

**USE OF HOSPITAL MANAGEMENT INFORMATION SYSTEMS AMONG
HEALTHCARE WORKERS AT KENYATTA NATIONAL AND MATER
HOSPITALS**

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DECLARATION

This is my original work and has not been presented for an award of a degree or certificate in any other university or institution.

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DEDICATION

I dedicate this project to my late dad Ferdinard Nkanata, I could not have asked for a better dad. The seed of hard work and determination you planted in us your children is still growing and bearing fruits.

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ABSTRACT

Health decision making is critically dependent on accurate, timely and reliable information. There is evidence to indicate that most of the national and sub-national health information systems fail in providing much needed information support for evidence based health planning and interventions. This situation is more acute in developing nations where resources are either stagnant or decreasing, coupled with the situations of demographic transition and double burden of diseases. Health information system failure is widely blamed for this situation. Improved information use requires improved quality of data and information products, which in turn requires effective health information systems. Decisions on what information systems to adopt have often been made without evidence of effectiveness; or information on implications; or extensive knowledge on how to maximize benefits the systems. This study examined use of the hospital management information systems among healthcare workers at Mater Hospital and Kenyatta National Hospital. The study objectives were to: assess the use of the hospital information system in both hospitals, establish the extent to which the software system provides accurate and relevant information of the patients. The study established the challenges being experienced using the hospital information management system in both hospitals and suggested possible solutions to improve the system. Descriptive survey was applied involving both quantitative and qualitative approaches. Structured questionnaire and document reviews were used to gather data. Respondents in both hospitals were healthcare workers. Health information system deal with data quality and is characterized by the relevance, accuracy, timeliness, and completeness of data while health system performance looks at decision makers explicitly considering information in policymaking, planning, management, and service delivery. The finding of the study has established both hospitals concurred hospital information management system provides accurate and relevant patient information and other useful data needed to effectively manage patient care and govern the health facility well. The study has also established that modern and sufficient information communication and telecommunication equipment are required in order for the system to deliver desired results. Training of healthcare workers and continuous support is also of paramount importance according to the findings of the study.

LIST OF ABBREVIATIONS AND ACRONYMS

EHC:	Electronic Health Card
EHIT:	Health Information Technology
EHRs:	Electronic Health Records
Epi-info:	Epidemiological Information Software
HCW:	Health Care Worker
HIS:	Health Information System
HIT:	Health information Technology
HMN:	Health Metrics Network
ICT:	Information and Communication Technology
IS:	Information Systems
KNBS:	Kenya National Bureaus of Statistics
KNH:	Kenyatta National Hospital
LQA:	Lot Quality Assurance
MMRS:	Mosoroit Medical Record System
MOH:	Ministry of Health
NCD:	Noncommunicable Diseases
NHIN:	Nationwide Health Information Network
PHC:	Primary Health Care
PIH:	Partners in Health
PRISM:	Performance of Routine Information System Management
RHIS:	Routine Health Information System
SSA:	Sub Saharan Africa
SSA:	Sub-Saharan Africa
WHO:	World Health Organization

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CHAPTER ONE

INTRODUCTION

This chapter introduces area of study including background of study, statement of the research problem, purpose of study, objectives of study, research questions, assumptions of the study, and scope of study, limitation of study significance of study and operational terms and concepts.

1.1 Background to the Study

Healthcare especially in the developed world is characterized by rapidly increasing use of information technology in patient care, increasing documentation, coding and billing, and management. Rise of health information technology worldwide is increasing the efficiency of health service delivery, reducing medical errors, improving quality of care, and providing better information for patients and physicians (Pollak and Lorch, 2007:4)

The overall goal of the information management function is to obtain, manage, and use information to improve health care and medical services, performance, governance and management and support processes.

The importance of healthcare to individuals and governments and its growing costs to the economy have contributed to the emergence of healthcare as an important area of research for scholars in business and other disciplines. Information systems (IS) have much to offer in managing healthcare costs and in improving the quality of care (Kolodner et al. 2008: 394). In additional, Piontek et al., (2010: 618) asserts that healthcare influences the quality of human lives and function in the society. Healthcare

mistakes have serious consequences that can affect ability to carry out social and productive endeavors. Recent reports highlight the gravity of adverse events in hospitals and the dangers such events pose to individuals and the public. Healthcare information systems have changed the healthcare industry drastically over the last decade as well as the last few years (Abraham & Junglas, 2011: 185).

The forces of competition and advancements in healthcare technology are pushing hospitals to follow the trend. Paperless healthcare systems have become inevitable and any healthcare institute that doesn't follow this trend will fall behind the rest of the industry. Health information system is a must and the faster this is adopted the more successful the healthcare facility will be.(Swanson et al. 2010: 9).Delone and Mclean (2003) being one of the most cited models in the fields of information systems seeks to provide a comprehensive understanding of information systems success by identifying, describing, and explaining the relationships between six success variables categories: systems quality, information quality, user, user satisfaction, individual impact, and organizational impact. Delone & Mclean (2003) model provides a comprehensive framework for measuring the performance of the information system and enhances the understanding of information systems success.

World Health Organization (WHO, 2008) cautions that, the goal of a health information system is often narrowly defined as the production of good-quality data. The ultimate goal is to produce relevant information that health system stakeholders can use for making transparent and evidence-based decisions for health system interventions. Health

information management system performance should therefore be measured not only on the quality of data produced, but on evidence of the continued use of data to improve health system performance, respond to emergent threats, and improve health (WHO, 2008). Improving health information systems in terms of data availability, quality and use often requires interventions that address a wide range of possible ‘determinants of performance’.

Health information systems recognizes that although new developments in technology, including the use of the internet and other modes of communication offer great potential in the flow of information amongst the providers and recipients regarding the provision and management of healthcare services, the Kenyan health sector remains far behind in taking advantage of such developments to improve reporting (HIS, 2008). Despite vast amounts of resources and time invested in the development and implementation of health information systems, health data is barely used by health workers for service delivery planning and decision-making. Performance is grossly under reported with developments to improve information management lagging behind other sectors improvement activities; the whole culture of information generation and use remain under-developed; and mechanisms for validating and assuring reliability are not optimally functional (HIS, 2008).

1.1.1 Context of the Study

Research was carried out in two hospitals, private and public. Kenyatta National Hospital (KNH) is the largest public hospital in Kenya. In addition to its primary mandate to

provide specialized health-care services to patients on referral from provincial and district level hospitals, the Hospital facilitates medical training and research and participates in national health-care planning. The specialized health-care services provided by the Hospital include radiotherapy, heart surgery, neurosurgery, renal dialysis and kidney transplant operations, plastic and reconstructive surgery, orthopedic surgery and burns management among others. The Kenya Health Policy (1994-2010) framework places Kenyatta National Hospital at level six; the apex of the national health-care delivery system. Therefore, the level of efficiency with which the Hospital delivers services to the public is a matter of national importance.

Kenyatta National Hospital is the country's chief referral and teaching institution, and there are provincial and district hospitals in the 47 counties. In rural areas, health centres and dispensaries offer diagnostic services, obstetric care, and outpatient treatment. In August 2014 Kenyatta National Hospital implemented funsoft hospital management information system to provide faster documentation, retrieval, and management of patient information. The system did not only provide a reduction in patient waiting time but will also enhanced staff accountability and resource management. The electronic medical record system is part of the management initiative towards implementation of fully integrated hospital management information system. The system was implemented at all patient entry points and in the wards. Every item being used on the patients are ordered and charged through the system. More often than not systems do not meet all the needs of the institutions as expected, hence the need to evaluate the use of funsoft in use at the Kenyatta National hospital.

The Mater hospital was opened in 1962 by the Sisters of Mercy, Catholic Order of Nuns originating from Ireland, three years after registering themselves as the Registered Trustees of the entity under the Perpetual Succession Act (the succeeding legislation after independence). Initially it was 60 bed general hospital to cater mainly for the poor, indigenous Kenyans, with the primary mission being general healthcare. In 1970, 60-bed maternity ward was opened with antenatal, postnatal and immunization clinics attached in order to upgrade the quality of maternity healthcare available to the poorer segments of the Nairobi population.

The Mater Hospital is a private hospital that provides health care. The mission of the hospital is to deliver timely and compassionate medical services to the patients and families to the highest possible standard through the provision of qualified staff, most appropriate equipment and staff training programmes. The hospital also seeks to contain its cost of operation such that the cost of medical care charged to patients remain as low and affordable as possible to as many patients as possible and such that the viability of the hospital, employment and investment are maintained in line with the ethos of the Sisters of Mercy Kenya.

Hospitals deal with the life and health of the patients. Good medical care relies on well-trained doctors and nurses, high-quality facilities, modern equipment and also good record keeping practices. Without accurate, comprehensive up-to-date and accessible patient case notes, medical personnel may not offer the best treatment or may in fact misdiagnose a condition, which can have serious consequences. Records, such as X-rays,

specimens, drug records and patient registers, must also be well cared for if the patient is to be protected. Effective records care ensures the hospital's administration runs smoothly and saves time and resources. Records also provide evidence of the hospital's accountability for its actions and form the key source of data for medical research, statistical reports and health information systems.

Patient care is adversely affected if correct records are not maintained, records are inadequately managed or there is no means of co-coordinating the health care the same patient receives in different departments. Structured and effective records management programme, covering all departments and all resources irrespective of media, is the aim of every hospital. Mater Hospital acquired and implemented lifeline integrated hospital management information software to be able to handle and support the patient records and all other departments. Lifeline integrated hospital software has been in use in the hospital since the 2001. Mater satellite clinics in different locations within the Nairobi County have been linked up with the main hospital integrated system. This gives the patients the choice to be treated in the main hospital or clinics, because the records are accessed from any of those locations. This expansion brought the need of the lifeline hospital management system upgrade and this was done in May 2014 to lifeline version 1.

1.2 Statement of the Research Problem

Reliable and timely health information is the foundation of public health action, it is often unavailable. Consequently, decision-makers cannot identify problems and needs, track progress, evaluate the impact of interventions and make evidence-based decisions on

health policy, program design and resource allocation (WHO, 2008). One of the key challenges in the Kenyan health sector (HIS, 2008), identified in the first medium term plan of vision 2030 document, is weak health information systems.

Various weaknesses identified in the existing information systems include lack of policy and guidelines, inadequate capacities of health information system, staff, and unskilled personnel handling data, lack of integration, many parallel data collection systems, and poor coordination, amongst others. Overall, the current health information system provides limited information for monitoring health goals and empowering communities and individuals with timely and understandable information on health (HIS, 2008). Kenyan health care systems are typically made up of a number of relatively independent health programs and services which all maintain own vertical and uncoordinated reporting systems. Additionally, fragmentation of services, locally within hospitals and between primary, secondary and tertiary health care settings, alongside the use of different information systems in different care settings can make it difficult to safely communicate information. This may lead to miscommunication or missing patient information, ultimately compromising patient safety. The problem of HIS fragmentation and integration of health care information system is consequently a priority that needs to be addressed to realize successful patient centered healthcare delivery in the country (African Development Bank et al, 2012). Proper computerization of health records is a problem that many countries have had to deal with to ensure patient safety and evidence based care. Most developed countries have managed to come up with arguably workable solutions. However their counterparts in third world countries are yet to get there.

Mwangi (2013:50). The study has not only indicated insufficient adoption of HIS system in the country but also a major disconnect between adoptions in different health care facilities, therefore bringing out the need to find out the use of HIS in two Kenya hospitals.

1.3 Purpose of the Study

The purpose of the study was to examine the use of hospital information management systems among healthcare workers at Mater and Kenyatta National Hospitals.

1.4 Objectives of the Study

The study was guided by the following objectives:

1. To assess the use of the hospital information systems in the two selected hospitals.
2. Establish the extent to which the hospital information system provides accurate and relevant information of the patient.
3. Establish the perception of the healthcare workers towards the system.
4. Find out the challenges faced in the use of hospital information management systems in the hospitals
5. Find out possible solutions to the identified challenges in use of hospital information management system in both hospitals.

1.5 Research Questions

This was guided by the following research questions:

1. What is the use of hospital information management systems at Mater and Kenyatta National Hospitals?

2. To what extent does the hospital information system provide accurate and relevant information of the patient?
3. What is the perception of the healthcare workers towards the system?
4. What are the challenges faced in the use of the hospital information management systems in the two hospitals?
5. What are the possible solutions and recommendations to improve system in the hospitals?

1.6 Assumptions of the study

The study was based on following assumptions

1. That the Mater hospital expansion rendered the lifeline operating system less efficient.
2. The manual systems being used by Kenyatta hospital could not manage the hospital resources effectively.
3. That the information provided by the employees will be true and reliable.

1.7 Scope of the Study

The subject area of the study is the evaluation of lifeline version I integrated hospital management information system currently in use at the Mater Hospital and the funsoft in Kenyatta National Hospital.

1.8 Limitation of the Study

The study adopted Kenyatta National Hospitals and Mater Hospital as the area of concentration; because of the challenges staffs at the services counter keep experiencing at times serving the hospital clients.

1.9 Significance of the Study

Mater hospital is a leading private hospital and Kenyatta National Hospital is leading among the public hospital. Health system functioning depends on production and use of quality health data and information at all levels of the health system. This study serves as a starting point for the assessment of HIS based on the situation in public to identify the strengths and weakness of the system in improving health system functioning. The study forms a basis for further research on evidence based management of health services in general and specifically lead to generation of new ideas for better and more efficient management of health facilities in Nairobi and the country at large. The study will look at the use of hospital information system in a private and a public hospital.

Findings and recommendations of the study would contribute towards the ongoing efforts of ministry of health to develop better health management operations system that would benefit facilities and healthcare workers identify their weakness and thus propose better ways that could help improve their efficiency through improved information use. The findings of the study will be used by all health care workers and health care managers as and will not rely on haphazard personal experiences or subjective personal judgments or of

friends/relative other than base their decisions and actions on concrete evidence and thus help re-invent themselves as problem solvers.

1.10 Operational Terms and Concepts

Electronic Health Record

Shared electronic health record that provides details from multiple organizations and healthcare settings to provide a complete longitudinal patient medical history.

Electronic Medical Record

Facility or organization-based records of all patient interactions that includes details of patient problems, diagnoses, investigations, test results, treatments and prescribed medicine.

Health Information Systems

System that captures, stores, manages or transmits information related to the health of individuals or the activities of organization's that work within the health sector.

Health Systems Effectiveness

Health outcomes (level and distribution), responsiveness (level and distribution) as compared to the expected outcomes.

Health Systems Functioning

Service delivery (service access, service efficiency, adherence to provider guidelines, reduced medical errors, improved patient tracking, improved tracking of equipment, logistics, and supplies), leadership and governance, human resources for health, financing, medicines and supplies.

Hospital information management systems

Element of health informatics that focuses mainly on the administrative needs of hospitals. In many implementations, HIS is the integrated information system that manages and supports the functions and operations of the hospital such as medical, administrative, financial, and legal issues and the corresponding processing of services

Routine Health Information System

System that provides information at regular intervals of a year or less through mechanisms designed to meet predictable information needs. This includes paper-based or electronic health records, and facility- and district-level management information systems.

1.11 Chapter Summary

The chapter discussed the introduction and background of the study, statement of the problem, aim of the study, highlighted the objectives, research questions to be used in the study, significance, assumptions and scope of the study. The chapter wrapped up with the definition of concepts and terms used in the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review on the areas of study based on the objectives. In addition, to studies that have been done in the past on health information management system locally, regionally and globally. The chapter also defines health information management system, implementation components and challenges.

2.2 Health Information Management Systems

Health information management system is defined as the comprehensive and integrated structure that collects, collates, analyses, evaluates, uses, and manages, disseminates, stores all health and health-related data and information (HIS strategic plan, 2009-2014). Health systems, like any software, consist of parts which are interrelated, interdependent and work towards a common goal. In general, the system is the combination of health information and management information that collects information on health (morbidity and mortality statistics, service statistics) and on management (human resources, financial, fixed assets and infrastructure, drugs and supplies logistics) and performs comparative analysis with population- based data from various surveys.

Health system is the powerful tool for making health care delivery more effective and efficient in hospitals (HIS, 2008). Statistical constituencies of this system are: civil registration process whose vital events include registration of live births, deaths, marriages, divorces, adoptions, recognition and legitimating; Kenya National Bureaus of Statistics (KNBS) as the custodian of all government statistical information maintains the

database for all national surveys including national population and housing censuses and population based health statistics derived from national surveys; AfriAfya (African Network for Health Management and Communication), which is consortium of seven Kenya-based health development agencies (HIS, 2008).

2.2.1. Hospital Information Systems

Hospitals are information-intensive organization and pay great attention to information management and processing, which have to be carried out using appropriate information system. Hospital information system and clinical information system are computer-based systems used in hospitals to assist the overall management of the health care facility through information about diseases and information about patient care (Haux, 2004) in terms of record keeping of patient information, accounting, human resource management, asset management, and stock management and knowledge management. Task of the hospital information system is to support patient care and associated administration by providing: information, primarily about patients that information must be correctly collected, stored, processed and documented; Knowledge, primarily about diseases- such as drug actions and adverse effects-to support diagnosis and therapy; information about the quality of patient care and hospital performance and costs (Haux, 2004).

2.2.2 Healthcare Workers

WHO (2010: 2) defines health care workers as “all people primarily engaged in actions with the primary intent of enhancing health”. Often work in hospitals, health care centres

and other service delivery points. Community health workers work outside formal health care institutions. Health care practitioners are commonly grouped into a number of professions: Medical includes general practitioners and specialists; nursing includes various professional titles, midwifery includes obstetrics, dentistry and allied workers.

2.3 Effectiveness of Health Information Systems

Information systems in healthcare allow the capture and dissemination of information to decision makers for better coordination of healthcare at both the individual and population levels (Fichman et. al 2011:421). The study indicates that data mining and decision support capabilities can identify potential adverse events for an individual patient whilst also contributing to the population's health by providing insights into the causes of disease complications. Gonzalez- Molero et.al (2012) in the study of the implementation of a telemedicine approach in subjects with type I diabetes equipped with an insulin pump and real-time blood sugar monitoring.

In this prospective one-year study, the investigators followed 15 subjects and noted that the telemedicine care improved multiple outcomes of health care including the variability in blood sugar control, and long-term measure of good sugar control (HbA1c). Such programs offer great potential to improve patient access to health care. Reduce travel time, cost for patients and reduce the burden on an already stretched health system. These are all good outcomes from a healthcare management perspective. The large pool of the potential benefits of information systems in healthcare is contained in the work of (Li et al 2012). In the study the authors undertook a cost benefit analysis in relation to the implementation of

an electronic medical record (EMR) system for a six-year period, and found out the net benefit to be in the range of half million dollars (US). Shekelle et. al (2006) undertook large piece of research involving systematic review of the evidence around the cost and benefits of health information technology (HIT) projects, many of which involved electronic health records. The study concluded that health information technology has the potential to enable dramatic transformation in the delivery of health care, making it safer, more effective, and more efficient.

2.3.1 DeLone and Mclean Information System Success Model

DeLone and McLean (2003) model has been found to be a useful framework for organizing information system success measurements. The model has been widely used by information system researchers for understanding and measuring dimensions of information system success, each of the variables describing success of an information system was consistent with one or more of the six major success dimensions of the updated model. The dimensions of success include: system quality the desirable characteristics of an information system. Information quality- desirable characteristics of the system outputs; that is, management reports and web page. Service quality- the quality of the support that system users receive from the information system department and information technology support personnel. System use- the degree and manner in which staff and customers utilize the capabilities of information. User satisfaction – users' level of satisfaction with reports, Web sites, and support services. Net benefits- the extent to which IS are contributing to the success of individuals, groups, organizations, industries, and nations. For example: improved decision-making, improved productivity,

increased sales. The practical application of the DeLone &McLean model is naturally dependent on the organizational context.

2.3.2 Organization Culture and RHIS Performance

Studies in organizational culture (Mead, 2006; Triandis, 2006) help understanding how values are generated, sustained and amenable to change. Organizational culture is a body of solutions to problems that have worked consistently (Shein, 2003) and new members are taught the correct way to perceive, think and feel in relation to those problems. The effectiveness of organizational culture in improving performance is well established (Glaser, et.al 1987; Taylor, 2005). Routine health information system management (Odhiambo-Otieno, 2005b:33) is crucial for RHIS performance is measured through availability of the RHIS vision statement and the establishment and maintenance of RHIS support services such as planning, training, supervision, human resources, logistics and finance. In identifying levels of support services, it is possible to develop priorities for actions. Information technology remains the engine for information system development as computers operate and communicate faster (Rotich et. al 2003: 295; Kamadjeu et. al 2005: 179; Odhiambo-Otieno, 2005b: 34).

Fundamentally, routine health information systems users must have good knowledge and information technology skills to effectively use and sustain the system. In low technology settings, well-designed, paper-based RHIS can still achieve acceptable levels of performance. If indicators are irrelevant, data collection forms are complex to fill, and if computer software is not user-friendly, it will affect the confidence level and motivation of

RHIS implementers. When software does not process data properly in a timely manner, and resulting analyses do not provide meaningful conclusions for decision-making, it will affect the use of information (Rotich et. al 2003: 297; Kamadjeu 2005: 180; Odhiambo-Otieno 2005b: 40). Measuring the impact of RHIS on health system performance is still unexplored. RHIS focuses mostly on the service delivery and resource management functions of the health system. Based on the proximity (Ajzen 2005: 7) of RHIS and health system performance, the proposed operational definition of health system performance is to ‘maintain or improve service coverage and make necessary adjustments or improvements in financial and human resources in relation to services provided.’

2.4 Relevance of Hospital information System

Due to extensive changes in medical technology and increased expectation of patients in the twenty-first century hospitals that lack hospital information Systems will not be able to compete with other hospitals. The most important necessity and reason for hospitals information systems automation are inefficiency manual procedures (Meinert & Peterson 2009:9). Hospital information systems help to improve operational efficiency, care quality and more informed decision making. According to Ghosh (2010), hospital information systems give comfortable and quick access to patient data.

2.4.1 Technology and Efficiency

Technology as the sub-factors hardware, software and connectivity, the hardware needed should be identified before the introduction of the system. This means that at the start of the project an assessment should be made about the hardware already available and the

hardware which is still needed for full introduction of the system. One of the major concerns with IS, is the fact that users often claim that they are not user friendly and lack intuitive data input. The way in which data is put into a system reflects the individual's practice style. The interface design and structure of the data need therefore to conform to each other. The other issue is that it depends on the technology being used. Flexibility and adaptability is also a challenge when introducing such a system. Looking for the right terminology for input is also a concern (Kuhn et. al 2001:7-8).

Software content issues include the lack of local content creation, the language used and the relevance of content to the local situation. Appropriate language is frequently neglected in ICT programmes and little content is available in local languages for health programmes (Chetley, 2006). Another concern of any health organization in the integration of health information systems is the fact that healthcare institutions need timely patient information from various sources at the point of- care. This means buying a fully functional system fulfilling all their needs from one vendor. This suggests working with standards for better data integration (Kuhn et. al2001:14).

With connectivity one has to deal with things like the lack of an enabling telecom policy and regulatory environment; access to electricity, solar power options, back-ups, insufficient infrastructure, connectivity access and high costs. The better these things are functioning the greater the chance for successful implementation. The actual integration of isolated systems is an important issue for the success of an information system. The use of simpler systems fitted better with the clinical work processes should also add to better

solutions. Service and maintenance not only of the hardware but of all technology being used should also be considered when introducing the system. The availability of a good backup for failing hardware and software should also be considered when implementing an HIS. There should also be a combination of old and new ICT in creative and innovative ways, no single technology will be suitable for all situations (Chan and Kaufman2010).

2.4.2 Financial Resources

Generally, there is little investment in ICT for health in most developing countries. The picture is one of fragmentation, with many different varieties of ICT being acquired from different donors. Invariably, there is no national health information and information technology infrastructure to underpin the delivery of health care. It is very important to make a realistic financial plan for all the costs in the system before the introduction of the health management information system (Gladwin et. al 2003:12).

Sustainability is very important when considering the introduction of the health management information system in the organization, especially in local hospitals in developing countries. Being able to continue supporting the system financially on the long run is the important issue to consider. Plans for sustainability should be clearly expressed ensuring that capital investments and costs are identified up front as well as ICT, capacity and infrastructure requirements. Monitoring and evaluation is also part of the sustainability failure to adopt a particular IM strategy may signal inappropriateness. Encouraging partnerships between stakeholders on local, national, regional and international level sustainability can grow (Gladwin et. al 2003:14).

2.4.3 Health Information Management Systems in Developed Countries

One notable observation in Europe is that each country has its own distinctive approach in the journey towards enabling technologies in healthcare. France is developing the concept of *digital hospitals* via telemedicine technologies (Currie and Finnegan 2009). Germany is working on an electronic health card (EHC) that allows the physicians to check the administrative data of the patient and write prescriptions on the system. This system will also have voluntary medical functions like the emergency data record and later the electronic patient record that can be checked anywhere using appropriate card readers (Sunyaev et. al2009:28-29).

Denmark leads the way in European ehealth and patient-controlled health records (Cruickshack et.al2012) boasts a universal electronic health record system and of national patient health record (PHR) service available to any Danish citizen that allows the control to accesses and use medical information. Launched in 2003, the country's government-run patient health record portal is *Sundhed.dk*, the website where, citizens view treatments and diagnoses from the hospital patient record, book appointments with the general practitioner, renew prescription drugs, monitor own drug compliance, survey shortest waiting lists for operations and quality ratings of hospitals, register as organ donor, and get access to local disease management systems in out-patient clinics (Makori, Musoke and Gilbert 2013:4).Information system development until recently relied mainly on technical approaches, from assessing information needs to developing data analysis and presentation tools, and using information communication and technology, with little recognition of the effects of contextual issues. Information system is described as the set of related elements

without any consensus on defining and measuring the systems' performance. Attention is given neither to how people react to and use information systems for problem solving or self-regulating performance (behavioural factors), nor organizational processes for creating enabling environment for using and sustaining routine health information system. When attention is given to these factors, there is need to put them in a coherent framework to understand the effects on RHIS processes and not follow their performance only

2.4.4 Health Information Management Systems in Developing Countries

Health system strengthening is a global priority and one of the core components is the need to improve health information systems. World Health Organization describes these components as integrated efforts to collect, process, report and use health information and knowledge to influence policy making, program action and research (Global Health Action, 2014). Most health information systems in developing countries, in practice are complex and fragmented (AbouZahr and Boerma 2005: 578). This is caused by the way systems have been developed and evolved over time, in piecemeal fashion, in response to donor pressure or requirements of disease specific initiatives (HMN, 2008).

Developing countries are now waking up to the realization that there is need to embrace information and communication technologies to deal with the problem of access, quality and costs of healthcare. Adoption of ICT in health sector across developing countries accelerates knowledge diffusion and increase access to health information (Ojo et al., 2007) Videoconferencing tools have been deployed in Tunisia for tele-diagnosing while in Botswana there is extensive e-learning for AIDS programs by community health workers.

In Rwanda, efforts are on-going to connect the district hospitals with referral hospitals for the transfer of medical information. This is going to be very important especially in the area of teleradiology (Makori, Musoke and Gilbert 2013:5). The problems that exist in the health sectors of many developing countries such as high mortality and morbidity rates, high population, and lack of enough medical staff can be addressed by telemedicine adoption (Orlando, 2007).

Hospital information systems have enabled faster processing, storage and transfer of medical information between service providers in developing countries. A health information system prominently featuring in developing countries' e-health landscape is the one shared by Southern African countries including Botswana, South Africa, Mozambique, Tanzania, Ethiopia and Malawi. In Ghana, adoption of electronic health information technology, (EHIT) has become the integral part of the national health care delivery system. Reliance on EHIT seems poised to grow in the years to come due to the myriad of advantages derived from the capture, storage, retrieval and analysis of large volumes of protected health data, and from multiple sources, which is spread over a long period of time. (Alkins and Binka 2011:3).

There exists evidence to show that electronic medical records are gaining ground in the health sector in developing countries. For instance, the OpenMRS developed by the Regienstrief Institute and Partners in Health, provides a user-friendly interface for electronically storing medical data and has been very successful in Kenya. The Mosoroi Medical Record System (MMRS), which was implemented at a primary care rural health

center in Kenya, provides patient registration and patient visit records management with capability to handle information of over 60,000 patients (Sood *et. al* 2008:14). Other electronic medical records that have succeeded in developing countries include the Lilongwe HIS used for wide range of clinical problems in pediatric department of the Central Hospital in Malawi; Partners in Health (PIH)-HIS, Peru; HIV-HIS system, Haiti; Careware, Uganda; PEPFAR project, Tanzania; National HIS, project Zambia (Sood *et al*, 2008:14).

These electronic medical records require addressing of confidentiality, privacy and security issues for maximum acceptability by clinicians. The clinicians must also understand the benefits and how systems will impact on routines and business processes in hospitals, a challenge that can be overcome by including ICT in the curriculum of medical courses offered in developing countries, this is why the study seeks to establish the health information systems effectiveness among the healthcare workers.

2.5 Healthcare Workers Training and Efficiency

In Kenya, use of computers in hospitals has not been a widespread practice. Computerization of hospital services has been embraced in private hospitals more than the government hospitals. According to Huryk, (2010:10) several factors have been found to shape the attitudes of health care workers towards the use of computers. Age, educational level, years of experience and experience with computers has frequently been described as factors influencing attitudes towards computerization. In a study by Kivuti-Bitok, (2014:3) conducted in Kenyatta National hospital and Aga Khan University Hospital (AKUH) age

of nurses showed a statistically significant association with the attitude towards computerization. Within KNH nurses aged less than 40 years had higher attitude towards computerization than those groups above 40 years. In AKUH nurses aged 40 years and above had the lowest attitude.

ICT training among clinicians is cited as the key determinant of electronic health (Ochieng and Hosoi 2005:27; Marques et al, 2011: 91). ICT skills are required to foster positive attitudes about electronic medical records which translate to greater adoption of electronic medical records. Therefore developed countries in an effort to raise ICT skills amongst clinicians have incorporated ICT training in health courses offered at various academic levels. Sood et.al (2008:16) notes that, developed countries are using cutting edge technologies like 3D simulations, virtual reality and robotics to train clinicians and that ICT is included in the curriculum of medical courses. Availability of ICT skills amongst clinicians is likely to lead to the acceptance and actual use of e-health in primary healthcare. This is because clinicians with ICT skills are able to appreciate the possible benefits of ICT in execution and improvement of the various processes they are engaged in.

Training is also an important part of capacity development. If the intended training approach is not undertaken there will be lack of understanding of changes needed to accompany the innovation. Health management information system data collection, processing and information use assumes certain level of general education and specialist training amongst health workers, which is often not available, especially in smaller health

units in developing countries. Too few health management information system training for health unit personnel to grasp new skills such as data processing, compiling graphs and statistics then leads to unsuccessful skills and lack of the right capacity. This is why workers' skills should always be aligned with the health management information system, (Chetley, 2006).

2.5.1 Human Capacity and Training

Impact of human capacity and training, as any technology will be insufficient if people do not understand how to put it into effective use (Bridges, 2010). Lack of trained human resources for health is a major problem in health care systems in most developing countries (Chetley, 2006). The limited human resources and capacity available, both in terms of technical skills in how to use ICT, as well as high-level technical support skills to ensure setup and maintenance, have resulted in high reliance on external resources and experts. Such a reliance on external capacity drives ICT costs upwards, and also produces significant retention problems and lack of locally-qualified personnel.

In particular, however, it is not only the recipient country that needs capacity development and training in the use of ICT. As demonstrated in Vanuatu (Khazei et. al2005: 38), international eHealth consultants must know what local resources are available and have an understanding of the conditions of the country they are providing information to (for example, standard treatment protocols and availability of various drugs and diagnostics). Overall, while technology can provide a link to information and

knowledge, the critical factor in all ICT initiatives is human resources and capacity for effectiveness in its use (Keke, 2007:14).

2.6 Health Information Systems Challenges

Given the high failure rate and the very visible and often politically embarrassing failure of many health ICT projects, there has been substantial academic and industry research on the factors that cause such systems to fail. Health systems are significantly different from other information system environments, due to complexity, lack of one single 'owner', and 'hyper turbulent' and 'information sensitive' nature (Al-Ahmad et.al 2009). Lack of senior management support is often cited as number one cause of project failures in ICT, and this is particularly the case in health ICT projects. In the 10 years since Dorsey (2000) published the report stating that almost every study to-date had identified top management support as the key factor in project success, it would appear that very little has changed.

Any worthwhile project causes disruption within the organization and challenges existing interests and practices. If senior management are not committed to the project and willing to undergo the difficulties involved in overcoming the internal and external barriers then the project is almost certain to fail. Lack of engagement of clinicians and other end-users remains the critical factor in the ultimate success or failure of the ICT project. In research on lessons learned from telehealth projects, Elder & Clarke, (2007) remark that, the fundamental issue pervading the continued failure of ICT projects in health is the lack of focus on the end-user. The internal dynamics of clinical organisations are quite different from those of other businesses. In the bank, for example, management can enforce the introduction of new

systems even if the end-users are opposed. In a clinical setting, doctors who have not been engaged in the introduction of new technology, who feel the systems waste the time or affect patient safety, can refuse to use the technology and often have the organisational power, even if informal, to have their wishes implemented.

The introduction of new ICT systems usually requires the introduction of new ways of working, new staff skills, new roles and may require organisational restructure. In general, people are resistant to such changes especially if issues of being threatened by the system remain unsolved. Health information systems not only deal with complex clinical information technologies, medical science, research and practices (Al-Ahmad et al 2009), but are often fragmented, disorganized and do not operate or progress as a coherent whole (HMN, 2008). Frequently, technology companies coming into the health domain underestimate its complexity and proceed on the assumption that if something has worked in another domain then it should be possible to achieve the same in health.

The under-investment in human resource capacity-building is a critical factor in the continued failure of ICT projects in health. As discussed by the UN agency on ICT for development (UNAPCICT, 2010), many proponents of ICT mistakenly assume that such projects are only about hardware, networking, software and applications; however a substantial amount of human activity is required when dealing with ICT. Challenges with equipment, infrastructure and connectivity, no online consultations are ever made, and despite the considerable investment made to the project, no direct benefits to the health of the rural population were observed.

One of the most common causes of ICT failure is the temptation to leapfrog certain aspects of the development path, in an attempt to decrease the gap between developed and developing countries (Avgerou, 2008). Technology offers attractive means to bypass some processes in the accumulation of human or system capabilities, Technology rarely stands independently; rather, it is embedded in a system of complementary technologies and capabilities and requires three key elements for success, people, process, and technology (Cleverley, 2009, and UNAPCICT, 2010).

If ICT is to be used to provide information at the right time and when required, key elements must be understood including what to collect, where to collect, whom to report to, and how the information will be used and by whom (Sinha ,2010). Technology needs to be appropriate to the capacity and maturity of the health system, this includes human and technological maturity, 'if you automate a mess, you'll get an automated mess' (USEPA, 2012).

2.6.1 Health Information Security Issues

In spite of many attempts in providing security in health information system, data security breaches in health care organizations have continued to increase and number of threats in this area has increased dramatically (Brady, 2011:6). Studies show that between 2006 and 2007 in hospitals alone, more than 1.5 million names were exposed to data breaches (HIMSS Analytics, 2008).

In addition, the results of 2010 healthcare information and management systems society security survey suggests that the reports of more than 110 healthcare organizations have shown the loss of sensitive protected health information. Personal identifying information affected over 5,306,000 individuals since January 2008 and damages from patient information lost top \$6 billion per year in 2010 (Sedlack and Tejay 2011). The report showed they were received as theft (stolen laptops, computers, or media), loss or negligence by employees or third parties, malicious insiders, system hacks, web exposure, and virus attacks (HIMSS Analytics, 2010). Some researchers categorized risks to hospitals information as the internal or external threats and found that employees' ignorance, curiosity, recklessness, inadequate behavior, using someone else's password and giving the password to other employees are some of the internal threats to health information system.

Viruses and spyware attacks, hackers and intruders are placed as external threat to information system (Samy et. al, 2011:8-9). Most organizations however, tend to focus on the vulnerabilities to external threats and have used technical solutions to improve the security of their information system (Parks *et al*, 2011). Most internal security breaches in health information systems continue to occur by legitimate users. People's behavior is a major source of threats to the various information systems so; security cannot be achieved only through technological tools (Herath and Rao, 2009: 159). According to Sood et al, (2008), information security is more of human problem than a technical problem. In this kind of scenario non-technological aspects of information security such as education and awareness must be considered together with technical aspects. Bakhtiyari, Shahri&Ismail

(2012a:2) identified more than 70 threats to health information system and have proved that threats caused by human in the role of users' technology play a big proportion in many threats to the system. (Asai and Fernando, (2011:128) prove that, human factors are the cause of 80% of privacy breach incidents, and (Eminağaoğlu et.al 2009:225) also confirm that human errors have a large proportion in privacy breaches in the United States.

In addition, published academic of Global Security Survey by Deloitte (2007), found that 91% of participants are concerned about the employees' security weaknesses, and that human factors known as the main reason of the information security failures by 79% of participants (Padayachee, 2012:31). Moreover, most people do not feel hurt nor see any threat (Asai and Fernando, 2011:117). As a result, health information systems users need to be informed and educated about the risk perception biases and understands the magnitude or implications of potential security breaches.

2.7 Conceptual Framework

The conceptual framework in this study uses the attributes of the updated DeLone and McLean (D&M) information system success model which are also the key success factors for successful implementation (Zaied, 2012); the researcher has also modified the model and included other parameters for evaluation that are important for this study including management support, training, perceived usefulness. It also uses aspects of TAM model (Davis, 1989) to determine the adoption factor and effectiveness of HIS systems. These parameters include: system effectiveness, relevance, training of healthcare workers and challenges as discussed in the literature review.

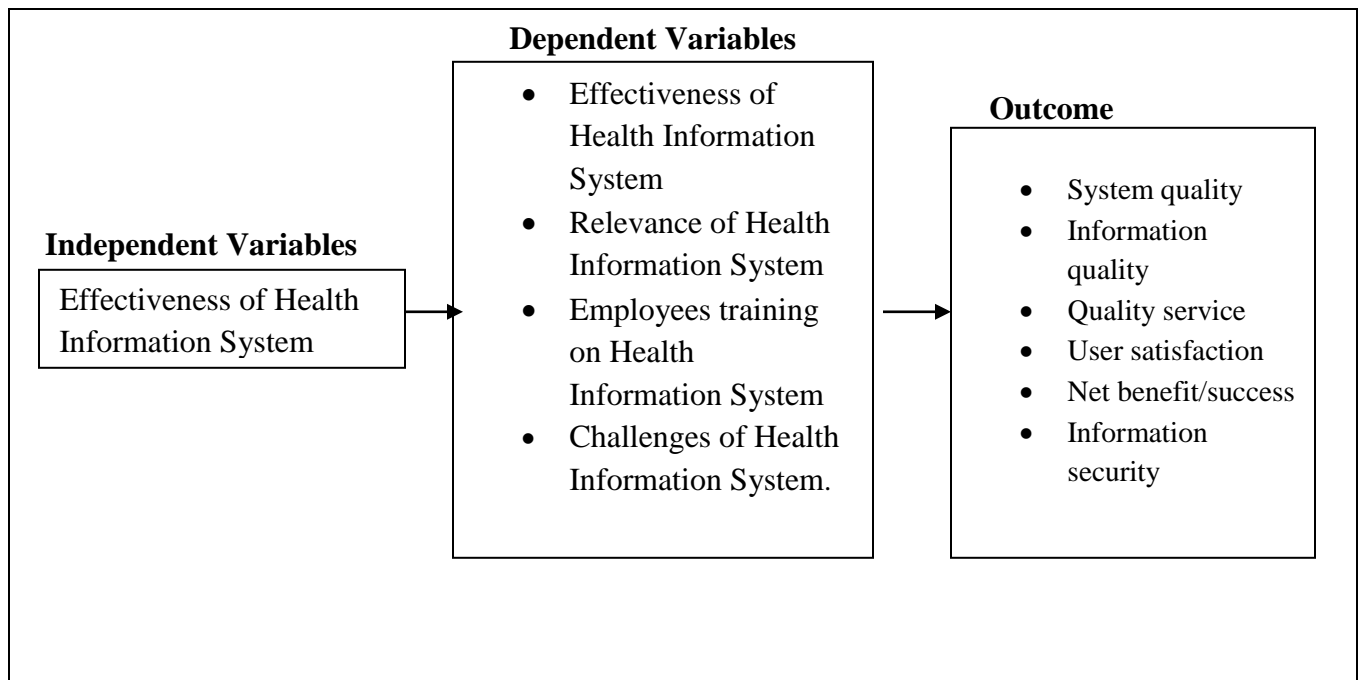


Figure 2.1: Conceptual Framework (Researcher, 2015)

2.8 Knowledge Gaps

Every healthcare organization depends on ICT in every level of activities. Nowadays, the healthcare relies on process application and information streamline to create value for every facet of its delivery. The aim of this study is to briefly summarize on the past and current health information systems and identify few emerging trends and research in health information system. The foremost observations to be drawn from previous sections include; concepts and terminologies related to health information systems' field, history of several generations of health information system, and concluded with the recent trend and development of tools and technologies in creating and managing health information system.

The vision of paperless hospital is delineated as the embodiment of the future health information systems with the hope that brings improvement, and Promises reliable effective and efficient. The current status of health varies among countries. There are 193 countries that are members of World Health Organization in 2009; with 114 participating in the global survey on e-health (WHO, 2011). Most developed countries have fully utilized health information system due to the available resources, expertise, and capital to implement solutions, although developing countries have not been fully utilized. In the competitive commercial healthcare environment, negative experiences, and poor service leads customers to switch healthcare providers because poor service indicates inefficiency, higher cost and lower quality of care. No doubt, the adoption of health information system is believed to boost effectiveness and efficiency in healthcare organizations.

Several examples of countries that have implemented health information system are Canada, Singapore and Australia. Canada established e-health Ontario in March 2009 with three targeted strategies to improve; diabetes management, medication management and wait times. One of the examples of the service offered is e-prescribing under the medication management that authorizes and transmits prescriptions from physicians and other prescribers to pharmacists and other dispensers (e-Health Ontario, 2009).

2.9Chapter Summary

The chapter has provided comprehensive and detailed information in relation to the area of study organized into various sections and subsections. This was guided by the objectives of the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter briefly describes the procedure that was taken in accomplishing the study. The chapter highlights the research design, target population, description of research instruments, sampling procedures, and description of data collection and data analysis procedures.

3.2 Research Design

Research design refers to the way the study was planned and conducted (Polonsky &Weller, 2009:14). The procedure and techniques employed to answer the research problem explains the pattern the study intended to follow so as to control variance due to independent variables, eliminate or reduce influence of extraneous variables, minimize error variance and at the same time ensure that the findings can be tested for significance.

The research design was a comparative study. The study was concerned with examining use of the hospital information management system in two hospitals a public and private. Routine information system functioning deal with data quality and is characterized by the relevance, accuracy, timeliness, and completeness of data. While health information systems performance looks at decision maker's use of information in policymaking, planning, management, and service delivery. It thus looks at relationship between availability of data and its determinants on one hand and use (outputs) and performance (outcomes) on the other. Such relationship is best investigated using a case study which

gives more insight into what is happening in a larger or bigger population. This study was conducted through descriptive survey research design approach. Survey design describes and explains the events in the real life context and occurrence (Polonsky & Weller, (2009:13).Qualitative and quantitative research design was used in this study to explore and understand peoples people beliefs, attitude behavior and interaction (qualitative) and to give systematic empirical investigation of social phenomena using statistical or numerical data or computation techniques (quantitative).

3.3 Area of Study

The study was conducted in two selected hospitals private and public hospitals .Mater is a private hospital and Kenyatta is a public hospital. This provides a cross sectional information of hospitals in public and private institutions.

3.4 Target Population

Population is a large collection of all subjects from where a sample is drawn (Zikmund, Babin Carr and Griffin 2012). The target population or the unit of observation is a group of individuals, or objects that a sample is drawn for measurement (Kombo and Troomp 2009).The study target population was all healthcare workers working in Mater and Kenyatta National Hospital in Nairobi County. The study population was based on departments in the hospitals. The departments include outpatients, inpatient, theatre, laboratory, stores, clinics and administrative. These departments are focal points for decision making. The target population therefore included the following cadre of staff; doctors, dentists, nurses, health records officers, laboratory and other ancillary staff. The

target population was chosen because they are the health care workers who are routinely involved with the management of health system functioning and performance in the county and have regularly contact with hospital information system. The study involved those who were at work at the time. All the healthcare workers were eligible to be involved in the study apart from those where on leave during the study period. The target population was 386 health care workers who use health information system in both hospitals.

3.5 Sample and Sampling Techniques

3.5.1 Sample Size

Sample size entails the number of participants chosen from the whole population to participate in a research or study (Ngoaka, 2011). Purpose sampling was used in the study so as to focus on particular characteristic of the population that are of interest. The primary consideration in purpose sampling is to draw on who can who can provide the best information to achieve the objectives of the study (Kumar, 2005:79).This method was ideal for this study because of the small size of target population, this enable the researcher get in-depth information rather than generalized information on the understanding of the research questions.

The sample size for research was based on healthcare workers using the hospital information system. From a total population of 193 health care employees in Kenyatta National Hospital using hospital information system 60 were chosen for the study. In Mater Hospital from a total population of 193 health care workers using the health system

60 were chosen, making a total of 120 respondents. Stratified Purposive sampling technique was adopted to illustrate the characteristics of particular subgroups of interest in the two hospitals and facilitate comparison in order to get information from various strata groups. The sample size involved in the study is shown in the table below.

Table 1: Sample Size Ratio

Departments	Kenyatta Hospital		Mater Hospital	
	Population size	Sample Size	Population Size	Sample Size
Nursing	24	7	24	7
Doctors	24	7	24	7
Laboratory	20	6	20	6
Dental	15	5	15	5
Pharmacy	15	5	15	5
Physiotherapy	15	5	15	5
Radiology	15	5	15	5
Procurement	15	5	15	5
IT Department	10	3	10	3
Registration/Administration	10	3	10	3
Medical records	10	3	10	3
Human Resources	10	3	10	3
Finance	10	3	10	3
TOTAL	193	60	193	60

3.5.2 Sampling Technique

To sample 120 interviewees, a stratified random sampling and purposive sampling techniques was used. The healthcare workers were stratified into the different departments according to their operations. This is because it provides equal chances to every sample of a given size in the accessible population. According to Kothari (2013:59), in stratified sampling, you first divide the population into subpopulation (strata) on the basis of supplementary information, and then draw samples randomly within the strata. So as to achieve a representation from every department. This study used the stratified random

sampling to select the 120 respondents. Mugenda & Mugenda, (2013:47 supports that 30% of the total population is enough to act as representative sample in a case study. In purposive sampling you decide the purpose you want respondents to serve and you go out to find some. Purposive sampling relies on the researcher's use of good judgment to hand pick those subjects that will satisfy the needs of the research (Hoyle et. al, 2000) .Purposive sampling was therefore used to select the individual respondents using the hospital information system in both hospitals and from each stratum to attain the required 60 from KNH and 60 from Mater.

3.6 Data Collection Methods

Data collection is the process of gathering and measuring information related to the study that helps in answering the research questions. The methods are varied in terms of time, cost of money or other resources at disposal of researcher (Orodho, 2008). The methods include questionnaires, personal interviews that are face to face or through the telephone. This study used semi structured questionnaire which were self-administered to obtain the primary data. The main tools used for collecting data in this study were questionnaires and documentary reviews. The study aimed at describing the situation in terms of practices, opinions and attitudes and thus the questionnaire was deemed the method to collect this kind of data.

3.6.1. Questionnaires

A questionnaire was deemed appropriate for the study as it will give an opportunity to carry out an inquiry on specific issues on a large sample and make the study findings

more dependable and reliable (Kothari, 2013:101).The questionnaire divided into sections, the first part sought to gather demographic information of the respondents and the other sections aided in responding to the specific research questions of the study. The questionnaires were self-administered by the researcher so as to collect relevant information relevant for the study. Open ended and closed ended questions were used on the healthcare worker in both Mater and Kenyatta national hospitals.

3.6.2 Documentary Reviews

The study utilized internet tools such as yahoo, Google scholar, HINARI health information data base and scholarly reviewed journals to carry out document analysis of literature and content written on hospital information management systems and compare the current trend on other comparative studies carried out on hospital information management systems.

3.7 Research Instruments

3.7.1 Pilot Study

A pilot test is conducted to detect weaknesses in the design, instrumentation and provide proxy data for probability sample (Kothari, 2013:27). It helps to validate the instruments consistency formatting wise and the respondents understanding (Bryman. 2012). The procedures used to pre-test the questionnaire will be identical with those that will be used during the actual study. The sample is usually small 10% of the target population (Connelly, 2008). In this study a pilot study was conducted in Nairobi hospital on 10

respondents after which two weeks the same instruments were administered to same respondents. The two results were subjected to correlation test using Cronbach Alpha.

3.7.2 Validity

Validity is the degree to which an instrument measures what it is expected to measure (Bryman, 2012). Validity of the study was tested through administering questionnaires to a small group of respondents who do not form part of the study to validate the information collected. The questionnaire for this study was carefully prepared to ensure it covers all the research objectives and address all the issues under investigation.

3.7.3 Reliability

According to Ng'ang'a *et. al* (2009:55) an instrument is considered reliable when it is able to elicit the same responses each time it is administered. Reliability is the consistency of measurement (Abbot & McKinney, 2013) despite the changing conditions. The reliability of the tools of data collection was conducted during the pilot study to determine where the results produced are achievable and consistent. This helped to determine whether the questionnaire was capable of yielding similar result to the same kind of people in a different occasion.

3.8 Data Collection Procedures

The study was based on primary data collected from the field using questionnaire. The main data collection instrument was the questionnaire administered to the sampled respondents. The respondents were requested to read the questions and complete the

questionnaire and return it at the end of the activity. Prior to applying the data tools, the researcher went to seek permission formally from the ethics and research committees in both Mater and Kenyatta hospitals for approval and authorization to carry out the research. According to Garaba (2010:162) questionnaires exist in different formats. They can either be self-administered, online, posted or mail-based, interview-administered, telephonic or interview schedules (Czaja & Blair (2005:36). The most popular are self-administered and researcher administered questionnaires. Researcher administered structured questionnaires were given to the 120 staff selected as respondents in both hospitals. The researcher was present to interpret the questions to the respondents and leave with the questionnaires. The administration of questionnaire was conducted in their units of work with the help of the unit in-charges. Qualitative data was collected from all 120 respondents out of 386 health care workers during the study period. Questionnaires are relatively inexpensive and allow a large number of respondents to be surveyed in a relatively short period of time even if the respondents are widely distributed geographically (Williams, 2006:88).

3.9 Data Analysis and Presentation

Before processing responses data was scrutinized for completeness and consistence. Data was then coded to enable the responses be grouped into various strata's. The classified data was tabulated into tables and columns and rows. Since the study was qualitative, data was summarized and presented by use of Statistical Package for Social Science (SPSS) in accordance to the objectives of the study. The Qualitative approach includes tables, pie charts graphs among others. The findings in this study were presented using tables and

charts, percentages, tabulations, means and other measures of central tendency. Tables were used to summarize responses for further analysis and facilitate comparison. For this study, the researcher was interested in finding out the use of hospital information management system in both Kenyatta National Hospital and Mater Hospital as a comparative study.

3.10 Ethical Considerations

Research ethics refers to the appropriateness of researcher's behavior in relation to the rights of those who become the subjects of the study work, or are affected by it Ng'ang'a *et. al* (2009:64). The appropriateness and acceptability of behavior as researchers affects broader social norms of behavior. Before the commencement of the study ethical approval was sought and granted in both Mater and Kenyatta hospitals. Copy of approval and authority letter from University guided the study.

3.11 Chapter Summary

The chapter described the research methodology of the study, explained the sample selection, described the procedures used in designing the instrument and collecting the data, and provided an explanation of the statistical procedures used to analyze the data. The chapter also sought the validity and reliability of the study. The area of pilot study was also indicated, ethical issues were considered, confidentiality of information adhered to and data analysis and presentation in relation to research questions and objectives stated

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter outlines the data presentation, data analysis, results and discussion the study. The study used questionnaires and documentary reviews to obtain the data and information. The study aimed at assessing the use of hospital information management systems among healthcare workers at Mater and Kenyatta National Hospitals. To attain this, the study was grounded on five objectives which were to: Assess the use of the hospital information systems in the two hospitals; Establish the extent to which the hospital information system provides accurate and relevant patient information; find out the perception of the healthcare workers towards the system; Find out the challenges faced in the use of hospital information management systems in the hospitals; Suggest possible solutions to improve the system in the hospitals. Therefore, the chapter presents data collected from primary sources based on five main thematic areas of the study and also based on the objectives and research questions of this research study.

4.2 Response Rate of Respondents

The study targeted a total of 120 respondents, 60 in each hospital. Mainly they were all healthcare workers in both Kenyatta and Mater hospitals. From the total population, the study used questionnaires on 120 respondents of which 49 were responded to and returned from Kenyatta and 55 from Mater .The total returned sample size was 104 respondents: 8 Doctors, 16 nurses, 13 Technicians and 67 other professionals. The overall

response rate for both hospitals was (86.67%) which was adequate for the study. Findings are tabulated in Table 2 below.

Table 2: Response Rate of Respondents

Institution	Distributed	Returned	Percent
Kenyatta National Hospital	60	49	47.12
Mater Hospital	60	55	52.88
TOTAL	120	104	100.00

4.3. Background Information of Respondents

The study sought to inquire information on various aspects of the respondents' background in terms of professional expertise, educational level and working experience. This aimed at testing the appropriateness of respondents in answering the questions regarding the use of hospital information management system in both Kenyatta and Mater hospitals.

4.3.1 Professional Expertise

The findings indicate Doctors level in Kenyatta Hospital at (4.1%) and Mater Hospital (10.9 %). As indicated in the questionnaire the doctors module in Kenyatta is not yet implemented making the response rate lower than Mater. At the nurse level, Kenyatta has (14.3%) and Mater (16.4 %), in this cadre Mater had higher respondent's percentage of nurses than Kenyatta. In other cadres besides doctors and nurses Kenyatta has a higher percentage of technicians (69.4%) higher than Mater (60%). The response rate for doctors in Kenyatta was low in this study due to the fact that the module for doctors had not yet been installed, meaning very few doctors participated in the study. Nurse's response rate

in Kenyatta Hospital was also low because of hitches of time to fill the questionnaire due to big numbers of patients in the wards. Others were not willing to participate in the exercise all together. Overall Kenyatta Hospital has shown to have more professionals in other cadres; these were indicated as radiologist, physiotherapists, and dentist. The findings are shown in Table3 below.

Table 3: Professional Expertise

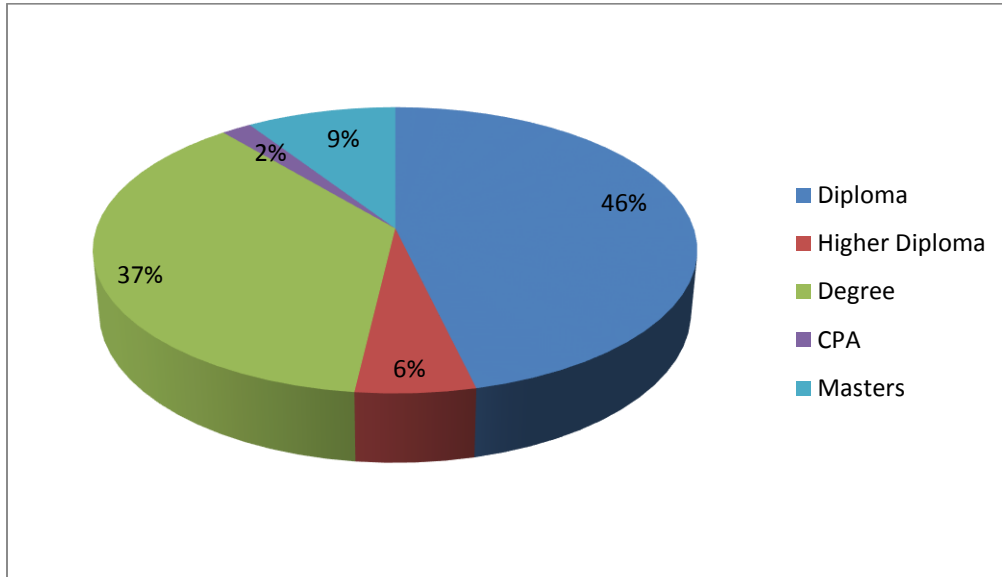
Professional Expertise	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Doctor	6	10.9	2	4.1
Nurse	9	16.4	7	14.3
Technician	7	12.7	6	12.2
Others	33	60	34	69.4
TOTAL	55	100	49	100

4.3.2 Highest Level of Education

The findings indicated diploma holders formed nearly half of the respondents. Degree holders are a third of the population. Mater Hospital has no employee with certificate level of education; it has outdone Kenyatta Hospital with regards to percentage of degree holders and has higher percentage of those with masters. In other cadres Kenyatta Hospital has higher percentages than Mater Hospital. The results indicate Mater has higher percentages of professional experts than Kenyatta but as mentioned earlier the response rate for doctors and nurses in Kenyatta was lower compared to Mater Hospital. A good number of nurses in Kenyatta indicated they had no time to fill the questionnaire and others didn't want to participate in the study. These hitches could have affected the

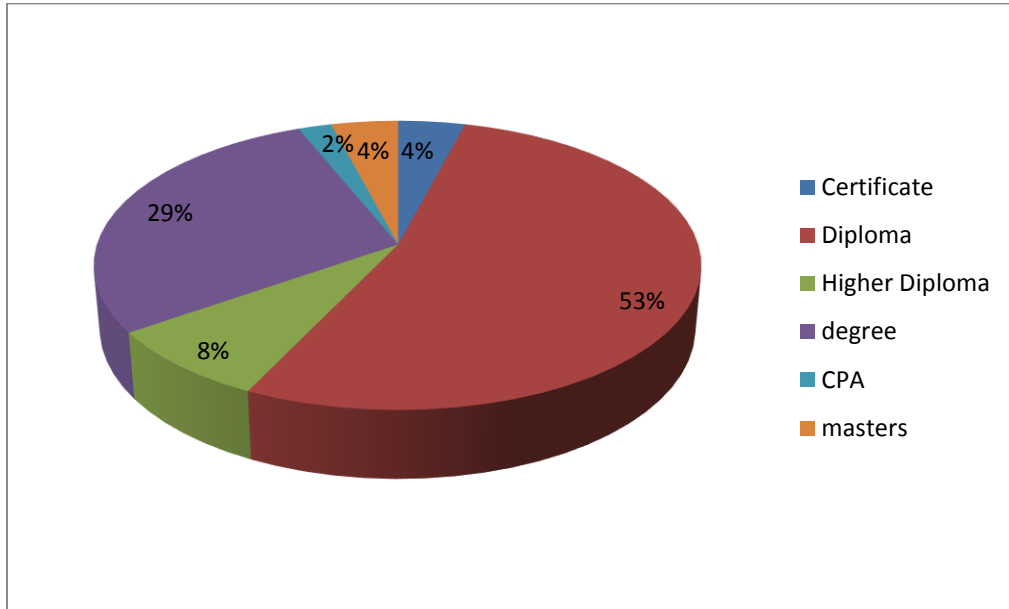
results of the study and given Mater Hospital higher percentages than Kenyatta Hospital. The findings are shown in Figure2 below.

Figure 2: Education Distribution for Mater Hospital



Kenyatta Hospital as indicated in Figure 3 page 48 below has 29% certificate holders and more than fifty percent percentage at diploma level (53%). As shown in the results it can be concluded that Mater Hospital has more healthcare workers with higher education levels than Kenyatta Hospital. These results could have reflected differently if the doctor's module in Kenyatta Hospital had been implemented and working. Few doctors participated in this study because of that hitch.

Figure 3: Education Distribution for Kenyatta Hospital



4.3.3 Working Experience

Majority of respondents in both hospitals have working experience of 1-10 years, Mater Hospital has a slightly higher percentage at 67.27% and Kenyatta at 58.33%. Kenyatta hospital has overall more experienced workers with 11-20 years at 30% and Mater hospital at 21.82%. Those with over 20 years' experience in both hospitals were almost at the same level, Mater had 10.91% and Kenyatta 7.77%. Results are indicated in Table 4 page 49 below.

Table 4: Working Experience Distribution

Experience (years)	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
1-10	37	67.27	28	58.33
11-20	12	21.82	18	37.5
21-31	6	10.91	2	4.17
TOTAL	55	100	48	100

4.4 Use of Hospital Information Management System

The respondents were asked to indicate the various ways the hospital information management system is used in their respective institution and the kind of data generated. The purpose for the ten questions asked in this section was to find out the use of the hospital information management system in the two hospitals and the type of data the system is able to generate. This being one of the objectives of the study the researcher sort to establish how the system in both hospital are being utilized. One and nine respondents at Mater Hospital and Kenyatta Hospital respectively found the question not applicable. In Mater Hospital a total of (88.9%) respondents indicated the system is easy to use against (7.41%) neutral and (3.7%) who disagreed. Kenyatta Hospital respondents agreed (55%) the system is easy to use, (40%) were neutral and (5%) indicated the system is not easy to use. The results imply overall Mater Hospital healthcare workers find the system in use easy for them to use than the Kenyatta Hospital healthcare workers. The findings are tabulated in Table 5 page 50 below.

Table 5: System was Easy or Hard to Use

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	0	0	1	2.5
Disagree	2	3.7	1	2.5
Neutral	4	7.41	16	40
Agree	32	59.26	19	47.5
Strongly Agree	16	29.63	3	7.5
TOTAL	54	100	40	100

4.4.1 System Functionality in Accessing Services

The study sought to find out whether the hospital information management system in use in both Kenyatta Hospital and Mater Hospitals is providing more functionality for accessing services. This was important in order to establish whether the system in use in both hospitals is providing different functions to the users. One and eight respondents at Mater and Kenyatta Hospitals respectively indicated the question was not applicable. Mater Hospital respondents agreed more to the system providing more functions (88.89%), (7.41%) neutral, and (3.7%) disagreed. Kenyatta Hospital respondents (31.71%) agreed the system is providing more functions, (31%) neutral, and (36.59%) disagreed. The results indicate Mater Hospital information system provides more functions for the users than the System in use in Kenyatta Hospital. The findings are a tabulated below in Table 6.

Table 6: Functionality for Accessing Services

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree				
Disagree	2	3.7	15	36.59
Neutral	4	7.41	13	31.71
Agree	33	61.11	11	26.83
Strongly Agree	15	27.78	2	4.88
TOTAL	54	100	41	100

4.4.2 Use and Access of in/out Patient Information

The study sought to establish if the system in use in both hospitals enables use and access of in/out patient information. This was important question in helping established where the system is integrated and enables access of both in/out patient information to the users both Kenyatta and Mater Hospitals. One and eight respondents at Mater and Kenyatta Hospital respectively indicated the question was not applicable. The study found out (74.08%) of respondents in Mater Hospital agreed the system enables them access both in/out patient information, (24.07%) neutral and(2%) disagreed. Kenyatta Hospital respondents (26.83%) agreed the system provides access to the patient in/out patient information, (41.46%) neutral and (31%) disagreed. The analysis implies Mater Hospital has a more integrated system providing access to in and out patient's information. Kenyatta hospital a third of the respondents disagreed to the system in use providing in/out patient information. The results are tabulated in Table 7 page 52 below.

Table 7: Enables Use and Access of in/out Patient Information

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree			1	2.44
Disagree	1	1.85	12	29.27
Neutral	13	24.07	17	41.46
Agree	26	48.15	7	17.07
Strongly Agree	14	25.93	4	9.76
TOTAL	54	100	41	100

4.4.3 Systems Quality of Service

Respondents were asked to indicate whether the system has improved the quality of service in their respective intuitions. The purpose for this question was to establish the quality of service the hospital information management system is providing the users in both hospitals. One and eight respondents at Mater and Kenyatta Hospital respectively found the question not applicable. In Mater Hospital the study found that (66.67%) agreed the system has improved the quality of service, (29.63%) were neutral, and (3.7%) disagreed. In Kenyatta Hospital the study found out 53.66% agreed the system has improved quality of service, (14.63%) were neutral and (31.71%) disagreed. The analysis indicates in both hospitals more than fifty percent agree the system has improved quality of service. Kenyatta may have had a lower percent agreeing because some respondents' indicated the system is not fully implemented in some areas. The findings are tabulated below in Table 8.

Table 8: System Improved Quality of Service

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	1	1.85	1	2.44
Disagree	1	1.85	12	29.27
Neutral	16	29.63	6	14.63
Agree	19	35.19	17	41.46
Strongly Agree	17	31.48	5	12.2
TOTAL	54	100	41	100

4.4.4 Disease Notification Data

The respondents were asked if the hospital information management system provides disease notification data. The purpose of the question was to determine the kind of data generated by the system. In a situation where there is a contagious disease outbreak the system can be used to give the number of patients affected and treated in the respective Hospitals. However, one and eight respondents at Mater and Kenyatta Hospital respectively found the question to not applicable. The findings were (50%) of respondents in Mater Hospital agreed the system provides notification data, 37.04% were neutral and (12.96%) disagreed. In Kenyatta Hospital (29.27%) agreed that the system provides disease notification, (65.88%) were neutral and (4.88%) disagreed. According to the results Mater respondents are more certain the system can provide disease notification data when required. In Kenyatta Hospital over sixty percent respondents were neutral on this aspect of the system meaning they are not sure whether the system would provide diseases' notification data. The findings are tabulated in Table 9 page 54 below.

Table 9: Provides Disease Notification Data

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	1	1.85		
Disagree	6	11.11	2	4.88
Neutral	20	37.04	27	65.85
Agree	18	33.33	11	26.83
Strongly Agree	9	16.67	1	2.44
TOTAL	54	100	41	100

4.4.5 Epidemiological Data

The respondents were asked whether the system provides epidemiological notification data. The purpose of this question was to determine whether the system can provide notification alerts when disease epidemics occur. Two and eight respondents at Mater and Kenyatta Hospital respectively found the question not applicable. The findings indicate that, (44.44%) in Mater Hospital agreed it can provide the data, (37.04%) were neutral and (16.6%) disagreed. In Kenyatta Hospital (43.9%) agreed the system can provide the data, (46.34%) were neutral and (9.76%) disagreed. The results show both hospitals having higher percentage of respondents not sure whether the system can provide epidemiological data. This implies in both hospitals respondents are not certain whether the system can provide epidemiological data. The findings are tabulated in Table 10 page 55 below.

Table 10: Provides Epidemiological Data

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	2	3.7		
Disagree	7	12.96	4	9.76
Neutral	20	37.04	19	46.34
Agree	13	24.07	16	39.02
Strongly Agree	11	20.37	2	4.88
TOTAL	53	100	41	100

4.4.6 System Financial Imperatives

The study sought to determine whether the system manages the financial imperatives in two hospitals. This was important as it helped establish how well the system is used in managing the charging of service being offered to the patient and other financial aspects in the two hospitals. One and eight respondents at Mater and Kenyatta Hospital respectively found the question not applicable. The findings indicate (77.77%) respondents in Mater Hospital agreed the system manages the finances imperatives and (85.36%) in Kenyatta Hospital equally agreed to the same. This close similarity between respondents in both hospitals indicates they agree the systems in use in both hospitals are managing the financial imperatives in both hospitals. Results are tabulated in Table 11 page 56 below.

Table 11: Manages Financial Imperatives

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	1	1.85	1	2.44
Disagree				
Neutral	11	20.37	5	12.2
Agree	18	33.33	7	17.07
Strongly Agree	24	44.44	28	68.29
TOTAL	54	100	41	100

4.4.7 Patient Information Security

The study also sought to find extent which the hospital information management system has improved on the patient information security in both hospitals. The purpose of this question was to establish the security of patient’s information in the system. It is noted that, one and eight respondents at Mater and Kenyatta Hospital respectively found the question not applicable. In Mater Hospital (75.93%) agreed the system has improved on patient’s information security, (20.37%) neutral and (3.7%) disagreed. Kenyatta Hospital,(31.71%) agreed the patients information is secure, (53.66%) neutral and (14.63%) disagreed. The result implies respondents in Mater Hospital agree strongly the patients’ information is secured by the system. The system in use in Mater Hospital as security parameters that ensure patient information is well secured and cannot be accessed by unauthorized persons. Over fifty percent of respondents in Kenyatta Hospital were neutral regarding this aspect of the system which implies they are not certain about the patient information security.

Table 12: System Improvements on Patient Information Security

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	2	3.7		
Disagree			6	14.63
Neutral	11	20.37	22	53.66
Agree	21	38.89	11	26.83
Strongly Agree	20	37.04	2	4.88
TOTAL	54	100	41	100

4.4.8 Accuracy and Relevance of information

One of the objectives of the study was to establish the accuracy and relevance of the information the hospital information management system provides in both hospitals. The purpose of this question was to establish the accuracy and relevance of the information provided by the system. One and eight respondents at Mater and Kenyatta Hospital respectively found the question to not applicable .The study found out (83.33%) respondents in Mater Hospital agreed information provided is relevant and accurate. Kenyatta hospital only (26.83%) agreed on the same. Majority 60.98% Kenyatta respondents were neutral and (14.8%) in Mater. Kenyatta Hospital (12.2%) disagreed and (1.85%) in Mater Hospital. The result implies Mater Hospital system is providing accurate and relevant information. While in Kenyatta Hospital over sixty percent respondents were neutral. As earlier mentioned the respondents in Kenyatta Hospital indicated the system not yet implemented in the whole hospital which means it not yet a fully integrated system. The results are tabulated below in Table 13.

Table 13: Provides Accurate and Relevant Information

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	1	1.85	5	12.2
Neutral	8	14.81	25	60.98
Agree	27	50	6	14.63
Strongly Agree	18	33.33	5	12.2
TOTAL	54	100	41	100

The study sought to establish the timeliness and relevance of data the system provided. This question was important in finding out how relevant and timely data provided by the system was to the system users. As a result, one and eight respondents at Mater and Kenyatta Hospital respectively found the question not applicable. Respondents from Mater Hospital agreed (70.37%), (neutral (25.93%) and (3.7%) disagreed. Kenyatta Hospital respondents (26.83%) agreed the system provides accurate and relevant patient information, (26.83%) neutral and (46.34%) disagreed. The findings imply Mater Hospital system provides timely and relevant data for users. Kenyatta Hospital almost half of the respondents did not agree the system provides relevant and timely data. This could be the case because respondents indicated the system is not fully integrated in the whole hospital. Results are tabulated in Table 14 page 59 below.

Table 14: Provides Timely Relevant Data

	Mater Hospital		Kenyatta Hospital	
	Frequency	Percent	Frequency	Percent
Strongly Disagree	1	1.85	1	2.44
Disagree	1	1.85	18	43.9
Neutral	14	25.93	11	26.83
Agree	21	38.89	6	14.63
Strongly Agree	17	31.48	5	12.2
TOTAL	54	100	41	100

4.5 Strengths of Hospital Information Management System

The study sought to find out the strength of hospital information management system in both Mater and Kenyatta Hospitals. The purpose for questions was to establish the strengths of the system in both hospitals. From the findings (70%) of the respondent in Mater Hospital agreed the system is more friendly than paper based and (64 %) Kenyatta Hospital respondents had similar opinion. The study also found out (14%) respondents in Mater indicated the system has a centralized resource planning function while (18%) Kenyatta respondents agreed on the same. The analysis below Table 15 also show (42%) Mater Hospital respondents indicated the system is easier and quick in accessing patient information and (44%) Kenyatta Hospital respondent also concurred. The results show that Mater and Kenyatta Hospital respondents agree strongly the system is friendlier than paper based system. The results are tabulated in Table 15 page 60 below.

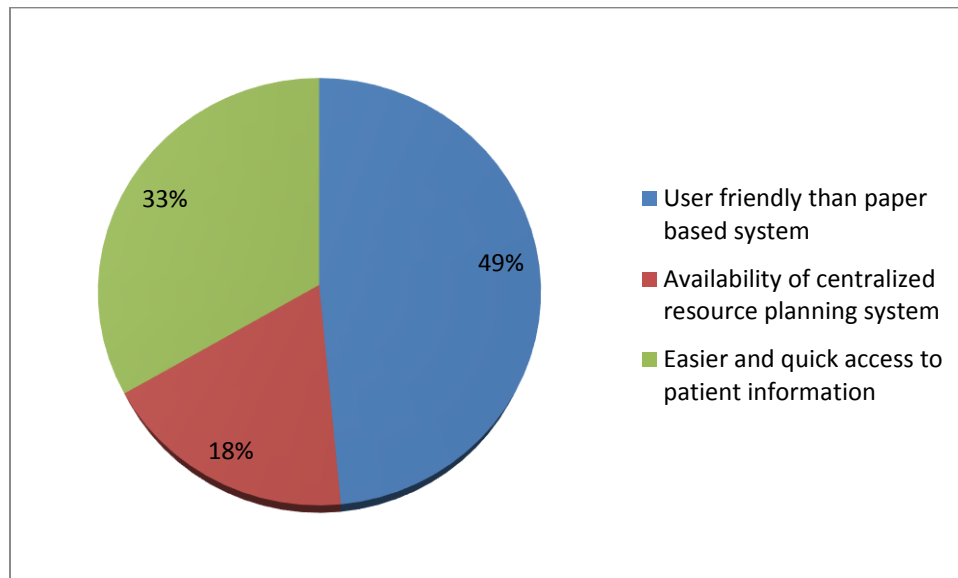
Table 15: Strengths of Hospital Information Management System

Strengths of HIMS	Mater Hospital	Kenyatta Hospital
	Frequency	Frequency
User Friendly	30	34
Availability of system	6	18
Access to information	7	37

The analysis shows a total of 30 and 34 respondents in Mater and Kenyatta Hospitals respectively find the system user friendly than paper based system. About 6 and 18 from Mater and Kenyatta Hospitals affirmed the availability of centralized resource planning. While 7 and 37 respondents from Mater and Kenyatta Hospitals indicated the system is easier and quick in accessing patient information.

Respondents in Kenyatta Hospital seem to agree more strongly that the hospital information management system has stronger functionalities in managing patients' health information. From the study it can be affirmed that hospital information management system is necessary in improving the efficiency and service delivery in hospitals. Though not all respondents agreed to these attribute of the system. The total respondent's opinion is further illustrated in Figure 4, page 61 below.

Figure 4: Strengths of Hospital Information Management System in Mater and Kenyatta hospitals



4.6 Perceptions of Healthcare Workers on Information Transactions

The study sought to find out the perceptions of healthcare workers towards information transactions. The results reveal that respondents in both hospitals were neutral on the perception of information not used for decision making .Mater Hospital respondents (mean=2.76) and Kenyatta Hospital (mean= 2.66). On the perception that the system provides meaningful information and makes worker easier, the findings are Mater Hospital (mean=4.3), Kenyatta Hospital (mean=4.1) this implies in both hospitals respondents strongly agreed on this perception. Respondents further agreed that, the system provide data and information needed for user performance and monitoring Mater Hospital respondent (mean=3.85) and Kenyatta Hospital (mean=3.65). Collected information is appreciated by co-workers and superiors respondent in both hospital agreed Mater Hospital (mean=3.8), Kenyatta Hospital (mean=3.67). The study results reveals that both Mater and Kenyatta Hospital respondents agreed the system provides

meaningful information for decision making .The system also provides data and information needed for user performance and evaluation. Both hospital respondents also agreed that collected information is appreciated by co-workers and supervisors. Results are tabulated below in Table 16.

Table 16: Perception of the Healthcare Workers on Information Transaction

Statement Mater	Hospital		Kenyatta Hospital	
	Mean	Standard Deviation	Mean	Standard Deviation
Information provided is not used for decision making	2.59	1.43	2.76	0.888
Information provided is meaningful and makes work easier	4.3	0.71	3.85	0.691
System provides data and information needed for user performance and monitoring	3.85	1.09	3.39	1.02
Collected information is appreciated by co-workers and supervisors	3.8	0.94	3.51	0.778

4.6.1 Healthcare Workers Training Perceptions

Again, the study sought to find out healthcare workers training perception. This was important as it helped establish the competence of healthcare worker on the use of the hospital information management system. The findings indicate Mater Hospital respondents agree (mean=3.67) on competent on the system use and Kenyatta respondents are neutral (mean=2.95).The results of the findings indicate Mater Hospital respondents are competent on the system use. On the system being easy to use perception, Mater Hospital respondents agreed it was easy to use mean=3.7and Kenyatta respondents were neutral (mean2.82). The results indicate Mater Hospital respondents find the system easy to use. The study also sought to find out if respondents were encountering problems using the system, Mater (mean 3.32) agreed to encountering

problems and Kenyatta strongly agreed (mean3.75) the results imply in both hospitals problems are encountered using the system. Respondents were further asked if training was conducted on how to use the system, Mater Hospital respondents agreed (mean=3.59), Kenyatta respondents were neutral (mean 2.59).The results indicate in Mater training on the system use was conducted. Most respondents in Kenyatta Hospital were neutral. Both hospitals had almost similar results indicating need for more training; the results imply there is need for more training on system use in both hospitals. The results are analyzed in Table 17 below.

Table 17: Healthcare Workers Training Perceptions

Statement	Mater Hospital		Kenyatta Hospital	
	Mean	Standard deviation	Mean	Standard deviation
Competent on system use	3.67	0.88	2.95	1.047
System is easy to use	3.7	1.06	2.82	0.771
Encounter problem when using the system	3.32	1.17	3.75	0.969
Training was conducted on how to use the system	3.94	0.93	2.59	1.117
Need for more training to adequately use the system	3.85	1.26	4.39	0.77

4.7 Challenges Encountered in the Use of Hospital Information Management System

The respondents were asked to respond to various challenges they may have encountered using the hospital information management system. The findings indicated the main challenges encountered in Mater Hospital as system being slow (67.2%), poor changeover between the new and old system(62%), few ICT staff to assist when needed (60%), system keeps going on and off (53%) and incapability between the old and the

new system (44%). Kenyatta Hospital main challenges being encountered are, few ICT staff to assist when needed (93%), few computers for use (92.24%), inadequate software coverage (90.24%), systems being slow (88%) and lack of training of users (82.3 %.), system yet to be implemented in some areas (4.81%).The summary of the findings are illustrated in Figure 5 below.

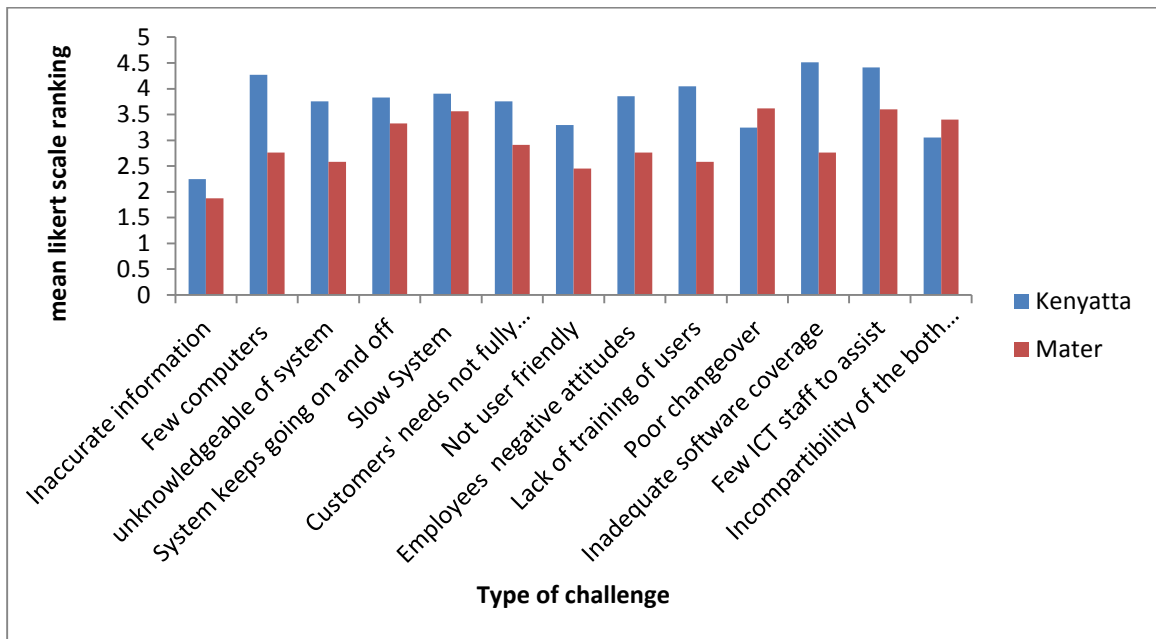


Figure 5: Challenges Faced Using Hospital Information Management System

4.8: Recommendations on Improving the Existing HIMS

The respondents were further asked to give recommendation on improving the existing hospital information management system. More respondent in Kenyatta Hospital want complete overhauls of the system. However, in Mater more respondents would want development of electronic resource planning system for the hospital and development of specific tools to the current structure. The results are presented in Figure6 below.

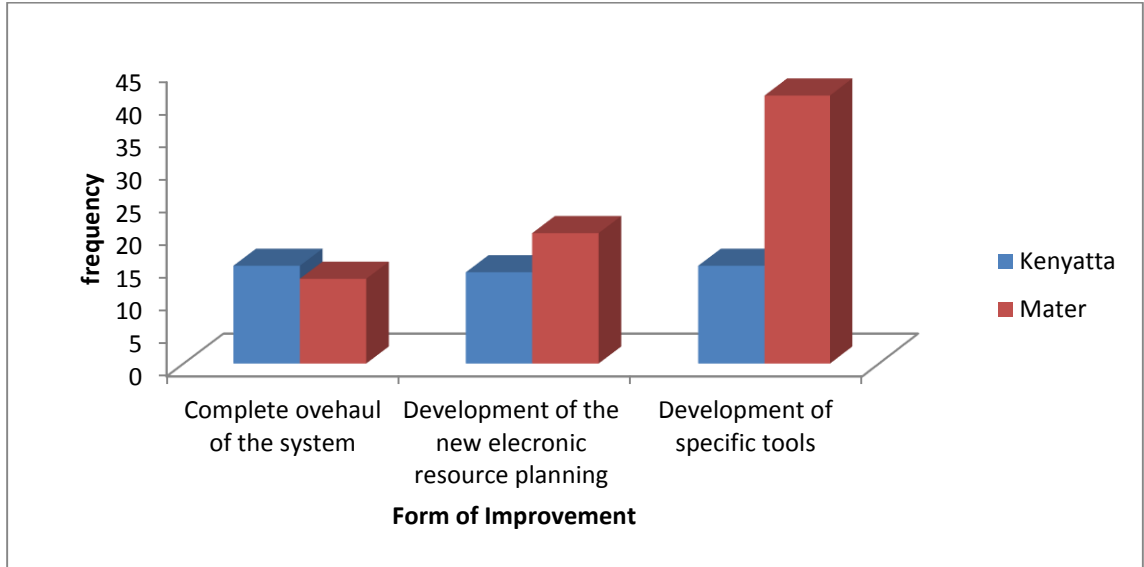


Figure 6: Recommendations on improving the existing HIMS

4.8 Chapter Summary

This chapter has presented and analyzed data collected from the study. The findings are further discussed in relation to the objective of the study. This information is used to discuss the findings and form the summary, conclusion and recommendation that are presented in the next chapter.

CHAPTER FIVE

SUMMARY OF THE FINDING, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter gives an overview of the findings, conclusion and recommendations made from the study. These are based on the objectives and research questions of the study. The aim of the study was to find out the use of hospital information management system in provision of relevant and effective services in Kenyatta hospital and Mater hospitals. It is a comparative study between a private and public hospital.

Objectives of the study were to:

1. To assess the use of the hospital information systems in the two selected hospitals.
2. Establish the extent to which the hospital information system provides accurate and relevant information of the patient.
3. Establish the perception of the healthcare workers towards the system.
4. Find out the challenges faced in the use of hospital information management systems in the hospitals
5. Find out possible solutions to the identified challenges in use of hospital information management system in both hospitals.

5.2 Summary of the Findings

Study findings are summarized as follows:

5.2.1 Background Information of the Respondent

The study generated information on respondent's profession, highest education level and work experience. This was considered necessary in validating the responses as this helped the researcher to understand the level of experience the respondent's answered the questions from. The study analysis indicated that respondent's rate was 104 (147.12%) as indicated in page 44, which was very adequate for the analysis. This implies that the respondents were willing to participate. The study found out the professional level of the healthcare worker at the Doctor's level was higher in Mater Hospital (10.91%) than Kenyatta Hospital (4.08%) and also higher percentage of nurses and technicians in Mater than Kenyatta as indicated in Table 2 page 47. As mentioned earlier few doctor in Kenyatta participated in the study because the doctor's module had not been implemented yet. Most nurses also could not fill the questionnaires as they expressed lack of time to do so. These hitches may have affected the outcome of the study. Interesting to note that Kenyatta Hospital has a higher percentage of healthcare workers in other area like physiotherapy, radiology at 69.39% and Mater Hospital 60%.

Profession categories were important to show how well the hospital is staffed. Level of education was important in establishing how well the healthcare workers are trained. HealthCare service is a specialized kind of service requiring well skilled staff. Education level was important in getting well balanced views and opinions on the study. Diploma holders formed nearly half of the population, Mater Hospital (46.3%), Kenyatta Hospital (53.06%), degree holders formed a third of respondents in both hospitals as indicated in Table 3 page 48. Mater hospital had slightly higher percentage (9.26%) with masters' degree than Kenyatta Hospital (4.08%). In both hospitals majority respondents have 1-

10years of experience Mater Hospital with a higher percentage 67.27% against Kenyatta Hospital (58.33%)as indicated in Table 4 page48.The study showed Kenyatta Hospital to have more experienced healthcare worker with over 20years experience (30%) against Mater Hospital (21.8%).

5.2.2 Use of Hospital Information management System

The first objective of the study was to find out the use of hospital information system in both Mater and Kenyatta Hospital. The researcher sought to find out functionality of the system in accessing more services, respondents in Mater strongly agreed the system has provided more functionality for accessing services at (89%) and Kenyatta respondents agreed on the same though not as strongly at (53.7%) as indicated in Table 6 page 50.The results show Mater system is well integrated and most services can be accessed via the system. Respondents in Kenyatta indicated some areas are not yet connected to the system meaning the system is not well integrated.

On use and access to in and out patient information, respondents in Mater Hospital strongly agreed (74.08%) the system enables more access to patient information and Kenyatta (26.83%) as indicated in able 7 page 51. Mater Hospital has more access and use of both in and out patient information. In finding out Improvement of quality service respondents in Mater (66.6%) and Kenyatta (53.66%) agreed the system has improved the quality of service in the hospitals. This implies both hospitals are in agreement the system has improved the management of the hospital and help in giving the patient better and improved service.

In disease notification function, results show (50%) Mater Hospital respondent indicated the system provide disease notification and Kenyatta (41%) agreed to the same as shown on. The results show less affirmation of this kind of data being accessed in both hospitals though Mater is slightly ahead of Kenyatta. Provision of Epidemiology data both hospitals had similar results (44%) agreed to system providing this kind of data as shown in Table 10 page 54. System manages financial imperatives Mater and Kenya Hospital respondents agreed strongly (77.77%) and (85.36%) the system is managing financial imperatives of the hospital. Improvement on patient information security, respondents in Mater agreed strongly (75.93%) the system manages the patient information security and Kenyatta (56.66%) as indicated in Table 12 page56. Information systems in healthcare allow the capture and dissemination of information to decision makers for better coordination of healthcare at both the hospital and population levels (Fichman et. al 2011:421).

5.2.3HMIS Provision of Accurate and Relevant patient Information

The second objective of the study was to establish the extent to which the hospital information system provides accurate and relevant patient information. The study findings revealed that respondents in Mater Hospital agreed strongly (70.37%) the system in use is providing accurate and relevant patient information and Kenyatta Hospital (26.83%) were of the same opinion as indicated in Table13 page 56. The results imply Mater Hospital system provides accurate and relevant patient's information for users. Majority respondents (60.98%) in Kenyatta Hospital were neutral on this aspect of the system. The study has established the system in use in Kenyatta Hospital is not fully

integrated some sections are yet to be automated and this could be hampering the provision of accurate and relevant patient information. Well integrated hospital information management system help to improve operational efficiency, care quality and more informed decision making (Ghosh (2010).

5.2.4 Perception of the Healthcare Workers towards the System.

The third objective was to establish the perceptions of healthcare workers towards the system. In both hospitals half of the respondents' agreed the system is easy to use, Mater Hospital (51%) and Kenyatta Hospital (54%) as indicated Table 17 page 63. Majority of the respondent's in Mater (72%) and Kenyatta (63%) indicated they are competent on the use of the system as indicated in page 63. Other almost similar percentages in both hospitals believe the system provides meaningful patients information Mater respondent (52%) and Kenyatta (59%) as indicated in Table 16 page 62. A number of respondents in both hospitals strongly agreed the system is slow and keeps going on and off implying users keep experiencing problems from time to time. In both Mater and Kenyatta Hospitals respondents expressed the need for more training to be able to utilize the system better. The under-investment in human resource capacity-building is a critical factor in the continued failure of ICT projects in health. As discussed by the UN agency on ICT for development (UNAPCICT, 2010), many proponents of ICT mistakenly assume that such projects are only about hardware, networking, software and applications; however a substantial amount of human activity is required when dealing with ICT projects.

5.2.5 Challenges in the Use of Hospital Information Management System

The fourth objective of this study was to establish challenges healthcare workers in both hospitals encounter in the use of hospital information management system. The study established as indicated in Figure 5 page 64 that the main challenges encountered in Mater hospital as system being slow, poor changeover between the new and old system, Few ICT staff to assist when needed, system keeps going on and off, and incapability between the old and new system. Kenyatta Hospital main challenge were, few ICT staff to assist when needed, few computers for use, inadequate software coverage, systems is slow and lack of training of users, system not yet implemented in some areas. Other challenges common in both hospitals were found out as system providing inaccurate information, respondents not knowledgeable with the system, System not user friendly, and employees having negative attitude towards the system. Respondents' recommendations on improving system, most respondents in Kenyatta Hospital want complete overhauls of the system. In Mater Hospital more respondents would want development of electronic resource planning system for the hospital and development of specific tools to the current structure, more training on the use of the system is recommended by respondents in both hospitals

5.3 Conclusion

- Well-integrated hospital information management system is able to manage effectively all the information and data needs of any hospital and in return provide quality service to the patients. Financial imperatives are well managed with this kind of system and can greatly curb financial malpractices.

- Hospital information management system is able to provide timely, accurate and relevant data whether on the patient, disease notification or epidemiological data very easily.
- Security on patient information can well be managed effectively with the help of the hospital information management system.
- Training on the use of healthcare workers is required from the time of implementation to enable the effective utilization, without which the system will not achieve purpose.

5.4 Recommendations

From the study findings the following recommendations are made:

5.4.1 Evaluation of Both Systems

Kenyatta Hospital to review the Funsoft in use currently and strives to have a more integrated system covering the whole hospital for the effective and efficient management of the hospital resources. Mater Hospital to evaluate the functions of the old and new upgraded Lifeline software currently in use and harmonize the changes.

5.4.2 Improve on the System Speed

Lifeline software in Mater and Funsoft in Kenyatta were mentioned in study to be slow.

Hospital administrators in both hospitals can explore ways of improving on the speed of the system or acquire new servers to improve on the speed for improved efficiency.

5.4.3 Employ More ICT Staff

Respondents in both hospitals have indicated need for more ICT staff to be employed.

This would translate quicker and improved response for staff whenever assistance with the system is required.

5.4.4 Acquire More Computers

The study has shown Kenyatta Hospital require more computers for effective utilization of the system and improved quality of service. Kenyatta Hospital could consider adding more computers for staff use.

5.4.4 Facilitate More Staff Training

Need for more training mentioned across the two hospitals. More continuous training on the system use for old and new healthcare workers would help in providing relevant and accurate information and data from the system. Training would help in changing the negative attitude of healthcare workers on system. More training would also improve in the hospital service delivery.

5.5 Suggested areas for Further study

The following areas are suggested for further study

5.5.1 Training of Healthcare workers

For any system to function effectively users must be trained before the implementation of the system and these training should be maintained contentiously in the course of system use. This enhances the user's confidence in the system use and improves efficiency. In return the easy access and use becomes effective and produces positive results. Further research can be carried out on how well to prepare and train users on the utilization of hospital information management systems

5.5.2 Implementation of Hospital information management system

Hospital information management systems are very costly and complex systems to implement. They need to be assessed and tailor made to the customer needs to be able to

serve and produce the required results. Further research can explore ways of effectively identifying appropriate hospital information management systems to suit the user's needs.

5.6 Chapter Summary

The chapter has highlighted key findings in the study, given recommendation and suggested further research options. Hospitals have to acquire systems suited for their specific needs and also be able to train effectively all the users at the implementation phase and provide efficient support in the course of utilization.

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APPENDIX I

LETTER OF INTRODUCTION

Mercy G. Nkanata
Department of Library and Information Science
University of Nairobi
P.O. Box 2534-00100
Nairobi.

Dear Respondent,

RE: INTRODUCTION LETTER

I am a Master of Library and information Science student in the Department of Library and Information Science, University of Nairobi. Presently, I am conducting a research titled; *Use of Hospital Information Management Systems among Healthcare Workers at Kenyatta National Hospital and Mater Hospital*. The purpose of this study is to collect data and information from the healthcare workers of both hospitals.

You have been selected to participate in this study. The information and opinions you provide are purely for academic purposes of the study and shall remain strictly confidential.

Thank you in advance for your cooperation.

Yours faithfully,



Mercy G. Nkanata

Registration Number: C54/71599/2014

APPENDIX 11

QUESTIONNAIRE FOR HEALTH WORKERS

INSTRUCTIONS

Please indicate your response by ticking (√) the provided box. For questions that require suggestions or comments, please use the space provided.

Background Information

1. Institution:

- (i) Kenyatta National Hospital []
 (ii) Mater Hospital []

2. Profession expertise:

- (i) Doctor []
 (ii) Nurse []
 (iii) Technician []
 (iv) Any other (specify).....

3. Highest educational level.....

4. Working experience:

- (1) 10 years []
 (ii) 11 – 20 years []
 (iii) 21 – 30 years []
 (iv) 31 – 40 years []

Use of the Hospital Information Management Systems

5. To what extent do you agree or disagree with the following statements regarding the use of the hospital information management systems. Use the following scale:
 Strongly Agree = 5, Agree = 4, Neutral =3, Disagree= 2, strongly Disagree = 1.

NO	STATEMENT	5	4	3	2	1
USE OF HOSPITAL INFORMATIONMANAGEMENT SYSTEM						
1.	System has become easier or harder to use					
2.	System provide more functionality for accessing services					
3.	System enables excellent use and access of in/out patient information					
4.	System has improved quality of service					
5.	Provides disease notification data					
6.	System provide epidemiological data					
7.	Manages financial imperatives					
8.	System has improved on patient information security					

6. Select from the list the statement that highlights the strengths of hospital information management system.

- (i) User friendly than paper based system []
- (ii) Availability of a centralized planning system []
- (iii) Easier and quick access to patient information []

7. Relevance and accuracy of patient information provided by System.

Yes No

- (i) System provides accurate and relevant information [] []
- (ii) Data provided by the system is accurate and relevant [] []

Perceptions of Healthcare workers on Information Collection

8. To what extent do you agree or disagree with the following statements regarding the Perceptions of the healthcare workers on information collection. Use the following scale: Strongly Agree = 5, Agree = 4, Neutral =3, Disagree= 2, strongly Disagree = 1

	Perception of information collection through HIMS	1	2	3	4	5
1.	Collecting information which is not used for decision making discourages me					
2.	Collecting information makes me feel bored					
3.	Collecting information is meaningful and makes work easier					
4.	Collecting information gives me the feeling that data is needed for monitoring facility performance					
5.	Collecting information is appreciated by co-workers and Superiors					

Healthcare Workers Training Perceptions

9. Please tick (√) statement that applies to the perception on training in the use of the Hospital Information Management System

STATEMENT	Yes	No
Competent on system use		
Hospital system is easy to use		
You encounter problem when using the system		
Training was conducted on how to use the system		
You feel you need more training to adequately use the system		

Challenges in the use of hospital information management systems

10. To what extent do you agree or disagree with the following statements regarding the challenges encountered using the Hospital Management information system:

Use the following scale: 5 = strongly agree, 4 = Agree, 3= Neutral, 2=Disagree, 1= Strongly Disagree.

No.	STATEMENT	5	4	3	2	1
1.	Incorrect information					
2.	Computers not enough for users					
3.	Not fully knowledgeable with the system					
4.	System keeps going on and off					
5.	Lack of comprehensive coverage of the system					
6.	System is slow					
7.	Users' needs not fully captured by the system					
8.	Not user friendly					
9.	Employees have negative attitudes towards changes					
10.	Lack of system testing					
11.	Lack of training of users					
12.	Poor changeover between the new and old software					
13.	Inadequate software coverage for the whole hospital					
14.	Few ICT Staff to assist when in need					
15.	Incompatibility between the new and old system					

3. State the recommendation to improve the existing hospital information system

- (i) Complete overhaul of the system
- (ii) Development of a framework based on hospital requirements
- (iii) Development of specific functional tools with minor reforms to the existing structure
- (iv) Any other (specify)

.....

APPENDIX III

LETTER OF INTRODUCTION MATER HOSPITAL



THE MATER HOSPITAL
P.O. Box 30325-00200
NAIROBI
TEL: 531190
Received 10.03.2015

UNIVERSITY OF NAIROBI

FACULTY OF ARTS

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P.O. Box 30197-00100 GPO
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Our Ref: UON/CHSS/DLIS/303

19th March, 2015

The Medical Director
Mater Hospital
P. O. Box 30325-00100
Nairobi.

Dear Sir/Madam,

RE: NKANATA, MERCY GACHERI REG NO: C54/71579/2014

The above named is a bonafide student at the University of Nairobi undertaking a Master of Library and Information Science (MLIS). She is currently in the process of collecting data as part of the requirements for the course.

Her topic is "*Effectiveness of Hospital Management Information Systems among Healthcare workers at Mater Hospital and Kenyatta National Hospital*"

Any assistance accorded to her will highly be appreciated.

Regards,

Dr. Dorothy Njiraine
Ag. Chairperson
Department of Library & Information Science (DLIS)

APPENDIX IV

LETTER OF INTRODUCTION KENYATTA NATIONAL HOSPITAL



UNIVERSITY OF NAIROBI

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P.O. Box 30197- 00100 GPO
Nairobi, Kenya.
dnjiraine@uonbi.ac.ke

Our Ref: UON/CHSS/DLIS/303

14th April, 2015

The Chairman
Kenyatta National Hospital
Research and Ethics Committee
P. O. Box 20723-00202
Nairobi.

Dear Sir/Madam,

RE: NKANATA, MERCY GACHERI REG NO: C54/71579/2014

The above named is a bonafide student at the University of Nairobi undertaking a Master of Library and Information Science (MLIS). She is currently in the process of collecting data as part of the requirements for the course.

Her topic is "*Effectiveness of Hospital Management Information Systems among Healthcare workers at Mater Hospital and Kenyatta National Hospital*"

Any assistance accorded to her will highly be appreciated.

Regards,

Dr. Dorothy Njiraine
Ag. Chairperson