

**INFLUENCE OF HEALTH INFORMATION APPLICATION  
SYSTEM ON SERVICE DELIVERY TO PATIENTS IN MOI  
TEACHING & REFERRAL HOSPITAL, UASIN GISHU COUNTY,  
KENYA**

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## DECLARATION

This research project report is my own original work and to the best of my knowledge has not been previously presented for the award of a degree in this and/ or any other university.

REG NO: L50/80396/2015

KINARA JACKSON Signed..... Date.....

A research project report has been presented for examination with my approval as the supervisor duly appointed by the university.

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## **DEDICATION**

This research project is dedicated to my family particularly my father Mr. Ben Kinara, mother Mrs. Joyce Nyabate kinara, siblings Alex, Joshua, and Martha for their encouragement and moral support in times of need.

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My thanks also go to my supervisor, Mr. Marigat for his consistent guidance in helping me carry out quality research. I would like to also appreciate the moral support given by my classmates who regularly kept in touch with phone calls, updating and encouraging me all the time. This research work would not have been complete without the invaluable assistance that I received from various people. I would like to thank God who has been with me and energized me during the challenging academic journey as without his love and strength, achieving knowledge would be in vain and would not have made it to this point. Lastly, I sincerely thank my family members for their morally, spiritually and financial support; your love, encouragement, guidance and understanding will not go unnoticed.

## TABLE OF CONTENT

DECLARATION.....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
TABLE OF CONTENT .....	v
LIST OF TABLES .....	viii
LIST OF FIGURES .....	ix
LIST OF ABBREVIATION AND ACRONYMS.....	x
ABSTRACT.....	xi
<b>CHAPTER ONE: INTRODUCTION .....</b>	<b>1</b>
1.1 Background to the Study.....	1
1.2 Statement of the Problem.....	6
1.4 Research Objectives.....	7
1.5 Research questions.....	7
1.6 Significance of the Study .....	7
1.7 Delimitation of the Study.....	8
1.9 Assumptions of the Study .....	9
1.10 Definition of significant terms of the study .....	9
<b>CHAPTER TWO .....</b>	<b>11</b>
<b>LITERATURE REVIEW.....</b>	<b>11</b>
2.1 The Concept of Health Information Systems.....	11
2.1.1 Implementation of the Health Information Application System in Public health institutions	12
2.2 Concept of Health Records Management .....	13
2.3 Data Collection and entry for Health Information Management .....	15
2.4 Data Analysis .....	19
2.5 Data Warehousing in Public Health Institutions .....	19
2.6 Data application .....	20
2.7 Theoretical Framework.....	21
2.7.1 Kotter’s Change Management Theory. . . . .	21
2.8 Conceptual Framework.....	24

<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>24</b>
3.1 Introduction.....	25
3.2 Research Design.....	25
3.3 Target Population .....	25
3.4 Sample Size and Sampling Procedures.....	25
3.4.2: Sampling Methods .....	26
3.5 Data Collection Methods .....	26
3.5 1 Questionnaires .....	26
3.6 Pilot Study.....	27
3.6.1 Reliability and Validity .....	27
3.7 Data Analysis and Presentation.....	27
3.8 Ethical Consideration.....	28
<b>CHAPTER FOUR.....</b>	<b>30</b>
<b>DATA ANALYSIS AND PRESENTATION OF FINDINGS .....</b>	<b>30</b>
4.1 Introduction.....	30
4.2 Response rate .....	30
4.3 Demographic Characteristics of the respondents.....	30
4.4 Influence of data collection and entry on service delivery to patients.....	33
4.4.1. Descriptive statistics for influence of data collection and entry on service delivery .....	33
4.5 Influence of data analysis on service delivery to patients.....	37
4.5.1. Descriptive Statistics for Influence of data Analysis on service delivery .....	37
4.6 Influence of data warehousing on service delivery to patients .....	41
4.7 Influence of data application on service delivery to patients.....	45
4.7.1. Descriptive statistics for influence of data application on service delivery .....	46
<b>CHAPTER FIVE .....</b>	<b>50</b>
<b>SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS .....</b>	<b>50</b>
5.1 Introduction.....	50
5.2 Summary of the study findings .....	50
5.2.1 Demographic characteristics of respondents .....	50
5.2.2 Influence of data collection on service delivery to patients. ....	50
5.2.3 Influence of data analysis on service delivery to patients .....	51
5.2.4 Influence of data warehousing on service delivery to patients .....	51
5.2.5 Influence of data application on service delivery to patients. ....	52

5.3 Conclusion of the study .....	52
5.4 Recommendation of the study .....	53
5.5 Suggestions for further studies.....	53
REFERENCES .....	54
APPENDIX 1: SAMPLE SIZE DETERMINATION TABLE .....	58

## LIST OF TABLES

Table 4.1 : Response rate	30
Table 4.2: Gender of the respondents	31
Table 4.3: Age of the respondents	31
Table 4.4: Religion of the respondents	32
Table 4.5: Education level of the respondents	33
Table 4.6: Descriptive statistics for influence of data collection and entry on service delivery	34
Table 4.7: Relationship between data collection and service delivery to patients	37
Table 4.8: Descriptive statistics for influence of data analysis on service delivery	38
Table 4.9: Relationship between data analysis and service delivery to patients	41
Table 4.10: Descriptive statistics for influence of data warehousing on service delivery	42
Table 4.11: Relationship between data warehousing and service delivery to patients	45
Table 4.12: Descriptive statistics for influence of data application on service delivery	46
Table 4.13: Relationship between data application and service delivery to patients	49



## LIST OF FIGURES

Figure 2.1: Effectiveness of HIMS on Management of Health Records ---- **Error! Bookmark not defined.**

## **LIST OF ABBREVIATION AND ACRONYMS**

<b>DIAMS</b>	:	Data Issues and Actions Management System
<b>EPR</b>	:	Electronic Patient Record
<b>EPI</b>	:	Expanded Program for Immunization
<b>HIEs</b>	:	Health Information Exchanges
<b>HIMS</b>	:	Health Information Management System
<b>ICT</b>	:	Information Communication Technology
<b>MOH</b>	:	Ministry Of Health
<b>MTRH</b>	:	Moi Teaching and Referral Hospital
<b>MTUHA</b>	:	Mfumo WA taarifa za Uendeleshaji WA Huduma Za Afya
<b>NACP</b>	:	National AIDS Control Program
<b>SPSS</b>	:	Statistical Package for Social Sciences

## ABSTRACT

Health Information management system is one of the most potent investments a health institution can effectively improve its ability in the provision of health services to its patients. Service providers in a health care system require data for interpretation not only at the point of service but also at the point of decision-making in a format that maximizes the decision-making process. Despite marked progress in the health sector to use health information application systems over the past decades, Kenya continues to grapple with stimulating health problems and issues of health service delivery. This is due to limited data availability and quality within and between the statistical constituencies despite the emphasis on adoption of a health information application system which is systematic and of high-quality data collection. However, not all health institutions have adopted new data management systems in their facilities, thus impeding management of health records of patients. The study examined the influence of health information application system on service delivery to patients in Moi Teaching and Referral Hospital in Uasin Gishu County, Kenya. The following specific objectives guided the study: to investigate how collection of data can influence record keeping of patients in the study area; determine how data analysis influences management of health records of patients in MTRH; establish how data warehousing can facilitate communication on management of patients health records in MTRH; and how data application influences the management of patients' health records in MTRH, Uasin Gishu County. This study was based on Kotter's change management theory that addresses the adoption of technological innovations in health institutions in his eight-stage process for transformational change. The study used a descriptive survey research design. The target population of the study was 773 employees of MTRH consisting of senior management, health records, audit and ICT. The study used questionnaires as the main method of data collection. Data was analyzed through quantitative analysis. Findings of the study were; health information application system through effective data collection, data analysis, data warehousing and data application influences service delivery to patients. Data application through clearly determined aim for collecting data, legality of the available data, clarification on data usage and identification of end-users and continuous patients' census improves data relevancy, consistency, accuracy and precision hence, positively influences service delivery to patients. The study recommended that effective data collection through adequate training and education of data entry clerks, adoption of appropriate data collection instruments should be enhanced; and efficient data warehousing through appropriate technology adoption, edits and continuous update of systems, tables and database. Further research should be done on the mediating effects on the relationship between health information system and service delivery to patients.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background to the Study

Although it is typically accepted that the practice and delivery of healthcare are fundamentally an information-based science (Hersh, 2002), and while the health care profession has a longstanding tradition of using medical technologies, information technology (IT) adoption and use by clinicians and care delivery organizations for the storage, management, and exchange of patient information is still relatively limited (Bower, 2005). According to Nyamtema (2010), a health management information system is a process whereby health data are recorded, stored and processed for policy-making, planning, implementation and evaluation of health programs.

In many developed and developing countries, health sector reforms and decentralization have brought about shifts in functions between the central and peripheral levels and generated new information needs with changing requirements for data collection, processing, analysis and dissemination that is known as health information systems (Chaudhry, 2006).

Many European countries, for instance, have moved toward automation hospital information system since early 1980. This systems developed significantly until now, and it has been an integrated system and with the inner core that called electronic medical records (EMR) from one inconsistent system (Aghajani, 2002).

In the developed world there have been two key drivers for investment in health information and communication technology (ICT). The first is the ever-increasing burden from chronic disease, often with complex comorbidities, on the health care system with costs increasing significantly faster than population or gross domestic product growth. The treatment and management of such chronic disease continues over an extended period of time and is performed by multiple health care providers in multiple settings. The second key driver is the recognition of the need for greatly improved quality and safety in the delivery of the health care (Kohn et al 2000). For instance, in the USA, it was estimated that, in hospitals alone, between 44000 and 98000 Americans die each year from medical error (AIHW, 2003).

Still in the USA, despite broad consensus on the potential benefits of electronic health records and other forms of health information technology, U.S. health care providers have been slow to adopt them (Jha 2006; Schoen, 2006). It was found that only 17% of U.S. physicians use either a minimally functional or a comprehensive electronic records system (DesRoches et al. 2008). On

the basis of responses from 63.1% of hospitals surveyed, only 1.5% of U.S. hospitals have a comprehensive electronic-records system (i.e., present in all clinical units), and an additional 7.6% have a primary system (i.e., present in at least one clinical unit). Computerized provider order entry for medications has been implemented in only 17% of hospitals. Larger hospitals, those located in urban areas, and teaching hospitals were more likely to have electronic-records systems. Respondents cited capital requirements and high maintenance costs as the primary barriers to implementation, although hospitals with electronic-records systems were less likely to cite these obstacles than hospitals without such arrangements (Ashish,2009). However, despite all these, since the passage of the HITECH Act in 2009, state EHR adoption rates have increased. EHR adoption rates increased from only two states reporting rates higher than 20% to all countries reporting rates 50% or greater by 2014. Furthermore, only two states currently have adoption rates below 60%. In addition to growth in EHR adoption overall, hospital adoption of technology with advanced functionality increased significantly. While fewer hospitals used Basic EHR systems without clinician notes, considerably more adopted systems with clinician notes. Additionally, over a third of hospitals were using more advanced EHR functionality. Hospital adoption of Comprehensive EHR systems has increased more than eleven-fold in the last five years (Charles, Gabriel & Searcy, 2015).

According to Aghajani (2002), many countries including European countries have moved toward automation hospital information system since early 1980. In India, Health Information Management System (HIMS) is one of the major concerns in the country, the second highest populated country in the world. The libraries of medical colleges and health institutes need an improvement to attain a certain benchmark level in terms of infrastructure, databases, resources and services. Steps towards resource sharing and networking of these libraries help in improving the accessibility of health information (Aghazadeh and Ebrahimnezhad, 2012). Success of such developments is seen in centrally funded and financially sound research institutes and hospitals in India. However, similar expansion in health care centers in smaller cities and rural areas seems to be still far off.

The treatment and management of such chronic disease continues over an extended period of time and is performed by multiple health care providers in multiple settings. The second key driver is the recognition of the need for greatly improved quality and safety in the delivery of health care. This recognition has been driven by such things as the National Institutes of

Medicine report *To Error Is Human* (Kohn, 2000) which estimated that in hospitals alone, between 44,000 and 98,000 Americans died each from medical error.

In Canada, improving data quality and lessening the burden of data collection on health care providers has been a twin focus of the country's effort to address the system-wide need for better information management (Iron and Manuel, 2007). The overriding goal is to produce better information for use in health care planning, performance measurement, decision-making, and research. In most health institutions in Canada, they utilize the Data Issues and Actions Management System (DIAMS). This is a new system designed to facilitate the management of data and the resolution of issues related to data quality. This information can then be used to prioritize issues and gaps for improvement, coordinate improvement activities and monitor progress in managing and/or resolving these issues.

Therefore, consequences of low adoption and usage rates of health information application systems at the point of care include poor quality and inaccessibility of relevant information, which have frequently been implicated for systemic problems in healthcare organizations. Thus, there is considerable interest among policy makers who wish to promote efficiency and standardization to understand the enablers and barriers to adoption and use. Because of their expertise in examining the introduction and use of Information Technology in many of the organizational, industrial and institutional settings, Information Systems (IS) researchers are in a unique position to inform the discourse in health IT (Bower, 2005).

A key enabling technology that facilitates the creation and sharing of better information about patients among different stakeholders in the healthcare delivery system is electronic health record (EHR) systems. An electronic health record entails the computerization of health record content and associated processes. Focusing on Health Information Management System is one of the most powerful investments a health institution can effectively improve its ability in provision of services. Over the years, from a global and local context, there has been a growing interest in comparative performance assessments in health, benchmarking, performance-based disbursement of funds, performance contracting and provision of health services (Mathers, 2002).

A World Bank Study conducted in 2005 found, for example, that the majority of public sector ICT applications in developed countries were either partial or total failures (cited in UNAPCICT

2010). Furthermore, in his report on electronic government projects for development, Heeks (2008) states that 35% of such projects are total failures and 50% partial failures, with only 15% being considered successful. A study by Gheorghiu (2006) found that 70–80% of all information technology and information systems fail. Similarly, Kaplan and Harris-Salamone (2009) reported international failure rates of major health information technology projects of between 30% and 70%. Such figures are repeatedly found throughout the academic and industry literature. There is a far smaller research base on the developing world, but intuitively one would expect the failure rates to be at least as high as in the developed world.

In sub-Saharan Africa, for example, fewer than ten countries have vital registration systems that produce usable data (Akacho, 2014). There are still very limited measures of health systems performance, and major reforms, such as decentralization, and are often done in the absence of adequate data on either needs or consequences. The Health Management Information Systems in most developing countries are inefficient and are greatly affected by unreliability of data resulting from underreporting.

In Tanzania the health information system is called MTUHA, which is an acronym for the Kiswahili meaning of Health Management Information System (HMIS) –“Mfumo WA Taarifa za Uendeshaji WA Huduma za Afya.” The system covers all health programmes and health care services. All health facilities (Government, Private, NGOs and Parastatal organizations) use the MTUHA system (Ministry of Health Tanzania 2002). Before MTUHA came into existence in 1993, several systems were operating. Most of these systems existed in the public and non-governmental organization (NGO) health facilities. In addition, programmes such as the Expanded Program for Immunization (EPI), tuberculosis (TB) and Leprosy and the National AIDS Control Program (NACP) had their own separate reporting systems (Rubona, 2001).

Studies such as (Rubona 2001; Akacho, 2014; and Iron and Manuel, 2007) show that there are two basic ways in which to collect data: routinely and periodically (non-routine). Periodic data collection usually means conducting surveys and these can appear to be expensive at first glance. However, they involve one-time cost, and which may be less expensive than routine data collection in the long run (Kahooei and Soleimani, 2007).

Without external financial and technical assistance, most developing countries cannot afford to rely on periodic data collection methods for generating information (Leppeveld, 2000). Many

health information systems in developing countries, for example, Mozambique and Tanzania deal with routine data collection at the health facility level, which are the main sources of data in healthcare information systems. The routine data collection involves the various health programmes: Maternal and Child Health (family planning, antenatal care, deliveries and immunization), Tuberculosis and Drug programmes.

Despite marked progress in many sectors over the past decades, Kenya continues to grapple with challenging health problems and issues of health service delivery. The Health Management Information System in Kenya is the principal responsibility of one directorate within the Ministry of Health (MoH). This is due to limited data availability and quality within and between the statistical constituencies despite the emphasis on adoption of a health information system which is systematic and of high quality data collection (Mathers. 2002). The routine health data collection in Kenya is conducted through a network of 5,170 peripheral health facilities/ units and 234 hospitals that are distributed throughout the country in 78 different health sub-counties. Within each sub-county, there are at least 2 Health Records and Information Officers as well as one Disease Surveillance Officer whose role is to collect data at the district level (MoH, 2014). Data collection registers are often improvised at the Public health units and reporting forms are not always available at all these facilities for monthly reporting of morbidity data and other health statistics.

From the above studies, it is asserted that effective coordination of health information is lacking, resulting in duplication and gaps in data collection, reporting, use and management of data. Consequently, vast amounts of data collected remain mostly incomplete, unreliable and unused. For instance, as in many developing countries, in Malawi, lack of reliable data and grossly inadequate appreciation and use of available information in planning and management of health services were two main weaknesses of the health information management systems. There were very little improvement has been noted in use of information in rationalizing decisions Chaulagai, 2005). The conclusion is that, no matter how good the design of an information application system, there is need for new knowledge to improve on its efficiency. However, not much research has been done to ascertain how the health information application system affect patient service delivery in public hospitals. The conception of this study was based on the concerns about the poor quality data collection; data analysis, data warehousing and inadequate application and/or integration of the Health Information Application System (HIAS) in public



hospitals despite its perceived change since its inception and the need to bridge the gaps in service delivery in the health sector.

## **1.2 Statement of the Problem**

The slag, breakdown and adverse medical outcomes on patients care of the computerized health information application system in the past three decades to replace paper records has raised more anxieties on the efficiency among health stakeholders (Dooling, 2012). In the year 2010, Moi Teaching and Referral Hospital (MTRH) in Eldoret Kenya adopted Funsoft software for management of health records. However, over the years, MTRH has faced greatest challenges in collecting, analyzing, evaluating and interpreting health data to aid patient service delivery (MoH, 2014). This is because health decision makers have little knowledge on how to improve the HIAS on patient management. Various studies such as (Horning, 2011; Njeru, 2013; Dooling, 2012; and Akacho, 2014) respectively conducted in health institutions have focused on implementing an electronic medical record with computerized prescriber order entry at a critical access hospital; influence of health information system on monitoring and evaluation on HIV/AIDS programmes. However, despite a consensus that the use of health information technology should lead to more efficient, safer, and higher quality care, there are few reliable estimates on the efficiency in many hospitals in Kenya. Besides, while the assumption is made that the development of information management system has a positive effect in healthcare, the evidence base supporting its practical use is slender (Wootton, 2009) thus, creates a gap. It is against this background this study focused on effect of health information application systems on management of health records of patients, with a particular focus on how data collection, analysis, warehousing and implementation impact service delivery to patients in MTRH Uasin Gishu County, Kenya.

## **1.3 Purpose of the Study**

To investigate the influence of health information application systems on service delivery to patients in MTRH Uasin Gishu County, Kenya.

#### **1.4 Research Objectives**

The study was guided by the following research objectives:

- i. To establish how data collection and entry can influence service delivery to patients in MTRH in Uasin Gishu County
- ii. To determine how data analysis influences service delivery to patients in MTRH in Uasin Gishu County
- iii. To establish how warehousing of data can facilitate communication on service delivery to patients in MTRH in Uasin Gishu County
- iv. To find out how data application influences service delivery to patients in MTRH in Uasin Gishu County

#### **1.5 Research questions**

This study was guided by the following research questions:

- i. How does data collection and entry influence service delivery to patients in MTRH in Uasin Gishu County?
- ii. Do data analysis influences service delivery to patients in MTRH in Uasin Gishu County?
- iii. How does warehousing of data can facilitate communication on service delivery to patients in MTRH in Uasin Gishu County?
- iv. Does data application influences service delivery to patients in MTRH in Uasin Gishu County?

#### **1.6 Significance of the Study**

The study is hypothetically vital for policy level intervention since the employed interventions and strategies have failed and blamed on inadequate information that can help to offer practical solutions to the underlying problem. Therefore, the study provides information through its recommendations that will lead to the implementation of appropriate strategies and interventions and upholding critical components of HIMS to promote its adoption and implementation in health institutions in the country. The findings of this study should, therefore, be important in advancing guidelines and strategies for improving the health sector.

The conception of this study was based on the concerns about how developing countries have

experienced poor health quality data and inadequate integration of the Health Management Information System. This has led to increasing burden of diseases in most of these countries as they don't have quality and evidence based data to inform their health interventions. Despite the advancement of HMIS since its inception in both developed and developing countries not much has been achieved in management of health records of patients. Therefore the result will benefit the MTRH community.

The intention of carrying out this study was two pronged. First, it can be seen from the point of an attempt to fill an intellectual gap. As noted earlier, HIMS have emerged as tools for proper management of health records of patient in hospital. However, weakness in Kenya HIMS is becoming apparent and is manifested in the relative poor quality data for management of health issues of patients. This is attributed to slow rate of uptake of the technology due to inadequate personnel among other reasons. Most studies on HIMS have dwelled on various issues affecting it and neglected how the use of HIMS influences health management.

### **1.7 Delimitation of the Study**

The study was confined within MTRH in seven departments that is senior management, health records, audit and ICT, to examine the influence of Health Information application System on Health Records Management. It focused on the availability of HIMS in Moi Teaching and Referral Hospital (MTRH) in Uasin Gishu County; the level of knowledge, attitudes and perception toward HIMS in MTRH in Uasin Gishu County; and the challenges facing health professionals in adopting the HIMS Uasin Gishu County. The study focused on health information application system on health records management the conceptual framework also provided operational scope of variables.

#### **1.8.1 Limitations of the Study**

The limitation of the study is that the researcher encountered some challenges in regards to lack of co-operation from some members of staff; some did hold vital information due to lack of incentives provided and some did feel that the researcher is intruding on their privacy. However, the researcher overcame these challenges by explaining on the confidentiality of the research.

## 1.9 Assumptions of the Study

The study was based on the following assumptions:

- i. The respondents would give honest and truthful responses.
- ii. The respondents would provide 100% effort when answering questions.

## 1.10 Definition of significant terms of the study

**Data application:** is a process whose primary purpose is using and retrieving information from a computerized database for a specified need.

**Data analysis:** Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making.

**Data collection:** Is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes.

**Data entry:** Is the act of entering health information into electronic formats by using word processing or data processing software hosted on a computer in a health set up.

**Data Reporting:** Is the process of collecting and submitting health data from patients to health information management system for use.

**Data warehousing:** it is the process of capturing and archiving of information captured for relevant future reference and use.

**System:** A collection of components that work together to achieve a common objective.

**Information System:** A system that provides information support to the decision-making process at each level of an organization.

**Health Information Application System:** A system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services.

**Health Management Information System:** An information system specially designed to assist in the management and planning of health programmes, as opposed to delivery of care.

**Health Record:** A health record is a confidential compilation of pertinent facts of an individual's health history, including all past and present medical conditions, illnesses and treatments, with emphasis on the specific events affecting the patient during the current episode of care.

**Health Record Management:** This refers to the practice of acquiring, analyzing and protecting digital and traditional medical information vital to providing quality patient care. The information documented in the health record is created by all healthcare professionals providing care and is used for continuity of care.

**Service delivery:** it is defined as accessibility, consistency and accuracy of services offered to patients

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 The Concept of Health Information Systems**

A Health Information System (HIS) is a functional entity within the framework of a comprehensive health system to improve the health of individuals and the population. As such, it is a management information system. Although many definitions of a management information system have been proposed, a comprehensive one has been given by Hurtubise (1984) as a system that provides specific information support to the decision making process at each level of an organization (Lippeveld, 2001).

The HIS structure should allow generation of necessary information for use in decision-making at each level of the health system with a given amount of resources. This involves the processes for collecting, processing and disseminating information in a health system (Shrestha and Bodart, 2000). Electronic Health Record (EHR) is defined as the aggregate electronic record of health-related information on an individual that is created and gathered cumulatively across more than one health care organization and is managed and consulted by licensed clinicians and staff involved in the individual's health and care (EHR & EMR, 2010).

Information is the knowledge which gives meaning to its receiver. When a person stores some information into the computer, it can be referred as data. Data is raw input, after some process this data gives output and that output is known as information. In today's world, the information is spread over in various forms and it is stored in the different kinds of devices. Getting an access to the right information on the right time in a very structured manner is an important need (WHO, 2003).

The demand for good-quality health information is growing—driven in part by the move towards performance-based resource allocation and by significant increases in the resources for health mobilized in recent years, for example through the Global Fund for HIV/AIDS, TB and Malaria (GFATM). In the context of such global initiatives, reporting requirements for countries are being stepped up, while the frequent monitoring of short-term programme outputs (such as improvements in service provision and the number of people using such services) is now required as part of performance-based disbursement systems. At the same time, enhanced reporting of health outcomes, for example improvements in the quality and length of life which

is required to monitor progress towards major international goals such as the Millennium Development Goals (MDGs). However, demands for data emanating from such international and disease-specific initiatives tend to focus on particular indicators and do not necessarily translate into building systems that meet both country-level and international health information needs. The recent upsurge in demand for health information cannot be adequately met at present because there has been insufficient investment in building streamlined health information systems capable of generating data on the full array of health-related issues (blaya, 2010).

Effective data management plays an important role in improving the performance of an organization's health care systems. Collecting, analyzing, interpreting, and acting on data for specific performance measures allows health care professionals to identify where systems are falling short, to make corrective adjustments, and to track outcomes. This module is designed to help users understand the relationship between quality improvement and data management and to provide information on how to gather, analyze, interpret, and act on data for a specific performance measurement (duranti, 1997).

### **2.1.1 Implementation of the Health Information Application System in Public health institutions**

Health information application system comprises of a wide range of networking technologies, clinical databases, electronic /health records, and other specific biomedical, administrative and financial technologies that generate, transmit and store healthcare information. All information from healthcare providers including hospitals, clinics, emergency rooms, small offices and multispecialty groups are entered into an electronic health record. This information is then networked to regional and national databases through electronic exchange. Data flows from EHRs and regional registries are then channeled into standards for prevention and treatment, which can be further processed to yield information for decision-making and decision-support. The application system if well utilized, then data transmission standards and data definition standards are equally important.

Shortliffe and Sondik (2006) discuss a practical application of a health information system like the one above in cancer information surveillance. In this example, information from EHRs are processed and used in a manner that improves cancer-related decision-making to bring about an improved quality care for cancer patients. Hence, using health information technology to monitor, manage and control cancer care. However, Wootton, 2009; and Chan and Kaufman,

(2010) have shown that there several barriers to and facilitators of Electronic Records adoption among hospitals. These include; inadequate capital for purchase, concerns about maintenance costs, resistance on the part of physicians, unclear return on investment, and lack of availability of staff with adequate expertise in information technology. Hospitals that had adopted electronic records systems were less likely to cite four of these five concerns as major barriers to adoption than were hospitals that had not adopted such systems (Ashash et al. 2009). However, while the assumption is made that technology can and does have a positive effect in healthcare; the evidence base supporting its practical use is slender (Wootton, 2009). In reality, many decisions on the adoption of new health care technologies are made in the absence of information on implications of its use (Kazanjian & Green, 2002). Decision-makers are often unaware of the information they lack, and rarely obtain feedback on the consequences of their decisions; be it feedback on the effectiveness, costs, ethical, legal or social implications of technology (Wootton, 2009).

Aside from the insufficient research on evidence for making informed decisions, available information on the selection of new technologies is often unstructured and unclear, and further compounded by the increasing number of technologies, and their increasing complexity (Ruder et al 2008, Chan and Kaufman 2010). There are a number of specific problems with the use of ICT that are generally better understood: costs associated with hardware and software, availability of broadband and mobile networks, the development of user interfaces and applications in languages other than English, and ongoing maintenance costs, to name a few (Wootton, 2009). As also noted by Ruder (2008), broader knowledge on the social, political and economic constraints also referred to as the ‘soft’ barriers is often lacking in considerations of technology innovations in health care (Ruder et al 2008). In response to this evident knowledge gap, this study investigates how an effective health information application system can increase health record management.

## **2.2 Concept of Health Records Management**

Despite having a number of benefits for healthcare settings, the successful implementation of health Information Management Systems (HIMS) continues to be a challenge in many developing countries (Ravindra et al. 2015). Electronic Health Record Management systems



assist health institutions and the society as a whole for instance, hospitals are able to manage their daily operations.

HIMS professionals are experts in collecting and classifying data to support a variety of needs such as severity of illness, meaningful use, pay for performance, data registries, and data mapping. Further, HIM professionals encourage and foster the use of data by ensuring its timely availability, coordinating its collection, and analyzing and reporting collected data.

As noted by Bansler & Havn (2010), the adaption and implementation of management of health records of patients prove to be more successful when users are involved in the discussion for its design and implementation. Developing countries such as India, Kenya and Haiti have benefited greatly with the intervention of EMR systems which provides accuracy, efficiency and has overall cost benefits (Blaya, Fraiser & Holt, 2010). However, according to Mohammed-Rajput et al. (2011) the benefits of an effective management of health record systems lie heavily in its successful implementation. Therefore, there is need to investigate on what can be improved on HIMS to make it effective and adaptive.

Studies have shown that HIMS's success of new system integration into daily workflow is dependent on how effectively the workplace culture emphasizes quality and innovation. Goldzweig et al. (2009) found that cultural barriers to system implementations in hospitals and confirmed that 77% of practices without an Electronic Health Record are resistant to it. Another 72% of physicians believed that moving towards an electronic system will result in frequent downtime, 64% believe that the system will increase the physicians' work time, and 60% fear that they do not have sufficient computer skills.

The main outcome of data quality management (DQM) is knowledge regarding the quality of healthcare data and its fitness for applicable use in all of its intended purposes (Bansler & Havn, 2010). DQM functions involve continuous quality improvement for data quality throughout the enterprise (all data in all healthcare settings) and include data application, collection, analysis, and warehousing. DQM skills and roles are not new to HIM professionals. As use of health information technology becomes widespread, however, data are shared and repurposed in new and innovative ways, thus making data quality more important than ever (AHIMA, 2012).

Related literature found that data are uniquely sought and collected by each requester. Data collection, analysis and warehousing are rarely rapid (Bansler & Havn, 2010). For instance, large

data sets are typically not accessible; the quality of the data is often poor; the requirements for centrally cleaning and standardizing the data may delay the beginning of analysis; there is almost no orderly method for reporting findings back to the data holders; and decision-makers can rarely obtain or use timely, high-quality information. The quality of collected data can be affected by software design and the mechanisms for data population. Automated population of data originates from various sources-systems such as clinical lab machines and vital sign tools like blood pressure cuffs. All automated sources must be checked regularly to ensure appropriate calibration. Likewise, any staff entering data manually should be trained to enter the data correctly and monitored for quality assurance such as registrars entering patient demographic data at the point of care (Dooling, 2012). In a fragmented health sector, data collection efforts are slow, costly, cumbersome, and redundant. Traditional methods for aggregating and sharing data pose many challenges to researchers and data sources alike (Karp, 2008).

### **2.3 Data Collection and entry for Health Information Management**

In healthcare, data are ubiquitous. Data collection is essential for informative decision making. Data elements will be used within a health institution for continuous quality development efforts and to strategically advance patient care. Besides, benchmarking population health initiatives (Horning, 2011). Working with data and information within the health information system involves filling in forms, tally sheets and registers, collecting data into aggregated reports and statistics and the reporting of health data from low levels to higher levels of the health information system. These activities make up important aspects of most health workers' jobs. The health information systems therefore tend to be deeply embedded in social work practices and are barely separable from social context of which they are part (Braa et al. 1999).

Whether collecting data to be stored in a paper medical/health record or in a computer-based or electronic patient record or for statistics or specific registries, data must be accurate, reliable and organized in such a way that they are understood and health information can be retrieved. The first step should be to determine what data are needed and how they are to be collected. Poor data collection occurs when data are collected in a logical sequence, and when the instrument used to collect the data is deficient (Zlabek et al, 2011).

Investing in the development of effective health information systems would have multiple benefits and would enable decision-makers at all levels to detect and control emerging and

endemic health problems; monitor progress towards health goals; and promote equity, empower individuals and communities with timely and understandable health-related information; and drive improvements in quality of services, strengthen the evidence base for effective health policies; permit evaluation of scale-up efforts; and enable innovation through research, and improve governance; mobilize new resources; and ensure accountability in their use.

Strengthening national and sub-national health information systems will also require a collaborative effort at the international level. In Kenya, Health Information is not integrated with information technology to the extent witnessed in developed countries. The limited availability of the requisite skills and equipment at the various levels and the high levels of IT illiteracy remain significant challenges. Thus, while the application of ICT is desirable the framework will focus on specific modes of generation and use of Health Information that are relevant in the Kenyan context.

Health care professionals spend a significant proportion of their working time collecting large amounts of client and patient data that is rarely analyzed and used at the point of collection. Health workers merely collect aggregate and dutifully pass over this data to the next level (Dooling, 2011). This information is rarely ever used to guide local action at the level at which data is collected. Very little information from the collected data ever reaches health system managers; this is despite the fact that an HIS is mainly designed to facilitate the operations of the health system managers at various levels. This could possibly be explained by lack of involving information users in the design of these systems.

While the basic data capture and reporting skills are present, there is little attention to data quality and staffs lack the self-assessment skills or the “epidemiological thinking” needed for the analysis, interpretation and use of information for actions. Additionally, even when information users are involved, they often make data demands that are not cognizant of the limitations or challenges faced by the providers to produce all the expected information. Lack of a coordinated data collection strategy is a recurrent problem which leads to duplication of effort and competition among data collecting units and health care providers.

Other problems relate to poor quality, incompleteness, inconsistency and lack of timeliness of much of the data being generated by HIS. Medical data should only be used for the purposes for which it was collected, and for additional purposes authorized by law, or consented to by the data

subject. The purposes for which health data is collected needs to be clear. The Health Information Management (HIM) profession in Kenya has been created because of a need for accurate, complete data regarding the care and treatment of patients and the production of timely information for evidence based decision making within the health sector. HIM professionals like their other colleagues within the health sector need to be regulated in order to ensure that they operate professionally.

Data is a representation of facts or concepts or instructions in a formalized manner, suitable for communication, interpretation or processing by manual or electronic means in a health institution (Abdelhak et al, 1996). In health care, data describes specific characteristics of individual patients. Whether data is collected on paper or in a computer, the data should be organized in such a way that we can understand and retrieve them when needed (Davis& LaCour, 2002). The data collected should include all relevant findings relating to the patient's condition, diagnoses, treatment, if any, and other events as they occur. Whether the data are collected manually or in a computer, it is important to ensure that the information is correct at the point of entry.

The starting point for any effective health institution is the availability of health care data to help in health care interventions. The collection of data, whether maintained manually or electronically at a large teaching hospital, health Centre or outlying clinic is paramount for health care decision. For patient's data to be useful, it has to be entered into a central database for easier and quick retrieval. Demographic and clinical data stored in a patient's medical/health record are the major source of health information and are of no value to medical science or health care management if they are not accurate, reliable and accessible (WHO, 2003).

Around the world, countless lives are lost due to insufficient access to quality health information. The availability of accurate, timely, and analyzed data is directly relevant to the quality of an individual's health and the healthcare system in general, the delivery of individual care, and the understanding and management of overall health systems (Jody, 2011). According to the United Nations, strengthening health information systems is emerging as a cornerstone of global health policy.

Akacho (2014) found that data entry may be hindered by lack of uniformity of data. This implies that without predetermined standards and uniform data sets, problems relating to the quality of health care data are difficult to solve. Additionally, poorly designed data collection forms may

also affect quality of data in that, if forms are not well designed, the collection of data could result in poor quality data. The limitations to doctors capacity to communicate is another cause poor quality data where some doctors find it difficult to record data in a clear and concise manner, hence poor information. The medics often use non-standard abbreviations and are 'too busy' to complete medical records once the patient has been discharged from the facility or does not require further treatment.

In a nutshell, limited education in documentation requirements of medical staff on data entry is a major factor in poor data quality. Limitations to information transfer from different parts of the facility, and sometimes information being transferred from the laboratory to the ward or a clinic does not contain the correct patient's name and medical/health record number. Such errors make it difficult to ensure that all data pertaining to an individual patient are filed in that patient's medical record. The transfer of information from one department to another or from a hospital to a clinic or aid post is often slow or information is lost in transmission.

The poor state of health systems in many parts of the developing world is keeping individuals from accessing essential health care and slowing progress toward health-related UN Millennium Development Goals. Proper information management starts with data entry into a central database for later retrieval and use. However, most of the developing countries neither have Health information management system nor, qualified personnel to carry out data entry tasks.

Until recently, discussions about applying information technologies to health care in the developing world revolved around replacing ubiquitous paper-based systems with computers. This study argues that regardless of whether in a hospital, health centre or an outlying clinic, the quality of health care data and statistical reports has come under intensive scrutiny in recent years. Thus, all health care service employees, including clerical staff, health professionals, administrators, and health information managers, need to gain a thorough knowledge and understanding of the key components of data quality and the requirements for continuous data entry and improvement.

This is for the reason that inaccurate health information may adversely affect the quality of an individual's healthcare, insurance, and employability. As computerization of health information continues and the scope of organizational exchange of health information widens into health information exchanges (HIEs), maintaining the integrity and completeness of health data is

paramount. The overarching goal of HIEs is to allow authorized users to quickly and accurately exchange health information to enhance patient safety and improve efficiency. Achieving this goal is dependent on the ability to link (match) multiple, disparate records relating to a single individual.

#### **2.4 Data Analysis**

Data analysis and reporting is one of the facets that can promote proper health care to patients. According to Johns, (2002) limited education of processing staff may hinder the processing of health records due to lack of understanding the need for accuracy and completeness. If they are not properly trained, the production of quality data is threatened. Additionally, lack of planning by administrative staff to ensure data quality control programmes are in place. Finally, data discrepancies arising when errors occur at the point of collection and plans lead to distorted information when reporting of data for action.

#### **2.5 Data Warehousing in Public Health Institutions**

According to Inmon (2002) a data warehouse is a subject-oriented, integrated, non-volatile, and time-variant collection of data in support of management's decisions. The data warehouse contains granular corporate data. In terms of subject-oriented, classical operations systems are organized around the applications of the company. Each type of company has its own unique set of subjects. In terms of integratedness. Data is fed from multiple disparate sources into the data warehouse. As the data is fed it is converted, reformatted, resequenced and summarized. The result is that data once it resides in the data warehouse has a single physical corporate image. Warehouse data is loaded and accessed, but it is not updated. Instead, when data in the data warehouse is loaded, it is loaded in a snapshot, static format. When subsequent changes occur, a new snapshot record is written. In doing so a history of data is kept in the data warehouse. Data warehousing is being hailed as one of the most strategically significant developments in information processing in recent times. One of the reasons for this is that it is seen as part of the answer to information overload (Inmon, 2002).

Data warehousing is a phenomenon that grew from the huge amount of electronic data stored in recent years and from the urgent need to use that data to accomplish goals that go beyond the routine tasks linked to daily processing. In a typical scenario, a large hospital institution has many branches, and senior managers need to quantify and evaluate how each branch contributes

to the global business performance. The corporate database stores detailed data on the tasks performed by departments within it. To meet the managers' expectations, tailor-made queries can be issued to retrieve the required data. In order for this process to work, database administrators must first formulate the desired query after closely studying database catalogs. Then the query is processed. This can take a few hours because of the huge amount of data, the query complexity, and the concurrent effects of other regular workload queries on data. Finally, a report is generated and passed to senior managers in the form of a spreadsheet. Many years ago, database designers realized that such an approach is hardly feasible, because it is very demanding in terms of time and resources, and it does not always achieve the desired results. Moreover, a mix of analytical queries with transactional routine queries inevitably slows down the system, and this does not meet the needs of users of either type of query (Lechtenbörger, 2001). However today's advanced data warehousing processes separate online analytical processing from online transactional processing by creating a new information repository that integrates basic data from various sources, properly arranges data formats, and then makes data available for analysis and evaluation aimed at planning and decision-making processes (Lechtenbörger, 2001).

## **2.6 Data application**

According to Zlabek, Wickus, and Mathiason (2012), data application is a term for the use of data. These data is arranged into data sets which are large and there for complex that traditional data processing applications. Therefore it is inadequate to deal with them due to the nature of the institutions, large accumulation of patients data ,hence endure Challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization, querying, updating and information privacy.

An examination of hospitals that recently implemented a comprehensive electronic health record (EHR) system finds that clinical and administrative leaders built EHR adoption into their strategic plans to integrate inpatient and outpatient care and provide a continuum of coordinated services. Successful implementation depended on: strong leadership, full involvement of clinical staff in design and implementation, mandatory staff training, and strict adherence to timeline and budget. The EHR systems facilitate patient safety and quality improvement through: use of checklists, alerts, and predictive tools; embedded clinical guidelines that promote standardized, evidence-based practices; electronic prescribing and test-ordering that reduces errors and

redundancy; and discrete data fields that foster use of performance dashboards and compliance reports (Jha, and Desroches, 2009).

However more accurate communication and streamlined processes have led to improved patient flow, fewer duplicative tests, faster responses to patient inquiries, redeployment of transcription and claims staff, more complete capture of charges, and federal incentive payments. Hospital and health system leaders used varied approaches to demonstrate that implementing EHRs was a high priority. All of the hospitals committed significant financial resources toward equipment, software, IT staff, and training (S. Jones, R. Koppel, M. S. Ridgely, 2011).

In addition to training hospital staff, integrated health systems trained physicians in their owned and affiliated practices that were adopting the medical office version of the EHR. And most also offered training to community physicians who had different office medical record systems but admitting privileges; this enabled them to add to the medical record when treating patients at the hospital and to access information from the EHR hospital record for their patients.

## **2.7 Theoretical Framework**

Initiating a change is a complicated process, and following a theoretical framework can provide a basis for making informed decisions that allows for better control over the outcomes of action (McEwen & Wills, 2007). Two theories on change and innovation that have been used successfully to facilitate the adoption of technology in health care organizations are Rogers' Innovation Diffusion Theory and Kotter's Change Management Model (Campbell, 2008; Wolf, 2006). Both of these models provide steps and guidelines for engaging individuals and organizations to support both willingness and ability, thus helping to improve the likelihood the EMR would be adopted.

### **2.7.1 Kotter's Change Management Theory**

There are many different change management models, but one that has been used successfully in health care (Clark, 2010), and specifically to address the adoption of technological innovations (Campbell, 2008), is John Kotter's eight-stage process for transformational change (Kotter, 1996). This dynamic model is comprised of eight stages that can be organized into three phases. The first phase is "creating a climate for change" and includes establishing a sense of urgency, creating a guiding coalition, and developing a vision and strategy. The second phase is "engaging and enabling the organization" and includes communicating the vision, empowering



action, and creating short-term wins. The final phase is “implementing and sustaining the change” and includes consolidating gains and producing more change, and anchoring new approaches in the culture.

### **Creating a Climate for Change**

The first stage is establishing a sense of urgency. The biggest mistake in attempting change is to allow complacency (Kotter, 1996). This is a critical step because without a sense of urgency people will cling to the status quo and resist change. Creating urgency involves helping people see and feel first hand why a change needs to occur (Campbell, 2008).

The second stage is creating a guiding coalition. The guiding team members need to have the knowledge, credibility, influence, and skills required to mobilize change (Kotter, 1996). The third stage is developing a vision and strategy. In this stage you need to create a clear and defining vision that is shared by all stakeholders. The result should be a compelling statement that clearly articulates what you are trying to achieve that can be explained in five minutes or less (Kotter, 1996). The vision needs to include a collective sense of what a desirable future looks like, in clear and measurable terms that all stakeholders can stand behind (Clark, 2010).

### **Engaging and Enabling the Organization**

The first stage in this phase is communicating the vision. Once the vision has been created and agreed upon by members from all stakeholder groups, it is imperative that it be communicated frequently and convincingly to all groups. This involves communicating the vision in words and actions by leading through example. Members from all groups need to be hearing the same message from everyone in order to gain buy-in and guide them from awareness of the change to a state where they feel empowered to advocate for the change (Campbell, 2008). This involves engaging in continuous dialogue with stakeholders to build commitment and trust.

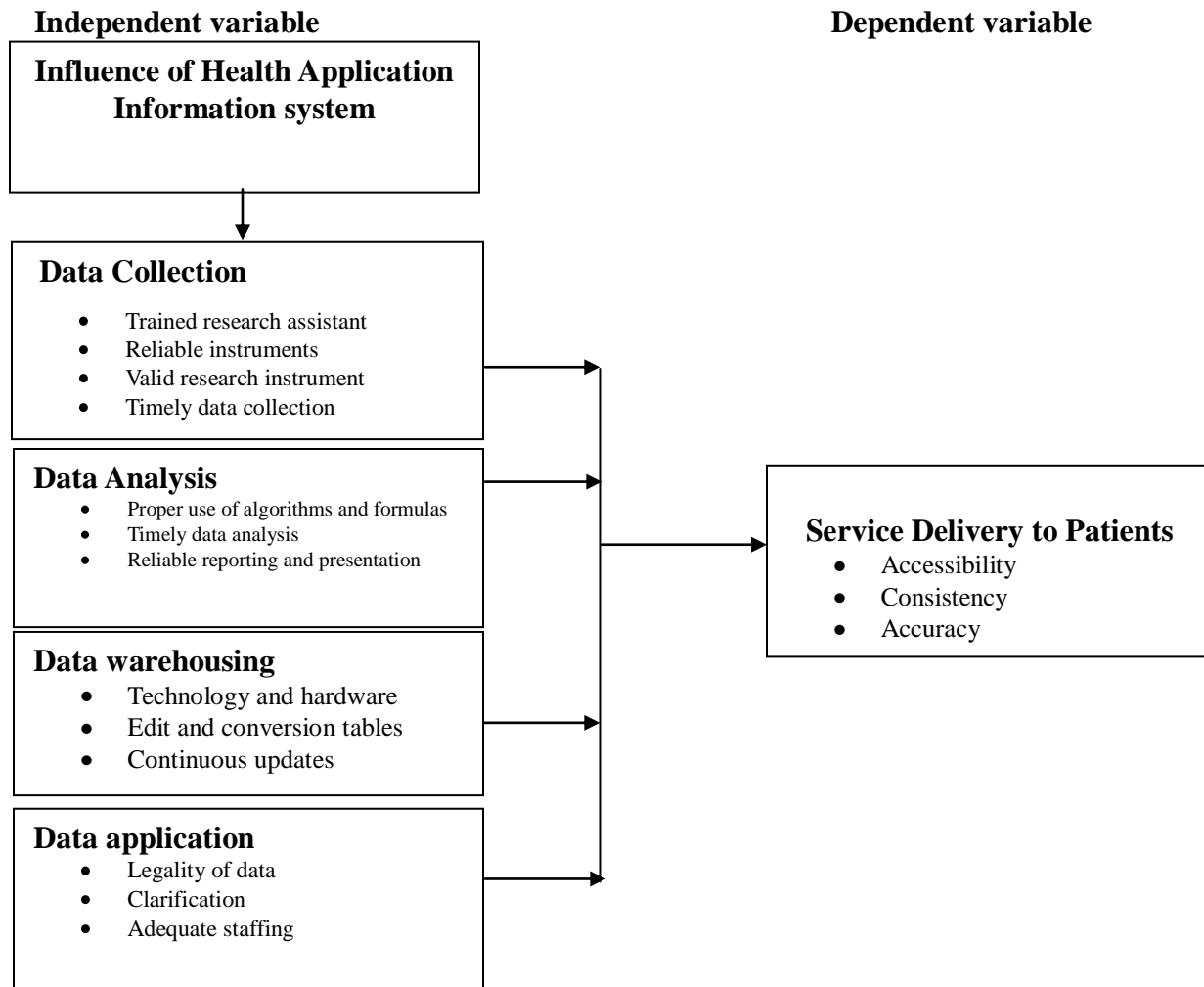
The next two stages in this phase are enabling action and creating short-term wins. At this stage all parties need to work together to remove obstacles and empower all members to participate. It may involve providing incentives for embracing change, and feedback on how they can use the changes for their benefit (Campbell, 2008). Changing the culture of a workplace takes time, and as time goes on urgency drops and complacency rises (Kotter, 1996). Creating short-term wins can help keep the momentum going. Wins should be celebrated in a highly visible way that is connected to the vision and then that momentum can be used to set new achievable goals (Clark,

2010). After each win it is important to analyze what went right and what needs improvement.

### **Implementing and Sustaining the Change**

The seventh and eighth stages are consolidating gains to produce more change and anchoring new approaches in the organizational culture. The warning in these stages is not to declare victory prematurely. Declaring that the change has been successfully implemented means that people lose all urgency and if the changes have not been firmly anchored into the culture, people will slip back into the 'old' way of doing things (Kotter, 1996). In this phase there needs to be a continued focus on the desired vision and the strategic steps required to achieve it until the change becomes a permanent part of the organization's culture and is reflected in the shared norms and values (Clark, 2010).

## 2.8 Conceptual Framework



**Figure 2.1: Effectiveness of HIMS on Management of Health Records**

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter looked at the research design, target population, sample size, sampling techniques, data collection instruments and procedures, validity, reliability of the study and data analysis components.

#### **3.2 Research Design**

The research problem was studied through the use of a descriptive survey research design. According to Kothari (2004), descriptive research is concerned with specific predictions, with narration of facts and characters concerning situation. The descriptive design is preferred since it is carefully structured to ensure complete description of the situation, making sure that there is minimum bias in the collection of data and to reduce errors in interpreting the data collected.

#### **3.3 Target Population**

The target population of the study was 773 employees of Moi Teaching and Referral Hospital (MTRH). The target population included people from senior management, health records, audit and accounts and Information and Communication Technology (ICT).

#### **3.4 Sample Size and Sampling Procedures**

Sampling is the process of choosing a number of individuals for a study in such a way that the individuals selected represents the larger group from which they are selected hence representing the characteristics found in the entire group (Orodho, 2003).

##### **3.4.1 Sample size**

The more the sample size approaches the population size, the more representative it is. This study applied the Krejcie and Morgan formula (attached appendix 1) sample determination to arrive at the 260 respondents.

### 3.4.2: Sampling Methods

The study employed simple random sampling (To pick respondents in a group). The samples were selected the four departments which deal with health records data and handling of patients. However, the researcher organized the four departments into clusters. The researcher used simple random sampling procedure to determine the number of respondents from each cluster proportionally as indicated in table 3.1.

**Table 3.1: Proportionate Sampling Procedure**

Department	Department Population	Sample size from Each Department(n1)
ICT	130	44
Audit	80	27
Health Records	520	175
Administration and Senior management	43	14
Total	773	260

Source: MTRH Information Office

\*Sample size per Department (n1) =  $\frac{\text{Population of each department}}{\text{Total no. of staff in MTRH}} \times 260$  (n)

Total no. of staff in MTRH

(Total number of staff in MTRH 4 Departments=773, total sample size (n) = 260)

### 3.5 Data Collection Methods

#### 3.5 1 Questionnaires

This method is used to collect a lot of information within a short period of time, (Mugenda & Mugenda 2003). This formed the main source of data. The collected data was obtained through the use of questionnaires structured according the study objective which include: investigating how collection of data can influence record keeping of patients in MTRH in Uasin Gishu County; determining how data entry influences management of health records of patients in the study area; establish how reporting of data can facilitate communication on management of patients health records; and find out how data storage influences the management of patients'

health records in MTRH.

The data required for this study was collected through actual visits to the zone. The questionnaires were administered by the researcher to the sampled population. Unstandardized questionnaires were modeled in this study, because the structure of this questionnaire is less rigid. They are typically small, and the questions will be open, hence the responses are unstructured allowing respondents to formulate their answers the way they want (Sarantakos, 2007).

### **3.6 Pilot Study**

The study was piloted in Uasin Gishu district hospital in the department of salaries, public health and radiology.

#### **3.6.1 Reliability and Validity**

According to Nunnally, (1978) measurements are reliable to the extent that they are repeatable and that any random influence, which tends to make measurements different from occasion to occasion or circumstance to circumstance, is a source of measurement error. Gay, (1987) defines reliability as the degree to which a test consistently measures whatever it measures whereas, according to Gregory, (1992) validity is the extent to which a test measures what it claims to measure. A measure is valid if it measures what it is supposed to measure, and does so cleanly without accidentally including other factors. The measurement tools need to be both reliable and valid. The questions used also need to yield consistent responses when asked multiple times (reliability). Equally, the questions asked need to get accurate responses from respondents (validity). In this study to determine the reliability and validity, the questionnaire was tested among 40 respondents 10 from each department, and 2 from administration. The sample was verified for response errors. The final questionnaire was then prepared on pre-test method. Findings from the pre-test were subjected to correlation analysis (spearman rank order) and a relationship between, 0.6-1 shows more reliability and below 0.4 shows no relationship.

### **3.7 Data Analysis and Presentation**

Data was collected through the use of questionnaires then coded and entered into the Statistical Analysis Software-Statistical Package for the Social Sciences (SPSS Version, 20) and analyzed descriptively and inferential statistics. For the inferential statistics, the researcher adopted

spearman's rank order correlation (scale of 0 to 1 where above 0.5=positive relationship, below 0.4 shows no relationship), while for the descriptive statistics, frequencies, percentages and means were used as the statistical technique. Kombo and Tromp (2007) further observe that descriptive approach is designed to obtain information concerning the current phenomenon and wherever possible to draw valid conclusions from facts discussed.

### **3.8 Ethical Consideration**

Participation in this study was absolutely voluntary. No one was forced to answer questions they don't want to. Informed consent seeks to incorporate the rights of autonomous individuals through self-determination. It also seeks to prevent assaults on the integrity of the participants and protect personal liberty and sincerity. Individuals made informed decisions in order to participate in research voluntarily only if they have information on the possible risks and benefits of the research. Free and informed consent needs to incorporate an introduction to the study and its purpose as well as an explanation about the selection of the research subjects and the procedures that were followed.

The researcher briefed participants to make sure that they do not have any problems or concerns with the questionnaires. The researcher made sure they answer questions they may have to ensure that they are completely comfortable with the research experience. The intent of this interpretation was that no such "constraint or coercion" must be either explicit or implicit on the part of the investigator. The collective consideration of all three elements of consent has great impact on the manner in which a study is planned and executed. Each research situation presents a different set of circumstances, and consent procedures must be adapted accordingly. For investigators in certain areas, the type of participants frequently studied requires special consideration and protection. Such participants receive repeated attention in our discussion and examination of consent issues regarding who and when.

**Table 3.2: Operationalization Table**

<b>Objectives</b>	<b>Variable</b>	<b>Indicators</b>	<b>Scale</b>	<b>Statistics</b>	<b>Statistical techniques of analysis</b>
	<p><b>Dependent</b> service delivery</p> <p><b>Independent variable</b> Data collection</p>	<p>Quick retrieval of patients information</p> <p>Train clerks on data collection</p>	Ordinal	inferential	Spearman rank correlation
	<p><b>Dependent</b> service delivery</p> <p><b>Independent</b> Data analysis</p>	<p>Proper use of algorithms and formulas</p> <p>Timely data analysis</p>	Ordinal	Descriptive statistics and inferential	Frequency, percentages and mean Spearman rank correlation
	<p><b>Dependent</b> service delivery</p> <p><b>Independent</b> Data warehousing</p>	<p>Safe archiving of data</p> <p>Appropriate use of technology.</p>	Ordinal	Descriptive statistics and inferential	Frequency, percentages and mean Spearman rank correlation
	<p><b>Dependent</b> Service delivery</p> <p><b>Independent</b> Data application</p>	<p>Knowledge awareness on applications</p> <p>Sufficient staffing</p>	ordinal	Descriptive statistics and inferential	Frequency, percentages and mean Spearman rank correlation



## CHAPTER FOUR

### DATA ANALYSIS AND PRESENTATION OF FINDINGS

#### 4.1 Introduction

This chapter presents the data analysis, presentation, interpretation and discussion of the findings. The study assessed the influence of health information application system on service delivery to patients at MTRH, Uasin Gishu County, Kenya. The chapter is divided into various sections namely; response rate, the demographic information of the participants and the study objectives specifically; investigated how data collection and entry can influence service delivery to patients, determined how data analysis influences service delivery to patients, established how warehousing of data can facilitate communication on service delivery to patients and find out how data application influences service delivery to patients in MTRH in Uasin Gishu County. The chapter starts with the response rate and then demographic information of the participants.

#### 4.2 Response rate

A total of 260 questionnaires were sent out to the respondents to fill. Of these questionnaires, 244 were returned for analysis. The returned 244 questionnaires accounted for 93.8% response rate. A response rate of 70% and above is adequate (Mugenda & Mugenda, 1999) and therefore a response rate of 93.8% was acceptable for data analysis. Table 4.1 shows the response rate.

**Table 4. 1 : Response rate**

Questionnaire	Frequency	Percentage
Administered	260	100.0
Returned	244	93.8

**Source (Researcher, 2016)**

#### 4.3 Demographic Characteristics of the respondents

Among the demographic information sought were; gender, age, ethnic affiliation and education level. These variables were considered to have an effect on service delivery to patients.

##### 4.3.1 Gender of the Respondents

The respondents were asked to indicate their gender in the questionnaire. The results are

presented in Table 4.2.

**Table 4. 2: Gender of the respondents**

<b>Description</b>	<b>Frequency</b>	<b>Percentage</b>
Male	149	<b>61.1</b>
Female	95	<b>38.9</b>
<b>Total</b>	<b>244</b>	<b>100.0</b>

**Source (Researcher, 2016)**

Table 4.2 indicates that 149(61.1%) of the respondents were male while 95 (38.9%) were female. The findings on male: female ratio attained the gender parity which requires that not more than 2/3 of staff should come from either gender (Constitution of Kenya, 2010).

This implies that both sexes were adequately represented in the study.

#### **4.3.2 Age of the Respondents**

The respondents were asked to indicate their age in the questionnaire. The results are presented in Table 4.3.

**Table 4. 3: Age of the respondents**

<b>Description</b>	<b>Frequency</b>	<b>Percentage</b>
18-27	54	<b>22.1</b>
28-37	88	<b>36.1</b>
38-47	46	<b>18.9</b>
48-57	41	<b>16.8</b>
Above 57	15	<b>6.1</b>
<b>Total</b>	<b>244</b>	<b>100.0</b>

**Source (Researcher, 2016)**

As shown in Table 4.3, majority 88(36.1%) of the respondents were of the ages between 28 to 37 years, 54(22.1%) were between 18-27 years and 46(18.9%) were between 38-47 years and only

15(6.1%) respondent were over 47 years. This implies that majority of the respondents were young employees who could easily achieve the hospital objectives and matured enough for the study.

### **4.3.3 Religion of the Respondents**

The respondents were asked to indicate their religion in the questionnaire. The results are presented in Table 4.4.

**Table 4.4: Religion of the respondents**

<b>Description</b>	<b>Frequency</b>	<b>Percentage</b>
Catholic	79	<b>32.4</b>
Protestants	137	<b>56.1</b>
Muslim	26	<b>10.7</b>
No religion	2	<b>0.8</b>
<b>Total</b>	<b>244</b>	<b>100.0</b>

**Source (Researcher, 2016)**

Table 4.4 shows that majority 137(56.1%) of the respondents were protestants, 79(32.4%) were Catholics, 26(10.7%) were Muslims, with only 2(0.8%) of the respondents having no religion.

### **4.3.4 Education level of the Respondents**

The respondents were asked to indicate their education level in the questionnaire. The results are presented in Table 4.4.

**Table 4. 4: Education level of the respondents**

<b>Description</b>	<b>Frequency</b>	<b>Percentage</b>
Primary	12	<b>4.9</b>
Secondary	54	<b>22.1</b>
Tertiary	118	<b>48.4</b>
University	60	<b>24.6</b>
<b>Total</b>	<b>244</b>	<b>100.0</b>

**Source (Researcher, 2016)**

As shown in Table 4.5, majority 118(48.4%) of the respondents had tertiary level of education, 60(24.6%) had University level, 54(22.1%) had secondary level of education, with only 12(4.9%) of the respondents having primary education. This implies that the staffs had adequate qualification to ensure quality service delivery.

#### **4.4 Influence of data collection and entry on service delivery to patients**

For analysis of objective one Spearman Rank Order Correlation was the preferred statistical technique used because the items of the dependent variable were measured in ordinal scale. This statistic helped to examine the influence of data collection and entry on service delivery to patients. The analysis therefore opens with the descriptive statistics (frequency, percentage and mean distribution) for the level of agreement on a five point Likert scale of the variable data collection (Table 4.6).

##### **4.4.1. Descriptive statistics for influence of data collection and entry on service delivery**

For analysis, frequency, percentages and mean ratings of response for each item were examined and summarized in Table 4.3.

**Table 4.5: Descriptive statistics for influence of data collection and entry on service delivery**

<b>Statement on data collection</b>		<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>	<b>MEAN</b>
Suitable education and training to those who collect data improved accuracy	F %	20 <b>8.2</b>	15 <b>6.1</b>	18 <b>7.4</b>	103 <b>42.2</b>	88 <b>36.1</b>	<b>3.92</b>
Development of data collection instrument that explore methods to access needed data ensure efficient service delivery	F %	2 <b>0.8</b>	35 <b>14.3</b>	15 <b>6.1</b>	99 <b>40.6</b>	93 <b>38.1</b>	<b>4.01</b>
Data definition and data precision impact from comprehensive data collection	F %	8 <b>3.3</b>	8 <b>3.3</b>	34 <b>13.9</b>	80 <b>32.8</b>	114 <b>46.7</b>	<b>4.16</b>
Adoption of standardized data collection and integrated/interfaced systems ensure data consistency	F %	6 <b>2.5</b>	25 <b>10.2</b>	12 <b>4.9</b>	74 <b>30.3</b>	127 <b>52</b>	<b>4.19</b>
Pilot of the data collection instrument ensured data relevancy	F %	14 <b>5.7</b>	11 <b>4.5</b>	27 <b>11.1</b>	89 <b>36.5</b>	103 <b>42.2</b>	<b>4.05</b>

**Source (Researcher, 2016)**

Table 4.6 shows that 103(42.2%) respondents agreed with the statement that suitable education and training to those who collect data improved accuracy, hence efficient service delivery, 88(36.1%) respondents strongly agreed with the statement, 20(8.2%) respondents strongly disagreed and 18 (7.4%) were undecided on the statement while 15(6.1%) respondents were in a disagreement with the statement. The study findings suggested that the respondents tended to agree (Mean=3.92) that suitable education and training to those who collect data improved accuracy, hence efficient service delivery. This is in agreement with the findings of Johns (2002) that limited education of processing staff may hinder the processing of medical/health records

due to lack of understanding the need for accuracy and completeness. This implies that for efficient service delivery to patients, those who are involved in data collection and entry should be adequately trained to enhance on their accuracy.

In addition, 99(40.6%) respondents agreed with the statement that development of data collection instrument that explored methods to access needed data ensured efficient service delivery, 93(38.1%) respondents strongly agreed with the statement, 35(14.3%) respondents disagreed with the statement and 15(6.1%) respondents were undecided while only 2(0.8%) respondents strongly disagreed with the statement. It emerged from the study that the respondents agreed (Mean=4.01) that development of data collection instrument that explored methods to access needed data ensured efficient service delivery. This is in line with Karp et al. (2008) that in a fragmented health sector, data collection efforts are slow, costly, cumbersome, and redundant. Traditional methods for aggregating and sharing data pose many challenges to researchers and data sources alike. This implies that development of appropriate data collection instrument that explored methods to access needed data should be ensured for efficient service delivery to patients.

Similarly, 114(46.7%) respondents strongly agreed with the statement that data definition and data precision impacted from comprehensive data collection improved quality service delivery, 80(32.8%) respondents agreed with the statement, 34(13.9%) respondents were undecided on the statement, 8(3.3%) respondents disagreed and another 8(3.3%) in a strong disagreement with the statement. The study findings suggested that the respondents agreed (Mean=4.16) that data definition and data precision impacted from comprehensive data collection improved quality service delivery. This is in agreement with the findings of Davis and LaCour (2002) that data definition and data precision impacted from comprehensive data collection improve quality service delivery. This implies that there should be complete data collection and entry to improve on data precision, hence enhanced quality service delivery to patients.

Further, 127(52.0%) respondents strongly agreed with the statement that adoption of standardized data collection and integrated/ interfaced systems ensured data consistency hence, improved service delivery, 74(30.3%) respondents agreed with the statement, 25(10.2%) respondents disagreed with the statement and 12(4.9%) respondents were undecided on the

statement while only 6(2.5%) respondents had a strong disagreement with the statement. The study findings suggested that the respondents agreed (Mean=4.19) that adoption of standardized data collection and integrated/ interfaced systems ensured data consistency hence, improved service delivery. This implies that for efficient delivery of data, there should be adoption of standardized data collection and integrated/ interfaced systems to improve data consistency, hence enhanced service delivery.

Finally, 103(42.2%) respondents strongly agreed with the statement that pilot of the data collection instrument ensured data relevancy, thus efficient service delivery, 89(36.5%) respondents agreed with the statement, 27(11.1%) respondents were undecided on the statement and 14(5.7%) respondents strongly disagreed while 11(4.5%) respondents disagreed with the statement. It emerged from the study that the respondents agreed (Mean=4.05) that pilot of the data collection instrument ensured data relevancy, thus efficient service delivery.

These descriptive statistics of objective one was followed by a Spearman Rank Order Correlation test to examine the relationship between data collection and entry and service delivery to patients. This was analyzed under the following sub-section.

#### **4.4.2. Spearman Rank Order Correlation test for relationship between data collection and service delivery**

The Spearman rank Correlation test at  $p \leq 0.05$  significance relation illustrating statistically significant relationship between data collection and service delivery in hospitals are as summarized in Table 4.7. Therefore, Table 4.7 presents the Spearman rank Order Correlation test that was conducted to examine whether there is a statistically significant relationship between data collection and service delivery in hospitals.

**Table 4.6: Relationship between data collection and service delivery to patients**

			Service delivery to patients	Data collection and entry
Spearman's rho	Service delivery to patients	Correlation Coefficient	1.000	
		Sig. (2-tailed)	.	
	Data collection and entry	Correlation Coefficient	.653**	1.000
		Sig. (2-tailed)	.000	.
		N	244	244

\*\* . Correlation is significant at the 0.05 level (2-tailed).

**Source (Researcher, 2016)**

Table 4.7 shows a strong positive relationship ( $r = .653$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data collection and service delivery to patients. The computed value ( $r = 0.653$ ) is greater than 0.5 which shows there is a strong positive relationship. This implies that there is a significant relationship between data collection and service delivery to patients.

**4.5 Influence of data analysis on service delivery to patients**

For analysis of objective two Spearman Rank Order Correlation was the preferred statistic because the items of the dependent variable were measured in ordinal scale. This statistic helped to establish the influence of data analysis on service delivery to patients. The analysis therefore starts with the descriptive statistics (frequency, percentage and mean distribution) for the level of agreement on a five point Likert scale of the variable data collection (Table 4.5).

**4.5.1. Descriptive Statistics for Influence of data Analysis on service delivery**

For analysis, frequency, percentages and mean ratings of response for each item were established and summarized in Table 4.8.



**Table 4. 7: Descriptive statistics for influence of data analysis on service delivery**

<b>Statement on data analysis</b>		<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>	<b>MEAN</b>
Appropriate use of algorithms, formulas, and translation systems	F	29	15	9	79	112	
	%	<b>11.9</b>	<b>6.1</b>	<b>3.7</b>	<b>32.4</b>	<b>45.9</b>	<b>3.94</b>
Ensuring appropriate analysis of all pertinent data impacting the application enhances comprehensiveness	F	14	24	12	79	115	
	%	<b>5.7</b>	<b>9.8</b>	<b>4.9</b>	<b>32.4</b>	<b>47.1</b>	<b>4.05</b>
Data analysis under reproducible circumstances by use of standard formulas, scientific equations, variance calculations adopted ensure data consistency	F	8	6	18	76	136	
	%	<b>3.3</b>	<b>2.5</b>	<b>7.4</b>	<b>31.1</b>	<b>55.7</b>	<b>4.34</b>
Data displayed to reflect the purpose for which they are collected ensure clear definitions	F	8	21	9	100	106	
	%	<b>3.3</b>	<b>8.6</b>	<b>3.7</b>	<b>41.0</b>	<b>43.4</b>	<b>4.13</b>
Timely data analysis allows for the initiation of action	F	21	19	9	81	114	
	%	<b>8.6</b>	<b>7.8</b>	<b>3.7</b>	<b>33.2</b>	<b>46.7</b>	<b>4.02</b>

**Source (Researcher, 2016)**

Table 4.8 shows that 112(45.9%) respondents strongly agreed with the statement that an appropriate use of algorithms, formulas, and translation systems improved service delivery, 79(32.4%) respondents agreed with the statement, 29(11.9%) respondents strongly disagreed and 15(6.1%) were in a disagreement with the statement while 9(3.7%) respondents were undecided on the statement. The study findings suggested that the respondents tended to agree (Mean=3.94) that an appropriate use of algorithms, formulas, and translation systems improved service delivery. This implies that when appropriate use of algorithms, formulas, and translation systems is adopted, data relevancy and consistency is assured, hence improved service delivery.

In addition, 115(47.5%) respondents strongly agreed with the statement that ensuring that all

pertinent data impacting the application were analyzed appropriately improved data comprehensiveness, hence efficient service delivery, 79(32.4%) respondents agreed with the statement, 24(9.8%) respondents disagreed with the statement and 14(5.7%) respondents were in a strong disagreement while 12(4.9%) respondents were undecided on the statement. It emerged from the study that the respondents agreed (Mean=4.05) that ensuring that all pertinent data impacting the application were analyzed appropriately improved data comprehensiveness hence efficient service delivery. This implies that for efficient service delivery, all relevant data impacting the application should be analyzed appropriately to improve data comprehensiveness, hence efficient service delivery.

Similarly, 136(55.7%) respondents strongly agreed with the statement that data analysis under reproducible circumstances by use of standard formulas, scientific equations, variance calculations adopted ensured data consistency, hence efficient service delivery, 76(31.1%) respondents agreed with the statement, 18(7.4%) respondents were undecided on the statement, 8(3.3%) respondents strongly disagreed and 6(2.5%) disagreed with the statement. The study findings suggested that the respondents agreed (Mean=4.34) that data analysis under reproducible circumstances by use of standard formulas, scientific equations, variance calculations adopted ensured data consistency, hence efficient service delivery. This implies that data analysis by use of standard formulas, scientific equations, variance calculations should be adopted to ensure data consistency, hence efficient service delivery.

Further, 106(43.4%) respondents strongly agreed with the statement that data displayed to reflect the purpose for which they were collected ensured clear definitions of data, hence quality service delivery, 100(41.0%) respondents agreed with the statement, 21(8.6%) respondents disagreed with the statement and 9(3.7%) respondents were undecided on the statement while 8(3.3%) respondents had a strong disagreement with the statement. The study findings suggested that the respondents agreed (Mean=4.13) that data displayed to reflect the purpose for which they were collected ensured clear definitions of data, hence quality service delivery. This implies that for efficient service delivery, data should be displayed to reflect the purpose for which they were collected.

Finally, 114(46.7%) respondents strongly agreed with the statement that timely data analysis

allowed for the initiation of action, 81(33.2%) respondents agreed with the statement, 21(8.6%) respondents strongly disagreed with the statement and 19(7.8%) respondents disagreed while 9(3.7%) respondents were undecided on the statement. It emerged from the study that the respondents agreed (Mean=4.02) that timely data analysis allowed for the initiation of action, thus efficient service delivery. This is in agreement with the findings of Jody (2011) that the availability of accurate, timely, and analyzed data is directly relevant to the quality of an individual's health and the healthcare system in general, the delivery of individual care, and the understanding and management of overall health systems. This implies that when there is timely analysis of data, the action can be initiated immediately to promote data accuracy thus improvement in quality of service delivery to patients

These descriptive statistics of objective two was followed by a Spearman Rank Order Correlation test to establish the relationship between data analysis and service delivery to patients. This was analyzed under the following sub-section.

#### **4.5.2. Spearman Rank Order Correlation test for relationship between data analysis and service delivery**

The Spearman rank Correlation test at  $p \leq 0.05$  significance relation showing statistically significant relationship between data analysis and service delivery in hospitals are as summarized in Table 4.9. Thus, Table 4.9 presents the Spearman rank Order Correlation test that was conducted to establish whether there is a statistically significant relationship between data analysis and service delivery in hospitals.

**Table 4.8: Relationship between data analysis and service delivery to patients**

			<b>Correlations</b>	
			Service delivery to patients	Data analysis
Spearman's rho	Service delivery to patients	Correlation Coefficient	1.000	
		Sig. (2-tailed)	.	
		N	244	
	Data analysis	Correlation Coefficient	.672**	1.000
		Sig. (2-tailed)	.000	.
		N	244	244

\*\* . Correlation is significant at the 0.05 level (2-tailed).

**Source (Researcher, 2016)**

Table 4.9 shows a strong positive relationship ( $r = .672$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data analysis and service delivery to patients. The computed value ( $r = 0.672$ ) is greater than 0.5 which shows a positive relationship. This implies that there is a significant relationship between data analysis and service delivery to patients.

**4.6 Influence of data warehousing on service delivery to patients**

For analysis of objective three Spearman Rank Order Correlation was the preferred statistic because the items of the dependent variable were measured in ordinal scale. This statistic helped to determine the influence of data analysis on service delivery to patients. The analysis therefore starts with the descriptive statistics (frequency, percentage and mean distribution) for the level of agreement on a five point Likert scale of the variable data collection (Table 4.10).

**4.6.1. Descriptive statistics for influence of data warehousing on service delivery**

For analysis, frequency, percentages and mean ratings of response for each item were determined and summarized in Table 4.10.

**Table 4.9: Descriptive statistics for influence of data warehousing on service delivery**

<b>Statement on data warehousing</b>		<b>SD</b>	<b>D</b>	<b>U</b>	<b>A</b>	<b>SA</b>	<b>MEAN</b>
Putting appropriate edits in place assures data accuracy	F	23	17	36	82	86	
	%	<b>9.4</b>	<b>7.0</b>	<b>14.8</b>	<b>33.6</b>	<b>35.2</b>	<b>3.78</b>
Technology and hardware impact data accessibility	F	16	31	22	82	93	
	%	<b>6.6</b>	<b>12.7</b>	<b>9.0</b>	<b>33.6</b>	<b>47.1</b>	<b>3.84</b>
Management of relationships of data owners, data collectors, and data end-users to ensure awareness of the data availability in the inventory and accessible systems	F	2	9	29	80	124	
	%	<b>0.8</b>	<b>3.7</b>	<b>11.9</b>	<b>32.8</b>	<b>50.8</b>	<b>4.29</b>
warehousing employ edits or conversion tables by coordinating edits and tables to ensure consistency	F	5	18	6	113	102	
	%	<b>2.0</b>	<b>7.4</b>	<b>2.5</b>	<b>46.3</b>	<b>41.8</b>	<b>4.18</b>
Continually updating of systems, tables, and databases ensure data accuracy	F	9	18	32	78	107	
	%	<b>3.7</b>	<b>7.4</b>	<b>13.1</b>	<b>32.0</b>	<b>43.9</b>	<b>4.05</b>

**Source (Researcher, 2016)**

Table 4.10 shows that 86(35.2%) respondents strongly agreed with the statement that appropriate edits put in place ensured data accuracy, hence improved service delivery, 82(33.6%) respondents agreed with the statement, 36(14.8%) respondents were undecided on the statement and 23(9.4%) were in a strong disagreement with the statement while 17(7.0%) respondents disagreed with the statement. The study findings suggested that the respondents tended to agree (Mean=3.78) that appropriate edits put in place ensured data accuracy, hence improved service delivery. This implies that when appropriate edits are put in place data accuracy is ensured, hence improved service delivery.

In addition, 93(47.1%) respondents strongly agreed with the statement that technology and hardware impacted data accessibility, hence enhanced service delivery, 82(33.6%) respondents agreed with the statement, 31(12.7%) respondents disagreed with the statement and 22(9.0%) respondents were undecided on the statement while 16(6.6%) respondents strongly disagreed with the statement. It emerged from the study that the respondents tended to agreed (Mean=3.84) that technology and hardware impacted data accessibility, hence enhanced service delivery. This is in line with the findings of Aghajani (2002), Chaudhry (2006) and Bower, 2005 Hersh (2002) and Nyamtema (2010) that technology and hardware impacted data accessibility, hence enhanced service delivery. However, contradicts the findings of Wootton (2009); Ruder et al (2008); Chan and Kaufman (2010) that, while the assumption is made that technology can and does have a positive effect in healthcare; the evidence base supporting its practical use is slender.

Similarly, 124(50.8%) respondents strongly agreed with the statement that management of relationships of data owners, data collectors, and data end-users to ensured awareness of the data availability in the inventory and accessible systems, 80(32.8%) respondents agreed with the statement, 29(11.9%) respondents were undecided on the statement, 9(3.7%) respondents disagreed and 2(0.8%) strongly disagreed with the statement. The study findings suggested that the respondents agreed (Mean=4.29) that management of relationships of data owners, data collectors, and data end-users to ensure awareness of the data availability in the inventory and accessible systems. This is in line with the findings of Aryee (2014) that, most healthcare centers keep patients' medical records in folders that seem to be hard to keep because of limited storage capacity and poor record-keeping practices. This implies that for quality service delivery, management of relationships of data owners, data collectors, and data end-users to ensure awareness of the storage capacity and record-keeping practices should be ensured for data availability in the inventory and accessible systems.

Further, 113(46.3%) respondents agreed with the statement that warehousing employed edits or conversion tables by coordinating edits and tables to ensure consistency, hence improved service delivery, 102(41.8%) respondents strongly agreed with the statement, 18(7.4%) respondents disagreed with the statement and 6(2.5%) respondents were undecided on the statement while 5(2.0%) respondents had a strong disagreement with the statement. The study findings suggested that the respondents agreed (Mean=4.18) that warehousing employed edits or conversion tables

by coordinating edits and tables to ensure consistency, hence improved service delivery. This implies that there should be employment of edits or conversion tables by coordinating edits and tables to ensure consistency, hence improved service delivery.

Finally, 107(43.9%) respondents strongly agreed with the statement that continually updating of systems, tables, and databases ensured data currency, 78(32.0%) respondents agreed with the statement, 32(13.1%) respondents were undecided, 18(7.4%) respondents disagreed while 9(3.7%) strongly disagreed with the statement . It emerged from the study that the respondents agreed (Mean=4.05) that continually updating of systems, tables, and databases ensured data currency, thus efficient service delivery. This corroborates the findings of WHO (2003), that demographic and clinical data stored in a patient's medical/health record are the major source of health information and are of no value to medical science or health care management if they are not accurate, reliable and accessible. This implies that there should be updates of systems, table and database as a form of health care management for accuracy, reliability and accessibility, hence efficient delivery of services to patients.

These descriptive statistics of objective three was followed by a Spearman Rank Order Correlation test to determine the relationship between data warehousing and service delivery to patients. This was analyzed under the following sub-section.

#### **4.6.2. Spearman Rank Order Correlation test for relationship between data warehousing and service delivery**

The Spearman rank Correlation test at  $p \leq 0.05$  significance level showing statistically significant relationship between data warehousing and service delivery in hospitals are as summarized in Table 4.11. Thus, Table 4.11 presents the Spearman rank Order Correlation test that was conducted to determine whether there is a statistically significant relationship between data warehousing and service delivery in hospitals.

**Table 4. 10: Relationship between data warehousing and service delivery to patients**

			<b>Correlations</b>	
			Service delivery to patients	Data warehousing
Spearman's rho	Service delivery to patients	Correlation Coefficient	1.000	
		Sig. (2-tailed)	.	
		N	244	
	Data warehousing	Correlation Coefficient	.708**	1.000
		Sig. (2-tailed)	.000	.
		N	244	244

\*\* . Correlation is significant at the 0.05 level (2-tailed).

**Source (Researcher, 2016)**

Table 4.11 shows a strong positive relationship ( $r = .708$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data warehousing and service delivery to patients. The computed value ( $r = 0.708$ ) is greater than 0.5 which shows a positive relationship between variables. This implies that there is a significant relationship between data warehousing and service delivery to patients.

**4.7 Influence of data application on service delivery to patients**

For analysis of objective four Spearman Rank Order Correlation was the preferred statistic because the items of the dependent variable were measured in ordinal scale. This statistic helped to assess the influence of data application on service delivery to patients. The analysis therefore starts with the descriptive statistics (frequency, percentage and mean distribution) for the level of agreement on a five point Likert scale of the variable data collection (Table 4.9).



#### 4.7.1. Descriptive statistics for influence of data application on service delivery

For analysis, frequency, percentages and mean ratings of response for each item were assessed and summarized in Table 4.12.

**Table 4.11: Descriptive statistics for influence of data application on service delivery**

Statement on data application		SD	D	U	A	SA	MEAN
Clearly determined aim for collecting data improve data accuracy	F %	32 13.1	15 6.1	14 5.7	109 44.7	74 30.3	3.73
Legality of the available data to be collected for application improved data accessibility	F %	13 5.3	25 10.2	15 6.1	106 43.4	85 34.8	3.92
Clarification on data usage and identification of end-users, enhances data comprehensiveness	F %	5 2.0	9 3.7	32 13.1	67 27.5	131 53.7	4.27
Consideration of the changes in appropriateness or value of an application improve data currency	F %	8 3.7	21 8.6	6 2.5	110 45.1	99 40.6	4.11
Adequate staffing is ensured through continues patient census	F %	11 4.5	30 12.3	25 10.2	87 35.7	91 37.3	3.89

**Source (Researcher, 2016)**

Table 4.12 shows that 109(44.7%) respondents agreed with the statement that a clearly determined aim for collecting data improved data accuracy, hence quality service delivery, 74(30.3%) respondents strongly agreed with the statement, 32(13.1%) respondents strongly disagreed with the statement and 15(6.1%) were in a disagreement with the statement while

14(5.7%) respondents were undecided on the statement. The study findings suggested that the respondents tended to agree (Mean=3.73) that a clearly determined aim for collecting data improved data accuracy, hence quality service delivery. This implies that when the aim for collecting data is clearly determined data accuracy is improved, hence quality service delivery

Similarly, 106(43.4%) respondents agreed with the statement that the legality of the available data to be collected for application improved data accessibility, hence enhanced service delivery, 85(34.8%) respondents strongly agreed with the statement, 23(10.2%) respondents disagreed with the statement and 15(6.1%) respondents were undecided on the statement while 13(5.3%) respondents strongly disagreed with the statement. It emerged from the study that the respondents tended to agree (Mean=3.92) that legality of the available data to be collected for application improved data accessibility, hence enhanced service delivery. This is in agreement with the findings of Kazanjian & Green (2002) and Wootton (2009) that health decision makers are often unaware of the information they lack, and rarely obtain feedback on the consequences of their decisions, costs, ethical, legal or social implications of technology. This implies that when the legality of the available data to be collected for application is ensured the data accessibility is improved hence efficient service delivery to patients.

In addition, 131(53.7%) respondents strongly agreed with the statement that clarification on data usage and identification of end-users, enhances data comprehensiveness, thus efficient service delivery, 67(27.5%) respondents agreed with the statement, 32(13.1%) respondents were undecided on the statement, 9(3.7%) respondents disagreed and 5(2.0%) strongly disagreed with the statement. The study findings suggested that the respondents agreed (Mean=4.27) that clarification on data usage and identification of end-users, enhances data comprehensiveness, thus efficient service delivery. This is in agreement with the findings of Dooling (2011) that health care professionals spend a significant proportion of their working time collecting large amounts of client and patient data that is rarely analyzed and used at the point of collection. This implies that when clarification on data usage and identification of end-users is ensured, data comprehensiveness is improved, thus efficient service delivery

Further, 110(45.1%) respondents agreed with the statement that consideration of the changes in appropriateness or value of an application improved data currency, thus enhanced service

delivery, 99(40.6%) respondents strongly agreed with the statement, 21(8.6%) respondents disagreed with the statement and 8(3.7%) respondents strongly disagreed with the statement while 6(2.5%) respondents were undecided on the statement. The study findings suggested that the respondents agreed (Mean=4.11) that consideration of the changes in appropriateness or value of an application improved data currency, thus enhanced service delivery. This implies that for service delivery, there should be consideration of the changes in appropriateness or value of an application to improve data currency.

Finally, 91(37.3%) respondents strongly agreed with the statement that adequate staffing was ensured through continues patients' census, 87(35.7%) respondents disagreed with the statement and 30(12.3%) respondents disagreed, 25(10.2%) respondents were undecided on the statement while 11(4.5%) respondents strongly disagreed with the statement. It emerged from the study that the respondents tended to agree (Mean=3.89) that adequate staffing was ensured through continues patients' census. This implies that patient's census enables the hospital administration to know the staff shortage and call for addition of more, hence enhanced service delivery to patients.

These descriptive statistics of objective four was followed by a Spearman Rank Order Correlation test to assess the relationship between data application and service delivery to patients. This was analyzed under the following sub-section.

#### **4.6.2. Spearman Rank Order Correlation test for relationship between data application and service delivery**

The Spearman rank Correlation test at  $p \leq 0.05$  significance level showing statistically significant relationship between data warehousing and service delivery in hospitals are as summarized in Table 4.10. Hence, Table 4.10 presents the Spearman rank Order Correlation test that was conducted to determine whether there is a statistically significant relationship between data application and service delivery in hospitals.

**Table 4.12: Relationship between data application and service delivery to patients**

			<b>Correlations</b>	
			Service delivery to patients	Data application
Spearman's rho	Service delivery to patients	Correlation Coefficient	1.000	
		Sig. (2-tailed)	.	
	N	244		
	Data application	Correlation Coefficient	.678**	1.000
		Sig. (2-tailed)	.000	.
		N	244	244

\*\* . Correlation is significant at the 0.05 level (2-tailed).

**Source (Researcher, 2016)**

Table 4.13 shows a strong positive relationship ( $r = .678$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data application and service delivery to patients. The computed value ( $r = 0.678$ ) is greater than 0.5. This implies that there is a significant relationship between data application and service delivery to patients.

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter summarized the findings, gave conclusions and recommendations. It also suggested areas for further research in the following sub themes

#### **5.2 Summary of the study findings**

Based on the data and information analysed in chapter four. The findings are summarized in this section.

##### **5.2.1 Demographic characteristics of respondents**

The findings indicates that most 149(61.1%) of the respondents were male and majority 88(36.1%) of the respondents were of the ages between 28 to 37 years. In addition, majority 137(56.1%) of the respondents were protestants. Further to that, majority 118(48.4%) of the respondents had tertiary level of education and most 60(24.6%) had University level.

##### **5.2.2 Influence of data collection on service delivery to patients**

The study findings suggested that the respondents tended to agree (Mean=3.92) that suitable education and training to those who collect data improved accuracy, hence efficient service delivery. In addition, it emerged from the study that the respondents agreed (Mean=4.01) that development of data collection instrument that explored methods to access needed data ensured efficient service delivery. Similarly, the study findings suggested that the respondents agreed (Mean=4.16) that data definition and data precision impacted from comprehensive data collection improved quality service delivery. Further, the study findings suggested that the respondents agreed (Mean=4.19) that adoption of standardized data collection and integrated/ interfaced systems ensured data consistency hence, improved service delivery. Finally, it emerged from the study that the respondents agreed (Mean=4.05) that pilot of the data collection instrument ensured data relevancy, thus efficient service delivery. For correlation analysis, the findings shows a strong positive relationship ( $r = .653$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data

collection and service delivery to patients.

### **5.2.3 Influence of data analysis on service delivery to patients**

The study findings suggested that the respondents tended to agree (Mean=3.94) that an appropriate use of algorithms, formulas, and translation systems improved service delivery. In addition, it emerged from the study that the respondents agreed (Mean=4.05) that ensuring that all pertinent data impacting the application were analyzed appropriately improved data comprehensiveness hence, efficient service delivery. Similarly, the study findings suggested that the respondents agreed (Mean=4.34) that data analysis under reproducible circumstances by use of standard formulas, scientific equations, variance calculations adopted ensured data consistency, hence efficient service delivery. Further, the study findings suggested that the respondents agreed (Mean=4.13) that data displayed to reflect the purpose for which they were collected ensured clear definitions of data, hence quality service delivery. Finally, it emerged from the study that the respondents agreed (Mean=4.02) that timely data analysis allowed for the initiation of action, thus efficient service delivery. For correlation analysis, the findings indicates a strong positive relationship ( $r = .672$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data analysis and service delivery to patients.

### **5.2.4 Influence of data warehousing on service delivery to patients**

The study findings suggested that the respondents tended to agree (Mean=3.78) that appropriate edits put in place ensured data accuracy, hence improved service delivery. In addition, it emerged from the study that the respondents tended to agreed (Mean=3.84) that technology and hardware impacted data accessibility, hence enhanced service delivery. Similarly, the study findings suggested that the respondents agreed (Mean=4.29) that management of relationships of data owners, data collectors, and data end-users to ensured awareness of the data availability in the inventory and accessible systems. Further, the study findings suggested that the respondents agreed (Mean=4.18) that warehousing employed edits or conversion tables by coordinating edits and tables to ensure consistency, hence improved service delivery. Finally, it emerged from the study that the respondents agreed (Mean=4.05) that continually updating of systems, tables, and databases ensured data currency, thus efficient service delivery. For correlation analysis, the

findings revealed a strong positive relationship ( $r = .708$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data warehousing and service delivery to patients.

### **5.2.5 Influence of data application on service delivery to patients**

The study findings suggested that the respondents tended to agree (Mean=3.73) that a clearly determined aim for collecting data improved data accuracy, hence quality service delivery. Similarly, it emerged from the study that the respondents tended to agreed (Mean=3.92) that legality of the available data to be collected for application improved data accessibility, hence enhanced service delivery. In addition, the study findings suggested that the respondents agreed (Mean=4.27) that clarification on data usage and identification of end-users, enhances data comprehensiveness, thus efficient service delivery. Further to that, the study findings suggested that the respondents agreed (Mean=4.11) that consideration of the changes in appropriateness or value of an application improved data currency, thus enhanced service delivery. Finally, it emerged from the study that the respondents tended to agree (Mean=3.89) that adequate staffing was ensured through continuous patients' census. Correlation analysis, shows a strong positive relationship ( $r = .678$ ;  $p = .000$ ;  $\alpha = 0.05$ ) between data application and service delivery to patients.

### **5.3 Conclusion of the study**

From the findings, the study concluded that; health information application system through effective data collection, data analysis, data warehousing and data application influences service delivery to patients. Consequently, data collection in terms of suitable education and training to those who collect data, adoption appropriate data collection instruments and comprehensive data collection improves data relevancy, consistency, accuracy and precision hence positively influence service delivery to patients. Similarly, data analysis through appropriate use of algorithms, formulas, and translation systems, use of standard formulas, scientific equations, variance calculations and timely data analysis improves data relevancy, consistency, accuracy and precision hence positively influence service delivery to patients. In addition, data warehousing in terms appropriate edits, technology and hardware adoption, continually updating of systems, tables, and databases improves data relevancy, and consistency, accuracy and precision hence positively influence service delivery to patients. Finally, data application through clearly determined aim for collecting data, legality of the available data, clarification on data

usage and identification of end-users and continuous patients' census improves data relevancy, and consistency, accuracy and precision hence positively influence service delivery to patients.

#### **5.4 Recommendation of the study**

In reference to the findings, conclusions and the guidance from the literature review, it was clear that health information application system enhances services delivery to patients. Therefore, the hospitals administration, policy makers and other health stakeholders should ensure;

- Effective data collection through adequate training and education of data entry clerks, adoption of appropriate data collection instruments.
- Appropriate data analysis procedure in terms of usage of suitable algorithms, formulas, and translation systems, use of standard formulas, scientific equations, variance calculations.
- Efficient data warehousing through appropriate technology adoption, edits and continuous update of systems, tables and database.
- Appropriate data application through clearly determined aim for collecting data, legality of the available data, clarification on data usage.

#### **5.5 Suggestions for further studies**

The researcher suggests the following further areas of research

1. A similar research should be carried out in a different institution to determine if the health information application system still influence service delivery to patients.
2. A research should be carried on the influence of other elements of health information application system on service delivery to patients.
3. A research should also be carried on the entire health institution in the country to determine the effects of health information application system on service delivery to patients in Kenya.
4. Further research should be done on the mediating effects on the relationship between health information application system and service delivery to patients.
5. Future studies need to test significant levels of the findings of the hypothesis using chi square test.



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**APPENDIX 1: SAMPLE SIZE DETERMINATION TABLE**

N	n	N	n	N	N
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	168	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	198	3000	341
80	66	420	201	2500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note: N = population size                      n = sample size

**Source: Krejcie and Morgan (1970: 23)**

## APPENDIX 2: QUESTIONNAIRE

Dear Respondent,

My name is Jackson Kinara, I am a postgraduate student at the University of Nairobi. I am carrying out a research entitled: **“Influence of Health Information Application System on Service Delivery to Patients in MTRH, Uasin Gishu County, Kenya.”** This study targets health workers in MTRH. I would like to get information on your experience health information application systems on service delivery in MTRH. The information collected will be used purely for academic purposes, although important for those designing programmes to health intervention practices. I would like to assure you of **confidentiality**. Your cooperation will be highly appreciated. Thank you in advance.

Yours Sincerely,

Jackson Kinara

**QUESTIONNAIRE NO:** \_\_\_\_\_

### SECTION A: DEMOGRAPHIC AND GENERAL INFORMATION

Please tick (√) all that apply

i. What is your gender

Primary  Secondary

ii. What is your age bracket?

18-27  28-37  38-47  48-57  Above 57 years

iii. What is your religion?

None  Protestant  Catholic  Muslim

iv. What is your level of education

Primary  Secondary  Tertiary  University

**SECTION B**

**CATEGORY I: DATA COLLECTION AND ENTRY ON SERVICE DELIVERY**

Please circle the number that represents your level of agreements with each of the following statements using the scale provided: **1=strongly Disagree, 2= Disagree, 3= Undecided, 4=Agree and 5= Strongly Agree**

<b>Statements</b>					
Does suitable education and training to those who collect data improved accuracy?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is development of data collection instrument that explore methods to access needed data ensure efficient service delivery?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Does data definition and data precision impact from comprehensive data collection?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is the adoption of standardized data collection and integrated/ interfaced systems ensure data consistency?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Does Pilot of the data collection instrument ensure data relevancy?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

**CATEGORY II: DATA ANALYSIS AND ENTRY ON SERVICE DELIVERY**

Please circle the number that represents your level of agreements with each of the following statements using the scale provided: **1=Strongly Disagree, 2= Disagree, 3= Undecided, 4=Agree and 5= Strongly Agree**

<b>Statements</b>					
Does appropriate use of algorithms, formulas, and translation systems?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Does Ensuring appropriate analysis of all pertinent data impacting the application enhances comprehensiveness?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Does data analysis under reproducible circumstances by use of	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

standard formulas, scientific equations, variance calculations adopted ensure data consistency?					
Is data displayed to reflect the purpose for which they are collected ensure clear definitions?	1	2	3	4	5
Does timely data analysis allows for the initiation of action?	1	2	3	4	5

**CATEGORY III: DATA WAREHOUSING AND ENTRY ON SERVICE DELIVERY**

Please circle the number that represents your level of agreements with each of the following statements using the scale provided: **1=Strongly Disagree, 2= Disagree, 3= Undecided, 4=Agree and 5= Strongly Agree**

Statements					
Does putting appropriate edits in place assures data accuracy?	1	2	3	4	5
Does technology and hardware impact data accessibility?	1	2	3	4	5
Is the Management of relationships of data owners, data collectors, and data end-users ensures awareness of the data availability in the inventory and accessible systems?	1	2	3	4	5
Is warehousing by employing edits or conversion tables by coordinating edits and tables ensures consistency?	1	2	3	4	5
Does continually updating of systems, tables, and databases ensure data accuracy?	1	2	3	4	5

**CATEGORY IV: DATA APPLICATION AND ENTRY ON SERVICE DELIVERY**

Please circle the number that represents your level of agreements with each of the following statements using the scale provided: **1=Strongly Disagree, 2= Disagree, 3= Undecided, 4=Agree and 5= Strongly Agree**

Statements					
Does clearly determined aim for collecting data improve data accuracy?	1	2	3	4	5
Does legality of the available data to be collected for	1	2	3	4	5



application improved data accessibility?					
Does clarification on data usage and identification of end-users, enhances data comprehensiveness?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Does consideration of the changes appropriateness or value of an application improve data currency?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is adequate staffing ensured through continues patient census?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

**CATEGORY V: SERVICE DELIVERY**

Please circle the number that represents your level of agreements with each of the following statements using the scale provided: **1=Strongly Disagree, 2= Disagree, 3= Undecided, 4=Agree and 5= Strongly Agree**

<b>Statements</b>					
Is data and information in the institution easily accessible?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is data and information in the institution consistent?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is data and information in the institution current?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is data and information in the institution accurate?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Is data and information in the institution relevant?	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>