METHODOLOGY	12
3.1 Introduction	12
3.2 Study Design	12

3.3 Study area.....	12
3.4 Study population	12
3.6 Sampling	12
3.6.1 Sampling approach.....	12
3.6.2 Sample size	12
3.7 Inclusion/ Exclusion criteria	13
3.8 Variables	14
3.8.1 Dependent Variable.....	14
3.8.2 Independent variables	14
3.9 Data collection	14
3.9.1 Data collection tools.....	14
3.9.2 Data collection technique.....	15
3.10 Data analysis	15
3.11 Ethical consideration.....	16
CHAPTER FOUR: RESULTS AND INTERPRETATION	17
4.1 Introduction.....	17
4.2 Demographic characteristics of the respondents.....	17
4.3 Availability of essential medicines	18
4.3.1 Proportion of medicines dispensed or administered	18
4.3.2 Availability of essential medicines	19
4.4 Procurement of essential medicines	20
4.4.1 Selection and quantification of medicines	20
4.4.2 Funding of medicines.....	24
4.4.3 Ordering and purchase of medicines.....	25
4.5 Inventory management.....	28
4.6 Management of Pharmaceutical information system.....	29
CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS.....	31
5.1 Introduction.....	31
5.2 Discussion	31
5.3 Study Limitations.....	34
5.4 Conclusion	34
5.5 Recommendations for Policy and Practice	34

5.6 Recommendation for Further Research	35
REFERENCES	36
APPENDICES	42
Appendix 1: Informed consent form	42
Appendix 2: Data abstraction tool	44
Appendix 3: Key informant guide	45
Appendix 4: Survey tool	50
Appendix 5: List of public hospitals In Nairobi by ownership	55
Appendix 6: List of tracer medicines to be assessed.....	56
Appendix 7: KNH/UON ERC approval.....	57
Appendix 8: County Health Services approval.....	59

CHAPTER ONE

Essential medicines refer to medicines that address the priority health care needs of the population based on public health relevance, evidence on efficacy and safety and cost-effectiveness (WHO, 2015). Hospitals and other dispensing entities must ensure that such medicines are made available at all times, in adequate amounts, in the appropriate dosage forms and with assured quality. In this chapter, background information of the study, concept of essential medicines list and availability of medicines are discussed.

1.1 Background of the study

Availability of essential medicines in healthcare facilities, particularly hospitals, is vital in promotion of curative health of the population and in ensuring healthcare outcomes and goals are met. This requires effective financing, procurement and inventory management systems; supported by timely and accurate pharmaceutical information for evidence-based decision making.

The Kenya National Pharmaceutical Policy's (KNPP) stated goal is provision to all Kenyans of efficient, effective pharmaceutical services that are sustainable, equitable, accessible and affordable with safe, efficacious and quality essential medicines, which are appropriately used (MoMs, 2008). This national goal resonates with the United Nation's Sustainable Development Goal (SDG) 3, Target 3.8: *Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.* The attainment of this SDG target would also contribute to the attainment of other targets under this goal mainly: improve maternal, neonatal and child health, combat both communicable and non-communicable diseases including TB, HIV/AIDS and malaria (UN, 2015)

There have been improvements in Kenya's pharmaceutical industry in recent years; however frequent medicines stock outs are common in Kenya's public health sector (UNIDO, 2010). Poor availability of medicines at facility level has been attributed to inappropriate selection, poor distribution, inadequate funding and irrational use. (Mwathi, 2014). Additionally conclusive local and regional data on sustainable access to affordable essential medicines are lacking. (UN, 2015)

1.2 Essential medicines List (EML)

The WHO recommends the essential medicines list as a list of minimum medicine needs for the basic health-care system. Such medicines are the most potent and cost-effective with a favourable safety profile.

EMLs facilitate equal access to medicines across different countries. The WHO, Universal Declaration of Human Rights (United Nations, 2015) and the Millennium Development Goals' targets (United Nations, 2008), highly advocate for world-wide enactment and periodic updates of national EMLs to ensure acceptable availability of essential medicines, especially in low and middle income economies. EMLs exist in 134 countries, where 94% use them for prioritisation of procurement of medicines in public sector for the poor (van den Ham R, 2011) However, the existence of EML does not directly translate to availability of prioritised medicines in health care facilities.

The Kenya Essential Medicines List 2010 and associated clinical guidelines were developed to replace the Kenya National Drug List 2003 and Clinical Guidelines 2002 (MoMS & MoPHS, 2010). Together, they comprised important pillars in the elaboration of the Kenya Essential Package for Health (KEPH) and the National Health Sector Strategic Plan (NHSSP II: 2005-2010). The EML and treatment guidelines are published to guide and standardize healthcare delivery. They are regularly reviewed to promote evidence based practice, and to enhance cost-effectiveness in healthcare.

1.3 Availability of essential medicines

The WHO in its medium-term strategic plan recommended 80% availability of medicines in all sectors (WHO, 2011). However, studies in subsequent years have shown poor availability of medicines in low and middle income countries (LMICs). Availability of 15 essential medicines in 36 developing countries was undertaken (Cameron A E. M.-D., 2009). Generic medicines were sub-optimally present in both the public and private sectors (median availability 38% and 64%, respectively). However, significant differences were noted in public and private sectors. A health facility survey on essential medicines in Kenya's public, faith based and private sectors established that; a majority of essential medicines for common ailments at primary care level were available and fairly affordable to citizens. However, stock outs for medicines including

essential medicines for priority health needs were significantly reported at hospital levels (MoMs & MoPHS, 2009). This was attributable to a number of factors including: irrational prescription, inadequate storage infrastructure, and an acute shortage of qualified pharmaceutical staff to manage medicines supply, dispensing and use.

Availability of essential medicines is routinely cited by healthcare consumers as the most important measure of quality of care, the absence of which contributes significantly to the under-utilization of public health services. The Kenya Service Availability and Readiness Assessment Mapping (SARAM) 2013 established generally availability of health commodities for primary care services in most health facilities. The mean availability of general tracer medicines in Nairobi County was 34% (national mean=49%). Notably and of concern were essential medicines for Non-Communicable Diseases, maternal health services and child health which were generally not available. The report recommended the need to prioritise financial resources by aligning quantification of the health products at health facilities with disease burden, and decentralization of procurement to lower levels to increase coverage and access to services. It also recommended the need to operationalize an information management system for pharmaceutical supplies to improve efficiency (MoH, 2013)

This study determined organizational practices that influence the availability of essential medicines at Public Hospitals. The results are expected to influence effective operational management of the pharmaceutical system particularly the procurement and inventory management units at County referral facilities. Managers will be able to better plan and monitor activities related to procurement and inventory management of essential medicines; critical steps in enhancing availability and hence clinical care outcomes.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter introduces studies that have been undertaken on essential drugs including those on: variability in the availability, management of the procurement system, financial sustainability for essential medicines, capacity of supply chains and pharmaceutical information systems.

Variability in the availability of essential medicines exists across geographical regions, therapeutic groups of medicines, sampling criteria, and number of medicines studied. These and other context specific factors have made generalization of such results impossible. The studies involve surveys of medicines at various levels of healthcare using the WHO/HAI Medicine Price Methodology framework (HAI/WHO, 2008).

2.2 Variability in availability of essential medicines

The WHO recommended at least 80% availability of medicines across health systems. Nevertheless, studies have reported sub-optimal availability in developing Countries. For instance, a study in 36 LMICs on availability of 15 medicines in the public and private sectors established that overall generic medicines were not adequately available in both the public and private sectors with median availability of 38% and 64%, respectively (Cameron A E. M.-D., 2009).

Similarly, systematic analysis of WHO/HAI surveys on drug price and availability established differences in the availability of medicines for chronic and acute diseases in the public and private sectors of developing countries for originator and generic brands of medicines. In the public sector, the mean availability of generic medicines was low for both baskets (acute conditions=53.5% and for chronic conditions=36%). In the private sector, the mean availability of generics in each basket was higher than in the public sector (66.2% for generics for acute conditions and 54.7% for generics for chronic conditions), but it was still low (Cameron A R. I.-T., 2011). Inadequate funding for medicines; inaccurate need forecasting at facility level and weak procurement and inventory management systems were identified as factors for the sub-optimal availability.

A few studies have however reported favourable medicines' situation. For instance a study in 36 public health facilities in Sudan established that averagely 82% of the basic medicines were

available in the facilities whereas 85% of the medicines prescribed by the clinician were dispensed to the patients. Adherence by prescribers to standard treatment guidelines in management of uncomplicated diarrhea and diarrhea was found to be 45% and 64%, respectively (Cheraghali, 2009). A similar study in Burkina Faso measured the availability, affordability and management of essential medicines in public hospitals. The average rate of availability of 50 basic medications was 77.69% (Saouadogo H, 2011).

None of the above surveys concentrated solely on essential medicines. A few studies have however explored the availability of medicines included in national EMLs.

The availability, cost and inclusion of children's medicines in essential medicines lists and standard treatment guidelines were assessed in 14 countries of the WHO African Region. It was found that the availability of key essential medicines for children was poor. District hospitals had marginally better availability (range: 10–80%) than teaching hospitals, while primary health care clinics generally had poorer availability (range: 18–48%) (Jane Robertson, 2009). Poor availability was associated with low understanding of the demand patterns and supply systems for medicines in the countries studied.

Availability of commonly prescribed medicines (antibiotics, analgesics, antihypertensive, emergency drugs and pediatric formulations) in Kenya's public hospitals remains sub-optimal with frequent stock outs reported. A study on public hospitals in Nakuru County established that a majority of the essential medicines were stocked out averagely for a period of one month for 3 classes of the drugs. Most out of stock days were reported for; analgesics (91%), antibiotics (75%) and anti-diabetic drugs (56%). Identifiable factors for the unavailability included: inadequate funding by national government, irrational selection of medicines and disregard of EMLs by procurement staff, extended lead times and irrational medicine use by prescribers (Mwathi, 2014). A related pharmaceutical survey across facilities revealed higher stock out rates in Kenya's rural than urban facilities (87% of rural health facilities experienced at least one stock out occurrence 3 months prior to the study). Kenya had the highest antimalarial stock out rate compared to Ghana and Uganda (7% of facilities compared to 2% in Ghana). Amoxicillin stock out was equally highest in Kenya (21% compared to Ghana's 5%). The study also established a significant association between having a laboratory and reduced essential medicines stock outs, owing to rational treatment of confirmed cases only (Masters, 2014).

2.3 Management of the procurement system

Pharmaceutical procurement is a complex and multi-phasic process routinely involving many actors. The main goals of an effective procurement process include: purchase of the most cost effective medicines of acceptable quality, the selection of reliable suppliers, availability of effective distribution systems for timely deliveries, and minimization of overall costs.

Procurement is guided by national and institutional laws, protocols, and structures that collectively may impede or facilitate the overall process (WHO, 1999). In Kenya the process is guided by the Public Procurement and Disposal Act (2006) (Kenya Law Reports, 2010).

Successful hospital procurement is a collaborative process, involving staff with skills in purchasing, finance, management, clinical and nursing specialties, pharmacy, quality control, and even the end user: the patient. Procurement ensures timely and effective delivery of medicines to patients as ensuring hospital, clinical, and pharmacy goals are met. In defining the role of a pharmacist in procurement, Karr (Karr, 2004) underscores the need for additional knowledge and skills in planning, management and law besides pharmacy. Other pharmaceutical tasks identified in related global surveys in hospital settings include purchasing and being involved in formulary decisions. However the surveys reported severe shortage of pharmacists in Kenya's public and private sectors that deter effective service delivery (FIP, 2009)

2.3.1 Selection and quantification of medicines

Procurement of pharmaceutical supplies ought to be guided by drug selection. The selection and quantification team identifies the drugs to be purchased through evidence-based decision making. The process of drug selection is also routinely facilitated by the availability of a national essential medicines list (MoMS & MoPHS, 2010) or more-specific drug formulary lists.

Selection and quantification are principally undertaken by pharmacists. However there is emerging need to ensure procurement matches demand by harmonization of medicine quantification with prescribing habits and preferences of consumers. This can be achieved through the involvement of prescribers in selection and quantification, and by use of surveys of consumer tastes and preferences to determine suitable dosage forms (Josephine, 2010).

Quantification of medicines is usually based on consumption patterns; however, morbidity patterns are used as well. Recommended by W.H.O as the most precise method, consumption based approach requires complete, accurate and properly adjusted data sources. However the

method does not address suitability of past consumption patterns, which may or may not match public health priorities and needs. Morbidity based approach is most complex and time consuming and is chiefly dependent on availability of valid morbidity data (MSH, 2012).

2.3.2 Financing for medicines

Successful procurement is tied on availability on adequate financial resources. Drug-financing may involve: government financing, pre-payment through insurance, donor financing, and out of pocket expenditure. In Kenya, 69.4% of household health-related out of pocket purchases were expended on outpatient care (WHO, 2011). According to the 2009/10 Kenya National Health Accounts, 3% of total health expenditure was spent on pharmaceuticals. When hospitals fail to procure enough medicines, patients either forfeit treatment altogether or buy medicines from private chemists at higher prices. (Mecca, 2014) demonstrated a change in stock out rate at Webuye district hospital (falling from 21.75% in 2010/11 to 19.47% in 2012/13) after introduction of the national health insurance scheme. This resulted from higher allocation for the ‘user fees’ and increase in actual expenditure on essential medicines.

2.3.3 Inventory management

The increase in healthcare costs has necessitated a rise in demand for quality care amongst health service providers. By increasing the efficiency of supply chain, healthcare cost savings could be realised (Kim, 2004). The American Production and Inventory Control Society (APICS) (Cox, 1998) defines inventory management as the branch of business management concerned with planning and controlling inventories.

Effective inventory management ensures determination of precise order quantities without subjecting the organization to unnecessary costs associated with overstock or under stock. Many challenges have been reported in handling hospital pharmacy including: influence by strong institutional and regulatory laws, operational limitations in demand forecasting due to variable consumption patterns and inaccurate data sources and the need to maintain adequate safety stock to cope with uncertainty demand, which results in high inventory holding costs.

In a study by (Bunde, 2007) on essential medicines supply chain, poor availability of reports to perform forecasting, quantification and procurement planning in Kenya was identified as a major challenge. Consequently patients experience treatment discontinuations and complications due to recurrent stock-outs (Pasquet, 2010). Related findings were reported by (Oballah, 2015).

Additionally, adequately trained staffs are an essential resource in ensuring proper inventory management. A study by (Waako, 2009) established that trainings on HIV/AIDS mainly emphasized clinical management with few programs having included pharmaceutical supply management in their training. This contributed significantly to the competence gap amongst staff in management of supplies. These findings were replicated in the service availability and readiness assessment report where only 8 staffs in Nairobi County had undergone short term training on procurement/supply management in the year preceding their study (MoH, 2013)

2.3.4 Management of pharmaceutical information

Staff at all levels of care relevant, need timely and accurate information to make rational decisions regarding planning, demand forecasting, and resource allocation for pharmaceutical services. These decisions influence the uninterrupted availability of essential medicines. However available information is often insufficient, incorrect, and untimely, which undermines its value and helpfulness (Luoma, 2010).

An assessment of the Logistics system in Kenya reported the existence of only incomplete data upon which planning and procurement for health products was being conducted (Bunde, 2007). An assessment of HIV/AIDS and malaria programs established limited use of collected data for effective decision making due to incompleteness and untimeliness (Owunna & Whitt, 2007). Additionally, private facilities had more complete medicines records than public health facilities. In a related study of anti-malarial management records Machini et.al reported 20% decline in the updating of records between 2010 and 2012, whereas completion of summary reports declined by 8.8% during the same period (Machini, 2013)

2.4 Problem statement

The quality of a public health care system is routinely evaluated by the patients, chiefly on the basis of the presence of adequate human resource for health and availability of quality essential medicines (WHO, 2004). Availability of essential medicines in healthcare facilities, particularly hospitals, is vital in promotion of curative health of the population and in ensuring healthcare outcomes and goals are met (MoMs, 2008). Essential medicines are supposed to be available in health facilities in adequate amounts, at appropriate dosage forms, assured quality and at affordable prices for use by the population. Availability is dependent on existence of a functional

pharmaceutical system that is characterized by: rational use and selection of essential medicines, sustainable financing, affordable prices and reliable health supply systems.

Nearly half of Nairobi residents are slum dwellers who principally rely on public health hospitals which are considered affordable. However, lack of availability of essential medicines in such facilities delays treatment thereby complicating outcome of diseases. This negatively affects access to health services. In Kenya health sector funding relies heavily on out-of-pocket payments due to underfunding and regressive health care contributions (Chuma and Okungu, 2011).

The public supply chain is prone to interruptions and stock-outs due to weaknesses in the distribution system and general poor performance of the supply chain. Stock-outs inevitably affect clinical outcomes since patients would miss medicines when needed (MoMs & MoPHS, 2009).

It is therefore imperative to understand practices that influence availability of essential medicines in key public hospitals, particularly: procurement practices in use, inventory management and management of pharmaceutical information.

2.5 Purpose of the study

2.5.1 Main objective

To determine organizational practices influencing availability of essential medicines at public hospitals in Nairobi County.

2.5.2 Specific objectives

- i. To assess the availability of essential medicines at public hospitals in Nairobi County.
- ii. To investigate whether recommended procurement practices of essential medicines in the public hospitals are adhered to.
- iii. To determine inventory management practices used in management of essential medicines in public hospitals.
- iv. To determine practices used in management of pharmaceutical information at public hospitals in Nairobi County

2.6 Research question

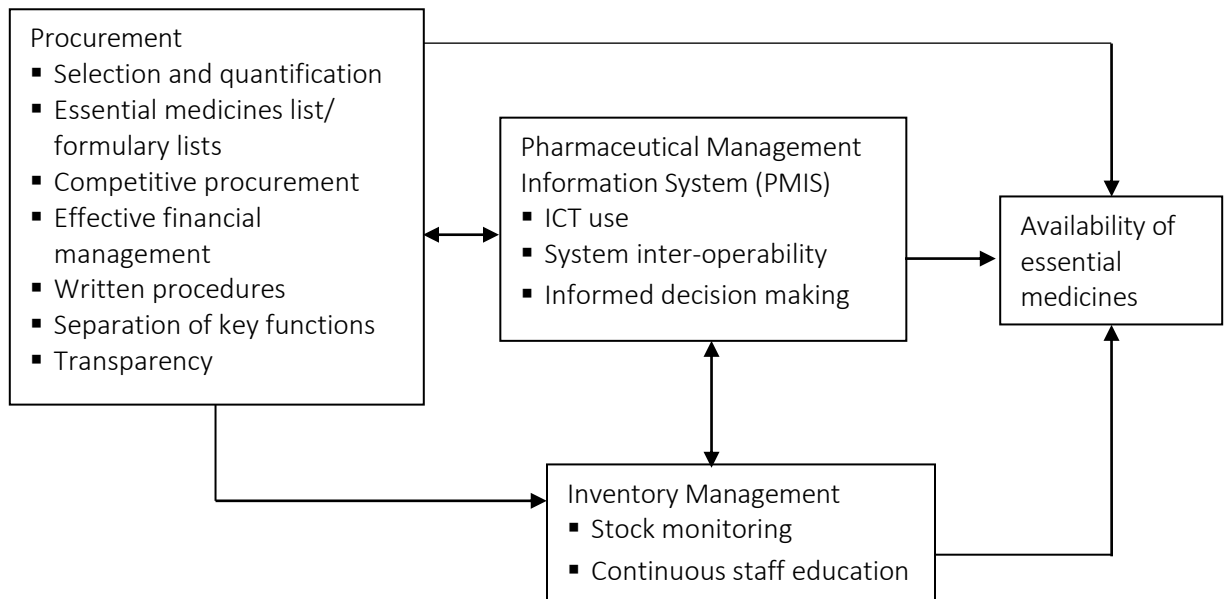
- i. How do prevailing pharmaceutical procurement practices influence availability of essential medicines at public hospitals in Nairobi County?

2.6 Conceptual Framework

Availability of essential medicines is reliant on effective interaction of the procurement and inventory management systems. These processes are cyclical in nature and mutually inter-dependent. Accurate and timely information has to be shared amongst all the involved stakeholders to facilitate evidence-based decision making.

Selection and quantification of medicines are supposed to be guided by essential medicines lists or formulary lists. All stakeholders are supposed to be engaged in such forums. Periodic reviews of quantities needed ought to be undertaken, so that supplies can be adjusted accordingly.

Figure 1: Conceptual Framework



Forecasted budgets should be reviewed accordingly based on available funds. The order frequency should be minimized through bulk purchase; this enables institutions to take advantage of economies of scale.

Supply of medicines should follow laid down contractual laws and regulations so as to reduce system complexity, promote transparency and reduce lead time. Once supplies are delivered, it

is important to have an efficient inventory management system that tracks stock movement, reduces losses and notifies the managers when to restock.

Having skilled staff at all these levels is important. Continuous education of staff should be emphasized. In order to promote effectiveness and improve efficiency automation of the systems using ICT ought to be undertaken.

2.7 Significance of the study

Availability of essential medicines is routinely cited by healthcare consumers as the most important measure of quality of care, the absence of which contributes significantly to the under-utilization of public health services. This study sought to establish availability of essential medicines and determine whether recommended procurement practices were being adhered to. It also sought to identify practices used in inventory management and management of pharmaceutical information at public hospitals.

The findings will influence effective operational management of the pharmaceutical system particularly the procurement and inventory management units. Managers will be able to better plan and monitor activities related to procurement and inventory management of essential medicines; critical steps in enhancing availability and hence health care outcomes. Ultimately quality of health care is expected to improve as is utilization of public facilities by health care clients.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter details the methods of data collection, analysis and presentation that were used in this study. It focuses on the methodology and steps that were taken to enhance validity and reliability of the data.

3.2 Study Design

A cross-sectional survey was done between 25th August and 15th September 2015 to determine organizational practices that influence availability of essential medicines at public hospitals in Nairobi County.

3.3 Study area

The study was conducted in Nairobi County which is the Kenya's capital city. The county occupies 695.1 square kilometres and is located in the Southern central part of the country at an altitude of 1798 meters above sea level. The county's projected population in 2015 was 3,942,705 with an inter-censal growth rate of 3.8 per cent (KNBS, 2013). The County has 9 sub-counties, a national referral hospital, 16 sub-County hospitals, 9 faith-based, 32 private, 15 nursing homes, 83 health centres 30 dispensaries, and 106 clinics (NCC, 2014).

3.4 Study population

The target population were pharmaceutical and procurement staff in the sampled public hospitals.

3.6 Sampling

3.6.1 Sampling approach

Selection of hospitals and hence staff expected to participate in the study was done purposively using a multi-level maximum variation sampling strategy (Anca Vitcu, 2007).

3.6.2 Sample size

Stage 1: Sampling of health facilities

Nairobi County has eight (8) public hospitals owned by National government (3), County government (3), Prisons Department (1) and Department of Defence (1). County hospitals

(representing 33% of all hospitals) were purposively selected for inclusion as primary study sites considering: their functional capacity as County referral facilities (Level 4) for primary care facilities and community units in Nairobi and beyond, being run as devolved units in Nairobi County (their scope of operation was thus comparable), ease of access (penetration) and existence of lean and functional procurement and pharmacy departments. This enabled easier and quicker data collection.

Stage 2: Sampling of respondents

Sample stratification was undertaken based on:

- a) The department where the staffs are based i.e. Pharmacy and Procurement.
- b) The position they hold in the department i.e. management staff, operational staff or support staff. Key informants comprised of management staff.

Pre-survey data on staff establishment in the respective hospitals was obtained; as shown in the table below:

	Hospital			Total
	CRH 1	CRH 2	CRH 3	
Pharmacy	11	11	3	25
Procurement	4	3	9	16
Total	15	14	12	41

All procurement and pharmaceutical staff on duty during the duration of the study were considered for the study. The pharmacist-in-charge and the head of procurement in each hospital were considered as key informants for being overall coordinators of respective departments. In total 33 respondents were interviewed (Response rate of 80.48%).

3.7 Inclusion/ Exclusion criteria

The inclusion criteria were all County referral hospitals within Nairobi County with operational procurement and pharmacy departments.

The exclusion criteria were national referral hospitals and hospitals classified as ‘other’ such as military and prison hospitals considering their operational complexity.

Other hospital staffs besides those involved in budgeting, procurement and inventory management of essential medicines were excluded from the study.

3.8 Variables

3.8.1 Dependent Variable

Availability of Essential Medicines, as measured by the following indicators:

- a) Proportion of medicines dispensed in full.
- b) Median availability of five tracer medicines at public hospitals.

Category of tracer commodity	No. of tracer commodities	Name of tracer commodity
i. Essential medicines for children	1	Amoxicillin suspension 125mg/5ml
ii. Essential medicines for children	1	Artemether/Lumefantrine(120/60 mg) 6' pack
iii. Essential medicines for children	1	Paracetamol suspension 120mg/5ml
iv. Maternal health	1	Ferrous salt tablets(alone or with folic acid)
v. Non-communicable diseases	1	Nifedipine retard tablets 20mg

3.8.2 Independent variables

- a) Procurement practices: quantification, adherence to policy guidelines and written procedures, order frequency, financial management and tendering process.
- b) Pharmaceutical information system: information communication/ reporting, uptake of Information Communication Technology, integration with other systems.
- c) Inventory control: stock monitoring and staff competency.

3.9 Data collection

3.9.1 Data collection tools

Data was collected using pre-tested structured questionnaires, key informant guides and observation checklists. These were adopted from UNHCR (Drug Management Manual 2006) and MSH (Managing access to Medicines and Health Technologies). Pre-testing of the questionnaires for validity was undertaken at Mutuini Sub-county hospital. The hospital was comparable to the county referral facilities for it had an established pharmaceutical department and a partially functional procurement unit. Five pharmaceutical and procurement staffs were identified for participation. Appropriate revision of the tools was done thereafter.

A data abstraction tool was used to collect quantitative data on availability of essential medicines from each hospital. Pre-coded, structured questionnaires were used to collect primary data and information on quantification, ordering, procurement and inventory management of essential

medicines. Check lists were used in validation of key observations during the study. These were incorporated in the questionnaire for easier collection of data.

3.9.2 Data collection technique

Approval of the study proposal was granted by the KNH/UON Ethics and Research Committee on 31st July 2015 vide letter Ref: KNH-ERC/A/335. The principal investigator (PI) thereafter sought relevant research authorisation from Nairobi's department of county health services and the respective hospitals (Appendix 7&8). Two Bachelor of Science Nursing (BSN) graduates who had prior experience and knowledge of the study area were recruited as research assistants to assist in data collection. They were trained by the PI on: aims and objectives of the study, data collection tools, ethical consideration and data collection skills. They also participated in pre-test and revision of the data collection tools.

Data collection was conducted between 25th August and 15th September 2015. After brief introduction by the researchers, the consent form was read out to the respondents. Only those who consented in writing (Appendix 1) were allowed to participate in the study. Interviews were conducted at the respective work desks of the respondents. The PI particularly conducted interviews for the heads of pharmacy and procurement departments being key informants. Significant observations such as availability of policy documents at hospitals were recorded on checklists that had been incorporated in the interview guide.

Abstraction of data on availability of essential medicines was done retrospectively using records found at the pharmacy stores. Copies of medicines prescriptions for patients who had sought care at the outpatient department were retrieved and documented. Stock cards (bin-cards) for a basket of five pre-determined medicines were retrieved and the number of 'out-of-stock' days for each documented. Completeness and timeliness of data were verified at end of each data collection exercise.

3.10 Data analysis

Triangulation of data sources was used to enhance validity of the findings. All questionnaires, checklists and abstraction tools were collected after each visit. These were cross checked for completeness and relevance. Quantitative data was analysed using Microsoft Excel ® 2010 and analysed using STATA®14. Univariate as well as bivariate analysis was undertaken.

Correlations between key variables were tested for statistical significance using Fisher's exact

test ($p=0.05$). Descriptive statistics are presented as frequencies, proportions and median. Key informant interview notes were analysed by identification of recurring themes.

3.11 Ethical consideration

- a) Permission from all relevant authorities (County Health Services and Hospital Medical Superintendents) was sought before conducting the study.

Ethical clearance was sought from the Kenyatta National Hospital and University of Nairobi Ethics and Research Committee. All provisions of the study were strictly adhered to.

- b) Confidentiality and anonymity of the respondents were upheld throughout the research process including at analysis and dissemination phase. Individual names were avoided and participation was voluntary.

CHAPTER FOUR: RESULTS AND INTERPRETATION

4.1 Introduction

This chapter focuses on the findings of this research. The data is summarized into tables and figures of frequencies and percentages. The results are organized based on: general demographic characteristics of the study participants, availability of essential medicines at hospitals, procurement and inventory management practices and management of pharmaceutical information.

4.2 Demographic characteristics of the respondents

A total of 33 respondents drawn from three hospitals participated in the study, response rate of 80.47%. Approximately (57.58%, n=19) females and (42.42%, n=14) males participated possibly reflecting the staffing characteristics of the departments by gender. The mean years of experience for the respondents were 3 with a standard deviation of 1.5 years. Pharmacy department had slightly more respondents (51.52%, n=17) than the procurement department (48.48%, n=16). These demographic characteristics are summarized in table 1 below.

Table 1: Demographic characteristics of respondents

Characteristics	Frequency	Percentage (%)
Respondents per County Referral Hospital (CRH)		
CRH 1	12	36.33
CRH 2	10	30.30
CRH 3	11	33.33
Gender		
Male	14	42.42
Female	19	57.58
Department		
Pharmacy	17	51.52
Procurement	16	48.48
Position in Department		
Head	6	18.18
Deputy	5	15.15
Operational staff	12	36.36
Clerk	4	12.12
Intern	6	18.18
Years of experience		
<1	5	15.15
1-2	8	24.24
3-4	10	30.3
5-6	6	18.18
7-8	1	3.03
9-10	2	6.06
>10	1	3.03
Education qualification		
Certificate	2	6.06
Diploma	12	36.36
Bachelors	16	48.48
Masters	3	9.09

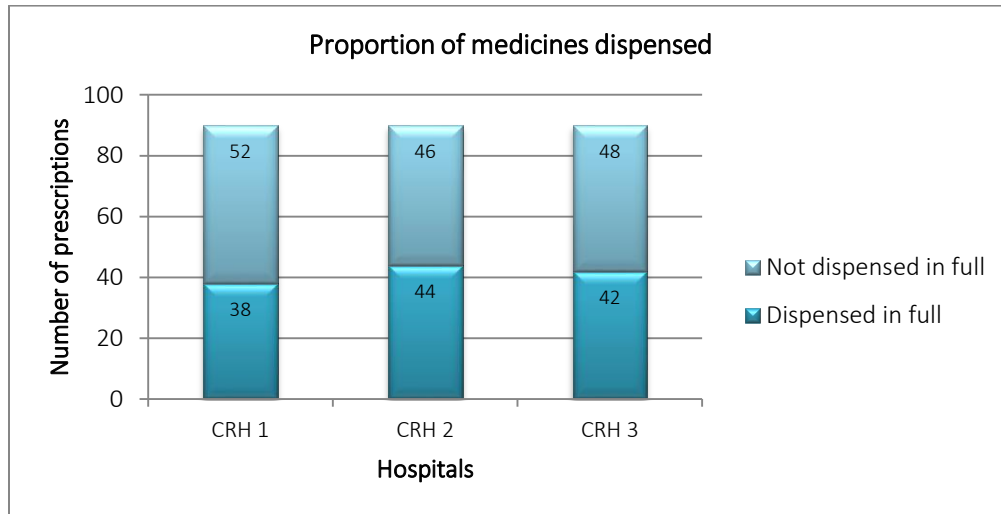
4.3 Availability of essential medicines

4.3.1 Proportion of medicines dispensed or administered

The extent to which hospitals were able to provide prescribed medicines was measured, and the proportion of prescribed medicines actually dispensed or administered in full determined (Figure 2). The data was abstracted retrospectively based on filed copies of prescriptions for a random sample of 30 outpatient encounters at each of the surveyed hospitals. This was done for 3 different days. Of 90 prescriptions sampled at each County Referral Hospital(CRH); 42.22 %

(n=38), 48.88% (n=44) and 46.66% (n=42) had their contents dispensed in full at CRH 1, CRH 2 and CRH 3 respectively. Overall the mean fill rate was 46% (Standard deviation= 0.20%)

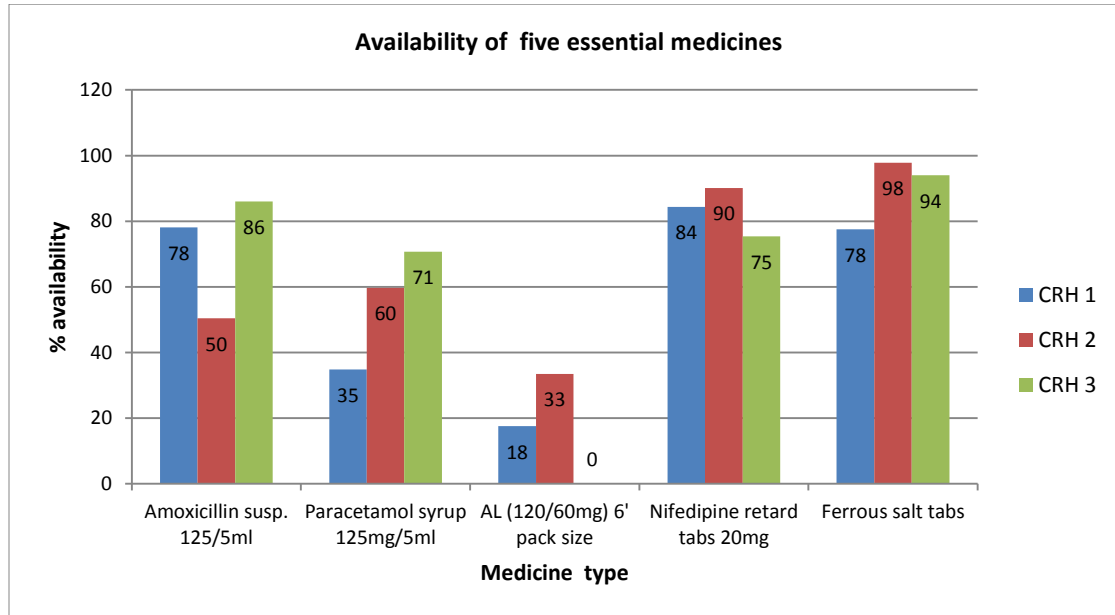
Figure 2: Proportion of medicines dispensed to patients



4.3.2 Availability of essential medicines

The percentage availability of a cluster of five essential medicines was determined in each hospital (Figure 3). The five included: amoxicillin suspension, paracetamol syrup and Artemether/Lumefantrine 6' pack (pediatric medicines), ferrous/folate salt tablets (maternal health medicine) and nifedipine retard tablets (general medicine). The number of stock-in days for each of the 5 medicines was determined over the review period (365 days). Bin cards at respective hospital stores were used for this purpose. The median availability of the five selected essential medicines was determined as 75.34 %.(Range: 0-98%)

Figure 3: Availability of five essential medicines in hospitals



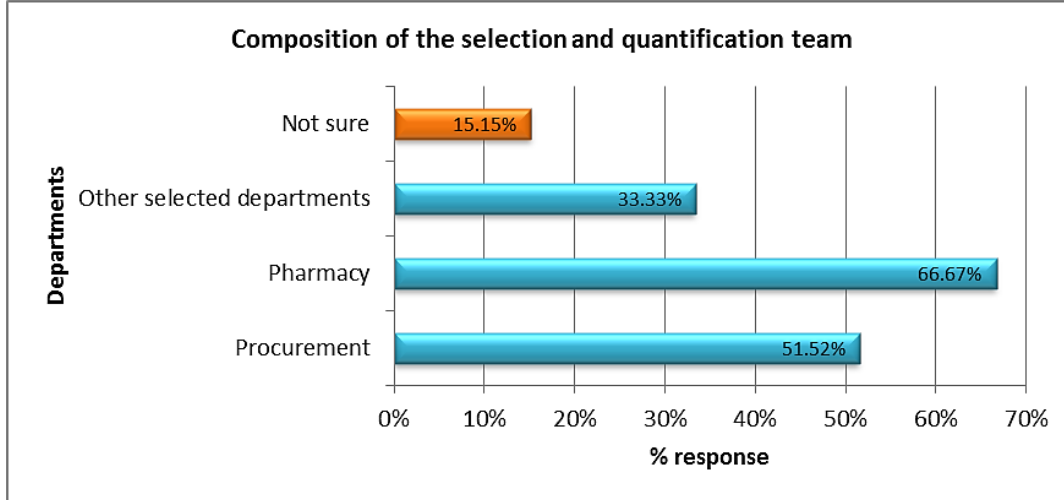
4.4 Procurement of essential medicines

All the hospitals surveyed had copies of the Public Procurement and Disposal Act (2006), hospital clinical guidelines, medicines and therapeutics committees and EMLs. Variations in procurement practices were nevertheless noted some being deviation from recommended practice. This has been explained below:

4.4.1 Selection and quantification of medicines

Of all the respondents, 45.45% (n=15) were involved in selection and quantification process whereas 54.45% (n=18) were not involved. Selection and quantification of medicines has been summarized in table 2 below. The selection and quantification teams were composed of mainly pharmacy and procurement staff (Figure 4).

Figure 4: Composition of medicine selection and quantification team



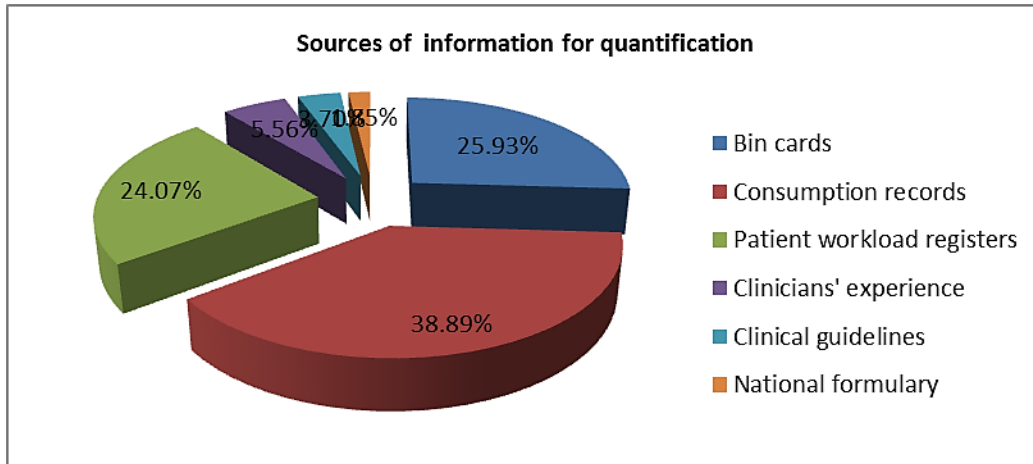
A majority of the respondents (81.82%, n=27) agreed that roles of the selection and quantification team were explicit. Over half, 57.58% (n=19) of the respondents used both morbidity- and consumption-based methods for quantification of medicines, while the rest, 42.42% (n=14) indicated only consumption based method was applied. Almost two thirds of the respondents (65.63%, n=21) indicated that quantification review meetings were held on a quarterly basis. Supply adjustments were done within 30-90 days of such review meetings. Asked whether selection of medicines was restricted to the essential medicines list or formulary lists, 48.48% (n=16) of the respondents negated, 27.27% (n=9) affirmed whereas 24.24% (n=8) were not sure.

Table 2: Selection and quantification of medicines

Characteristics	Frequency	Percentage (%)
Respondent involved in selection & quantification		
Yes	15	45.45
No	18	54.55
Roles of the quantification team explicit		
Yes	27	81.82
No	1	3.03
Not certain	5	15.15
Quantification method in use		
Consumption	14	42.42
Morbidity	0	0
Both	19	57.58
Frequency of quantification review meetings		
Monthly	6	18.75
Quarterly	21	65.63
Annually	1	3.13
Not certain	4	12.5
Duration of supply adjustments		
Immediately	1	3.03
<30 days	9	27.27
30-90 days	19	57.58
Not certain	4	12.12
Restriction of orders to EML or formulary lists		
Yes	9	27.27
No	16	48.48
Not certain	8	24.24

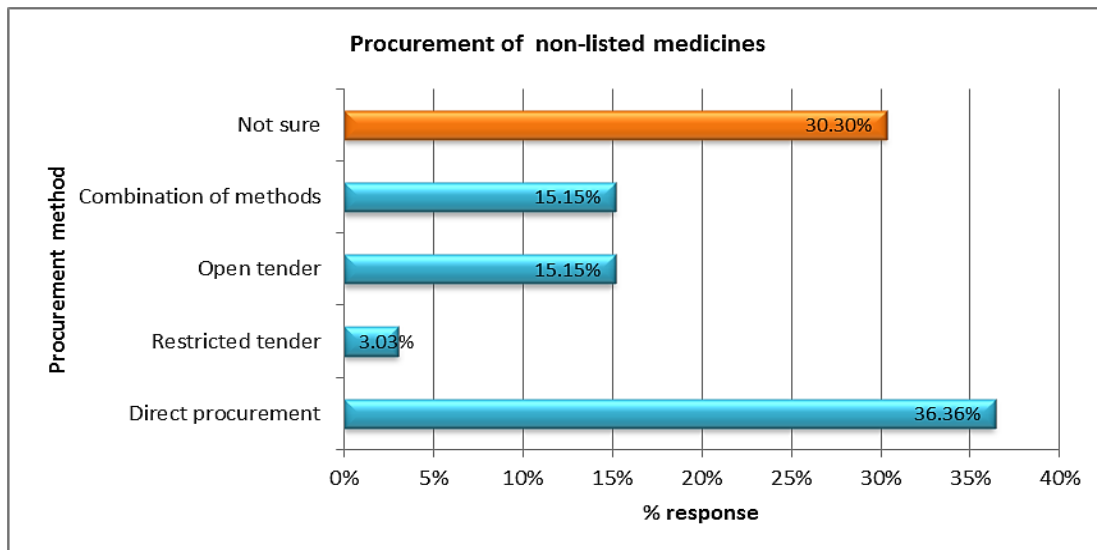
The sources of data used in quantification are shown in figure 5 below. Past consumption records (38.88%, n=21), bin cards (25.92%, n=14), and patient workload registers (24.07%, n=13) were mainly used (Figure 5).

Figure 5: Sources of information for quantification of medicines supplies



Procurement of non-listed medicines was undertaken at hospitals using varied means (Figure 6). Almost thirty six percent (36.36%, n=12) of the respondents cited direct purchases as routinely used whereas 15.15% (n=5) used open tendering.

Figure 6: Procurement methods for non-listed medicines



4.4.2 Funding of medicines

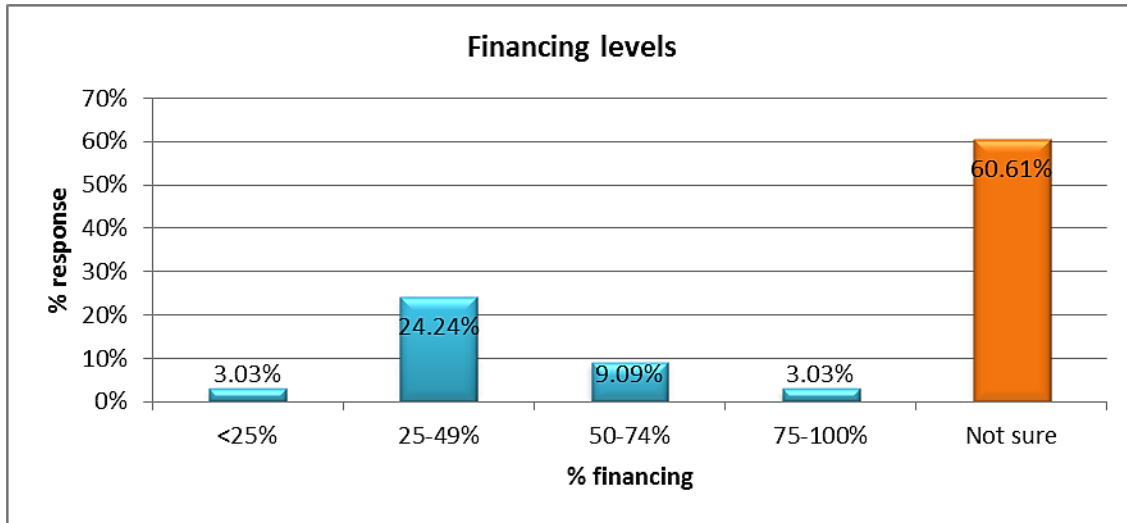
Table 3: Funding for medicines

Characteristics	Frequency	Percentage (%)
Payment duration for supplies		
<30 days	1	3.03
30-90 days	4	12.12
>90 days	10	30.3
Variable	5	15.15
Not certain	13	39.39
Existence of unpaid invoices for medicines		
Yes	29	87.88
Not certain	4	12.12
Existence of revolving medicine fund		
Yes	10	30.3
No	19	57.58
Not certain	4	12.12
Existence of separate vote for medicines		
Yes	24	72.73
No	4	12.12
Not certain	5	15.15

The respondents indicated that payment duration of medicine supplies varied (table 3 above), 12.12% (n=4) reported payments were made between 30-90 days after delivery of medical supplies whereas 30.30% (n=10) reported this was done after 90 days. Unpaid invoices for medicines already consumed were reported by 87.88% (n=29) of the respondents. Existence of unpaid invoices was significantly associated with delays in medicine supplies ($p=0.033$).

When asked about the existence of a revolving medicine fund, 57.58% (n=19) of the respondents denied its existence whereas 30.30% (n=10) indicated there was one in place. A majority of the respondents (72.73%, n=24) indicated that medicines funds were remitted via separate vote. However most of the respondents (60.61%, n=20) were not certain of the funding levels for medicines as shown below (Figure 7).

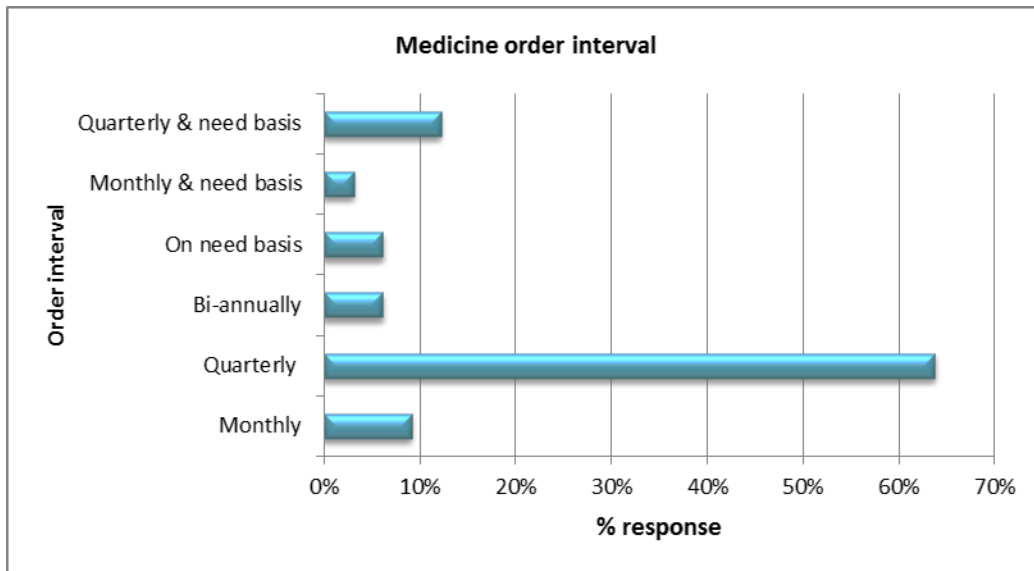
Figure 7: Financing levels for medicines



4.4.3 Ordering and purchase of medicines

Ordering across the three facilities was predominantly done on quarterly basis (63.64%, n=21) as shown in Figure 8 below.

Figure 8: Medicine order frequency



The order interval above was influenced by a number of factors; mainly consumption patterns of medicines (50%) but also by government regulation and funding patterns (Table 4). Almost half of the respondents (48.48%, n=16) indicated that the average lead time for supplies from KEMSA ordered via the County office was 2-3 months while 39.39% (n=13)

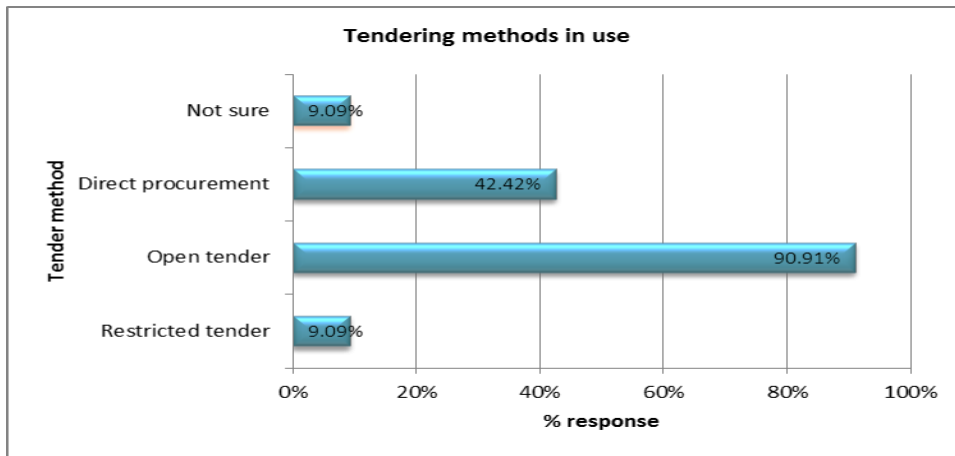
reported it took over 3months. On the contrary the average lead time for hospital based orders was 1-14 days as reported by a majority of the respondents (84.85%, n=28). Ordering on quarterly basis was significantly associated with lead times of between 2-3 months (P=0.036). The main causes of delays in medicine supplies were cited as delayed funding (87.88%, n=29) and bureaucracy of the supply chain (42.42% n=14).

Table 4: Ordering process for medicine supplies

Characteristics	Frequency	Percentage (%)
Factors influencing order interval		
Government policy	8	23.53
Consumption pattern	17	50
Funding pattern	9	26.47
Lead time for KEMSA supplies		
2-3 months	16	48.48
>3 months	13	39.39
Not certain	4	12.12
Lead time for hospital based supplies		
1-14 days	28	84.85
1-3 months	1	3.03
Not certain	4	12.12
Single sourcing undertaken		
Yes	12	36.36
No	20	60.61
Not sure	1	3.03
Causes of supply delays		
Delayed/ inadequate funding	29	87.88
Bureaucracy in order process	14	42.42
Shortages of commodities in market	5	15.15
Poor commodity specification	2	6.06

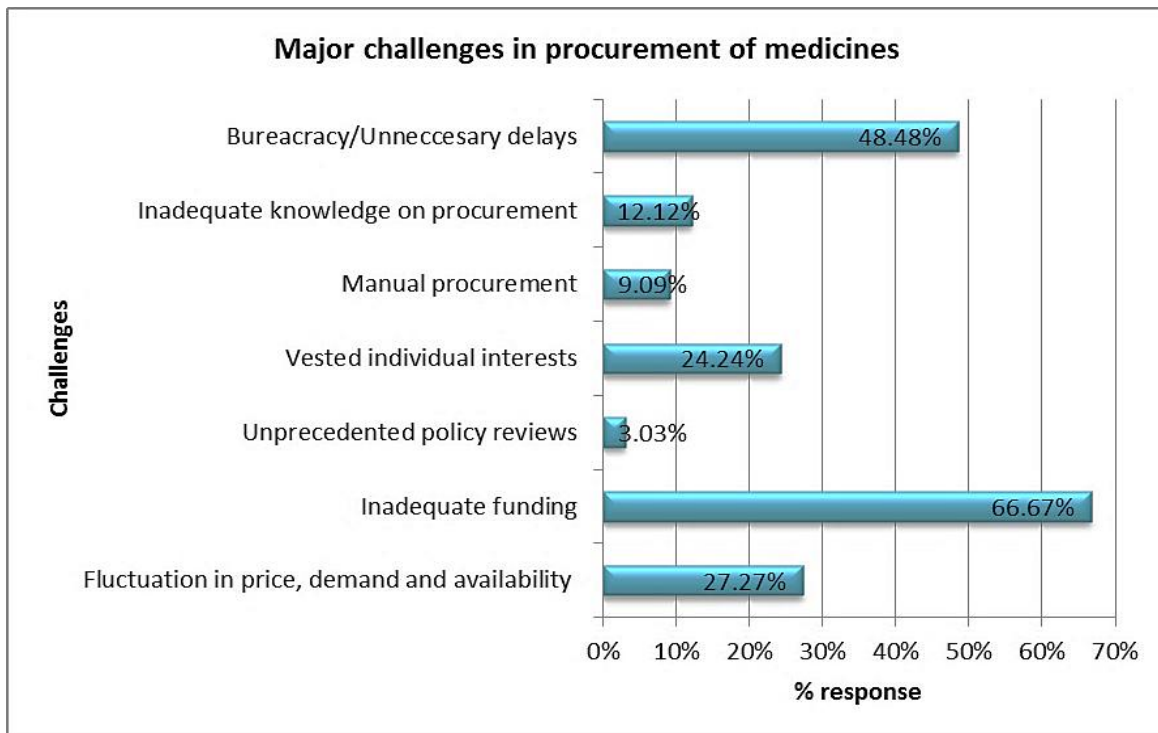
Open tenders formed the bulk of tendering methods used in purchase of medicines (90.91%, n=30) though direct procurement was also undertaken (42%, n=14) (Figure 9).

Figure 9: Tender methods used in purchase of medicines



Tender results were disclosed to all stakeholders in the procurement chain in most of the cases; 75.76% (n=25) affirmed that indeed the results were communicated whereas 21.21% (n=7) negated. 60.61% of supplies were not singly sourced from the awarded supplier for various reasons.

Figure 10: Major challenges in procurement of medicines



The main challenges in the procurement of medicines at hospitals are shown in Figure 10 above. They included mainly inadequate funding (66.67%, n=22) and bureaucracy/unnecessary delays (48.48%).

4.5 Inventory management

Table 5: Inventory management

Characteristics	Frequency	Percentage (%)
Occurrence of stock shortages		
Yes	31	93.94
No	1	3.03
Not sure	1	3.03
Frequency of stock checks		
Daily	2	6.06
Weekly	12	36.36
Monthly	12	36.36
Quarterly	2	16.67
Annually	4	12.12
Not sure	1	3.03
Use of ICT in stock management		
Yes	1	3.03
No	32	96.97
Refresher training		
Yes	5	15.15
No	28	84.85
Staffing adequacy		
Adequate	11	33.33
Inadequate	22	66.67

Occurrence of stock shortages at hospitals was explored (Table 5). A greater majority of the respondents (93.94%, n=31) reported at least an incidence of stock shortage at the hospitals. Varied opinion was given regarding frequency of stock check, slightly over a third (36.36%, n=12) of the respondents indicated that it was done at least weekly, whereas a third (36.36%,

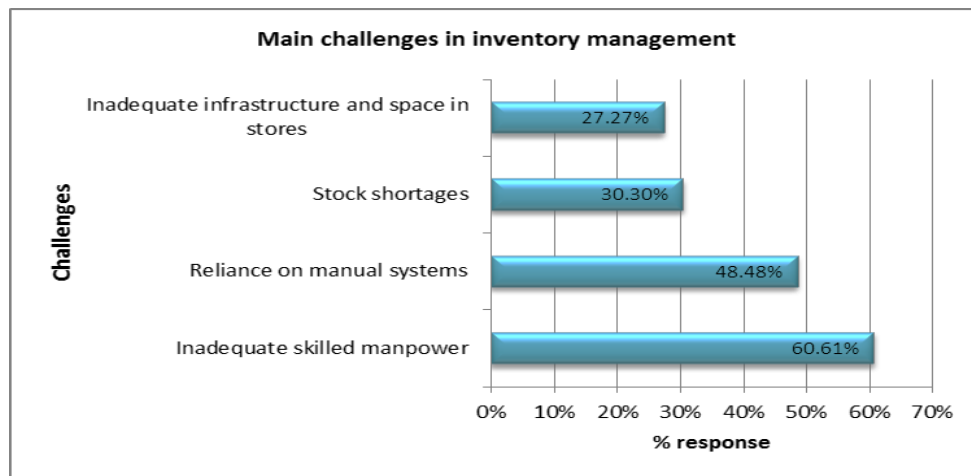
n=12) reported that it was done at least monthly. A significant majority of the respondents (96.97%, n=32) indicated that ICT was not routinely used in inventory management. Stock monitoring was principally done manually.

Refresher trainings for staff were rarely done. A significant majority (84.85%, n=28) of the respondents had not attended any refresher training on inventory management during the period under study. Staffing was a major challenge in inventory management as affirmed by two thirds of the respondents (n=22).

However no statistical significance was established in the association between occurrence of medicine stock-outs and; use of ICT(p=1.000), frequency of stock checks(p=0.477), maintenance of safety stock(p=1.000), refresher training(p=0.284), staffing levels(p=0.562), education level(p=0.773), years of experience(p=0.140) and lead time(0.231).

The main challenges thus encountered during inventory management are summarized below (Figure 11). They included: inadequate skilled manpower to run stores (60.61%, n=20) and reliance on manual inventory management systems.

Figure 11: Challenges in inventory management



4.6 Management of Pharmaceutical information system

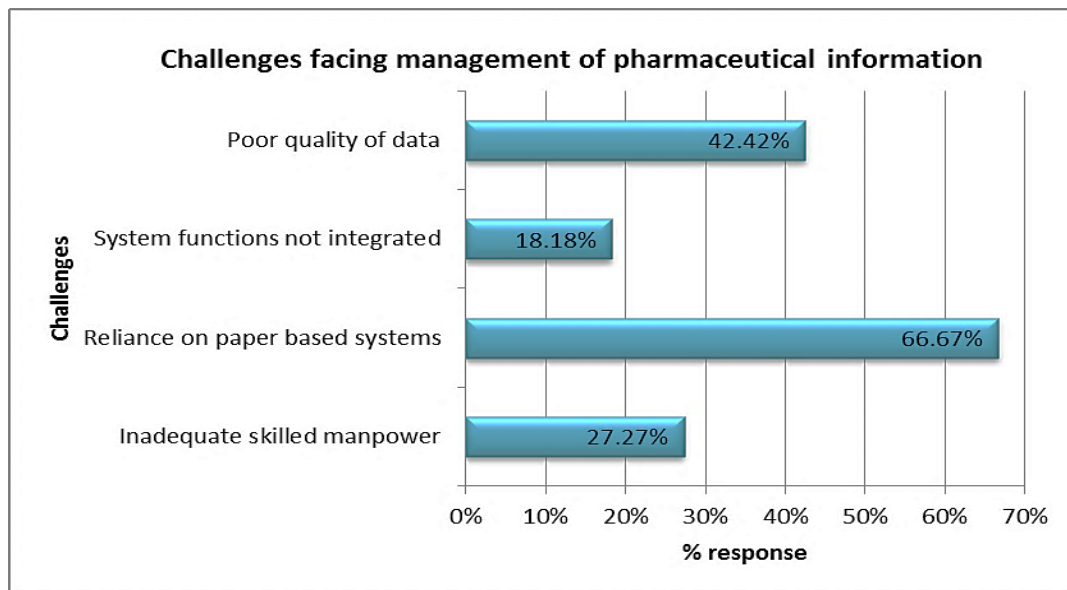
Use and integration of Information Communication Technology (ICT) in routine management of pharmaceutical information was determined (Table 6). A significant majority of the respondents (90.91%, n=30) negated this. Consequently decision making was reportedly not based on accurate and timely data (84.85% n=28).

Table 6: Management of pharmaceutical information

Characteristics	Frequency	Percentage (%)
Use/ Integration of ICT in routine management of pharmaceutical information		
Yes	3	9.09
No	30	90.91
Availability of timely and accurate data for decision making		
Sometimes	5	15.15
No	28	84.85

The main challenges in the management of pharmaceutical information included: reliance on paper based systems (66.67%, n=22) and poor quality of data (42.42%, n=9) (Figure 13).

Figure 12: Challenges in management of pharmaceutical information



CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In this chapter, study findings related to availability of essential medicines, procurement and inventory management practices and management of pharmaceutical information are discussed and conclusions drawn from the findings. Recommendations have been made based on the study findings and conclusions.

5.2 Discussion

Availability of essential medicines at hospitals

Essential medicines exist in categories and cover a wide variety of elements. This study focused on five tracer commodities used for priority clinical outcome areas within the public health sector, to assess their availability. Less than half of the patients obtained all prescribed medicines from the facilities; they probably had to buy them from private chemists at a higher price or forego the treatment at all. This finding contrasted significantly with the health facility essential medicines survey (MoMs & MoPHS, 2009) where at least 4 out of every 5 patients received all the prescribed medicines at the facility. This was highly attributed to interruption in pharmaceutical management systems between county and national government after devolution of healthcare in Kenya in 2013. Such was the case in Philippines where historical review of decentralization (1992-1997) revealed some negative effects in the immediate and intermediate period that resulted in inefficiency and ineffectiveness of health services management (Grundy, 2003).

The mean availability of a cluster of five essential medicines in the three hospitals was 63.32% (CI 46.82%-79.81%). The 2009 health facility survey established a mean availability of 82.6 % for 15 basic medicines at public health facilities. A similar study in Sudan established average availability of 80.6% for selected essential medicines at public pharmacies (Elfatih Ibrahim Elamin, 2010). This signifies that currently public facilities are experiencing more ‘stock-out’ days for essential medicines than before.

Procurement practices for essential medicines

Effective pharmaceutical procurement involves key supply-side practices that include: selection, quantification, and product specification, pre-selection of suppliers, tender-evaluation, ordering and financing. These practices need to be separated as they require different expertise (WHO, 1999). Stock-shortages typically represent a break-up in the above functions. Findings of this study indicate that recommended pharmaceutical procurement practices were deficient in the hospitals studied despite the existence of policy guidelines. Selection and quantification teams were mainly composed of pharmacists and heads of procurement. However other important stakeholders: prescribers, suppliers and end-users were not involved. A study on medicines supply outlets in Uganda established that expiries occurred partly due to poor harmonization of medicine quantification with prescribing tendencies and consumer preferences. The study recommended the involvement of prescribers in selection and quantification, and harmonization of medicine quantification with demand estimates for medicines (Josephine, 2010). Facilities relied predominantly on consumption based quantification though this was routinely combined with morbidity approach. Recommended by W.H.O as the most precise method, consumption based approach however requires complete, accurate and properly adjusted data sources. However the method does not address suitability of past consumption patterns, which may or may not match public health priorities and needs. Morbidly based approach is most complex and time consuming and is solely reliant on availability of valid morbidity data (MSH, 2012).

Ordering of medicines at facilities was not restricted to essential medicines or formulary lists despite such lists being a proven cost-effective intervention that promotes access to and rational use of pharmaceuticals and improves quality of care (USAID, 2015). In a related study in rural health facilities of Kirinyaga district, (Agwanda, 1996) established the existence of marked differences between drugs supplied and the actual monthly needs. This implied morbidity patterns were not essentially being used for re-ordering of essential drugs.

Adequate financing is necessary for successful procurement. In this study, unavailability of essential medicines and delayed pharmaceutical procurement were attributed to delayed and /or inadequate funding. Drug-financing mechanisms in public hospitals include: government allocation, health insurance, out-of-pocket and donor financing. When hospitals fail to procure enough medicines, patients either forfeit treatment altogether or buy medicines from private

chemists at higher prices. (Mecca, 2014) demonstrated a change in stock out rate at Webuye district hospital (falling from 21.75% in 2010/11 to 19.47% in 2012/13) after introduction of the national health insurance scheme. This resulted from higher allocation for the 'user fees' and increase in actual expenditure on essential medicines.

Inventory management

Effective inventory management ensures determination of precise order quantities without subjecting the organization to unnecessary costs associated with overstock or under stock. This study established that medicine stock-outs were frequently incurred at hospitals partly due to unreliable record-keeping and inadequately trained staff. Effective record management is a critical function of inventory management that ensures accuracy of records, tracking of inventory movement and estimation of stock levels (Oballah, 2015). Chuchu et.al established a substantial association between automation and correctness of stock records. The study also highlighted unavailability of training opportunities for staffs on stock keeping and reporting for medicines. Consistent findings were reported by (Waako, 2009) regarding training curricula for HIV/AIDS which mainly emphasized clinical care with fewer modules on management of medicines supply. This contributed significantly to the competence gap amongst staff in management of supplies.

Use of ICT in management of pharmaceutical information

Application of ICTs (including data software) in management of pharmaceutical data and information was not practised at any of the three hospitals; despite all facilities having computers and related accessories for management of stock records. Subsequently all departmental functions in the hospitals related to management of medicines were done manually. Poor quality of data was cited as a key challenge as records were either incorrectly or incompletely filled. This negatively affected procurement processes such as quantification and stock level estimation thereby contributing to medicines unavailability. These findings were consistent with similar study findings where facilities that automated their systems achieved improved medicines control (Muthoni, 2014). Inadequate sensitization of staff on rationale for automated systems was cited as reason for low usage of ICT at public facilities in Nairobi (Chuchu, 2015).

5.3 Study Limitations

a) Methodological

The study focused on public hospitals only excluding periphery primary care facilities which provide a larger proportion of pharmaceutical products and services as well. Their inclusivity in this study would have strengthened the findings.

The dependent variable was estimated using a cluster of five randomly selected essential medicines (SARAM report 2013). This cluster was however not conclusive. Use of retrospective data may also have compromised accurate determination of the dependent variable as a few records were minimally incomplete.

b) Conceptual

The study focused on supply and inventory management systems only. The pharmaceutical system is composed of many inter-related and mutually functioning sectors and systems. These include finance, service delivery, quality and standards. A comprehensive study would have yielded stronger conclusions.

5.4 Conclusion

As reported in other related studies on essential medicines, this study established that county referral hospitals failed to provide all prescribed medicines to a majority of its clients due to stock-shortages. One or more commodities were lacking in stock at any given time. For a cluster of five essential medicines; the median availability was marginally low whereas the stock-out duration was significantly high. Varied pharmaceutical procurement practices were established many of which were suboptimal compared to the recommended policies and guidelines.

5.5 Recommendations for Policy and Practice

Based on the gaps identified above, this study recommends the following interventions aimed at improving availability of essential medicines at public hospitals;

- i. Need to strengthen the pharmaceutical procurement system in hospitals by ensuring: accurate selection and quantification of medicines, adequate funding, and inclusion of prescribers, suppliers and end-users in planning for pharmaceutical procurement.
- ii. Adoption of effective inventory management mechanisms that prioritise accurate record-keeping and routine training of staff on supply chain management.

- iii. Improve the quality of pharmaceutical information used in planning, resource allocation, monitoring and evaluation of pharmaceutical processes. This can be achieved through full automation of the existent paper-based systems.

5.6 Recommendation for Further Research

Considering the complexity of the pharmaceutical procurement and management systems, there is need for in-depth systematic studies to identify and correlate other immediate factors influencing availability of essential medicines in health facilities particularly in the devolved setup.

REFERENCES

- Agwanda, R. K. (1996). Essential drugs supply and usage as a reflection of outpatient morbidity in Kirinyaga District, Kenya. *East African Medical Journal*, 73(2), 120-5.
- Anca Vitcu, E. L. (2007). Multi-stage maximum variation sampling in health promotion programs' evaluation. *Journal of preventive medicine*, 15, 5-18.
- Balasubramaniam R, B. B. (2011). A national survey of availability of key essential medicines for children in sri lanka. *Ceylon J*, 56, 101-107.
- Barbara S. Carasso, M. L. (2009). Availability of essential medicines in Ethiopia:an efficiency-equity trade-off? *Tropical Medicine and International Health*, 14(11), 1394–1400.
- Bunde, E. E. (2007). *Kenya: Stock Status and Logistics System Assessment 2006*. Arlington, VA: DELIVER, for the U.S. Agency for International Development.
- Cameron A, E. M.-D. (2009). Medicine prices,availability, and affordability in 36 developing and middle-income countries:A secondary analysis. *Lancet*, 373(10.1016/S0140-6736(08)61762-6), 240–249.
- Cameron A, R. I.-T. (2011). Differences in the availability of medicines for chronic and acute conditions in the public and private sectors of developing countries. *Bulletin of World Health Organization*, 89(10.2471/BLT.10.084327; 10.2471/BLT.10.084327), 412–421.
- Carasso BS, L. M. (2009). Availability of essential medicines in ethiopia:An efficiency-equity trade-off? *Trop Med Int Health*, 14(10.1111/j.1365-3156.2009.02383.x), 1394–1400.
- Chandani, Y. E. (2009). HIV/AIDS Drug Procurement and Supply Chain Management. In R. G. Teitelbaum (Ed.), *From the Ground Up: Building Comprehensive HIV/AIDS Care Programs in Resource Limited Settings* (Vol. 1, pp. 209-230). Washington, D.C. 20036: Elizabeth Glaser Pediatric AIDS Foundation.
- Chen W, T. S.-D. (2010). Availability and use of essential medicines in china: Manufacturing, supply, and prescribing in shandong and gansu provinces. *BMC Health Serv Res*, 10(10.1186/1472-6963-10-211), 211.
- Cheraghali, A. I. (2009). Availability, affordability, and prescribing pattern of medicines in sudan. *Pharm World Sci*, 31(10.1007/s11096-009-9282-3), 209-215.
- Chomba EN, H. A. (2010). The current availability of antiepileptic drugs in zambia: Implications for the ILAE/WHO “out of the shadows” campaign. *Am J Trop Med Hyg*, 83(10.4269/ajtmh.2010.10-0100), 571-574.

- Chuchu, S. A. (2015). Information management for essential medicines supplies in public primary care facilities in Nairobi County, Kenya. *African Journal of Pharmacy and Pharmacology*, 10(5897), 532-539.
- Chuma and Okungu. (2011). Viewing the Kenyan health system through an equity lens: implications for universal coverage. *International Journal for Equity in Health* 2011, 10:22, 1-14.
- Cohen, J. a. (2001). *Using technology to fight corruption in pharmaceutical purchasing: lessons from the Chilean experience*. Retrieved October 29, 2015, from http://info.worldbank.org/etools/docs/library/48617/oj_chile.pdf
- Cox, F. J. (1998). *APICS Dictionary* (9th ed.). USA: American Production Inventory Control Society.
- Dixit R, V. M. (2011). Availability of essential medicines: A primary health care perspective. *Indian J Pharmacol*, 43(10.4103/0253-7613.84981), 599-600.
- Ebenezer, K. (2008). Providing affordable essential medicines to African households: The missing policies and institutions for price containment. *Social Science and Medicine*, 66(3), 569-581.
- Elfatih Ibrahim Elamin, M. I. (2010). Availability of Essential Medicines in Sudan. *SJPH*, 5(1).
- Farkhondeh, A. H. (2011). Pharmacy information systems in Tehran university hospitals and their relationship with pharmaceutical companies. *Journal of Paramedical Sciences*, 2(1).
- FIP. (2009). *2009 FIP Global Pharmacy*. The Hague, The Netherlands.
- Gitanjali B, M. S. (2011). Availability of five essential medicines for children in public health facilities in india: A snapshot survey. *J Pharmacol Pharmacother*, 2(10.4103/0976-500X.81900), 95-99.
- Grundy, J. H. (2003). Overview of devolution of health services in the Philippines. *NCBI*, 3(2), 220.
- HAI/WHO. (2008). *Measuring medicine prices, availability, affordability and price components 2nd edition*. Retrieved February 20, 2015, from <http://www.haiweb.org/medicineprices/>
- Higuchi M. (2010). Access to diabetes care and medicines in the philippines. *Asia Pac J Public Health*, 22(10.1177/1010539510373005), 96S-102S.
- Huff-Rousselle M, B. F. (1996). Cost containment through pharmaceutical procurement: a Caribbean case study. *International Journal of Health Planning and Management*, 11(2), 135-157.
- Jane Robertson, G. F.-M. (2009). What essential medicines for children are on the shelf? *Bulletin of the World Health Organization*, 87(3), 231-237.
- Josephine, K. N. (2010, February). Expiry of medicines in supply outlets in Uganda. *Bulletin of the World Health Organization*, 88(2), 154-158.

- Karr, A. (2004). Specializing in procurement. *Hosp Pharm*, 11, 379–82.
- Kenya Law Reports. (2010). *The Public Procurement and Disposal Act*. National Council for Law Reporting.
- Kim, S. M. (2004). *An empirical investigation of the impact of electronic commerce on supply chain management: A study in the healthcare industry*. Retrieved November 11, 2015, from ETD collection for University of Nebraska - Lincoln: <http://digitalcommons.unl.edu/dissertations/AAI3126954/>
- KNBS. (2013). *The 2009 Kenya Population and Housing Census*.
- KPMG. (2013). *Devolution of Healthcare Services in Kenya-Lessons Learnt from other Countries*. KPMG Services (Proprietary) Limited.
- Luoma, M. J. (2010). *Kenya Health System Assessment 2010*. Bethesda, MD: Health Systems 20/20 project, Abt Associates Inc.
- Machini, B. K. (2013). *Monitoring outpatient malaria case management under the 2010 diagnostic and treatment policy in Kenya- 2010-2012 progress report*. Division of Malaria Control, Ministry of Public Health and Sanitation.
- Masters, B. R. (2014). Pharmaceutical Availability across Levels of Care: Evidence from Facility Surveys in Ghana, Kenya, and Uganda. *PLoS ONE*, 9(12).
- Mecca, L. W. (2014). *Financing and availability of essential medicines before and after introduction of the national hospital insurance fund civil servants and disciplined services medical scheme: a case study of Webuye district hospital, western Kenya*. Retrieved November 15, 2015, from University of Nairobi Digital Repository: <http://erepository.uonbi.ac.ke/handle/11295/77993>
- MoH. (2003). *Assessment of the pharmaceutical situation in Kenya: A baseline survey*.
- MoH. (2007). *Kenya Household Health Expenditure and Utilization Survey*. Nairobi.
- MoH. (2013). *Kenya Service Availability and Readiness Assessment Mapping(SARAM) Report*. Nairobi.
- MoMs & MoPHS. (2009). *Access to Essential Medicines in Kenya-Ahealth Facility Survey*. Nairobi: Ministry of Medical Services and Ministry of Public Health& Sanitation.
- MoMs & MoPHS. (2009-2010). *Kenya National Health Accounts 2009/10*. Nairobi: Ministry of Medical Services; Ministry of Public Health and Sanitation.
- MoMS & MoPHS. (2010). *Kenya Essential Medicines List 2010*.
- MoMs. (2008). *Kenya National Pharmaceutical Policy*. Nairobi: Ministry of Medical Services.

- MSH. (2012). Pharmaceutical Management Information System. In *Managing access to Medicines and Health Technologies* (p. 49.15). Arlington, V.A: Management Sciences for Health.
- MSH. (2012). Quantifying pharmaceutical requirements. In *Managing access to medicines and health technologies* (p. 20.5). Arlington.
- Muthoni, N. W. (2014). Adoption of internet based systems for stock monitoring. *International Journal of Scientific and Research Publications*, 4(5).
- Mwathi, M. W. (2014). Availability of essential medicines in public hospitals: A study of selected public hospitals in Nakuru County, Kenya. *African Journal of Pharmacy and Pharmacology*, 8(17), 438-442.
- NCC. (2014). *Nairobi County Integrated Development Plan*.
- Oballah, D. W. (2015). Effect of inventory management practices on organizational performance in public health institutions in Kenya: a case study of Kenyatta National Hospital. *International Journal of Education and Research*, 3(3).
- Odermatt P, L. S. (2007). Availability and costs of antiepileptic drugs and quality of phenobarbital in Vientiane Municipality, Lao PDR. *Neuroepidemiology*, 28(10.1159/000103270), 169-174.
- Owunna & Whitt. (2007). *Managing Pharmaceuticals for TB/HIV Collaboration: Lessons Learned from a Five-Country Study in East Africa*. Arlington, VA: Rational Pharmaceutical Management Plus Program. Management Sciences for Health.
- Pasquet, A. M.-B. (2010). Impact of Drug Stock-Outs on Death and Retention to Care among HIV-Infected Patients on Combination Antiretroviral Therapy in Abidjan, Côte d'Ivoire. *PLoS ONE*, 5(10).
- Paul J Waako, R. O.-a.-o. (2009). Existing capacity to manage pharmaceuticals and related commodities in East Africa: an assessment with specific reference to antiretroviral therapy. *Human Resources for Health*, 7(21), doi:10.1186/1478-4491-7-21.
- Saouadogo H. (2011). Measuring availability, affordability and management of essential medicines in public hospitals of Burkina Faso. *World Hospitals and Health Services*, 47, 8-11.
- Senarathna SM, M. U. (2011). Medicines prices, availability and affordability in Sri Lanka. *Indian J Pharmacol*, 43(10.4103/0253-7613.75672), 60-63.
- Tren R, K. a. (2009). Drug Procurement, the Global Fund and Misguided Competition Policies. *Malaria Journal*, 8, 305.
- UN. (2008). *Delivering on the Global Partnership for Achieving the Millennium Development Goals*. New York: United Nations.

UN. (2012). *Millennium Development Goal 8; The Global Partnership for Development: Making Rhetoric a Reality*. New York: United Nations.

UN. (2015). *Sustainable Development Goals*. Retrieved October 2015, from Sustainable Development Knowledge Platform: <https://sustainabledevelopment.un.org/topics>

UN. (2015). *The Millennium Development Goals Report*. NEW YORK: UNITED NATIONS.

UNIDO. (2010). *Pharmaceutical Sector Profile: Global UNIDO Project-Strengthening the local production of essential generic drugs in least developed and developing countries*. Vienna.

United Nations. (2008). *Millennium Development Goals Indicators*. Retrieved January 24th, 2015, from <http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm>

United Nations. (2015). *Universal declaration of human rights, article 25: “(1) everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care...”*. Retrieved February 20, 2015, from <http://www.un.org/en/documents/udhr/index.shtml#a25>

USAID. (2015). *Systems for Improved Access for Pharmaceuticals and Services*. Retrieved November 12, 2015, from USAID: <http://siapsprogram.org/approach/pharmaceutical-services/essential-medicines-lists/>

van den Ham R, B. L. (2011). *The world's medicines situation 2011, selection of essential medicines*. Retrieved February 20, 2015, from <http://apps.who.int/medicinedocs/documents/s18770en/s18770en.pdf>

van Mourik MS, C. A. (2010). Availability, price and affordability of cardiovascular medicines: A comparison across 36 countries using WHO/HAI data. *BMC Cardiovasc Disord*, 10(25. 10.1186/1471-2261), 10-25.

Voelker R. (2010). One casualty of global economic crisis: uncertain finances for HIV/AIDS programs. *JAMA*, 304(3), 259-261 doi: 10.1001/jama.2010.962.

Waako, P. J.-a.-o. (2009). Existing capacity to manage pharmaceuticals and related commodities in East Africa: an assessment with specific reference to antiretroviral therapy. *Human Resources for Health*, 7(21).

WHO. (1999). *Operational principles for good pharmaceutical procurement*. Geneva.

WHO. (2004). *Equitable Access to Essential Medicines: A Framework for Collective Action - WHO Policy Perspectives on Medicines, No. 008*. Retrieved from World Health Organisation: <http://apps.who.int/medicinedocs/en/d/Js4962e/1.2.html>

WHO. (2011). The Worlds Medicines Situation. *Options for financing and optimizing medicines in resource-poor countries*, pp. 8-9.

WHO. (2011). *WHO MEDIUM-TERM STRATEGIC PLAN 2008–2013; plan M-TS. 2008–2013*.

Retrieved February 2015, 19, from http://apps.who.int/gb/e/e_amtsp.html

WHO. (2015). *Essential Medicines*. Retrieved January 2015, from

http://www.who.int/topics/essential_medicines/en/

World Health Organisation. (2004). *The World Medicines Situation*.

Yasmin Chandani, M. N. (2012). Factors Affecting Availability of Essential Medicines among Community Health Workers in Ethiopia, Malawi, and Rwanda: Solving the Last Mile Puzzle. *American Journal of Tropical Medicine and Hygiene*, 87(Suppl 5), 120-126.

APPENDICES

Appendix 1: Informed consent form

“Organizational practices that influence availability of essential medicines at public hospitals in Nairobi County”

Informed consent for staffs working in procurement and pharmaceutical departments in public hospitals in Nairobi.

Source: Modified input from UNHCR (Drug Management Manual 2006) and MSH (Managing access to Medicines and Health Technologies)

Contact information: The study proposal has been reviewed and approved by the Kenyatta National Hospital /University of Nairobi-Ethics Review Committee (KNH/UON-ERC) (P252/04/2015). In case of any questions you can contact the committee through:

The Secretary,
KNH/UON-ERC
P.O. BOX 20723 Code 00202 Nairobi, Kenya
Tel: (020)726300-9
Email: uonknh_erc@uonbi.ac.ke

Principal investigator: Dr. Zimbulu Victor,

Organization: University of Nairobi, School of public Health

Supervisors: **Dr. Richard Ayah. Lecturer, School of Public Health**

University of Nairobi

Dr. Peter Ndirangu Karimi. Lecturer, School of Pharmacy

University of Nairobi

Introduction

My name is Zimbulu Victor a student at the University of Nairobi, School of Public Health. I am conducting a study to determine organizational practices that influence availability of essential medicines at public hospitals in Nairobi County. I am here today to gather information on procurement, inventory management and information management for essential medicines at this health facility. Before we start, I want to tell you more about the study and seek your consent to participate.”

Purpose of the research

The results of the study will influence effective operational management of the pharmaceutical system particularly the procurement and inventory management units. Managers and staff will be able to better plan and monitor activities related to procurement and inventory management thereby improving availability of essential medicines.

Type of research intervention

The study will be based on interviewer administered questionnaire

Participant selection

I am inviting you as a staff in this department to participate in the study.

Voluntary participation

You are invited to voluntarily consent to participate in this study with the full understanding of the information outlined above. You are also free to withdraw or end a survey/interview and there will be no consequences regarding any potential benefits from the study.

Confidentiality

All information will be kept confidential and names of respondents will not be quoted, instead codes will be used during analysis and dissemination of the findings.

Benefits

There will be no direct benefits from participating in this exercise. However, the findings and recommendations of the study will be shared to help managers and staff be able to better plan and monitor activities related to procurement and inventory management thereby improving availability of essential medicines. The study will help further inform future research exercises.

Risks and Discomforts:

There are no risks involved for respondents choosing to participate in the study as your interviews will be in private and I shall not identify nor link responses to individual respondents. However, you may refuse to answer any question or not take part in a portion of the assessment if you feel the question(s) are personal or if talking about them makes you uncomfortable.

Consent Status

I therefore consent to participate in this study and fully understand the purpose, benefits, risks and confidentiality issues as read and/or explained to me by the interviewer.

Written consent:

Signature of respondent: _____

Date: _____

Interviewer: _____

Signature: _____

Date: _____

Contact of principal investigator: Dr.Zimbulu Victor 0704-507-823

Appendix 2: Data abstraction tool

a) Proportion of medicines dispensed in full

Record the number of prescriptions out of 30 randomly sampled prescriptions that had the indicated medicines dispensed in full on 3 different days?

No	Hospital code	Medicines dispensed versus prescribed					
		Day 1(6/9/14)		Day 2(1/8/14)		Day 3(1/7/14)	
		D	P	D	P	D	P
1.	MDH		30		30		30
2.	MLKH		30		30		30
3.	PMH		30		30		30

b) Number of stock-out days of 5 basic medicines over 12 months

No	Name of tracer medicine ↓ Month →	Number of days out of stock between January to December 2014													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL	
		4.	Amoxicillin suspension 125mg/5ml												
5.	Paracetamol syrup 120mg/5ml														
6.	Artemether/Lumefantrine(120/60 mg) 6' pack														
7.	Nifedipine retard tablets 20mg														
8.	Ferrous salt tablets(alone or with folic acid)														

Appendix 3: Key informant guide

Source: Modified UNHCR (Drug Management Manual 2006) and MSH (Managing access to Medicines and Health Technologies)

County

Date of interview: __/__/2015 Hospital Name: _____ Department_____

Respondents: Hospital administrators and Heads of Procurement and Pharmaceutical departments.

Interviewer: Before administering this tool, please read out the consent form to the interviewee. Only after the consent has been granted by the interviewee shall the interviewer proceed.

PART 1: General and demographic information

No.	Question	Code	Coding category
11.	Gender	I.	Female
		II.	Male
12.	Name of your department		
13.	What is your current position in the department?		
14.	For how long have you been in this position?		_____Years _____Months
15.	What is your profession?		
16.	What is your highest completed level of education?	I.	Certificate
		II.	Diploma
		III.	Bachelors
		IV.	Masters
17.	What are your main roles and responsibilities in this department?		
18.	How many staff do you directly supervise?(Indicate the number)		

PART 2: Procurement of medicines and medical supplies

No.	Question	Code	Coding category
A.	SELECTION AND QUANTIFICATION OF MEDICINES		
19.	Are you involved in selection and quantification of medicines?	I.	Yes(Elaborate the role played)
		II.	No
20.	Who are the other members involved in the selection and quantification process?(List their		

No.	Question	Code	Coding category
	titles and/or positions)		
21.	Are roles of the various members clearly defined and/or documented?	I.	Yes
		II.	No
22.	Are resolutions and decisions made by these members at meetings routinely implemented?	I.	Yes
		II.	No
23.	How is quantification for medicines done? Probe method used(Consumption method, Morbidity method)		
24.	What sources of information are used for an accurate quantification process?		
25.	Were stock shortages incurred in this facility in the last 12 months?		
26.	Were stock surpluses incurred in this facility in the last 12 months?		
27.	How often are quantification review meetings held?		
28.	How soon are supply adjustments made following such reviews? (Specify the period)		
29.	Is selection of medicines limited to essential medicines/formulary lists?	I.	Yes
		II.	No(Elaborate answer)
30.	Explain the procedure used in procurement of non-listed medicines?		
B.	FUNDING FOR MEDICINES		
31.	How soon are payments for medicines made?		

No.	Question	Code	Coding category
32.	Are there current unpaid invoices for medicines already supplied and/or consumed?	I.	Yes
		II.	No
33.	Are funds for medicines remitted via a separate vote?	I.	Yes
		II.	No
34.	Does the hospital have a revolving medicine fund?	I.	Yes
		II.	No
35.	In your opinion what is the extent of financing for the medicines budget?(Probe percentage of budget funded)		
36.	How often are the medicines accounts audited? (When was the last audit-date/month/year)		
37.	Are the audit findings for medicines disclosed to all stakeholders?		
C. ORDERING AND PURCHASING OF MEDICINES			
38.	How frequent are orders for medicines placed?	I.	Annually
		II.	Bi-annually
		III.	Quarterly
		IV.	Other
39.	What influences the order interval above?		
40.	What is the average lead time for medicine supplies?(Time in days or months)		
41.	What are the major causes of delays in medicine supplies?		
42.	Which procurement method is routinely used in purchase of medicines?		
43.	Are results for the tendering process disclosed to the general public?	I.	Yes
		II.	No
44.	Are supplies sourced solely from the 'awarded supplier'?	I.	Yes
		II.	No
45.	What are the major challenges in procurement for		

No.	Question	Code	Coding category
	medicines in this hospital?		
D. INVENTORY MANAGEMENT			
46.	How often is stock checked and updated?		
47.	Which reporting tools are used in stock validation?(List the tools used)		
48.	Is Information Communication Technology (ICT) used in routine stock management?	I.	Yes (Probe ICT type in use)
		II.	No
49.	Does this pharmacy maintain adequate safety stock?	I.	Yes
		II.	No
50.	How are medicine stock losses accounted for in the department?		
51.	How many of your staffs have been trained on inventory management in the last 12 months?		
52.	In your opinion, is this department adequately staffed?	I.	Yes
		II.	No (Elaborate the answer)
53.	What are the major challenges encountered during inventory management?		
E. PHARMACEUTICAL INFORMATION SYSTEM			
54.	Is Information Communication Technology (ICT) integrated in routine management of pharmaceutical information?	I.	Yes(Describe ICT type in use)
		II.	No
55.	Are all departmental functions related to management of medicines captured by the system in (54) above?	I.	Yes
		II.	No
56.	Is the system programmed to automatically generate summary reports for decision making?	I.	Yes
		II.	No
57.	Are you conversant with input and retrieval of information from the system? How many of your		

No.	Question	Code	Coding category
	staffs are conversant?		
58.	Is the system's information routinely used to support decision making?	I.	Always
		II.	Sometimes
		III.	Never
59.	What are the main challenges in management of pharmaceutical information?		
F. OBSERVATION CHECKLIST(tick appropriately for availability of the following at the hospital)			
	Item	Available?	
60.	Kenya essential medicine list 2010/or hospital formulary list	I.	Yes
		II.	No
61.	Clinical guidelines for level 4-6 hospitals	I.	Yes
		II.	No
62.	Latest minutes of the procurement/medicines and therapeutic committee	I.	Yes (Note the date)
		II.	No
63.	Public procurement and disposal guidelines 2006	I.	Yes
		II.	No
64.	Latest audited medicines accounts	I.	Yes(Note date)
		II.	No

Appendix 4: Survey tool

Organizational practices that influence availability of essential medicines at hospitals in Nairobi County

Date of interview: ___/___/2015 Hospital Name: _____ Department _____

Start time _____ End time _____

Respondents: Staff working in the pharmaceutical and procurement departments at county referral hospitals.

Interviewer: Before administering this tool, please read out the consent form to the interviewee. Only after the consent has been granted by the interviewee shall the interviewer proceed.

If self-administered: Leave the tool with respondent only after obtaining informed consent. Indicate to the respondent that you will return after 40 minutes to pick the form

PART 1: General and demographic information

No.	Question	Code	Coding category
9.	Gender	I.	Male
		II.	Female
10.	Name of your department		
11.	What is your current position in the department?		
12.	For how long have you been in this position?	_____	Years
		_____	Months
13.	What is your profession?		
14.	What is your highest completed level of education?	I.	Certificate
		II.	Diploma
		III.	Bachelors
		IV.	Masters
15.	What are your main roles and responsibilities in this department?		
16.	How many staff do you directly supervise?(Indicate the number)		

PART 2: Procurement of medicines and medical supplies

No.	Question	Code	Coding category
A.	SELECTION AND QUANTIFICATION OF MEDICINES		
17.	Are you involved in selection and quantification of medicines?	I.	Yes
		II.	No
18.	Who are the other members involved in the selection and quantification process?(List their		

No.	Question	Code	Coding category
	titles and/or positions)		
19.	Are roles of the various members clearly defined and/or documented?	I.	Yes
		II.	No
20.	Are resolutions and decisions made by these members at meetings routinely implemented?(Evidenced by minutes and reports)	I.	Yes
		II.	No
21.	Which method is used during the quantification process?	I.	Consumption based method
		II.	Morbidity based method
		III.	Both
		IV.	Other (Elaborate)
22.	Name the sources of information used for accurate quantification?		
23.	Were stock surpluses incurred in this facility in the last 12 months? (Elaborate your answer)		
24.	Were stock shortages incurred in this facility in the last 12 months? (Elaborate your answer)		
25.	How often are quantification review meetings held?		
26.	How soon are supply adjustments made following such reviews? (Specify the period)		
27.	Is selection of medicines limited to essential medicines/formulary lists?	I.	Yes
		II.	No
28.	Which procedure is used in procurement of non-listed medicines?		
B.	FUNDING FOR MEDICINES		
29.	How prompt are payments for medicines made?		
30.	Are there unpaid invoices for medicines already supplied and/or consumed?	I.	Yes
		II.	No
31.	Are funds for medicines remitted via a separate	I.	Yes


No.	Question	Code	Coding category
	vote?	II.	No
32.	Does the hospital have a revolving medicine fund?	I.	Yes
		II.	No
33.	In your opinion what is the extent of financing for the medicines budget? (Percentage of budget funded)		
34.	How often are the medicines accounts audited? (When was the last audit?-date/month/year)		
35.	Are the audit findings for medicines shared amongst all the relevant stakeholders? (Probe for the media used)		
C. ORDERING AND PURCHASING OF MEDICINES			
36.	How frequent are orders for medicines placed?	I.	Annually
		II.	Bi-annually
		III.	Quarterly
		IV.	Other _____
37.	What influences the order interval above?		
38.	What is the average lead time for medicine supplies?(Probe for the time in days)		
39.	What are the major causes of delays in medicine supplies?		
40.	How is tendering for medicines done at this hospital? (Probe for the procurement method)		
41.	Are results for the tendering process disclosed to the general public?(Probe for the media used)	I.	Yes
		II.	No
42.	Are supplies sourced solely from the cheapest supplier?	I.	Yes
		II.	No (Elaborate answer)
43.	What are the major challenges in procurement for medicines in this hospital?		

No.	Question	Code	Coding category
D.	INVENTORY MANAGEMENT		
46.	How often is stock checked and updated?		
47.	Which reporting tools are used in stock validation?(List the tools used)		
48.	Is Information Communication Technology (ICT) used in routine stock management?	I.	Yes (Explain ICT type in use)
		II.	No
49.	Does this pharmacy maintain enough safety stock?	I.	Yes
		II.	No
50.	How are medicine stock losses accounted for in the department?		
51.	Have you attended any short-course training on inventory management in the last one year?		
52.	In your opinion, is this department adequately staffed?	I.	Yes
		II.	No (Elaborate the answer)
53.	What are the major challenges encountered during inventory management?		
E.	PHARMACEUTICAL INFORMATION SYSTEM		
54.	Is Information Communication Technology (ICT) integrated in routine management of pharmaceutical information?	I.	Yes(Explain ICT type in use)
		II.	No
55.	Are all departmental functions related to management of medicines captured by the system in (54) above?	I.	Yes
		II.	No
56.	Is the system programmed to automatically generate summary reports for decision making?	I.	Yes
		II.	No
57.	Are you conversant with input and retrieval of information from the system?		
58.	Is the system's information routinely used in decision making?	I.	Always
		II.	Sometimes
		III.	Never

No.	Question	Code	Coding category
59.	What are the main challenges in management of pharmaceutical information?		
F. OBSERVATION CHECKLIST(tick appropriately for availability of the following at the hospital)			
	Item	Available?	
60.	Kenya essential medicine list 2010/Formulary list	I.	Yes
		II.	No
61.	Standard treatment guidelines	I.	Yes (Specify)
		II.	No
62.	Latest minutes of the procurement /drugs committee	I.	Yes (Note date)
		II.	No
63.	Public procurement and disposal guidelines 2013	I.	Yes
		II.	No
64.	Latest audited medicines accounts	I.	Yes(Note date)
		II.	No

Appendix 5: List of public hospitals In Nairobi by ownership

Facility code	Hospital name	County	District	Division	Hospital Type	Owner
13000	Kamiti prison hospital	Nairobi	Kasarani	Kasarani	Other	Prisons Dept.
13023	K.N.H	Nairobi	Dagoretti	Dagoretti	National Referral	M.O.H
17411	Mama Lucy Kibaki Hospital	Nairobi	Embakasi	Embakasi	County Referral	Nairobi County
13076	Mathari Hospital	Nairobi	Starehe	Kariokor	National Referral	M.O.H
13080	Mbagathi Hospital	Nairobi	Kibra	Kibra	County Referral	Nairobi County
13194	National Spinal Injury	Nairobi	Westlands	Westlands	National Referral	M.O.H
13095	Moi Air Base	Nairobi	Kamukunji	Eastleigh	Other Hospital	D.o.D
13156	Pumwani Maternity Hospital	Nairobi	Kamukunji	Pumwani	Maternity Hospital	Nairobi County

 Facilities selected to participate in the study

Appendix 6: List of tracer medicines to be assessed

No	Name of tracer commodity	Category of medicine
1.	Amoxicillin suspension 125mg/5ml	Essential medicine for children
2.	Ferrous salt tablets(alone or with folic acid)	Maternal health
3.	Artemether/Lumefantrine 120/60 mg 6' pack	Malaria
4.	Nifedipine retard tablets 20mg	Non-communicable diseases
5.	Paracetamol syrup 120mg/5ml	General medicine

Appendix 7: KNH/UON ERC approval



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355



KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202

Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/335

31st July 2015

Dr. Zimbulu Victor
H70/69478/2013
School of Public Health
College of Health Sciences
University of Nairobi

Dear Dr. Zimbulu

Research proposal – Organizational practices that influence availability of essential medicines at Hospitals in Nairobi county (P252/ 04/2015)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 31st July 2015 – 30th July 2016.


This approval is subject to compliance with the following requirements:

- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website <http://www.erc.uonbi.ac.ke>

Protect to discover

Yours sincerely,



PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC

c.c. The Principal, College of Health Sciences, UoN
 The Deputy Director CS, KNH
 The Chair, KNH/UoN-ERC
 The Director, School of Public Health, UoN
 Supervisors: Dr. Richard Ayah, Dr. Peter Ndirangu Karimi

Appendix 8: County Health Services approval

NAIROBI CITY COUNTY

Telephone 020 344194
web: www.nairobi.go.ke



City Hall,
P. O. Box 30075-00100,
Nairobi,
KENYA.

COUNTY HEALTH SERVICES

REF: PHD/1/13/ (08) - 015

✓ TO: ZIMBULU VICTOR
UNIVERSITY OF NAIROBI
P O BOX 19676
NAIROBI

DATE: 20TH AUGUST, 2015

RE: RESEARCH

Authority is hereby granted to you to carry out research on "Organizational practices that influence availability of essential medicines at Hospitals (Mbagathi Hospital, MLKH and PMH in Nairobi County".

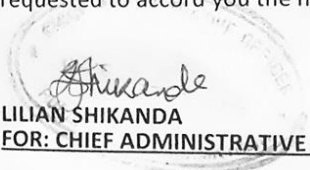
Please note that your research runs One for (1) month
w.e.f from 31st August, 2015 to 30th September, 2015.

During the course of your research you are expected to adhere to the rules and regulations governing the Nairobi City County.

You will also be expected to submit a copy of your research project to the office of the undersigned.

You will be expected to pay a research fee of Kshs. 5,000/-.

By a copy of this letter, the Medical Superintendents of the above mentioned Hospitals are requested to accord you the necessary assistance.


LILIAN SHIKANDA

FOR: CHIEF ADMINISTRATIVE OFFICER – (CHS)

Cc:- Medical Superintendent – Mbagathi, MLKH, PMH.
Hospital Administrator – Mbagathi, MLKH, PMH.