

**FACTORS AFFECTING MEDICAL EQUIPMENT UTILIZATION IN
HEALTH SERVICE DELIVERY IN MANDERA COUNTY REFERRAL
HOSPITAL, KENYA**

HASSAN ALIOW GUYOW

HSM-3-2449-1/2013

**A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THEREQUIREMENTFOR THE DEGREE OF MASTER OF SCIENCE IN
HEALTH SYSTEMSMANAGEMENT OF KENYA METHODIST
UNIVERSITY**

September 2021

DECLARATION

Declaration by the Student

This Thesis is my original work and has not been presented for a degree or any other award in any other university

Signature: _____ **Date:** _____

Hassan Aliow Guyow

HSM-3-2449-1/2013

Declaration by the Supervisors

We confirm that the work reported in this thesis was carried out by the candidate under my/our supervision.

Signature: _____ **Date:** _____

Dr Wanja Mwaura-Tenambergen.

Department of Health Systems Management

Kenya Methodist University

Signature: _____ **Date:** _____

Mr Musa Oluoch

Department of Health Systems Management.

Kenya Methodist University

COPYRIGHT

© Guyow Hassan A.

All rights reserved. No part of this thesis may be produced, stored in any retrieval system or transmitted in any form or by any means, electronically, mechanical, by photocopying or otherwise without prior written permission of the author or Kenya Methodist University, on that behalf

ACKNOWLEDGEMENT

I would like to specially thank my supervisors Dr Wanja Mwaura and Mr Musa Oluoch for their tremendous guidance and support in the development and completion of this thesis. I am heavily indebted to them for their review, support and guidance of my proposal and their timely and well thought feedback that has helped me shape this proposal. Finally, I would like to thank the entire Health Systems Management faculty members for their support in my coursework, which shaped the theoretical and technical guidance in writing the proposal not forgetting my family for their support and perseverance during the course of my studies.

DEDICATION

I dedicate this thesis to my loving wife, children and my dear mum for their prayers and immense support throughout my study period.

ABSTRACT

Medical equipment utilization is critical to health service delivery in the health sectors globally and locally in Kenya. In Mandera county referral hospital, the major problem is poorly functioning health system due to poor utilization of important medical equipment. This study therefore sought to investigate factors that affect medical equipment utilization in health service delivery in Mandera county referral hospital, Kenya. Specific objectives were to investigate the effect of human resource capacity development, medical equipment management policy, medical equipment procurement policy and adherence to customer service charter on utilization of medical equipment in Mandera county referral hospital. This study therefore sought to investigate factors that affect medical equipment utilization in health service delivery in Mandera county referral hospital. The study used a descriptive cross-sectional survey design. The target population of this study was 147 staffs. The staffs consisted of Doctors, Nurses, Clinical Officers, Laboratory Technologists, biomedical engineers, commodity officers and Pharmacists. The study expects that human resource capacity development, adherence to customer service charter, medical equipment policy and medical equipment procurement policy will have a significant influence on medical equipment utilization in health service delivery. The tools of data collection adopted were questionnaires and observation checklist for selected equipment. The filled questionnaires were checked for adequacy before coding. Quantitative data from questionnaires were coded, entered into SPSS Version 23 for further analysis. The study adopted descriptive and inferential statistics to analyse the data. Descriptive analysis involved frequencies, percentages, cross tabulations. The inferential analysis consisted of chi-square test of significance and the binary logistic regression. The findings of the study revealed that human resource capacity development is a significant predictor of utilization of medical equipment ($p = 0.000$, Ex (β) =0.064). The study also established that medical equipment management policy is a significant predictor of medical equipment utilization ($p = 0.031$, Ex (β)= 8.891). The causal effect relationship between medical equipment procurement policy and medical equipment utilization was also significant ($p = 0.025$, Ex (β) = 1.221). Finally, adherence to service charter was a significant predictor of utilization of medical equipment at the hospital at Mandera referral hospital ($p = 0.000$, Ex (β) =2.119). The study thus concluded that the major determinants of medical equipment utilization at Mandera referral hospital included human resource capacity development, medical equipment management policy, medical equipment procurement policy and adherence to service charter. The study recommends to the management of Mandera referral hospital to continue improving human resources at their disposal through training their staff on medical equipment, motivating the employees by remunerating those who do well and involving employees in purchasing of medical equipment. The study suggests to top management of Mandera referral hospital to have a detailed medical equipment management policy. The medical equipment policy must categorically identify all medical equipment and show the movement logs of the equipment. Further, the study recommends to management of Mandera hospital to strictly adhere to medical equipment procurement policy.”

TABLE OF CONTENTS

DECLARATION.....	ii
COPYRIGHT	iii
ACKNOWLEDGEMENT.....	iv
DEDICATION.....	v
ABSTRACT.....	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	x
ABBREVIATIONS AND ACRONYMS.....	xi
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background of the Study	1
1.2 Statement of the Problem.....	4
1.3 Objective of the Study	5
1.4 Research Hypotheses	6
1.5 Rationale of the Study.....	6
1.6 Justification of the Study	7
1.7 Limitations of the Study.....	7
1.8 Delimitation of the Study.....	8
1.10 Assumptions of the Study	9
1.11 Operational Definition of Terms.....	9
CHAPTER TWO	11
LITERATURE REVIEW	11
2.1 Introduction.....	11
2.2 Human Resource Capacity Development	13
2.3 Medical Equipment Management Policy	19
2.4 Medical Equipment Procurement Policy	21
2.5 Adherence to Service Charter	24
2.6 Theoretical Framework.....	26
2.7 Conceptual Framework.....	27
CHAPTER THREE	29
RESEARCH METHODOLOGY	29

3.1 Introduction.....	29
3.2 Research Design.....	29
3.3 Target Population.....	29
3.4 Sample Size.....	30
3.5 Sampling Procedure	31
3.6 Research Instruments	32
3.7 Data Collection Procedure	32
3.8 Pre- Testing	33
3.9 Data Processing and Analysis	34
3.10 Ethical Considerations	36
CHAPTER FOUR.....	37
RESEARCH FINDINGS AND DISCUSSION.....	37
4.1 Introduction.....	37
4.2 Response Rate and Pre-Testing	37
4.3 Demographic Characteristics of the study population	38
4.4 Descriptive Analysis of Study Variables	42
4.5 Correlation Analysis	61
4.6 Regression Analysis.....	63
CHAPTER FIVE	69
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS 69	
5.1 Introduction.....	69
5.2 Summary of Findings.....	69
5.3 Conclusion	72
5.4 Recommendations.....	72
5.5 Suggestions for Further Research	73
REFERENCES.....	74
APPENDICES	82
Appendix I: Questionnaire.....	82
Appendix II: Observation checklist of medical equipment utilization	86
Appendix V: NACOSTI Research Permit	87
Appendix V: Scientific and Ethics Review Committee Letter	88

LIST OF TABLES

Table 3.1 Target Population Distribution.....	30
Table 3.2 Sample Distribution	31
Table 4.1 Response Rate	37
Table 4.2 Reliability Test.....	38
Table 4.3 Demographic Characteristics	39
Table 4.4 Demographic Variables against Utilization of Medical Equipment	41
Table 4.5 Equipment Utilization	44
Table 4.6 Availability and Working Condition of Medical Equipment.....	45
Table 4.7 Human Resource Capacity Development	48
Table 4.8 Medical Equipment Management Policy	53
Table 4.9 Medical Equipment Procurement Policy	58
Table 4.10 Adherence to Customer Service Charter.....	60
Table 4.11 Correlation Coefficients	62
Table 4.12 Multivariate Regression Analysis Results	64

LIST OF FIGURES

Figure 2.1 Conceptual Framework.....	27
Figure 4.1 Skill, Motivation and Attire of the staff	49
Figure 4.2 Existence of Equipment Maintenance Contract and Schedule	55

ABBREVIATIONS AND ACRONYMS

BMET	:	Biomedical Equipment Technicians
CSCMP	:	Council of Supply Chain Management Professionals
EMMS	:	Essential Medicines and Medical Supplies
ETCI	:	Electro Technical Council of Ireland
HAS	:	Health and Safety Authority
HFA	:	Health for All
HIQA	:	Health Information and Quality Authority
HTM	:	Healthcare Technology Management.
KEMSA	:	Kenya Medical Supplies Agency
MES	:	Managed Equipment Service
MRI	:	Magnetic resonance Imaging
NSAI	:	National Standard Authority of Ireland
PHF	:	Public Health Facilities
PPOA	:	Public Procurement Oversight Authority
SDGs	:	Sustainable Development Goals
SPSS	:	Statistical Packages for Social Scientists
UK	:	United Kingdom
WHO	:	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally, the issue of weaknesses in the health systems is a challenge to the delivery of health services and the achievement of the Sustainable Development Goals (SDGs) and other health targets at the global, regional, national and county levels. The efforts to boost the status of health systems globally is an important pillar in improving health service delivery (World Health Organization [WHO], 2008). Health system challenges emanates from inadequate health policies, inadequate staff, backward health technology coupled with poor levels of health service delivery. The challenges need timely and urgent address to strengthen the health sector (Barr, 2007). Countries around the world particularly in Africa have had weak health systems that has roots in inadequate skilled health workers, poor state of health equipment, poor quality of care, inadequate drugs supply among other critical challenges and Mandera county is not exceptional in the above phenomenon (Mutia et al., 2012).

Literature has established that in the United Kingdom (UK), about four hundred people lose their lives annually due to serious injuries in accidents involving medical equipment every year. The situation in Ireland is not any different thereby calling for the need to adopt strong governance procedures in the health systems to ensure the Medicare is in tandem with set regulations and best practices (Buse & Hawkes, 2015). The major setback in Kenya and more so in the devolved system of government is that the resources have been devolved but policies are not in place to guide the procurement and use of medical device and the aftermath of which is the haphazard procurement of important devices which are dumped in stores because of lack of prioritization and staff

capacity development on the use of the device (Miriti, 2018; WHO, 2008 ;WHO 2011). There is a rising number of medical equipment adoption in the delivery of health service in the hospitals and their availability and utilization is very critical in enabling a health care organization to deliver quality health services to those in need and effectively manage health conditions. The World Health Organization (WHO) has continuously identified and advised that policies regarding medical equipment be revised to enable the health systems globally to handle emerging needs for the equipment in managing health conditions. The Commission on Patient Safety and Quality Assurance has strictly stressed on the need to adopt standards and best practices in the utilization of medical equipment in enhancing Medicare management and governance(Miriti, 2018).

In the developing world especially in Africa, nations have made efforts in enhancing medical equipment utilization especially in the rural and sub urban areas. However, success in this front has not been forthcoming occasioned by poor health structures at the grass root health facilities and poor management of conditions for optimal medical equipment utilization (WHO, 2008). Lack of enough qualified personnel in the maintenance department and capacity development of the overstretched human resource is a major bottleneck in the current county health department. The medical engineering department is critically understaffed while it is mandated to carry out all the maintenance activity. The ratio of staffing against the number of health facilities is unimaginable which greatly deter the efficiency of the staffs because of overwhelming workloads. Medical equipment utilization is critical to health service delivery given its one on one interaction with patients who have different and divergent needs and attitude (Camino & Gatos, 2015). The utilization of medical equipment involves people and systems that may not directly be involved with the medical equipment hence there is need for cooperation across various sub systems within the health system. All factors

considered for the optimal use of medical equipment, should be involved in the delivery of health service. The utilization of medical equipment is dependent on factors such as staff development policy, medical equipment management policy and medical equipment procurement policy (Douglas & Connor, 2003; WHO, 2011).

Lately, Kenya has become one of the few countries globally to adopt sustainable health care project via the Managed Equipment Service (MES). The MES project is an arrangement that involves the management, provision and servicing of critical medical equipment. About 98 hospitals were part of the deal involving an estimated cost of USD 500 million. As stated by the Strategic Investment Plan for Kenya's Ministry of Health for the period 2014 to 2018, the aim of the MES has been to build a responsible, progressive and sustainable health system through collaboration with the private sector. Regarding this matter of the MES, the project has been praised as a first in Africa in equipping the health sector in Kenya which has for a long time been riddled with inefficiencies in medical equipment utilization (Getuno et al., 2015).

The MES project implementation faced different challenges especially the resistance from the County Governments calling for awareness creation of all stakeholders as well as collecting the opinion of the same stakeholders in the implementation of the project. Additionally, public participation was necessary especially as a requirement in the Constitution of Kenya (CoK). Moreover, the Ministry of Health in collaboration with Public Procurement Oversight Authority, conducted key stakeholder engagement with the county and national government to be assured that the project had general acceptance by the political and social stakeholders. The stakeholders' involvement carried out was very necessary. The MES contract involves a strategy of involvement of the stakeholders throughout the life of the project (Mutia et al., 2012).

The MES project contract was to deliver and maintain medical equipment in selected hospitals at the county level. The arrangement needed the existence of well-trained staff to work with the equipment hence the need to have well trained medical staff. The availability of well-trained medical staff is thus a critical component of the MES; even though the contract could have the supply of medical equipment together with necessary needed staff, the supply of medical staff as part of the contract was not sustainable. There was therefore the need for the public health hospitals to have locally trained staff to ensure long term benefits of the arrangement. (McIntyre et al., 2013). The major setback in Kenya and more so in the devolved system of government is that the resources have been devolved but policies are not in place to guide the procurement and use of medical device and the aftermath of which is the haphazard procurement of important devices which are dumped in stores because of lack of prioritization and staff capacity development on the use of the device(Buse & Hawkes, 2015; WHO, 2008;WHO 2011).

1.2Statement of the Problem

Globally, health system strengthening has been recognized as critical in achievement of the Sustainable Development Goals and other Global, Regional, National and County health targets particularly improvement of health services delivery (Edwards et al., 2014;Mutia et al., 2012). However, most countries around the world and especially in Africa have weaknesses in their health systems. Health system challenges faced globally is also an issue of concern for Kenya and particularly for Mandera County. In Mandera county referral hospital, the major problem is poorly functioning health system due to poor utilization of important medical equipment. It has been alleged that the utilization of medical equipment in Mandera referral hospital is being affected by factors such as lack of human resource capacity development, lack of strict adherence

to service delivery charter and insufficient focus on quality of care (Mutia et al., 2012). Lack of enough qualified personnel in the maintenance department is a major bottleneck in Mandera County. The department is critically understaffed when it is mandated to carry out all the maintenance activity. The ratio of staffing is eight (8) biomedical technicians against seventy-two (72) functional facilities in Mandera County, which greatly deter the efficiency of the staff because of workloads. There is also high level of vacancy rate with most medical staff migrating to other counties(Cannon & Ali, 2018; Ibrahim, 2019). However, there is no empirical study done to establish the actual factors affecting medical equipment utilization in Mandera county referral hospital. This study therefore sought to establish the factors affecting medical equipment utilization in health service delivery in Mandera County, Kenya.

1.3 Objective of the Study

1.3.1 General Objective

To establish factors affecting utilization of medical equipment in health service delivery in Mandera County Referral Hospital, Kenya.

1.3.2 Specific Objectives

- i. To establish effect of human resource capacity development on medical equipment utilization for service delivery in Mandera county referral hospital.
- ii. To establish the effect of medical equipment management policy on medical equipment utilization in health service delivery at Mandera county referral hospital.
- iii. To examine effect of medical equipment procurement policy on medical equipment utilization in health service delivery at Mandera county referral hospital.

- iv. To establish the effect of adherence to customer service charter on medical equipment utilization in health service delivery at Mandera county referral hospital.

1.4 Research Hypotheses

The following hypotheses were tested:

- H₀₁: There is no significant relationship between human resource capacity development and utilization of medical equipment in health service delivery in Mandera county referral hospital.
- H₀₂: Medical equipment management policy does not influence medical equipment utilization in health service delivery at Mandera county referral hospital.
- H₀₃: Medical equipment procurement policy does not significantly affect equipment utilization in health service delivery at Mandera county referral hospital.
- H₀₄: There is no significant relationship between adherence to customer service charter and utilization of medical equipment in health service delivery in Mandera county referral hospital.

1.5 Rationale of the Study

Delivery of health services in Kenya has over the last ten years been characterized by the lack of medical equipment (World Development Indicators [WDI], 2008). This study is therefore very important because it provides enumeration of major factors that have stood in the path of effective health service delivery due to equipment underutilization in Mandera County. In addition, the world health report (2008) notes that there is a huge gap in the utilization of health equipment in Kenya. This is mainly so in the former North Eastern Province where human resource capacity is inadequate.

1.6 Justification of the Study

The study provides the health care managers and policy makers with critical information on challenges facing health staffs in health policy gap on procurement; preventive maintenance; and use of medical device for service delivery improvement in Mandera County. The information generated in the report will be critical for the county to improve the delivery of health service at the county. The study will therefore help the Mandera County to strengthen the county referral hospital. The study will establish gaps in the utilization rate of medical equipment and how the utilization is determined by factors such as human resource development, medical equipment policy, medical equipment procurement policy and adherence to customer service charter in public health hospitals in Mandera County. Finally, the study will be critical to health systems scholars and researchers in establishing factors that are critical in the utilization of medical equipment for health service delivery. Additionally, the study will also identify research gaps that will provide future researcher with areas of study that they can further their studies. The study will also be critical literature for further studies on the factors that are incidental to medical equipment utilization in the delivery of health service delivery.

1.7 Limitations of the Study

A number of key impediments were expected to come in the way of the success of this study. Firstly, respondents were suspicious of the study. The researcher had to explain to the respondents that the research is only meant for the education purposes and show the introductory letter from the University to prove that the research has no negative motive. The researcher also had a difficult time going through the selected facility stores reaching for idle or underutilized medical equipment; policy documents, procurement plans and human resource retention strategy. The store managers were

difficult to get for discussion and guidance because of workload but the researcher settled on appropriate time when the store staffs were not busy. Financial resources might be limited since a substantial financial input is required in transport and logistics including the production of the questionnaires for the entire target respondents however, the researcher minimized resources needed to save on the finances and effectively conduct the study.

1.8 Delimitation of the Study

The conceptual scope of the study was four factors affecting medical equipment utilization including human resource capacity development, medical equipment management policy and medical equipment procurement policy and adherence to customer service charter. The geographic scope of the study was Mandera County referral hospital since it was not practical to carry out the study in all 72 health facilities in Mandera County. The researcher picked on Mandera County referral hospital because it is the largest, oldest and most equipped facility in Mandera County and can represent all the other facilities and the study outcome was generalized for all the facilities in Mandera County. The respondent's scope for the study was all 147 health personnel at Mandera County referral hospital from different departments but the finding may be generalized as the same situation in all hospitals within Mandera County.

1.9 Significance of the Study

Findings from this study can be used as decision support tools that can help Mandera county government in identifying areas of possible intervention to enhance human resource capacity development, medical equipment and preventive maintenance, procurement policies of equipment thus increased medical equipment utilization hence

improved productivity. In essence Mandera county policy makers utilize this result presented herein to determine and formulate the right policies on medical equipment procurement; utilization and preventive maintenance hence improved service delivery. The study would also be useful to the general population in Mandera County regarding medical equipment utilization. The study findings provide useful information to the residents of Mandera County on the factors influencing the availability and utilization of various medical equipment. The patients will be in a position to understand the factors affecting utilization of various medical equipment existing at the referral hospital.

1.10 Assumptions of the Study

The study was based on the assumption that the respondents were truthful and honest while filling the questionnaires. Additionally, the instruments of data collection were reliable and valid for the purpose of the study.

1.11 Operational Definition of Terms

Adherence to Customer Service Charter: Implies strict provision of medical services according to the customer service charter of the hospital.

Human Resource Development: “is a Well-designed, professional capacity building programs that can contribute to increasing health worker competency. Training, supervision, mentoring, and the use of a variety of quality assurance and quality improvement methods have also shown to be effective in raising standards of care.”

Medical Equipment Management Policy: This document elaborates on the maintenance, repairs and use of various medical equipment at the hospital.

Medical Equipment Procurement Policy: This document details the processes of acquisition and retiring and disposal of medical equipment at the hospital.

Medical Equipment Utilization: This describes the rate of usage of medical equipment at the hospital in health service provision.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review on equipment utilization in health service delivery. The chapter has sub topics on equipment utilization as a concept, factors that affects equipment utilization; human resource capacity development, medical equipment policy, procurement of equipment and adherence to service delivery charter. The chapter also examines the empirical literature on the factors affecting medical equipment utilization. The chapter concludes with a conceptual framework.

2.1.1 Factors Affecting Medical Equipment Utilization

Human Resource Development: is a Well-designed, professional capacity building programs that can contribute to increasing health worker competency(Wei et al., 2018). Training, supervision, mentoring, and the use of a variety of quality assurance and quality improvement methods have also shown to be effective in raising standards of care, Inadequate capacity building of health staffs on maintenance and use of equipment is the biggest challenge that ever existed in the health sector that remained unmentioned and given platform of discussion for solution(Lelutiu-Weinberger et al., 2016). Lack of investment in training of maintenance staffs and other health workforce on proper handling and use of machines and equipment purchased is the biggest challenge in health sector. Human resource capacity development is measured using indicators such as Adequacy of staff, staff capacity, retention packages and involvement(Kamugisha, 2018).

Medical Equipment Management Policy: This document elaborates on the maintenance, repairs and use of various medical equipment at the hospital. Medical

equipment management policy is measured by stakeholders' participation, implementation, M &E and preventive maintenance(Ivlev et al., 2014). The Policy should be developed and updated continuously in line with National health policy of the country regarding provision of health services (Kirui et al., 2013). The medical equipment management policy should guide the management and health care managers during the life cycle of medical equipment including purchase, use, maintenance and sale of medical equipment(Lari et al., 2021).

Medical Equipment Procurement Policy: This document details the processes of acquisition and retiring and disposal of medical equipment at the hospital(Douglas & Connor, 2003b). Need Based Procurement is the requirement of a good procurement policy for medical equipment. There should be a competitive bidding and selection of vendors that is often throttled by corruption or information opaqueness of the tendering process. The opaque tendering process leads to blockage of information to some stakeholders hence affecting the transparency of the process. The variable medical equipment procurement policy is measured by need based procurement, stakeholder participation and quality supplies(Eze et al., 2019). Adherence to Customer Service Charter: Implies strict provision of medical services according to the customer service charter of the hospital. Service charter is a public document that states the information on services available, the level of standards of service that users should receive, and the avenues for making suggestions and or complaints (Mwania, 2015). Health service charter is a written document that contains the agreement obtained between the health service provider and patients with the organization stating expressly the promises on the quality standards that can be expected from it (Baccarani & Ugolini, 2000).Adherence to customer service charter was measured by awareness, Implementation and Compliance.

2.1.2 Medical Equipment Utilization

Medical Equipment Utilization: This describes the rate of usage of medical equipment at the hospital in health service provision. Medical equipment utilization is critical to health service delivery given its one on one interaction with patients who have different and divergent needs and attitude (Camino & Gatos, 2015). The utilization of medical equipment involves people and systems that may not directly be involved with the medical equipment hence there is need for cooperation across various sub systems within the health system. All factors considered for the optimal use of medical equipment, should be involved in the delivery of health service. The utilization of medical equipment is dependent on factors such as staff development policy, medical equipment management policy and medical equipment procurement policy (Douglas & Connor, 2003;WHO, 2011). Medical equipment utilization was measured by patient waiting time, equipment performance and equipment idle time.

2.2 Human Resource Capacity Development

In developing world, countries are making efforts to achieve optimal medical equipment utilization especially in the rural inhabitants However; success in this adventure has been curtailed by various human resource challenges including training and motivation of staff. There are a number of Human resource capacity development activities including staff adequacy, involvement, retention packages and training.

2.2.1 Staff Adequacy

Lack of enough qualified personnel in the maintenance department is a major bottleneck in the current county health department and Mandera County is not exceptional(Cannon & Ali, 2018). The department is critically understaffed when it is mandated to carry out all the maintenance activity. The ratio of staffing is eight (8) biomedical technicians against seventy two (72) functional facilities in Mandera

County which greatly deter the efficiency of the staff because of workloads (Kimathi, 2017).

2.2.2 Staff Involvement

Lack of staff involvement especially from the maintenance department in planning during purchase of equipment leading to idle equipment whose spare parts are not easily found in case of breakdown. Prioritization of devices receiving maintenance by hospital management and Sharing of views with the few technical personnel available is totally lacking, keeping in mind workload and travel time between different facilities(Kirui et al., 2013). Inadequate capacity building of health staffs on maintenance and use of equipment is the biggest challenge that ever existed in the health sector that remained unmentioned and given platform of discussion for solution.

2.2.3 Staff Capacity and Training

Lack of investment in training of maintenance staffs and other health workforce on proper handling and use of machines and equipment purchased is the biggest challenge in health sector. Negotiation must be made with manufacturer or suppliers of equipment for to include the training of medical staff who will be responsible for the running of the medical equipment at the hospital. The training should involve the operation of the medical equipment together with continuous skill update on improvement of the technology used in the medical equipment (Mutia et al., 2012; Fulmer & Ployhart, 2014).

A well-functioning and effective health service relies on the availability of operational and appropriate medical equipment at all levels of delivery(Mutia et al., 2012). To achieve this, staff with appropriate skills must be available. Training Biomedical Engineering Technologists (BMETs) must target working with partners, focuses on

investment in human resources to ensure effective management and maintenance of medical equipment on appropriate skills. About 40% of medical equipment in developing countries is out of service due to break down, inadequate maintenance, the unavailability of spare parts and consumables, and lack of operational knowledge among end users. This represents a huge risk to the quality of health services. Out of service equipment affects the level to which the healthcare workers are able to provide, accurate diagnosis, the safety of patients, and the ability of health workers to save lives(Lari et al., 2021).Biomedical Engineering Technologists (BMETs) fix, maintain and manage medical equipment within a hospital or health Centre setting and are crucial to the medical equipment life cycle, advising on procurement, initial inspection and installation, data collection, instruction on use and maintenance, development of preventive maintenance plans, corrective maintenance and repair, end of use, and decommissioning. The deployment of trained BMETs is therefore a big step towards the proper management of medical equipment, ensuring that hospitals and health centres get the most out of their equipment. In Zambia, there are no medical equipment technicians or technologists in district hospitals. As a result, cold chain specialists are in charge of the operation of medical equipment in the health centres. The medical equipment are maintained by electricians, plumbers, mechanics rather than medical equipment engineers(Council of Supply Chain Management Professionals [CSCMP], 2016).

Proper and adequate training is important for the user of medical equipment and technical staff to ensure the safety of the medical equipment while providing health services to the patients. The clinical medical engineering unit must ensure the technical staff and the non-technical health service staff are well trained regarding their duties in using the medical equipment (Tosi et al., 1991). The training of the medical staff both

the technical and users is a continuous process that ensures staff keep updating their skills regarding the use of the medical equipment as they are purchased and updated. The training for the medical staff especially the technical staff can be provided through medical equipment training manual prepared by the medical engineering department, the manuals provided by the manufacturer and training provided by third party trainers (Kirui et al., 2013).

The training may also involve the medical engineer training the medical technician on the working of the medical equipment or a medical technician guiding other technicians on the operation of the medical equipment. The training may also involve biomedical equipment technician being part of the training of clinical users about how to operate various medical equipment. The clinical engineering department may also contract outside medical equipment trainer to train staff on maintenance and use of different medical equipment being acquired. The engineering department can also bring forth trainers from the manufacturer to train medical equipment technicians who will in turn also train the clinical users at the facility. The training may be on job or off job where on job training is provided while working at the place of work while off job training is provided outside the work environment(Kirui et al., 2013; Mutia et al., 2012).

The training offered by manufacturers of medical equipment is often targeted at medical engineers and technicians who will later on train user clinical staff. The training by manufacturers is especially necessary for complicated medical equipment especially those involving software based medical equipment. The training may be given from the least expensive to the most expensive depending on the resource endowment of the hospital or health care system concerned. The best practice involving cost minimization in training is the collaboration among various hospitals to have their biomedical

technicians trained in a group. The sustainability in training can be achieved by the hospitals having adequate trained staffs who will later on become reservoir of knowledge for new upcoming staff compared to if the staff was provided by the medical equipment supplier (CSCMP, 2016; Kirui et al., 2013). National Taiwan University Hospital runs a program for medical equipment management system used for in-house clinical engineering department training. The system was web-based and it integrated the clinical engineering and hospital information system components. Via related information application, it effectively and efficiently enhanced the operation management of medical devices immediately and continuously. The medical engineers were able to share experiences, reduce maintenance, cost improves work quality and to promote the safety of medical device used in patients and clinical staffs (Chien et al., 2010). The achievement of optimal medical equipment utilization and delivery of health service has often been constrained by workforce attrition. The achievement of Millennium Development Goals (MDGs) regarding health service delivery has been blamed on loss of critical medical staffs to developed countries due to poor motivational strategies hence making the bad condition even worse. The problem of retention of highly trained medical staffs has been of concern to health systems across developing countries with highly trained medical staffs living their countries to the developed nations that have better working conditions. The retention of adequately trained medical staffs is critical for the delivery of health service in developing countries (Kemboi & Moronge, 2016; Peters & Savoie, 2000).

2.2.4 Retention Packages

The utilization of medical equipment has also been constrained by inadequately remunerated staff. Empirical studies have shown that medical staffs who are under paid have a high chance of leaving their workstations in the public health sector in search of

better work conditions especially outside the country. Additionally, studies have established that financial incentives alone is not enough and must be used in combination with other incentives like better working conditions and tenure to ensure highly trained staff is retained to deliver health services. The studies further revealed that poorly trained staff coupled with low pay leads to high staff turnover that further leads to sub optimal medical equipment utilization (Robbins & Judge, 2007).

Career development and progression was another factor identified in the literature as being incidental optimal medical equipment utilization. The empirical literature revealed that career development was critical when medical staff is making decision on the place of work. The studies have established that medical staffs shy away from working in the rural setting due to low career progression opportunities as compared to urban areas. The studies revealed that health officers are motivated by being accorded opportunity to progress in their careers. Medical equipment utilization especially in the rural areas has been hampered when staffs leave for the urban centres that have adequate opportunity for career progression through additional training and promotion. The health officers can also have opportunity for private practice for those wishing to transition to the private sector (Svoronos et al., 2015).

In a study in Nigeria, (Umunna, 2012) examined determinants of utilization of primary health service. The study revealed that utilization of medical equipment was influenced by experience and perception of medical facility users. The users who demonstrated good perception of services delivered. Additionally, the study revealed that medical equipment utilization was influenced by staff level of training and adequacy of the staff.

2.3 Medical Equipment Management Policy

Medical equipment is a critical component of assets of health service delivery and has to be managed well to ensure optimal service delivery. The purchasing, use and disposal of medical equipment have a significant bearing on the quality of health services offered to patients (Douglas & Connor, 2003). Literature has shown that medical equipment that is not well maintained can be a health hazard to the clinical user and the patients receiving health care. Therefore, the routine maintenance practices are critical to ensure that medical equipment are held and used at the most cost-effective way (WHO, 2011).

2.3.1 Stakeholders Participation

There is need for budget allocation to the medical engineering department for the purpose of maintenance and repairs of medical equipment in use at the hospital (Mutia et al., 2012). The health facility needs to develop robust medical equipment management policy to handle issues of medical equipment management to enable them offer optimal services to patients. The country has to document knowledge in medical equipment management policy (Kirui et al., 2013).

The health service cost is a function of medical equipment maintenance cost as reported by (WHO, 2011). The National Medical Equipment Policy of the country should be developed to ensure that the most cost effective medical equipment is acquired and maintained in the health sector through setting of priorities. The Policy should be developed and updated continuously in line with National health policy of the country regarding provision of health services (Kirui et al., 2013). The medical equipment management policy should guide the management and health care managers during the life cycle of medical equipment including purchase, use, maintenance and sale of

medical equipment. The medical equipment policy requires that purchase contract of medical equipment to include provision of manuals for operation, training of biomedical technicians, provision of needed spare parts(Douglas & Connor, 2003; Kirui et al., 2013).

2.3.2 Preventive Maintenance

The medical equipment policy should also detail the part on medical equipment maintenance. The maintenance section should provide that the equipment be maintained according to the specification and requirement of the manufacturer of the equipment to ensure optimal service provision. The hospital is required to maintain the medical equipment according to the stringent conditions given by the manufacturer. If the hospital is maintaining the equipment according to the recommendation of the supplier, there should be detailed record of the maintenance carried out. In instances of maintenance of medical equipment below the recommendation of the manufacturer, it should be accompanied by evidence based information for the rationale being the adoption of a maintenance policy that is deviating from that recommended by the manufacturer (CSCMP, 2016).

In the designing and preparation of medical equipment management policy, planning is very critical in the maintenance program. The planners must identify critical factors that influence the cost effectiveness of maintenance program through taking necessary steps in balancing the critical factors. Planned preventive maintenance is repetitive, regular, maintenance carried out to ensure medical equipment are working at their optimal level. The activities that ought to be carried out under preventive maintenance includes, calibrating, regular cleaning, lubrication, checking on wear and tear so as to ensure the equipment is in good working condition to avoid breakdown. The planned

maintenance program should include the removal and replacement of worn out parts. The hospital management needs to identify what to do including the planned maintenance to ensure cost effectiveness of the operation of the medical equipment(CSCMP, 2016; Mutia et al., 2012).

2.3.3 Implementation, Monitoring and Evaluation

In an examination of the utilization of medical equipment in hospitals in Ethiopia, Ademe et al.(2016)revealed that most medical equipment was not functioning hence affecting their utilization. The study further revealed that utilization of medical equipment was influenced by lack of maintenance, over use, purchasing not needed devices, inadequate training on the operation of the medical equipment. Bahreini et al.(2018)evaluated the determinants of medical equipment maintenance and management. The study revealed that critical factors included quality control, repairs and maintenance. The study also revealed that medical equipment that were rarely maintained were prone to breakdown. Wei et al. (2018)evaluated the utilization rate of medical equipment and factors affecting utilization in India. The study revealed that lack of strategic planning in management of medical equipment especially acquisition of equipment at the right time, right place and right maintenance agreement influenced utilization rate. Additionally, constant breakdown hindered the optimal utilization of medical equipment.

2.4 Medical Equipment Procurement Policy

The public procurement reforms led to the enactment of Public procurement and Disposal Act 2005 and the Public Procurement and Disposal Regulations 2006. The acts provides for a framework for regulation of procurement under the auspices of the Public Procurement Oversight Authority (PPOA). The PPOA functions at the macro level, however the entities in the medical sector should observe procurement policy to

ensure compliance with provisions of the act as well as other international legal instruments that have been adopted into Kenyan law that are propagated by the WHO regarding the availability of Essential Medicines and Medical Supplies (Getuno et al., 2015). A comprehensive medical equipment procurement policy must be based on needs, Stakeholder Participation and Quality Supplies.

2.4.1 Need Based Procurement

Need Based Procurement is the requirement of a good procurement policy for medical equipment. There should be a competitive bidding and selection of vendors that is often throttled by corruption or information opaqueness of the tendering process. The opaque tendering process leads to blockage of information to some stakeholders hence affecting the transparency of the process (Dealtry, 2017). The procurement process that is not transparent leads to low quality and above market prices in the tendering process. The tendering process that is not based on needs and is accompanied by lack of transparency leads to inefficient resource use. Additionally, when medical equipment is purchased, or disposed without needs assessment, the hospital ends up acquiring medical equipment it does not need or disposing medical equipment it still needs or at a price below the market rate (Nemec et al., 2021). Medical equipment procurement policy must also take into consideration the push and pull factors of procurement. The Kenya medical supplies agency has been using the push system of procurement of medical commodities for hospitals that has resulted in acute shortages of essential commodities and oversupply of slow moving or unutilized drugs. The medical hospitals have been facing the challenges of push procurement where the purchase and disposal of medical equipment is not based on needs but rather purchasing of medical equipment hoping that their need will arise in the hospitals in future (Oosting et al., 2019). This system of procurement leads to problems such as obsolescence, overstocking, under

stocking and expiry of medical supplies. The procurement based on push factors without the involvement of public health facility managers that are the final users of the equipment and other supplies procured leads to acquisition of wrong medical equipment which intern leads to idle medical equipment and supplies(Miriti, 2018).

2.4.2 Stakeholder Participation

The procurement of medical equipment was also constricted by lack of adequate stakeholder involvement. The red tapes in communication between procuring parties hampers the access to decision making parties. Additionally, lack of involvement of the procuring entity or unit in the decision-making leads to procurement of wrong medical equipment and other supplies that do not meets the intended use in a cost-effective manner(Eze et al., 2019). The county and sub-county health managers have not been involved in the procurement process despite raising a red flag on several occasions on the supply and expiry of commodities at the county and sub-county stores. The procurement system is not demand based thus causing low morale (Kazi, 2012).

2.4.3 Quality Supplies

Quality of the procured products has been another area of concern regarding the acquisition of medical equipment and other supplies in the public health sector. Purchasing of low quality medical equipment and other supplies leads to additional costs especially with repeated procurement process in which the initially procured goods and equipment do not meet the standards. The challenge of quality is connected to procurement processes of defining product specification, vendor selection and inspection and testing of performance of procurement contract. Addressing the challenge of procuring substandard medical equipment and other supplies requires that the health system be vigilant in the specification and selection of vendors (CSCMP, 2016).

The procurement of medical equipment has also been affected by funding bottlenecks. The limited access to funding often resulting from budgeting process that is not transparent, funding communication that is not coordinated. The availing of funds for procuring medical supplies was delayed by poor coordination of donor's funds and budget deficits. In a study in Kenya, (Oloo et al., 2017) evaluated the casual effect link obtained between performance of public hospitals and procurement practices. The research showed that most procurement were on single or multiple course. The study further revealed that integrity of the procurement staff was very critical to performance of public hospitals in terms of medical equipment utilization. Other procurement factors that affected performance of hospitals included supplier selection and tendering process transparency.

2.5 Adherence to Service Charter

Service charter is a public document that states the information on services available, the level of standards of service that users should receive, and the avenues for making suggestions and or complaints (Mwania, 2015). Health service charter is a written document that contains the agreement obtained between the health service provider and patients with the organization stating expressly the promises on the quality standards that can be expected from it (Baccarani & Ugolini, 2000). The document is critical for communicating quality and revealing the effort put to ensure the delivery of high quality services. The service charter facilitates the feedback from the final user of health service regarding quality expected against quality delivered. Adherence to health service charter informs the utilization rate of medical equipment. The provision of services, specified in the health service charter, depends on the level of utilization of medical equipment used in offering those services. The study on influence of service charter utilization on influence health service delivery in Thika Level 5 Hospital

established that failure to utilize the service charter lead to deterioration of quality and equity of healthcare. The study also established that the waiting time to acquisition of medical services based on medical equipment and staffs has not improved despite the availability of service charter (Masese et al., 2016). Adherence to service charter is a function of employee awareness, implementation of charter and compliance to service charter.

2.5.1 Staff Awareness

Adherence to service charter is dependent on employee awareness. Employee awareness describes the level of knowledge of employees on the expected services to be offered by them. Employee awareness has critical components including ensuring integrity and transparency, disseminating corporate culture and ethics, and enhancing the commitment to performance codes. Awareness further involves employees having practical knowledge and skills regarding processes, procedures and routines (Labani, 2019).The adherence to service charter by employees depends on the knowledge acquisition by employees that is critical to deliver various services. The employees needs to be aware of the services they are supposed to offer and the quality standards to be offered as stated in the charter(Mwamunyange, 2019).

2.5.2 Compliance

The level of adherence to service charter also depends on compliance of employee to the service charter. Employee compliance to Customer Service Charter describes the level at which the employee follows the dictates of the service charter document. Compliance to service charter depends on the level of service commitment from the employees (Mahoo, 2016).The medical staffs of the organization are the critical resources of health service provision of the organization. The employees need to be treated with care to ensure their loyalty and commitment to delivery of excellent

services. The organization's image especially regarding the quality of health services depends on the employees who are delivering health services (Raphael, 2019).

2.5.3 Implementation

Finally, the adherence to service charter is a function of implementation of service charter. The implementation of service charter needs the commitment of resources especially in the delivery of health services. The service charter principles have to be implemented according overall organizational plan and policy regarding service delivery. Additionally, the effective working of service charter depends on continuous improvement in quality provision coupled with determination of patient needs (Masese et al., 2016). This leads to development and provision of services that are customer focused, culturally accepted and effective and accountable service provision. The health service organization needs to involve the customers who are the patients in fine tuning services according to the service charter. The organization needs to always tailor its services according to the needs of the customers for it to have service charter that is implemented (Kanunu, 2016).

2.6 Theoretical Framework

This study is guided by the functionalist theory as proposed by Parsons, (1951). This theory emphasis on the role of a normal functioning medical equipment utilization culture for continued adequate health service delivery. The theory notes that it is important for all the aspects of healthcare systems such as personnel, the guiding policies, procurement policies and maintenance policies to be well laid out in advance for optimal functioning of medical equipment in a normal functioning society. In Parsons, (1951)theory, he explains that there should be a governing policy that guides the medical personnel in utilization of medical equipment. He also notes that all aspects of the equipment procurement, utilization in healthcare delivery and/or

maintenance/servicing should work in synchronization. The medical personnel should be well trained on the policies governing medical equipment utilization at all times(Parsons, 1951).

2.7 Conceptual Framework

The conceptual framework details the relationship between major variables of the study with various factors that determined medical equipment utilization being examined. The factors influencing utilization of medical equipment in Mandera County examined are human resource capacity development, medical equipment management policy, medical equipment procurement policy and adherence to service charter. The equipment utilization for service delivery is a dependent variable and factors that hinder equipment utilization being independent variables as shown in figure 1.

Figure 2.1

Conceptual Framework

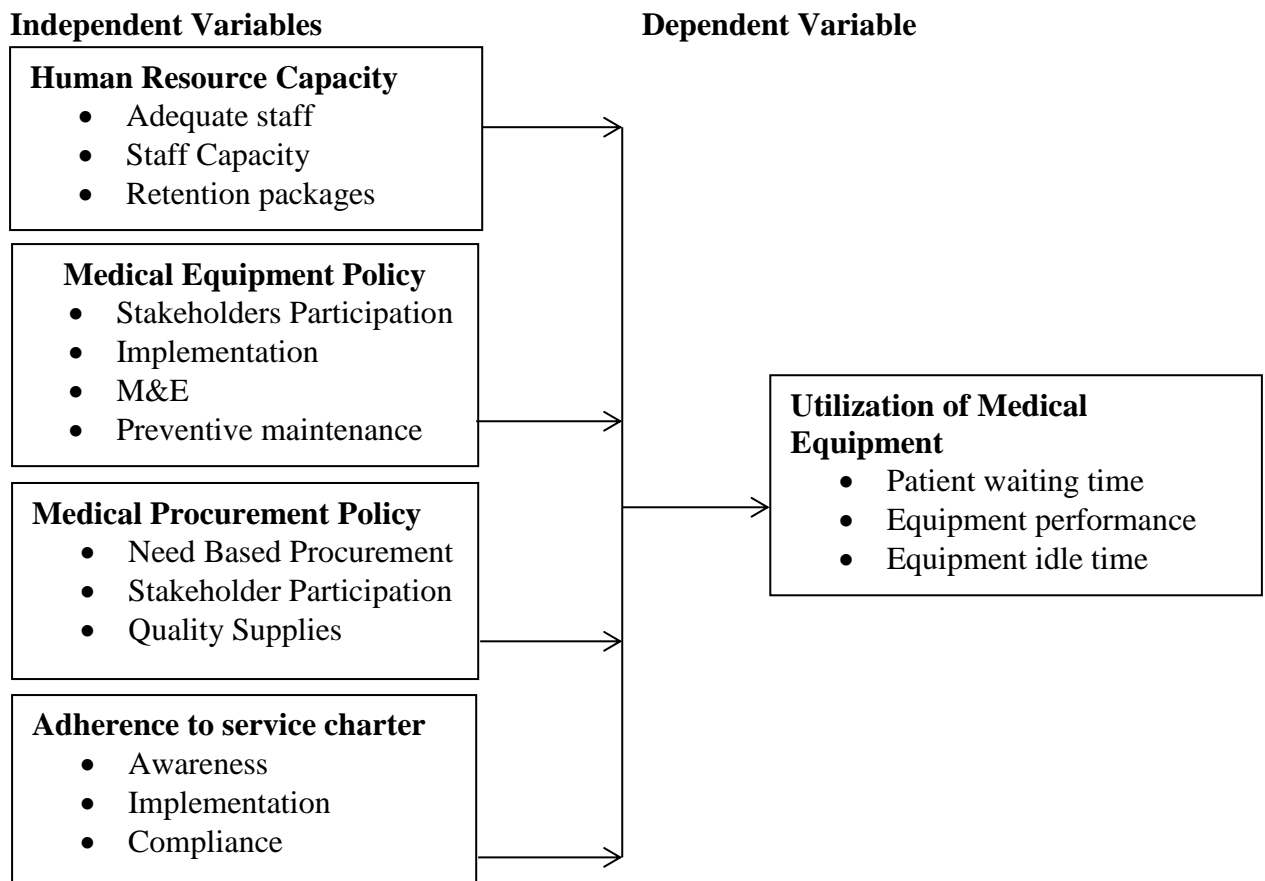


Figure 2.1 illustrates the relationship between factors affecting medical equipment utilization, which are the independent variables, and service delivery in Mandera county hospital as the dependent variable of the study. The independent variable is human resource capacity development, medical equipment procurement policy, medical equipment management policy and adherence to customer service charter. It is expected that the factors will affect medical equipment utilization that will in turn affect service delivery at Mandera County Referral Hospital.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter elaborated on the methods used to collect and analyse relevant data for the study. The elements covered included research design, target population, sampling procedures, sample and sampling techniques, research instruments, data collection procedure, pre-testing and data analysis and presentation.

3.2 Research Design

The research adopted descriptive survey design aimed at examining the factors influencing medical equipment utilization in Mandera County referral hospital. According to Fowler, (2009), Descriptive survey design is adopted when the researcher intends to collect ex post facto data so as to test hypotheses of the study. The current study sought to test various hypotheses based on factors influencing utilization of medical equipment at the Mandera county Referral hospital. The design was chosen because the researcher was interested in factors after their interaction with medical equipment utilization without having to control the environment in which the factors interact with medical equipment utilization.

3.3 Target Population

Target population is a complete enumeration of all the elements that the researcher is interested in studying and to which generalization is made after data analysis and interpretation (Cohen et al., 2007). Table 1 presents the target population that consisted of Doctors, Nurses, Clinical Officers, Laboratory Technologists and Pharmacists, biomedical engineers and commodity management officers. In total, there are Doctors (12), Nurses (92), Clinical Officers (13), Laboratory Technologists (14) and

Pharmacists (9), biomedical technicians (3) and commodity management officers/store men (4) in Mandera County referral hospital (Ministry of Health,[MOH] 2016/2017).

Table 3.1

Target Population Distribution

Category	Numbers of Staff
Doctors	12
Nurses	92
Clinical Officers	13
Laboratory Technologists	14
Pharmacists	9
Commodity officers	4
Biomedical engineers	3
Total	147

Source: Ministry of Health (2016/2017)

3.4 Sample Size

The sample size was derived obtained by calculating the sample from the target population by applying (Yamane, 1967) Formula.

$$n = \frac{N}{1 + N(e)^2}$$

Where: n= Sample size, N= Population size e= Level of Precision.

At 95% level of confidence and P=5

$$n = 147 / 1 + 147 (0.05)^2$$

$$n = 108$$

3.5 Sampling Procedure

Sampling is a process of picking elements from the population that is representative of the population (Kothari, 2012). This research involved staffs from seven different departments of Mandera county referral hospital who directly interact with medical equipment on daily basis. Sampling was done using stratified sampling method and applying Yamane (1967) formula. The study adopted proportionate stratified sampling where the general population was stratified into various groups including medical and non-medical staff. The study then distributed the sample size so determined based on the distribution of the population among the strata such that stratum with more elements in had more elements picked compared to stratum with smaller number of elements. The proportionate sampling is presented in Table 2.

Table 3.2

Sample Distribution

Category	No. of Staff	Percentage	Sample
Doctors	12	8.2	9
Nurses	92	62.5	67
Clinical Officers	13	8.9	10
Laboratory Technologists	14	9.5	10
Pharmacists	9	6.1	7
Biomedical engineers	3	2.1	2
Commodity management officers	4	2.7	3
Total	147	100	108

Table 2 shows sample distribution where the sample size of 108 has been distributed based on the proportion of each stratum in the population. The strata included Doctors,

Nurses, Clinical Officers, Laboratory Technologists and Pharmacists, biomedical engineers and commodity management officers.

3.6 Research Instruments

Primary data was collected using structured questionnaires. Structured questionnaires adopted had binary scale responses in the form of ‘yes’ and ‘no’ alternative questions. The study instruments also had Likert scale. The questionnaire method was preferred given the large sample size and inadequacy of financial resources as well as time constraint. The questionnaire was divided into parts with the first part covering descriptive information and the later part covering variable specific information. The study also adopted observation checklist where the utilization of selected medical equipment was observed by the researcher. The study adopted checklist methods to collect additional data on medical equipment utilization. A total of 15 medical equipment were observed hence one observation checklist was used for each medical equipment observed. Observation checklist was preferred over other methods of data collection because is an objective data collection tool. The equipment observed included: Radiography (X-ray machine), computed tomography (CT scan), magnetic resonance imaging (MRI scan), ultrasound, echocardiography, stethoscope, Doppler, pulse oximeters, Oxygen Concentrator Ventilators, Medical Laser, Dialysis Machine, Blood gas analyser, Incubator and Infusion Pump.

3.7 Data Collection Procedure

The data collection proceeded with the researcher obtaining introduction letter from the ethics review committee of the University. This was followed by obtaining research permit from National Commission of Science, Technology and Innovation [NACOSTI](Ref. No: 816639). On the day of the study, the researcher established

rapport with respondents before explaining to them the purpose of the study and telling them their right to exit the study at any stage if they felt they could not continue. Questionnaires were self-administered to all the respondents. The observation checklist was carried out by the researcher where different medical equipment were observed to determine their availability for use, their working condition and how the staff operated them in terms of skills and motivation.

3.8Pre- Testing

Pre-testing, also called pilot testing, is a small scale study carried out before the actual study to examine the suitability of the instruments of data collection in terms of reliability and validity (Brooker & Joppe, 2014). According to Mugenda and Mugenda, (2003)the number of respondents to participate in pre-study should be at least 10% of the sample size targeted hence given the sample size of 108, the study selected 35 respondents for the pilot study. The pretesting was done at Marsabit District Hospital where 35 staffs drawn from different departments participated in questionnaire filling. The researcher also adopted observation checklist to cheque the availability and utilization of different medical equipment at Marsabit District Hospital. The resultant data generated was used to examine the reliability and validity of the research instruments to be used in the study. Marsabit District Hospital was chosen as the site for pre-study given the fact that Mandera county referral hospital and Marsabit District Hospital are found in the arid areas of Kenya with minimal government support.

3.8.1 Validity of Instruments

Validity describes the extent to which data collection instruments measure what they are supposed to measure (Braun & Clarke, 2013). Research instruments are valid when the instruments collect relevant data that can enable the researcher to test hypotheses and arrive at conclusion and generalization. The researcher determined the validity of

the instruments through involving various experts of health systems management with the advisors being the chief persons helping with determination of the validity of the instruments adopted in the study.

3.8.2 Reliability of Instruments

Validity describes the consistency of the research instruments in the collection of data. Research instruments are reliable when the instrument can consistently collect the needed information (Braun & Clarke, 2013). The study examined the internal consistency of the questionnaires by generating the Cronbach alpha from the data collected during the pre-study. The acceptable value of Cronbach alpha was 0.7 and above. The variables not meeting the reliability level were adjusted. The study established a Cronbach of above 0.7 in all the variables used in the study hence the instrument of data collection was reliable for use in the study.

3.9 Data Processing and Analysis

The filled questionnaires and observation checklist was examined for completeness and adequacy for analysis. The instruments were further coded and entered into SPSS version 23 before analysis was carried out. The analysis involved Descriptive and inferential statistics. Where the descriptive statistics used included frequency distributions, percentages, mean and standard deviation for each of the factors affecting medical equipment utilization at Mandera referral hospital. Given that the dependent variable (Medical equipment utilization) was binary and the explanatory variables were categorical in nature, the study adopted binary logistic regression analysis to investigate the effect of human resource capacity development, medical equipment management policy, medical equipment procurement policy and adherence to service charter on medical equipment utilization. The variable adherence to customer service charter was

based on five-point scale. The variable was converted to binary scale using the recoding option in SPSS where responses of 4 and 5 were recorded to one (1) and responses of 1, 2, and 3 were recorded to zero (0).

The Nagelkerke's coefficient of determination (R-Square) resulting from the logistic regression was used to determine the percentage variation in utilization of medical equipment that is explained by human resource capacity development, medical equipment management policy, medical equipment procurement policy and adherence to service charter on medical equipment utilization. P-values and the odds ratio (Exp β) were adopted to examine the significance of the predictor variables (human resource capacity development, medical equipment management policy, medical equipment procurement policy and adherence to customer service charter) on the dependent variable (Utilization of medical equipment). Those variables with a p-value less than 0.05 are significant predictors of utilization of medical equipment while those variables with p-values greater than 0.05 are not predictors of utilization of medical equipment. The regression model used is presented in equation (1).

$$f(p) = \frac{1}{1 + e^{-p}} \dots\dots\dots 1$$

Equation 1 can be simplified as

$$\text{logit}(p) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \dots\dots + b_nX_n \dots\dots\dots 2$$

Where:

p = probability of presence of the characteristic of interest

b₀ = representation of the reference group

b₁ = the regression coefficients associated with the reference group

X₁, ..., X₄ = explanatory variables

X₁ = Human Resources capacity development

X₂ = Medical equipment management policy

X₃ = Medical equipment procurement policy

X₄ = adherence to service delivery charter

3.10 Ethical Considerations

The researcher first obtained research authorization from school of post-graduate studies department of health system management and medical education inform of letter of introduction. The researcher also obtained ethical review letter from KeMU Scientific and Ethical Review Committee (SERC). The researcher used the ethical review letter from KeMU SERC to get permit from NACOSTI. The researcher used the research permit from NACOSTI (Ref. No: 816639), to apply for permission from Mandera County Research Committee. The researcher also obtained permission from the top management of Mandera county referral hospital before actual data collection. The researcher assured the respondents that the data collected were treated with utmost confidentiality it deserves and the researcher will not collect any information that can directly be associated with a respondent like names. The researcher also required the respondents to participate in the study without compulsion of any kind while filling the consent form.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The chapter presents the research findings and discussion. The study sought to investigate the factor affecting medical equipment's utilization in Mandera County referral hospital. The data collected was analysed using descriptive and inferential statistics. The data was presented in the form of tables and associated explanations.

4.2 Response Rate and Pre-Testing

4.2.1 Response Rate

The study sought to establish the response rate on the questionnaires distributed to the respondents. The researcher delivered 108 questionnaires to the respondents of which 82 were adequately filled for analysis. The returned questionnaires generated a response rate of 76 % which was considered adequate for analysis. Mugenda and Mugenda (2003) hold that response rate of 70% and above is adequate for analysis. The researcher ensured that the response rate was high through follow up on the filling of the questionnaires with the respondents through phone calls and emails.

Table 3 presents the response rate.

Table 4.1

Response Rate

Questionnaires	Frequency	Percentage (%)
Adequately filled	82	76
rejected	8	7
Not returned	18	17
Total	108	100.0

4.2.2 Pre- testing

The study carried out pretesting of the questionnaires to ensure the items were reliable. The study adopted measure of internal consistency where Cronbach alpha was calculated. The study revealed that all the variables used in the study were reliable given that all the Cronbach alphas were above 0.7 thresholds. The reliability of the variable Human resource capacity development was 0.777. The reliability of the variable medical equipment Procurement policy was 0.730. The reliability of medical equipment management policy was 0.738. The reliability of adherence to customer service charter was 0.718 and finally, the reliability of equipment utilization was 0.728. The study therefore concluded that the questionnaires used in the study were reliable. The results are presented in table 4.

Table 4.2

Reliability Test

Variable	Cronbach Alpha	Number of items	Conclusion
Human resource capacity development	0.777	8	Reliable
Medical equipment Procurement policy	0.730	11	Reliable
Medical equipment management policy	0.738	6	Reliable
Adherence to customer service charter	0.718	5	Reliable
Medical Equipment utilization	0.728	7	Reliable

4.3 Demographic Characteristics of the study population

Demographic characteristics are population features of the respondents who participated in the study. The research sought to establish the demographics of the respondents with the major demographic variables including age, education and marital status. Regarding age, those aged between 20-39 years were 70(85%) while those aged 40 years and above were only 12(15%) hence the minority. With the majority of the respondents being youthful, the study concludes that they are energetic and should

utilise the available medical equipment well. The study also examined the education level of the respondents. Sixty-one (74%) of the respondents possessed tertiary level of education that includes diploma, certificate and higher diploma. Those with bachelor's degree were 17 (21%).

Finally, only 4(5%) were possessed postgraduate and secondary education. Given that majority of the respondents were having tertiary and bachelor's degree, it can be concluded that they possessed requisite knowledge for utilization medical equipment, however effective utilization of medical equipment requires more than academic qualification to on job continuous training. The study also sought to establish the marital status of the respondents of the study which revealed that 55(67%) of the respondents were married. This was followed by 21(26%) of the respondents who were single. Finally, those who were divorced or widowed were 5(6%) and 1(1%) respectively. Given that majority of the respondents were married, it implies that they had both hospital duties and home duties hence work life imbalance could be an issue that could end up affecting their performance in terms of utilization of medical equipment to offer services to patients that needs those services. Table 5 presents the findings on demographic characteristics.

Table 4.3

Demographic Characteristics

Variable	Category	Frequency	Percent
Age	20-29 years	40	49
	30-39 years	30	37
	40-49 years	9	11
	50 years and above	3	4
	Total	82	100
Education level	Secondary	2	2
	Diploma/Certificate	61	74
	Bachelors	17	21

	Post graduate	2	2
	Total	82	100
Marital status	Single	21	26
	Married	55	67
	Divorced	5	6
	Widow	1	1
	Total	82	100.0

The study also carried out a cross tabulation of the demographic variables with the dependent variable utilization of medical equipment. Regarding age, for those aged 20-29, out of the 40 respondents, 28(70%) said that medical equipment was not utilised as required while 12(30%) were of the opinion that medical equipment was utilised well. For those aged 30-39, out of the 30 respondents, 22(73%) were of the opinion that medical equipment was not utilised as required while 8(27%) said that medical equipment was utilised as required. For those aged 40-49, of the 3(33%) were of the opinion that medical equipment was not utilised as required while 6(68%) were of the opinion that medical equipment was utilised as required. Those aged 40 years and above tended to state that medical equipment was highly utilised given that most of them are in management positions in their various departments and would report positive outcomes. This can be compared to younger employees who are not in leadership positions hence tends to see ill by leadership of the hospital in terms of utilization of medical equipment.

Regarding marital status, of the 21 singles, 14(68%) were of the opinion medical equipment were not utilised well while 7(33%) said medical equipment were utilised as required. Those that were married, 39(71%) of the respondents were of the opinion that medical equipment was not utilised as required while only 16(29%) said that medical equipment was well utilised. For the divorced, 3(60%) said that medical equipment was not well utilised while 2(40%) said that medical equipment was well

utilised. For the widowed, all the respondents said medical equipment were well utilised. Regarding education, for those holding secondary education, all said medical equipment were well utilised. For those holding diploma, 40(66) of the respondents were of the opinion that medical equipment was not utilised as required while 21(34%) were of the opinion that medical equipment was well utilised. For those holding bachelors education, 15(88%) said medical equipment were not utilised well while 2(12%) held that medical equipment was well utilised. Finally, for those holding postgraduate education, half-said medical equipment were well utilised while the other half-said medical equipment were not well utilised.

Table 4.4

Demographic Variables against Utilization of Medical Equipment

Demographic Variables		Utilization of Medical Equipment		Total N(%)
		NoN(%)	YesN(%)	
Age	20-29 years	28	12	40
		70%	30%	100%
	30-39 years	22	8	30
		73%	27%	100%
	40-49 years	3	6	9
	33%	68%	100%	
	50 years and above	3	0	3
		100%	0%	100%
Marital status	Single	14	7	21
		66%	33%	100 %
	Married	39	16	55
		71%	29%	100%
	Divorced	3	2	5
	60%	40%	100%	
	Widow	0	1	1
		0%	100%	100%
Education level	Secondary	0	2	2
		0%	100%	100%
	Diploma/Certificate	40	21	61
		66%	34%	100%
	Bachelors	15	2	17
	88%	12%	100%	
	Post Graduate	1	1	2
		50%	50%	100%

The results presented in Table 6 reveals that younger employees between ages 20-39 tended to utilise medical equipment better than older employees given that younger employees are more active and are better placed in utilizing medical equipment. Additionally, married individuals were better in utilising medical equipment compared to other marital status that could be attributed to them being settled in life compared to other marital status. Finally, those who possess educational level of Certificate and above had a better medical equipment utilization compared to those that had qualification lower than that. Those with certificate qualification and above were trained in various areas including operating medical equipment hence are expected to be better at utilizing medical equipment. The findings are in agreement with Umunna, (2012)who examined the procurement of medical equipment among low-income countries. The research showed that the age and qualification of staff was influencing medical equipment utilization with public health facilities that trained staff on medical equipment registering better medical equipment utilization. Additionally, the study revealed that younger medical workforce had better utilization of medical equipment.

4.4 Descriptive Analysis of Study Variables

The research adopted descriptive statistics to examine the study variables. The ‘Yes’ responses were coded (1) and the ‘No’ responses were coded as (0). The study utilised SPSS version 23 to generate frequency distribution and percentages for each statement about the study variable. The study variables included Human resource capacity development, medical equipment Procurement policy, medical equipment management policy, adherence to customer service charter and equipment utilization in health service delivery.

4.4.1 Medical Equipment Utilization

The research also sought to establish the nature and level of utilization of medical equipment at Mandera county referral hospital. The respondents were presented with a number of statements which they were required to respond with a 'yes' or a 'no'. The findings are presented in Table 7. The statement that medical equipment rarely breaks down at the facility was supported by 42 (51%) of the respondents who responded with a 'yes' with the remaining 40 (49%) responding with a 'no' implying that the medical equipment breaks often. The statement that services offered by the medical equipment are at the expected level was supported by majority of respondents at 52(63%) with only 30(37%) responding otherwise implying the equipment are offering expected level of services. The study also sought to establish whether when medical equipment breaks down, they are repaired immediately.

The study established that medical equipment is repaired promptly as depicted by 46(56%) of the respondents who responded with a 'yes' against 36(44%) of the respondents who responded with a 'no'. The statement that medical equipment is performing according to design capacity was agreed upon by 54 (66%) of the respondents against only 28 (34%) who responded with 'no' meaning that most of the medical equipment possessed by the hospital are performing according to design. The statement that patients do not wait for long for their turn to use medical equipment was supported by 51 (62%) of the respondents against 31(38%) who responded with a 'no'. The researcher sought to establish whether quality of health services provided by availing equipment are much higher was supported by a few respondents as shown by only 37(45%) who responded with a 'yes' compared with majority at 45(55%) responding with a 'no'. The statement that medical equipment rarely lies idle at the health facility for any reason was not supported by majority of the respondents with the

study establishing that the medical equipment was mostly idle as depicted by 55(67%) ‘No’ responses against 26(32 %) ‘Yes’ responses.

Table 4.5

Equipment Utilization

Statements		Frequency	Percent
The medical equipment rarely breaks down at the facility	No	40	49
	Yes	42	51
	Total	82	100
The services offered by the medical equipment are at the expected level	No	30	37
	Yes	52	63
	Total	82	100
When medical equipment breaks down, they are repaired immediately	No	36	44
	Yes	46	56
	Total	82	100
The medical equipment is performing according to design capacity	No	28	34
	Yes	54	65
	Total	82	100
Patients don’t wait for long for their turn to use medical equipment	No	31	38
	Yes	51	62
	Total	82	100
The quality of health services provided by availing equipment are much higher	No	45	55
	Yes	37	45
	Total	82	100
Medical equipment rarely lies idle at the health facility for any reason	No	55	67
	Yes	26	32
	Total	82	100

The researcher also used an observational checklist to examine the utilization of medical equipment at the hospital. Fifteen (15) machines were observed. The finding is presented in Table 8. From the observation checklist, it was seen that regarding the availability of the medical equipment observed, 10(67%) were available for use in service provision around the clock due to their relatively low demand. Three (20%) medical equipment was available on specific timings as given by their demand hence patients are given specific time for their use. The remaining 2(13%) of the medical equipment observed were only available on request given that the hospital did not have adequately trained personnel to operate them hence patients were to request in advance.

Medical equipment utilization is a function of other variables including the involvement of stakeholders outside the use of the medical equipment (Douglas & Connor, 2003).

Table 4.6

Availability and Working Condition of Medical Equipment

Variable	Category	Frequency	Percentage
Availability	Round the clock	10	67
	Specific timings	3	20
	on request	2	13
	Total	15	100
Working Condition	Not Working	1	7
	poor working condition	3	20
	good working condition	8	53
	very good working condition	3	20
	Excellent working condition	0	0
	Total	15	100

Regarding the working condition of the medical equipment observed, majority were in good working condition as depicted by 8(53%) which were in good working condition. Three (20%) medical equipment was in poor working condition, as they needed maintenance, which had not been performed at the time of data collection. Three (20%) were in very good working condition especially those that were just purchased recently and only one was not working having broken down and the hospital is still waiting for spare parts to be brought from the manufacturer based in china.

The findings generated from analysis of data collected through questionnaires and observation checklist revealed that generally, the utilization level of medical equipment was not to the required level. The low utilization rate of medical equipment below expectation was evidenced by high percentages of No responses among the total responses in the questionnaires response analysis. Additionally, the observation

checklist revealed that availability of medical equipment around the clock was just about 67%. Regarding working condition, good working conditions were about 73%. The finding is in agreement with Camino and Gatos (2015) that revealed that lack of enough qualified personnel in the maintenance department and capacity development of the overstretched human resource is a major bottleneck in the current county health department. The ratio of staffing against the number of health facilities is unimaginable which greatly deter the efficiency of the staffs because of overwhelming workloads.

4.4.2 Human Resource Capacity Development

The respondents were presented with statements about human resource capacity development at the hospital of which they were required to respond with a 'yes' or a 'no'. The findings are presented in Table 9. Regarding the statement that management involves employees when medical equipment is to be purchased, 50 (61%) responded with a no response and 32(39%) responded with a yes. Given that majority of the responses were 'No', it was clear that management of the hospital seldom involves employees when purchasing medical equipment. There was no significance difference in the responses given by the respondent regarding involvement of employees when medical equipment is to be purchased ($\chi^2= 3.408$, $p= 0.078$).

The statement that staff who works with equipment are usually trained well in advance received 'yes' response from 42 (51%) respondents with the remaining 40 (49%) responding with a 'no'. It was thus established that the hospital trains some employees in advance before purchasing medical equipment. There was no significance difference in the responses given by the respondent regarding staff working with equipment being usually trained well in advance ($\chi^2= 2.077$, $p= 0.165$). The study also sought to establish whether the hospital has enough qualified staff that are highly trained on use of different

equipment. The 'No' responses were 61(74%) and the 'yes' responses were 21(26%) implying that the hospital is deficient in terms of trained and qualified staff to work with medical equipment. There was no significance difference in the responses given by the respondent regarding the statement that hospital has enough qualified staff that are highly trained on use of different equipment ($\chi^2= 1.833$, $p= 0.218$).

The statement that staffs are adequately compensated to motivate them to do their best at work attracted 63(77%) 'No' responses and 19(23%) 'Yes' responses implying that the staffs are not motivated well at the hospital. There was no significance difference in the responses given by the respondent regarding the relationship between employee compensation and utilization of medical equipment ($\chi^2= 1.606$, $p= 0.258$).

The study also sought to establish whether hospital has specialist medical engineer who oversee repairs and maintenance. The 41(50%) responded with a 'no' and 41 (50%) responded with a 'yes' implying that the respondents were divided on whether the hospital has specialist medical engineer to monitor repairs and maintenance of medical equipment. There was a significant difference in the responses given by the respondent regarding the statement that hospital has specialist medical engineer who oversee repairs ($\chi^2 = 5.325$, $p= 0.027$).

The statement that staffs are required to put on protective clothing when dealing with equipment's at the hospital received 59 (72%) yes responses and 23(28%) no responses implying that the staff always put on protective clothing while operating medical equipment's at the hospital. There was no significance difference in the responses given by the respondent regarding statement that staffs are required to put on

protective clothing when dealing with equipment's at the hospital ($\chi^2 = 0.423$, $p=0.809$).

The statement that hospital has a good program for staff retention at the facility was disapproved by 48(59%) of the respondents who responded with a no with only 34(42%) responding with a 'yes'. There was no significance difference in the responses given by the respondent regarding the statement that hospital has a good program for staff retention at the facility ($\chi^2 = 3.772$, $p= 0.063$). The study also sought to establish on whether the hospital recognizes the hard work of employees by compensating good performance. Majority of respondent 49 (60%) responded with a no and only 33(40%) responded with a yes implying that the hospital rarely rewards hard work. There was no significance difference in the responses given by the respondent regarding statement that hospital recognizes the hard work of employees by compensating good performance ($\chi^2 = 3.586$, $p= 0.166$).

Table 4.7

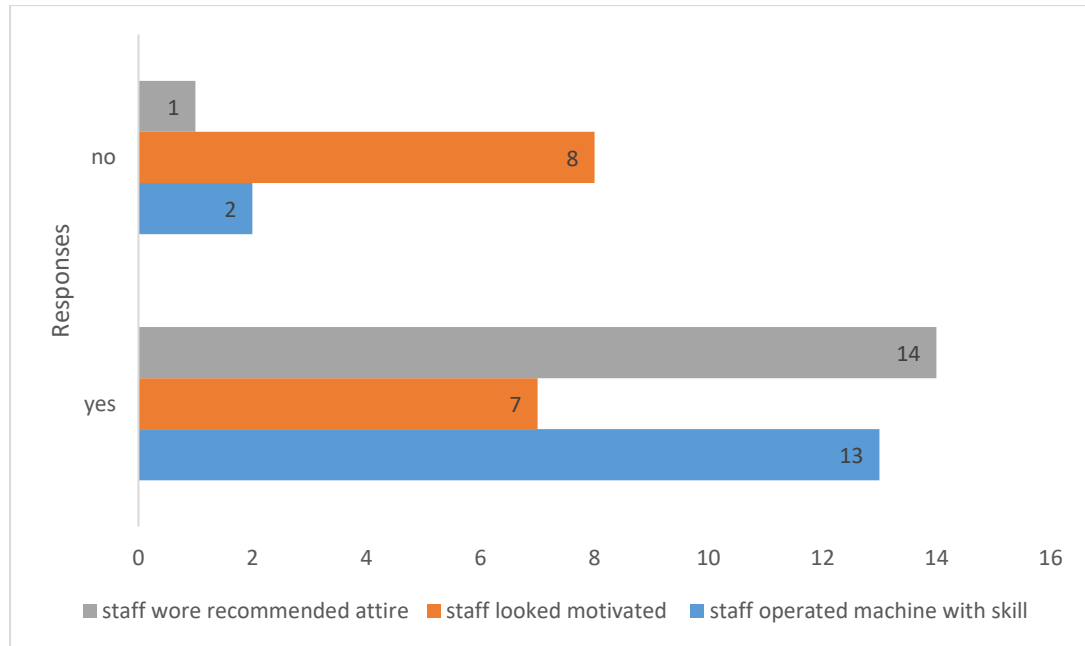
Human Resource Capacity Development

Statements	NO n(%)	Yes n(%)	Chi square	p- value
Management involves employees when medical equipment is to be purchased	50(61)	32(39)	3.408	0.078
Staff who works with equipment are usually trained well in advance	40(49)	42(51)	2.077	0.165
The hospital has enough qualified staff that are highly trained on use of different equipment	61(74)	21(26)	1.833	0.218
The staffs are adequately compensated to motivate them to do their best at work	63(77)	19(23)	1.606	0.258
The hospital has specialist medical engineer who oversee repairs and maintenance	41(50)	41(50)	5.325	0.027
The staffs are required to put on protective clothing when dealing with equipment's at the hospital	23(28)	59(72)	0.423	0.809
The hospital has a good program for staff retention at the facility	48(59)	34(42)	3.772	0.063
The hospital recognizes the hard work of employees by compensating good performance	49(60)	33(40)	3.586	0.166

The researcher also used an observational checklist to examine the human resource capacity development attributes at the hospital. Fifteen(15) machines were observed as the staff used them to provide services. The finding is presented in figure 2.

Figure 4.1

Skill, Motivation and Attire of the staff



From the observation checklist, it was seen that regarding the statement that staff operated machine with skills, out of the 15-medical equipment observed, 13 were operated with skills and competence with only 2 being operated without adequate skills implying that generally, the staff who operated the medical equipment had skills. Regarding the statement that staff looked motivated, seven machines were operated with staff that looked motivated against eight machines that were operated with staff that were demotivated as seen from their attitude in operating the machines. Finally, with respect to the statement that staff wore recommended attire at work, the study established that 13 machines were operated by staffs who wore recommended attire with only two machines operated by staff that did not have full protective attire

implying the hospital had acquired adequate protective attire for staff working with machines.

The findings on human resource capacity development were based on analysis of data collected using questionnaires and observation checklist. Generally based on data collected and based on questionnaires, the respondents tended to respond more with a 'No' compared to 'Yes' responses. This implies that human resource capacity development was not as expected. Additionally, the observation checklist showed that the staffs were generally not motivated as shown by more 'No' responses. All the statements on human resource capacity development were positively associated with utilization of medical equipment. The findings are in agreement with Mutia et al. (2012) that revealed that inadequate capacity building of health staffs on maintenance and use of equipment is the biggest challenge that ever existed in the health sector that remained unmentioned and given platform of discussion for solution. Lack of investment in training of maintenance staffs and other health workforce on proper handling and use of machines and equipment purchased is the biggest challenge in health sector.

4.4.3 Medical Equipment Management Policy

The study sought to establish the existence and use of medical equipment management policy. The respondents were required to respond with a 'yes' or a 'no' to statements regarding the existence and use of Medical equipment management policy of the hospital. The findings are presented in table 10. The statement that all stakeholders are usually involved before an equipment is purchased was supported by only 27(33%) with 55(67%) responding with a 'no' implying that stakeholders are rarely involved when the hospital makes purchasing decisions over medical equipment. There was a

significant difference in the responses given by the respondent regarding existence and use of medical equipment management policy of the hospital ($\chi^2 = 14.908$, $p = 0.001$).

The study also sought to establish whether the health facility has a detailed medical equipment policy for use. The respondents who responded with a 'yes' were 37(45%) with the remaining 45(55%) responding with a 'no' implying the medical equipment policy could be existing but it is not detailed to the required level. There was no significance difference in the responses given by the respondent regarding existence of detailed medical equipment policy for use at the health facility ($\chi^2 = 1.850$, $p = 0.397$). The statement that medical equipment policy has been effectively and adequately established was only supported by 28 (34%) with the remaining 54(66%) of the respondents responding with a 'no' implying that the medical equipment management policy is lacking completely or is inadequate to handle all the hospital medical equipment's. There was no significance difference in the responses given by the respondent regarding statement that medical equipment policy has been effectively and adequately established ($\chi^2 = 1.128$, $p = 0.208$).

The study also sought to establish whether the hospital continuously monitors and evaluates the use of the medical equipment. The findings showed that 49(60%) of the responses were 'no' with only 33(40%) being yes meaning monitoring of medical equipment was not up to expectations. There was a significant difference in the responses given by the respondent regarding the statement that hospital continuously monitors and evaluates the use of the medial equipment ($\chi^2 = 5.553$, $p = 0.032$). The statement that the staffs are well informed of the medical equipment policy at the hospital was only supported by 35(43%) of the respondents with the remaining 47(57%) responding with a 'no' meaning that only a few staff are informed of the medical

equipment policy. There was a significance difference in the responses given by the respondent regarding statement that the staffs are well informed of the medical equipment policy at the hospital ($\chi^2 = 15.213$, $p= 0.034$).

The study also sought to establish whether the health facility keeps equipment use logs for all equipment at the health facility. Majority of the respondents comprising 56(68%) staff responded with a 'yes' with the remaining few responding with a 'no' hence it can be concluded that the hospital keeps a log on the medical equipment at the hospital. There was a significance difference in the responses given by the respondent regarding the statement that health facility keeps equipment use logs for all equipment at the health facility ($\chi^2 = 4.684$, $p= 0.025 < 0.05$).

The statement that the hospital performs scheduled time intervals maintenance on medical equipment's to minimize equipment degradation was supported by only 34(42%) with the remaining majority of 48(59%) disagreeing by responding with a 'no'. The response implies that the hospital does not carry out scheduled maintenance practices on medical equipment as required. There was a significance difference in the responses given by the respondent regarding the statement that the hospital performs scheduled time intervals maintenance on medical equipment's to minimize equipment degradation ($\chi^2 = 10.088$, $p=0.044$). The statement that the health facility has a detailed plan on the preventive maintenance practices activities was supported by only 37(45%) with the remaining majority of 45(55%) respondents disagreeing with the statement. There was a significance difference in the responses given by the respondents regarding the statement that health facility has a detailed plan on the preventive maintenance practices activities ($\chi^2 = 13.241$, $p= 0.021$).

The respondents were divided in opinion on whether preventive maintenance ensures equipment is performing at a reliable level given by 40(49%) ‘Yes’ responses and 42(51%) ‘No’ responses. There was no significance difference in the responses given by the respondent regarding statement that preventive maintenance ensures equipment is performing at a reliable level ($\chi^2 = 3.960$, $p= 0.555$). Majority of the respondents were of the opinion that preventive maintenance ensures that the equipment is safe for the patients and staff as depicted by 67(82%) yes responses against 15(18%) ‘No’ responses. There is a significance difference in the responses given by the respondent regarding statement that preventive maintenance ensures that the equipment is safe for the patients ($\chi^2 = 15.920$, $p= 0.042$). The statement that preventive maintenance ensures that the medical equipment is available when needed was supported by 52(63%) ‘Yes’ responses against only 30(37%) who stated ‘no’ responses. There was a significance difference in the responses given by the respondent regarding statement that preventive maintenance ensures that the medical equipment is available when needed ($\chi^2 = 16.261$, $p= 0.031$).

Table 4.8

Medical Equipment Management Policy

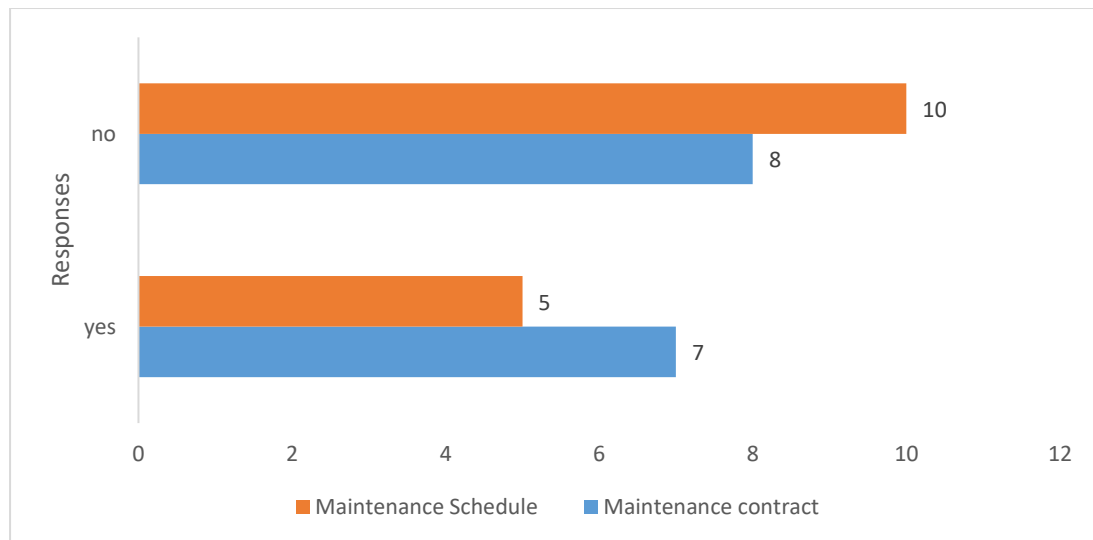
Statement	No n(%)	Yes n(%)	Chi- square	P- Value
All stakeholders are usually involved before an equipment is purchased	55(67)	27(33)	14.908	0.001
The health facility has a detailed medical equipment policy for use	45(55)	37(45)	1.850	0.397
Medical equipment policy has been effectively and adequately established	54(66)	28(34)	1.128	0.208
The hospital continuously monitors and evaluates the use of the medial equipment	49(60)	33(40)	5.553	0.032

The staffs are well informed of the medical equipment policy at the hospital	47(57)	35(43)	15.213	0.034
The health facility keeps equipment use logs for all equipment at the health facility	26(32)	56(68)	4.684	0.025
The hospital performs scheduled time intervals to minimize equipment degradation	34(42)	48(58)	10.088	0.044
The health facility has a detailed plan on the preventive maintenance practices activities	45(55)	37(45)	13.241	0.021
Preventive maintenance ensures equipment is performing at a reliable level	42(51)	40(49)	3.960	0.555
Preventive maintenance ensures that the equipment is safe for the patients and staff	15(18)	67(82)	15.920	0.042
Preventive maintenance ensures that the medical equipment is available when needed	30(37)	52(63)	16.261	0.031

The researcher also used an observational checklist to examine the presence of medical equipment management policy at the hospital. Fifteen 15 machines were examined about existence of maintenance contract and maintenance schedule. The finding is presented in figure 3. From the observation checklist, it was seen that regarding the presence of maintenance contract, out of the 15-medical equipment observed, only 7 had maintenance contract with the manufacturer with the remaining 8 not having any formal contract with their maintenance. This implies that most of the medical equipment at the hospital did not have formal contracts with manufacturers. Regarding the presence of maintenance schedule and plan, only five machines had maintenance schedule and plan against 10 machines that did not have maintenance schedule and plan. The results mean that the medical equipment were not being maintained according to formal plan and schedule as is expected.

Figure 4.2

Existence of Equipment Maintenance Contract and Schedule



The study findings on medical equipment management policy were based data collected, questionnaires and observation checklist. The findings based on questionnaires generally showed that medical equipment management policy was not to the expected standard. Majority of the respondents tended to respond with a ‘No’ on most of the statements regarding existence and use of medical equipment policy. The finding based on observation checklist also revealed that the hospital performed poorly regarding the existence of maintenance schedule and maintenance contract with manufacturers. The finding implies that most of the medical equipment were not maintained according to schedule and that there was no arrangement for most equipment regarding their maintenance. The findings are in congruence with CSCMP (2016) which showed that the medical care establishment needs to carry out planned maintenance processes and activities on the existing stock of medical equipment (Kirui et al., 2013). On the other hand, it showed that medical equipment management policy should be guided by cost effectiveness during the life cycle of the medical equipment from purchase, use, maintenance and disposal.

4.4.4 Medical Equipment Procurement Policy

The study sought to establish the existence and adherence to procurement policy when purchasing or disposing off medical equipment at the hospital. The respondents were required to respond with a 'yes' or 'no' response to various statements. The findings are presented in table 11. The statement that the procurement of all medical equipment is done based on need assessment was supported by 43(52%) respondents who stated 'yes' response against 39(48%) who responded with a 'no' implying that need assessment is always done but not all the time when procuring medical equipment. There was a significance difference in the responses given by the respondent regarding statement that the procurement of all medical equipment is done based on need assessment ($\chi^2 = 5.871$, $p= 0.050$).

The respondents were divided on the statement that the hospital does not purchase any medical equipment it does not need as shown by equal number of no and yes responses of 41(50%) implying that sometimes the hospital buy medical equipment they do not need while other times they buy medical equipment that they need. There was a significance difference in the responses given by the respondent regarding the statement that the hospital does not purchase any medical equipment it does not need ($\chi^2 = 5.325$, $p= 0.027$). The statement that Medical equipment are usually disposed by the hospital following the laid down procurement policies was supported by 42 (51%) against 40(49%) who responded with a 'no' implying that sometimes the laid down procedures are followed while sometimes they are never followed when disposing off medical equipment. Additionally, there was a significance difference in the responses given by the respondent regarding the statement that Medical equipment are usually disposed by the hospital following the laid down procurement policies ($\chi^2 = 5.591$, $p= 0.024$).

The statement that stakeholders are involved in all decision regarding the purchase of medical equipment was only supported by 32(39%) with the remaining majority of 50(61%) responding with a 'no' implying that the involvement of stakeholders is rarely done when making medical equipment purchasing decisions. There was a significance difference in the responses given by the respondent regarding statement that stakeholders are involved in all decision regarding the purchase of medical equipment ($\chi^2 = 3.408$, $p= 0.041$). Only a few respondents agreed that the equipment purchased meet the quality standards set in advance as depicted by 39(48%) of the respondents against a majority of 43(52%) who stated 'no' responses. It was thus clear that few medical equipment purchased by the hospital meets minimum quality standards set out in advance. There was a significance difference in the responses given by the respondent regarding the statement that equipment purchased meet the quality standards set in advance and utilization of medical equipment at the hospital was positive and statistically significant ($\chi^2 = 4.829$, $p= 0.035$).

The statement that medical equipment not meeting set quality standards are returned back to the suppliers at their cost was only supported by 24(29%) respondents with the remaining majority of 58(71%) responding with a 'no' meaning that poor quality medical equipment is rarely returned to suppliers. Additionally, there was no significance difference in the responses given by the respondent regarding the relationship between utilization of medical equipment and procurement policy was positive but not statistically significant ($\chi^2 = 2.203$, $p= 0.168$).

Table 4.9***Medical Equipment Procurement Policy***

Statement	No n(%)	Yes n(%)	Chi- square	P- Value
The procurement of all medical equipment is done based on need assessment	39(48)	43(52)	5.871	0.050
The hospital does not purchase any medical equipment it does not need	41(50)	41(50)	5.325	0.027
Medical equipment is usually disposed of following the laid down procurement policies	40(49)	42(51)	5.591	0.024
Stakeholders are involved in all decision regarding the purchase of medical equipment	50(61)	32(39)	3.408	0.041
The equipment purchased meet the quality standards set in advance	43(52)	39(48)	4.829	0.035
Equipment not meeting set quality standards are returned back to the suppliers at their cost	58(71)	24(29)	2.203	0.168

The findings on medical equipment procurement policy were based on data collected using questionnaires. The analysis generally showed that majority of respondents was in disagreement with most of the statements regarding medical equipment procurement policy. The finding implies that the hospital did not follow the procurement policy as required by law. There were breaches on procurement law thereby affecting utilization of medical equipment. Additionally, most of the statements on medical equipment procurement policy were positively and significantly correlated with utilization of medical equipment as evidenced by p-values less than 0.05. The findings are in agreement with Oloo et al. (2017) who examined the causal effect link between medical equipment procurement strategies at public hospitals performance in Kenya. The study revealed that the evaluations and selection of vendors was critical to performance of public health hospitals given that procurement determined the quality of medical equipment utilization. The research also revealed that integrity of procurement staff

was low and that low integrity of procurement personnel has influenced the purchase of right medical equipment which in turn affected medical equipment utilization.

4.4.5 Adherence to Customer Service Charter

The research also examined the adherence to service charter at the Mandera Referral hospital. The study presented the respondents with a number of statements regarding adherence to customer service charter. The findings are presented in table 12. The statement that Mandera county referral hospital treats all its customers with courtesy and respect was supported by majority of the respondents as evidenced by 74(90%) of the respondents who agreed against only 8(10%) who disagreed. There was no significance difference in the responses given by the respondent regarding the statement that Mandera county referral hospital treats all its customers with courtesy and respect ($\chi^2 = 0.635$, $p = 0.410$). The response implies that patients are treated with respect and courtesy.

The study also established that Mandera county referral hospital treats, upholds professionalism in serving its customers as shown by majority of respondents who agreed with the statement as depicted by agreement rate of 71(87%) against disagreement rate of only 11(13%). There was no significance difference in the responses given by the respondent regarding the statement that Mandera county referral hospital treats, upholds professionalism in serving its customers ($\chi^2 = 0.635$, $p = 0.523$). Majority of respondents with agreement rate of 61(74%) supported the statement that Mandera county referral hospital ensures equity in its allocation of medical equipment to patients care against disagreement rate 21(26%). The chi square showed that there was a significance difference in the responses given by the respondent regarding the statement that Mandera county referral hospital ensures equity in its allocation of medical equipment to patients care ($\chi^2 = 8.268$, $p = 0.014$).

Majority of respondents were in agreement that Mandera county referral hospital treats patients according to laid down clinical procedures as depicted by majority of the respondents who agreed with agreement rate of 76(93%) against disagreement rate of only 6(7%). Further, there was no significance difference in the responses given by the respondent regarding the statement that Mandera county referral hospital treats patients according to laid down clinical procedures ($\chi^2 = 1.263$, $p= 0.323$). The statement that Mandera county referral hospital treats upholds good working ethics in a corruption free environment was supported by slight majority of respondents as shown by agreement rate of 47(57%) against disagreement rate of 35(43%). There was a significance difference in the responses given by the respondent regarding the statement that Mandera county referral hospital treats uphold good working ethics in a corruption free environment ($\chi^2= 7.150$, $p= 0.012$).

Table 4.10

Adherence to Customer Service Charter

Statement	Disagreed n(%)	Agreed n(%)	Chi- square	P- Value
Mandera county referral hospital treats all its customers with courtesy and respect.	8(10)	74(90)	0.635	0.410
Mandera county referral hospital treats, upholds professionalism in serving its customers.	11(13)	71(87)	0.199	0.523
Mandera county referral hospital ensures equity in its allocation of medical equipment to patients' care	21(26)	61(74)	8.268	0.014
Mandera county referral hospital treats patients according to laid down clinical procedures.	6(7)	76(93)	1.263	0.323
Mandera county referral hospital treats uphold good working ethics in a corruption free environment.	35(43)	47(57)	7.150	0.012

The overall, majority of the respondents agreed with statements showing that in general, the responses on adherence to service charter were tending towards agreement implying that respondents were generally of the opinion that the hospital was working and offering medical services according to the service charter. The findings are in agreement with Wilson et al., (2008) who stated that employee awareness of customer service charter was critical in adherence to service charter. Employees who are aware of the level of services to deliver as stated in the organization policies tends to be better in utilizing medical equipment to offer various Medicare services.

4.5 Correlation Analysis

The study sought to establish the association between human resource capacity development, medical equipment management policy, medical equipment procurement policy, adherence to customer service charter and Utilization of medical equipment in Manderu referral hospital. The study adopted Pearson correlation coefficient to establish the correlation among the study variables. The study variables human resource capacity development, medical equipment management policy and medical equipment procurement policy were binary in nature based on two-point scale, however the variable adherence to customer service charter was based on five-point scale. The variable was converted to binary scale using the recoding option in SPSS where responses of 4 and 5 were recorded to one (1) and responses of 1, 2, and 3 were recorded to zero (0). The findings are presented in Table 13. The study established that the correlation between human resource capacity building and utilization of medical equipment was positive ($r = .353$, $p\text{-value} = .001$). The association between medical equipment management policy and utilization of medical equipment was also positive ($r = .339$, $p\text{-value} = .001$). The study also revealed that there exists positive correlation between medical equipment procurement policy and utilization of medical equipment

($r = .267$, p -value $.008$). Finally, the association between adherence to service charter and utilization of medical equipment at the hospital was positive ($r = 0.407$, p -value = 0.000).

Table 4.11

Correlation Coefficients

		HRCapacity development	Medical Equipment Management Policy	Medical Equipment Procurement Policy	Adherence to Service Charter	Utilization of Medical Equipment
HRCapacity development	Pearson	1	.726**	.722**	.391**	.353**
	Correlation Sig. (1- tailed)		.000	.000	.000	.001
	N	82	82	82	82	82
Medical Equipment Management Policy	Pearson	.726**	1	.699**	.470**	.339**
	Correlation Sig. (1- tailed)	.000		.000	.000	.001
	N	82	82	82	82	82
Medical Equipment Procurement Policy	Pearson	.722**	.699**	1	.408**	.267**
	Correlation Sig. (1- tailed)	.000	.000		.000	.008
	N	82	82	82	82	82
Adherence to Service Charter	Pearson	.391**	.470**	.408**	1	.407**
	Correlation Sig. (1- tailed)	.000	.000	.000		.000
	N	82	82	82	82	82
Utilization of Medical Equipment	Pearson	.353**	.339**	.267**	.407**	1
	Correlation Sig. (1- tailed)	.001	.001	.008	.000	
	N	82	82	82	82	82

Note: **. Correlation is significant at the 0.01 level (1-tailed).

The study results revealed that the correlation between human resource capacity building and utilization of medical equipment was positive ($r = .353$, p -value = $.001$). This implies that human resource capacity development and utilization of medical equipment tends to increase together such that improving human resource capacity is accompanied by increasing utilization of medical equipment. The correlation analysis

revealed that the association between medical equipment management policy and utilization of medical equipment was also positive ($r= 0.339$, $p\text{-value}= 0.001$).The positive association between medical equipment management policy and medical equipment utilization means that existence and use of medical equipment management policy is accompanied by improved utilization of medical equipment at Mandera referral hospital. Based on Pearson correlation, the study revealed that there exists positive correlation between medical equipment procurement policy and utilization of medical equipment ($r= 0.267$, $p\text{-value} 0.008$). The positive association between medical equipment procurement policy and utilization of medical equipment means that when firm makes procurement of medical equipment in line with the procurement policy, the firm experiences improved utilization rate of the medical equipment. Finally, the association between adherence to service charter and utilization of medical equipment at the hospital was positive ($r= .407$, $p\text{-value} = .000$). The direct correlation between adherence to service charter and utilization of medical equipment implies that strict adherence to customer service charter is accompanied by high utilization rate of medical equipment at the referral hospital. The findings are in agreement with Bahreini et al. (2018)who examined the procurement of medical equipment in low and middle-income countries. The study revealed that the environment in which the equipment was procured influences procurement processes of medical equipment. The study further established that the utilization of medical equipment is influenced by procurement policy, qualification of staff and management of medical equipment.

4.6 Regression Analysis

The research sought to establish the determinants of medical equipment utilization in Mandera county referral hospital. The study adopted binary logistic regression analysis to establish the causal effect relationship between determinants of medical equipment

utilization (Human resource capacity development, Medical equipment management policy, Medical equipment procurement policy, Adherence to service charter) and Utilization of medical equipment in Mandera county hospital. Binary logistic regression was deemed the most suitable model for this study since the dependent variable was binary in nature. The results of the analysis are as presented in table 14.

Table 4.12

Multivariate Regression Analysis Results

Variables	B	S.E.	P – value	Odds Ratio
Human Resources Capacity Development:				
No staff training opportunities (reference)	-	-	-	1.000
There are staff training opportunities	2.742	0.756	0.000	7.064
Medical Equipment Management Policy:				
No detailed medical equipment policy (reference)	-	-	-	1.000
There is detailed medical equipment policy	2.185	1.012	0.031	8.891
Medical Equipment Procurement Policy:				
No procurement policy (reference)	-	-	-	1.000
There is a procurement policy	0.200	0.102	0.025	1.221
Adherence to Service Charter:				
Service charter is not adhered to (reference)	-	-	-	1.000
Service charter is adhered to	1.054	0.476	0.000	2.119

4.6.1 Effect of Human Resource Capacity Development on Medical Equipment Utilization

The first objective of the study was to examine the effect of human resource capacity development on medical equipment utilization at Mandera county referral hospital. A binary logistic regression analysis was conducted to predict utilization of medical equipment at Mandera county referral hospital using human resource capacity development as a predictor of utilization of medical equipment. The results of the analysis indicated that there is a significant relationship between human resource

capacity development initiatives and the utilisation of medical equipment in Mandera County. Employees who are subjected to continuous training are 7.064 times more likely to be effective in medical equipment utilization as compared to those who are not trained implying that training enhances medical equipment utilization. The results were significant at 5% level of significance.

The findings are in agreement with Kirui et al. (2013) who established that lack of staff involvement especially from the maintenance department in planning during purchase of equipment leading to idle equipment whose spare parts are not easily found in case of breakdown. Prioritization of devices receiving maintenance by hospital management and Sharing of views with the few technical personnel available is totally lacking, keeping in mind workload and travel time between different facilities. Further, Mutia et al. (2012) revealed that inadequate capacity building of health staffs on maintenance and use of equipment is the biggest challenge that ever existed in the health sector that remained unmentioned and given platform of discussion for solution. Lack of investment in training of maintenance staffs and other health workforce on proper handling and use of machines and equipment purchased is the biggest challenge in health sector (Mutia et al., 2012).

4.6.2 Effect of Medical Equipment Management Policy on Medical Equipment Utilization

The second objective of the study was to establish whether medical equipment policies are associated with effective utilization of medical equipment. The results of the analysis indicated that there is indeed a significant relationship between knowledge of medical equipment management policy and effective utilization of medical equipment. Where there is existence of an elaborate medical equipment policy, employees are 8.891 times more likely to effectively utilise medical equipment as compared to

situations where elaborate medical equipment policy does not exist. The results were significant at 5% level of significance.

The findings are in agreement with WHO (2011) that established that health service cost is a function of medical equipment maintenance. The National Medical Equipment Policy of the country should be developed to ensure that the most cost effective medical equipment is acquired and maintained in the health sector through setting of priorities. The Policy should be developed and updated continuously in line with National health policy of the country regarding provision of health services (Kirui et al., 2013). The medical equipment management policy should guide the management and health care managers during the life cycle of medical equipment including purchase, use, maintenance and sale of medical equipment. The medical equipment should require that purchase contract of medical equipment include provision of manuals for operation, training of biomedical technicians, provision of needed spare parts (Douglas & Connor, 2003; Kirui et al., 2013).

4.6.3 Effect of Medical Equipment Procurement Policy on Medical Equipment Utilization

The third objective of the study was to determine whether existence of medical equipment procurement policy is significantly associated with effective utilization of medical equipment. The results of the analysis indicated that there is a significant relationship between existence of medical equipment procurement policy and effective utilisation of medical equipment. For instance, employees who are aware of medical equipment procurement policy are 1.221 times more likely to be effective in medical equipment utilisation in Mandera county referral hospital when compared to those who are not aware of the medical equipment procurement policy. The results were significant at 5% level of significance.

The results are in agreement with Dealtry (2017) who examined the procurement of medical equipment in low income and middle-income countries. The study revealed that procurement processes of medical equipment are a function of the environmental factors including cultural and political factors. The study further established that the utilization of medical equipment is influenced by procurement policy, qualification of staff and management of medical equipment. Further, Oloo et al. (2017) examined the causal effect link between performance of public health hospitals and procurement practices. The study revealed that tendering, supplier selection and ethical practices influences performance of public hospitals in terms of service provision via medical equipment utilization.

4.6.4 Effect of Adherence to Service Charter on Medical Equipment Utilization

The fourth objective of the study was to determine whether adherence to service charter is significantly associated with effective utilization of medical equipment at Mandera county referral hospital. The results of the analysis indicated that there indeed exists a significant relationship between adherence to service charter and effective utilisation of medical equipment. Employees who adhered to service charter were 2.119 times more likely to be effective in medical equipment utilisation in Mandera county referral hospital when compared to those who never adhered to the existing service charter. The results were significant at 5% level of significance.

The findings are in agreement with Labani (2019) that revealed that medical equipment utilization was dependent upon the adherence to service charter. The study revealed that hospitals that strictly adhered to service charter were able to optimally use their medical equipment to deliver Medicare services. The adherence to service charter by employees depends on the knowledge acquisition by employees that is critical to deliver various services. The employee's needs to be aware of the services they are supposed

to offer and the quality standards to be offered as stated in the charter (Mwamunyange, 2019)The level of adherence to service charter also depends on compliance of employee to the service charter. Employee compliance to Customer Service Charter describes the level at which the employee follows the dictates of the service charter document. Compliance to service charter depends on the level of service commitment from the employees (OnyambuMasese et al., 2016)

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter elaborates on summary of study findings, conclusion, recommendations and areas of further studies. The study examined the determinants of medical equipment utilization at the Mandera referrals hospital in Mandera County, Kenya.

5.2 Summary of Findings

5.2.1 Medical Equipment Utilization

The findings generated from analysis of data collected through questionnaires and observation checklist revealed that generally, the utilization level of medical equipment was not to the required level. The low utilization rate of medical equipment below expectation was evidenced by high percentages of ‘No’ responses among the total responses in the questionnaires response analysis. Additionally, the observation checklist revealed that availability of medical equipment around the clock was just about 66.6%. Regarding working condition, good working condition was about 73%. The finding is in agreement with literature that showed that utilization of medical equipment was not to the required level of 100%.

5.2.2 Human Resource Capacity Development

Descriptive analysis revealed that the respondents tended to respond with a ‘no’ on most statements regarding human resource capacity development at the hospital. For instance, the study showed that management does not usually involve employees when medical equipment are to be purchased. The study also showed that the hospital does not have enough qualified staff that are highly trained on use of different equipment. The research also revealed that the staffs at the hospital were not adequately

compensated to motivate them to do their best at work. The study also showed that the hospital does not have a good program for staff retention at the facility. Based on correlation analysis, the study results revealed that the correlation between human resource capacity building and utilization of medical equipment was positive. In addition, the regression coefficient revealed that human resource capacity development has a significant relationship with medical equipment utilization. Therefore, human resource capacity development was a predictor of medical equipment utilization. The study further showed that training at the hospital, as an aspect of human resource development, was associated leads to improvement in medical equipment utilization.

5.2.3 Medical Equipment Management Policy

Based on descriptive analysis, the study revealed that majority of respondents tended to respond with a 'no' on most statements about existence and use of medical equipment management policy. The respondents were in disagreement with a number of statements by responding with a 'no'. For instance, the study revealed that not all stakeholders are usually involved before equipment is purchased. The study also established that the health facility does not have detailed medical equipment policy for use. The study also revealed that medical equipment policy has been effectively and adequately established. The correlation analysis revealed that the association between medical equipment management policy and utilization of medical equipment was also positive. The regression analysis further revealed that the causal effect relationship between medical equipment management policy and utilization of medical equipment at the hospital was significant. Additionally, an improvement in medical equipment management policy at the hospital leads to improved medical equipment utilization.

5.2.4 Medical Equipment Procurement Policy

The descriptive analysis generally showed that medical equipment procurement policy was fairly followed as shown by majority of 'yes' responses on various statements on use of medical equipment procurement policy at the hospital. For example, the study revealed that procurement of all medical equipment is done based on need assessment. The study also showed that medical equipment is usually disposed of by the hospital following the laid down procurement policies. Based on Pearson correlation, the study revealed that there exists positive correlation between medical equipment procurement policy and utilization of medical equipment. Moreover, the regression analysis revealed that medical equipment procurement policy has a significant relationship with medical equipment utilization. Further, a change in medical equipment procurement policy at the hospital leads to changes in medical equipment utilization.

5.2.5 Adherence to Service Charter

Descriptive statistics also examined the level of adherence to customer service charter at the hospital. The majority of the respondents tended to agree with most statements regarding adherence to customer service charter. For instance, the statement that Mandera county referral hospital treats all its customers with courtesy and majority of the respondents with most respondents agreeing with statements supported respect compared to those who disagreed. The study also established that Mandera county referral hospital treats, upholds professionalism in serving its customers as depicted by mean and standard deviation tending towards strong agreement. The statement that Mandera county referral hospital ensures equity in its allocation of medical equipment to patients' care was supported by majority of respondents with mean responses and standard deviation tending towards agreement. Most of the statements on adherence to service charter were positive but not significantly related with utilization of medical

equipment. The association between adherence to service charter and utilization of medical equipment at the hospital based on Pearson correlation coefficient was positive. The regression analysis revealed that adherence to service charter has a significant effect on medical equipment utilization. Further, the study revealed that an improvement in adherence to service charter at the hospital leads to an improvement in medical equipment utilization.

5.3 Conclusion

The study findings culminated to a number of conclusions. The study concludes that lack of human resource capacity development activities like no training leads to reduced utilization of medical equipment. In addition, the study concluded that human resource capacity development has a significant predictor of medical equipment utilization. The study also concludes that the existence and use of medical equipment management policy is associated with improved utilization of medical equipment at Mandera referral hospital. The research also concluded that medical equipment procurement policy was a significant predictor of medical equipment utilization. Adherence to medical equipment procurement policy means that every purchase or disposal of medical equipment is based on need analysis. Finally, concludes that whenever the hospital is working in accordance with their customer service charter, the hospital experiences high utilization rate in medical equipment.

5.4 Recommendations

Based on the findings that human resource capacity development has a significant effect on medical equipment utilization, the study recommends to the management of Mandera county referral hospital to:

- i. Continue improving human resources capacity development at their disposal through training and motivation.
- ii. Develop detailed medical equipment management policy that covers all medical equipment.
- iii. Strictly adhere to medical equipment procurement policy in purchase and disposal decisions.
- iv. Continue offering health service according to the hospital customer service charter.

5.5 Suggestions for Further Research

The current study was on the factors affecting medical equipment utilization in Mandera county referral hospital. The study has been successfully carried out, however gaps still remains that can be filled by future research. The study suggests to future researchers to examine the factors affecting medical equipment utilization in other hospitals apart from Mandera referral hospital. The study also recommends that future studies can examine other factors affecting medical equipment utilization in addition to the ones studied to extend the scope of the current study.

REFERENCES

- Ademe, B. W., Tebeje, B., & Molla, A. (2016). Availability and utilization of medical devices in Jimma zone hospitals, Southwest Ethiopia: A case study. *BMC Health Services Research*, *16*(1), 1–10. <https://doi.org/10.1186/s12913-016-1523-2>
- Baccarani, C., & Ugolini, M. (2000). *Quality in health service: Using Patient Charter as a managerial tool*. <https://www.dea.univr.it/documenti/Avviso/all/all278250.pdf>
- Bahreini, R., Doshmangir, L., & Imani, A. (2018). Affecting Medical Equipment Maintenance Management: A Systematic Review. *Journal of Clinical & Diagnostic Research*, *12*(4), 20–35. [https://scholar.google.com/scholar?q=Bahreini,+R.,+Doshmangir,+L.,+%26+Imani,+A.+\(2018\).&hl=en&as_sdt=0,5](https://scholar.google.com/scholar?q=Bahreini,+R.,+Doshmangir,+L.,+%26+Imani,+A.+(2018).&hl=en&as_sdt=0,5)
- Barr, D. A. (2007). Ethics in public health research: A research protocol to evaluate the effectiveness of public-private partnerships as a means to improve health and welfare systems worldwide. *American Journal of Public Health*, *97*(1), 19–25. <https://doi.org/10.2105/AJPH.2005.075614>
- Braun, & Clarke. (2013). *Successful Qualitative Research: A Practical Guide For Beginners.*: Sage. <http://www.uk.sagepub.com/books/Book233059>
- Brooker, E., & Joppe, M. (2014). A critical review of camping research and direction for future studies. *Journal of Vacation Marketing*, *20*(4), 335–351. <https://doi.org/10.1177/1356766714532464>
- Buitendach, J. H. D. W. (2005). Job insecurity, extrinsic and intrinsic job satisfaction and affective organisational commitment of maintenance workers in a

- parastatal. *South African Journal of Business Management*, 36(2), 27-35.
<https://doi/abs/10.10520/EJC22284>
- Buse, K., & Hawkes, S. (2015). Health in the sustainable development goals: Ready for a paradigm shift? *Globalization and Health*, 11(1), 13-23.
<https://doi.org/10.1186/s12992-015-0098-8>
- Camino, E., & Gatos, H. L. (2015). *Hospital Conditions of Admission The CMS Hospital Conditions of Participation and Interpretive Guidelines*. HCPro.
- Cannon, B. J., & Ali, J. H. (2018). Devolution in Kenya four years on: A review of implementation and effects in mandera county. *African Conflict and Peacebuilding Review*, 8(1), 1–28.
<https://doi.org/10.2979/africonfpeacrevi.8.1.01>
- Chien, C. H., Huang, Y.Y., & Chong, F. C. (2010) 31 Aug -4 Sept). *A framework of medical equipment management system for in-house clinical engineering department*, [Conference session] Annual International Conference of the IEEE Engineering in Medicine and Biology. Buenos Aires, Argentina
<https://doi.org/10.1109/IEMBS.2010.5627617>
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education*. Routledge. <https://doi.org/10.1108/978-1-78743-345-820171018>
- Council of Supply Chain Management Professionals (2016). *Supply Chain Management Definitions and Glossary*. CSCMP. <https://doi.org/10.1007/978-3-8349-3769-8>
- Dealtry, R. (2017). *Managing the Issue of Learning Relevance in the Formulation of Corporate Learning Strategies: The Future of Corporate Universities*. Bingley: Emerald Publishing Limited, Bingley.

- Douglas, L., & Connor, R. (2003). Attitudes to service quality – the expectation gap. *Nutrition & Food Science*, 33(4), 165–172. <https://doi.org/10.1108/00346650310488516>
- Edwards, K. J., Duff, J., & Walker, K. (2014). What really matters? A multi-view perspective of one patient’s hospital experience. *Contemporary Nurse*, 49(1), 122–136. <https://doi.org/10.1080/10376178.2014.11081962>
- Eze, S., Ijomah, W., & Wong, T. C. (2019). Accessing medical equipment in developing countries through remanufacturing. *Journal of Remanufacturing*, 9(3), 207–233. <https://doi.org/10.1007/s13243-018-0065-7>
- Fowler, F. J. (2009). Survey research methods. In L. Bickman & D. Rog, (Eds), *Applied social research methods series*, 5 (1). Sage publishers <http://dx.doi.org.sheffield.idm.oclc.org/10.4135/9781452230184#sthash.Rz4pyv2R.dpuf>
- Fulmer, I. S., & Ployhart, R. E. (2014). Our Most Important Asset. *Journal of Management*, 40(1), 161–192. <https://doi.org/10.1177/0149206313511271>
- Getuno, P. M., Awino, Z. B., Ngugi, P. K., & Mwaura, F. (2015). Implementation of the public procurement and disposal act,(2005). *DBA Africa Management Review*.5(1),75-93. <http://hdl.handle.net/11295/88511>
- Ibrahim, A. K. (2019). *Work-life balance practices for scaling up health workers productivity in public hospitals in Kenya: A case of Mandera County*. [Unpublished Master’s Thesis] Kenya Methodist University.
- Ivlev, I., Kneppo, P., & Bartak, M. (2014). Multicriteria decision analysis: A multifaceted approach to medical equipment management. *Technological and Economic Development of Economy*, 20(3), 576–589. <https://doi.org/10.3846/20294913.2014.943333>

- Kamugisha, F. (2018). *Effect human resources capacity building of on service delivery in local government in Rwanda* [Unpublished Master's Thesis]. University of Rwanda.
- Kanunu, D. C. (2016). *An assessment of client service charter implementation in local authorities in Tanzania: A case of Tabora municipal council* [unpublished Master's Thesis]. Mzumbe University.
- Kazi, S. K. (2012). *Supply chain management practices and performance at Kenya Medical Supplies Agency*[Unpublished Masters Thesis]. University of Nairobi.
- Kemboi, P. C., & Moronge, M. (2016). Determinants of employee job satisfaction in public security sector in Kenya: A case of National Police Service. *The Strategic Journal of Business & Change Management*, 3(2), 659–688. <https://doi.org/10.1063/5.0044182>
- Kirui, M. K., Luciani, A., Ochieng, M., & Kamau, J. (2013). *Improving Benchmarks for Key Health Service Delivery Areas: Evaluation of Demonstration Sites Interventions*. 217(10)263-272. <https://doi.org/10.1016/j.jconrel.2015.09.013>
- Kothari, C. (2012). *Research methodology: Methods and Techniques*. New Age International.
- Labani, D. (2019). *The Role of Client Service Charter in Promoting Effective Public Sector Performance: A Case of Weights and Measures Agency Temeke Municipal-Tanzania* [Unpublished Masters Thesis] Mzumbe University.
- Lari, A., Komeili, A., Hajinabi, K., & Riahi, L. (2021). Designing a model of medical equipment purchase management in hospitals of Tehran University of Medical Sciences. *Asia Pacific Journal of Health Management*, 16(2), 137–147. <https://doi/abs/10.3316/informit.890190220021296>

- Lelutiu-Weinberger, C., Pollard-Thomas, P., Pagano, W., Levitt, N., Lopez, E. I., Golub, S. A., & Radix, A. E. (2016). Implementation and evaluation of a pilot training to improve transgender competency among medical staff in an urban clinic. *Transgender Health*, 1(1), 45–53. <https://doi.org/10.1089/trgh.2015.0009>
- Mahoo, M. (2016). *Assessment of utilization of client service charter in local government authorities: A case of Morogoro Municipality, Tanzania* [Master's Thesis, Sokoine University of Agriculture]. <http://www.suaire.sua.ac.tz/handle/123456789/1554>
- McIntyre, D., Ranson, M. K., Aulakh, B. K., & Honda, A. (2013). Promoting universal financial protection: Evidence from seven low- and middle-income countries on factors facilitating or hindering progress. *Health Research Policy and Systems*, 11(1), 11-36. <https://doi.org/10.1186/1478-4505-11-36>
- Miriti, L. K. (2018). Effect of Procurement Planning On Supply Chain Performance of Kenya Medical Supplies Authority. *Journal of International Business, Innovation and Strategic Management*, 1(4), 1–19. https://doi.jibism.org/core_files/index.php/JIBISM/article/view/40
- Mugenda, O., & Mugenda, A. (2003). *Research methods: Quantitative and Qualitative methods*. Acts Press.
- Mutia, D., Kihiu, J., & Maranga, S. (2012). Maintenance Management of Medical Equipment in Hospitals [Masters Thesis, Jomo Kenyatta University of Agriculture and Technology]. <http://ir.jkuat.ac.ke/handle/123456789/706>
- Mwamunyange, M. (2019). *Contribution of client service charter on improvement of public service delivery in public sector; a case of Tanzania Revenue Authority-Head Office*. [Unpublished Masters Thesis]. Mzumbe University.

- Mwania, K. N. (2015). *Influence of customer service charter on service delivery: A case of Nairobi city water and Sewerage Company in Kenya*[Unpublished Masters Thesis]. University of Nairobi.
- Nemec, J., Kubák, M., Donin, G., & Kotherová, Z. (2021). Efficiency of Public Procurement in the Czech and Slovak Health Care Sectors. *Transylvanian Review of Administrative Sciences*, *17*(62), 115–133. <http://dx.doi.org/10.24193/tras.62E.7>
- Oloo, O., Atambo, W., & Muturi, W. (2017). Effects of Procurement Practices on the Performance of Public Hospitals in Kenya: A comparative study of Hospitals in Homabay and Kisii Counties. *International Journal of Social Science and Information Technology*, *3*(2), 1899–1916. <http://dx.doi.org/10.6007/IJARBSS/v9-i1/5376>
- OnyambuMasese, C., Mwaura-Tenambergen, W., & Muiruri, L. (2016). Utilization of Service Charters in Public Hospitals in Kenya: A Case of Thika Level 5 Hospital, Kiambu County. *International Journal of Scientific and Research Publications*, *6*(6), 258–263. <http://repository.kemu.ac.ke:8080/handle/123456789/317>
- Oosting, R. M., Wauben, L. S., Mwaura, S. W., Madete, J. K., Groen, R. S., & Dankelman, J. (2019). Barriers to availability of surgical equipment in Kenya: A surgical equipment journey approach. *Global Clinical Engineering Journal*, *1*(2), 35–42. <https://doi.org/10.31354/globalce.v1i2.61>
- Parsons, T. (1951). Illness and the role of the physician: A sociological perspective. *American Journal of Orthopsychiatry*, *21*(3), 452-460. <https://psycnet.apa.org/doi/10.1111/j.1939-0025.1951.tb00003.x>

- Peters, B. G., & Savoie, D. J. (2000). Summary for Policymakers. In Intergovernmental Panel on Climate Change (Ed.), *Climate Change 2013—The Physical Science Basis* (pp. 1–30). Cambridge University Press.
<https://doi.org/10.1017/CBO9781107415324.004>
- Raphael, T. (2019). *Factors affecting implementation of Client Service Charter in Tanzania local government authorities. A case of Bagamoyo District Council* [Unpublished master's Thesis].Mzumbe University.
- Robbins, S. P., & Judge, T. A. (2007). *Essential of Organizational Behaviour* (9thed.).Prentice Hall.
- Svoronos, T., Macauley, R. J., & Kruk, M. E. (2015). Can the health system deliver? Determinants of rural Liberians' confidence in health care. *Health Policy and Planning, 30*(7), 823–829. <https://doi.org/10.1093/heapol/czu065>
- Tosi, H. L., Locke, E. A., & Latham, G. P. (1991). A Theory of Goal Setting and Task Performance. *The Academy of Management Review, 16*(2), 480.
<https://doi.org/10.2307/258875>
- Umunna, Z. I. (2012). *Exploring the factors that contribute to poor utilization of primary health care services: A study of two primary health care clinics in Nasarawa State, Nigeria*[Unpublished Masters Thesis] University of the Western Cape.
- Wei, Y., Yu, H., Geng, J., Wu, B., Guo, Z., He, L., & Chen, Y. (2018). Hospital efficiency and utilization of high-technology medical equipment: A panel data analysis. *Health Policy and Technology, 7*(1), 65–72.
<https://doi.org/10.1016/j.hlpt.2018.01.001>
- World Health Organization (2008). Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases The six objectives of the

2008-2013. Geneva: World Health Organization, 1, 48.

<https://doi.org/10.1186/1756-0500-7-564>

World Health Organization. (2011). *Introduction to medical equipment inventory management*. In WHO Medical device technical series.

World Bank (2008). *World Development Indicators*. The World Bank.

<https://doi.org/10.1596/978-0-8213-7386-6>

Yamane, T. (1967). *Elementary Sampling Theory*. Prentice-Hall.

APPENDICES

Appendix I: Questionnaire

This questionnaire is meant to collect information on the factor hindering proper maintenance and use of medical equipment's in Mandera County hospital. This information is being sought solely for academic purposes and will be treated with strict confidence. Kindly answer the questions by ticking the boxes provided as will be applicable.

SECTION I: GENERAL INFORMATION

1. How old are you?
2. What is your highest level of education?
 - i) Secondary []
 - ii) Tertiary college []
 - iii) University graduate []
 - iv) University postgraduate []
3. What is your marital status?
 - i) Single
 - ii) Married
 - iii) Divorce
 - iv) Widow

SECTION II: HUMAN RESOURCE FACTORS

4. i) The management involves employees when medical equipment are to be purchased
Yes No
- ii) Staff who works with equipment are usually trained well in advance
Yes No

- iii) The hospital has enough qualified staff that is highly trained on use of different equipment
 Yes No
- iv) The staffs are adequately compensated to motivate them to do their best at work
 Yes No
- v) The hospital has specialist medical engineer who oversee repairs and maintenance
 Yes No
- vi) The staffs are required to put on protective clothing when dealing with equipment at the hospital
 Yes No
- vii) The hospital has a good program for staff retention at the facility
 Yes No
- viii) The hospital recognizes the hard work of employees by compensating good performance
 Yes No

SECTION III: MEDICAL EQUIPMENT POLICY

5. i) All stakeholders are usually involved before an equipment is purchased
 Yes No
- ii) The health facility has a detailed medical equipment policy for use
 Yes No
- iii) Medical equipment policy has been effectively and adequately established
 Yes No
- iv) The hospital continuously monitors and evaluates the use of the medial equipment
 Yes No
- v) The staffs are well informed of the medical equipment policy at the hospital
 Yes No
- vi) The health facility keeps equipment use logs for all equipment at the health facility
 Yes No
- vii) The hospital performs scheduled time intervals to minimize equipment degradation
 Yes No
- viii) The health facility has a detailed plan on the preventive maintenance practices activities

- Yes No
- ix) Preventive maintenance ensures equipment is performing at a reliable level
- Yes No
- x) Preventive maintenance ensures that the equipment is safe for the patients and staff
- Yes No
- xi) Preventive maintenance ensures that the medical equipment is available when needed
- Yes No
- xii) How many times is preventive maintenance done on equipment's every year?
- Non []
- Once []
- Twice []
- More than twice []

SECTION IV: PROCUREMENT POLICY

6. i) The procurement of all medical equipment is done based on need assessment
- Yes No
- ii) The hospital does not purchase any medical equipment it does not need
- Yes No
- iii) Medical equipment is usually disposed of following the laid down procurement policies
- Yes No
- iv) Stakeholders are involved in all decision regarding the purchase of medical equipment
- Yes No
- v) The equipment purchased meet the quality standards set in advance
- Yes No
- vi) Equipment not meeting set quality standards are returned back to the suppliers at their cost
- Yes No

SECTION V: ADHERENCE TO SERVICE CHARTER

7. To what extent does the adherence to customer service charter commitment influence equipment utilization? 5 = strongly agree, 4 = Agree, 3 =Not sure, 2 = Disagree, 1 = strongly disagree. Please tick the appropriate box.

Sn	Statements on adherence to service charter	SA	A	N	D	SD
	Mandera county referral hospital treats all its customers with courtesy and respect.					

	Mandera county referral hospital treats, upholds professionalism in serving its customers.					
	Mandera county referral hospital ensures equity in its allocation of medical equipment to patients care					
	Mandera county referral hospital treats patients according to laid down clinical procedures.					
	Mandera county referral hospital treats upholds good working ethics in a corruption free environment.					

SECTION VI: EQUIPMENT UTILIZATION AT THE HEALTH FACILITY

8. i) The medical equipment rarely breaks down at the facility

Yes No

ii) The services offered by the medical equipment are at the expected level

Yes No

iii) When medical equipment break down, they are repaired immediately

Yes No

iv) The medical equipment are performing according to design capacity

Yes No

v) Patients don't wait for long for their turn to use medical equipment

Yes No

vi) The quality of health services provided by availing equipment are much higher

Yes No

vii) Medical equipment rarely lies idle at the health facility for any reason

Yes No

Appendix II: Observation checklist of medical equipment utilization

- i) Name of the equipment
- ii) Purpose of the equipment
- iii) Department section in which the equipment is lying
- iv) Name of the manufacturing firm.....
- v) Year of manufacture
- vi) Serial number of the equipment.....
- vii) Cost of the equipment.....
- viii) Service book maintained (yes/no).....
- ix) Total number of working days in the year 2017.....
- x) The equipment is available for use
 - (a) Round the clock
 - (b) Specific timings
 - (c) on request/ permission
 - (d) Other.....
- xi) Working condition of equipment
 - a) Not working at all
 - b) Poor working condition
 - c) Good working condition
 - d) Very good working condition
 - e) Excellent working condition
- xii) Staff operated medical equipment with skill and competence
Yes No
- xiii) The staff looked motivated while working with medical equipment
Yes No
- xiv) Staff wore recommended attire while operating equipment
Yes No
- xiii) Patients were served without having to wait long
Yes No
- xiv) There was presence of maintenance contract
Yes No
- xv) There was presence of maintenance schedule
Yes No

Appendix V: NACOSTI Research Permit

 REPUBLIC OF KENYA	
Ref No: 816639	Date of Issue: 26/November/2020
RESEARCH LICENSE	
	
This is to Certify that Mr.. Hassan Aliow Guyow of Kenya Methodist University, has been licensed to conduct research in Mandera on the topic: FACTORS AFFECTING MEDICAL EQUIPMENT UTILIZATION IN HEALTH SERVICE DELIVERY IN MANDERA COUNTY REFERRAL HOSPITAL for the period ending : 26/November/2021.	
License No: BAHAMAS ABS/P/20/7857	
816639	
Applicant Identification Number	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
	Verification QR Code
	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	

Appendix V: Scientific and Ethics Review Committee Letter



KENYA METHODIST UNIVERSITY

P. O. BOX 267 MERU - 60200, KENYA
TEL: 254-064-30301/31229/30367/31171

FAX: 254-64-30162
EMAIL: info@kemu.ac.ke

24TH JULY 2018

Hassan Aliow Guyow
HSM-3-2449-1/2013

Dear Hassan,

RE: ETHICAL CLEARANCE OF A MASTERS' RESEARCH THESIS

Your request for ethical clearance for your Masters' Research Thesis titled "Factors Affecting Medical Equipment Utilization in Health Service Delivery in Mandera County Referral Hospital" has been provisionally granted to you in accordance with the content of your project proposal subject to tabling it in the full Board of Scientific and Ethics Review Committee (SERC) for ratification.

As Principal Investigator, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the project.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the SERC for re-review and approval prior to the activation of the changes. The Proposal number assigned to the project should be cited in any correspondence.
3. Adverse events should be reported to the SERC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for SERC review. The SERC and outside agencies must review the information to determine if the protocol should be modified, discontinued, or continued as originally approved.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The SERC may conduct audits of all study records, and consent documentation may be part of such audits.

5. SERC regulations require review of an approved study not less than once per 12-month period. Therefore, a continuing review application must be submitted to the SERC in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion will result in termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.

Please note that any substantial changes on the scope of your research will require an approval.

Yours sincerely



DR. WAMACHI

Chair, SERC

cc: Director, RI & PGS