ASSESSING THE LEVEL OF READINESS FOR COMPUTERIZED HEALTH MANAGEMENT INFORMATION SYSTEM AMONG NURSES IN KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

By

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MAY, 2014

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

This thesis is dedicated to my grandchild Amani Gathoni Gitau.

ACKNOWLEDGEMENT

Despite the fact that writing of this fact is an individual effort, the amount of work that goes into its initiation, organization, and writing of numerous drafts before its completion is a result of a number of cooperative efforts.

While it may not be possible to acknowledge all these individually, some minimal appreciation is, however, inevitable.

First and foremost I acknowledge God Almighty for his sufficient grace. Gratitude goes to my supervisors, who devoted a lot of time and patience to this study. I am particularly very grateful for the extraordinary advice, guidance and concern accorded by my supervisors, Dr. George Ochieng Otieno of the Department of Health Management and Informatics, Kenyatta University and Dr. Isaac Mwanzo of the Department of Community Health, Kenyatta University.

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DEFINITION OF TERMS

Computerized health management information system: Is a health information system that collects health management related data using a computer.

Discomfort: The discomfort trait is defined as an inhibitor of technology readiness and pertains to a perceived lack of control over technology and a feeling of being overwhelmed.

Health information system: Is a comprehensive and integrated structure that collects, collates analyses, evaluates, stores, and disseminates health and health –related data and information for use by all.

Health Management Information System: Is an efficient collection, collation, analysis, evaluation strategy, dissemination and use of information about individual patients, population, resources used and health outcomes of intervention and the state and nature of systems through which the intervention are applied.

Information communication Technology (ICT): Is as a set of technological tools and resources, used to communicate, and to create, disseminate, store and to manage information.

Information Technology (IT): Is the study that involves the support, management, study design, development and implementation of information systems that are computer based.

Innovativeness: The innovativeness trait is defined as a tendency to be a technology pioneer and thought leader.

Insecurity: The Insecurity trait is defined as distrust of technology and skepticism about its ability to work properly.

Nurse: A health professional licensed by the Nursing Council of Kenya to practice and provide some kind of nursing care.

Optimism: The optimism trait of technology readiness is defined as a positive view of Technology and a belief that IT offers people increased control, flexibility and efficiency in their lives.

Technology readiness: TR is defined as peoples' propensity to embrace and use new technologies for accomplishing goals in home life and at work". This construct is the basis for discussion regarding the preparation and attitude of nurses towards the rapidly emerging innovations in health (Parasuraman & Colby, 2001).

ABBREVIATIONS AND ACRONYMS

ACN	-	Assistant Chief Nurse
CHMIS	-	Health Management Information System
ERC	-	Ethical Research Committee
FGD	-	Focus Group Discussion
HIS	-	Healthcare Information System
HMIS	-	Health management information system
ICT	-	Information Communication Technology
IT	-	Information Technology
KNH	-	Kenyatta National Hospital
KU	-	Kenyatta University
MOH	-	Ministry of Health
NGO	-	Non-Governmental Organization
SPSS	-	Statistical Package for Social Sciences
TAM	-	Technology acceptance model
TR	-	Technology Readiness
TRI	-	Technology Readiness Index
UON	-	University of Nairobi
WHO	-	World Health Organization

ABSTRACT

Healthcare Organizations are now in the process of implementing computerized health management health information system (CHMIS) with a hope that they will improve on safety, efficiency and effectiveness of patient healthcare (Ammenwerth, 2004). More specifically, due to advances of technologies, the adoption of CHMIS is growing rapidly. CHMIS are believed to offer significant benefits in improving patient health care delivery (Thompson, 2005). Health care Organizations implement CHMIS, without knowing whether, nurses will be willing to adopt such systems. If nurses reject the new technologies, CHMIS implementation will not succeed, resulting to poor health care and wastage of resources. The main objective of this study was to assess the level of readiness for CHMIS among nurses in Kenyatta National Hospital (KNH). The specific objectives were to assess the level of readiness for CHMIS, to determine the influence of demographic characteristics influencing readiness for CHMIS, to determine the institutional characteristics influencing readiness for CHMIS, determine the influence of information technology (IT) skills on readiness for CHMIS. The research problem was studied with cross sectional descriptive design using both quantitative and qualitative techniques. The study was conducted at KNH with a sample of 313. The study used a self-administered questionnaire for the respondents, focus group and key informant interview guides for focus group discussion and key informant interviews. Standard package for social sciences (SPSS) version 19.0 was used for analysis. Descriptive and inferential statistics were computed. Results were presented in tables and in narration. The mean for level of readiness was 3.5 which was low. The study found that 110 (35%) were ready for CHMIS, while 203(65%) were not ready. The study showed a significant relationship between designation and readiness for CHMIS among nurses in KNH x2 (1) = 12.26, p = 0.000). However, there was no significant relationship between gender x^2 (1) = 0.01, p = 0.91; age x^2 (2) = 3.87, p = 0.14; level of education x^2(1) =0.15, p =0.70; highest qualification x^2 (1) = 3.34, p = 0.07; work experience x^2 (1) = 3.67, p = 0.05 and readiness for CHMIS among nurses. The study further showed a significant relationship between overall institutional characteristics x^2 (1) = 41.69, p= 0.000 and readiness for CHMIS among nurses. The study showed a significant relationship between IT skills and readiness for CHMIS x^2 (1) = 7.613, p = 0.006. Results from focus group discussion and key informant interviews indicated that the hospital has not trained nurses in IT, the top management has not communicated the IT strategy to nurses, and awareness and participation among nurses was lacking. System champions were also lacking among nurses as well as technical support. Further, KNH lacked sufficient infrastructure for CHMIS and the hospital has not carried any technology assessment to find out whether nurses were ready for CHMIS or not. The hospital information communication technology (ICT) master plan was still on draft. Based on these findings, the study recommends that; the top hospital management should fully assess nurses level of readiness and other requirements prior to implementing CHMIS, provide IT training to nurses, identify system champions among nurses, provide sufficient infrastructure for CHMIS implementation, and finalize the ICT master plan for possible implementation. The study recommended that future research could investigate which new constructs such as high innovativeness, low insecurity and discomfort could add to the explained levels of technology readiness (TR).

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Healthcare Organizations are now in the process of implementing computerized health management health information system (CHMIS) with a hope that they will improve on safety, efficiency and effectiveness of patient healthcare (Ammenwerth, 2004).

More specifically, due to advances of technologies, the adoption of CHMIS is growing rapidly. CHMIS are believed to offer significant benefits in improving patient health care delivery (Thompson, 2005).

The health management information system (HMIS) is an integrated reporting system used by Ministry of Health (MOH), development partners and stakeholders to collect relevant and functional information on a routine basis to monitor the health sector strategic plan indicators to enable planning, decision making, monitoring and evaluation of health care delivery system (MOH,2008). It is designed to assist managers to carry out evidence based decision making at all levels of the health care delivery. The major goal is to provide quality information to support decision at all levels of health care system.

Maintaining a good Health Management Information System (HMIS) is an essential part of running a health system. This can be done manually or maintained in a computerized system. Information generated is expected to assist in the formulation of health policies, setting of priorities and evaluation of health care programmes.

World Health Organization (WHO) policy makers believe there is urgency for health technologies to be adopted world-wide in health care (WHO,2004). There has been very few examples globally where a computerized HMIS has been operational in a population based health care delivery system for a significant duration (John, 2003).

According to WHO (2006), few systems in developing countries are ineffective because the available data tend to be out of date therefore making trend assessment particularly difficult.

There are many factors contributing to the successful implementation of a health management system. Based on literature about implementation in Europe and the United States as well as developing countries, authors have identified factors and issues contributing to the successful implementation of information systems based on information communication technology (ICT) into a hospital (Chetley, 2006; Gladwin, 2003; Kuhn et al., 2001). African countries such as Uganda, Tanzania, Ethiopia and few hospitals in Kenya have implemented CHMIS. Although there is some automation, handling of data is still manual at most levels of health care delivery.

Success of CHMIS adoption has been low for developing countries, which are generally resource constrained e.g. insufficient CHMIS infrastructure due to lack of required ICT support, awareness among stakeholders, a drive to adopt new systems, and lack of readiness assessment for such technologies (Watts, 2005). Moreover, costs, available information technology (IT), and a lack of technical expertise and computer skills of staff are major issues which would need to be addressed before CHMIS implementation is possible (Watson, 2006).

In Kenya, the public service was generally vibrant and responded well to the needs of Kenyans in the 1970s. In the 1980s however; the demand for public service was higher than the supply capacity owing to increased population and resource constraints. This was manifested in decline of services delivered. The Government responded by embracing reforms aimed at improving efficiency and productivity. The Ministry of

Health (MOH), established Health Information Systems offices in each district. With Kenya's National Health Sector Strategic plan (1999-2004), the MOH laid out strategies to improve coordination with the private sector and Non-Governmental Organizations (NGO's) and recognized the need for integrated health information systems (HIS). The goal of HIS was to generate and use health information for policy formulation, management, planning, budgeting, implementation, monitoring and evaluation of health services and programme interventions in the health sector. The increase in use of data for management of health services resulted to the change of name from HIS to HMIS.

HMIS are an essential foundation for evidence-based decision making with public health systems. However, most HMIS are inadequate in supporting their public health systems as they fail to generate the high quality (timely, complete, accurate, and consistent) data needed to support decision-making activities such as health planning.

Kenya's HMIS have historically supported epidemiological data, explaining the lack of other sub –systems of a comprehensive HMIS, such as nursing, drugs, laboratory services, logistics, finance and human resources.

HMIS are being introduced into nurses' workstations at an alarming rate. These systems are implemented with limited input from nurses who provide direct patient care and without considering factors in system design and implementation process. The need for nurses to be involved at every level for decision-making as it relates to technological innovation into their work is imperative to mitigate system failure and truly support their work (Fenenga & Jager, 2007).

Kenyatta National Hospital (KNH) is a government public hospital under the MOH. It is the largest referral Hospital in Kenya. Its mandate is to offer quality health care, medical

training, facilitate in research, health planning and policy. Nurses (37%) are the largest group of employees in the hospital. Implementation of CHMIS can help nurses in accomplishing their daily care routines and record keeping jobs more efficiently and effectively. Further, CHMIS cannot improve Organizational performance if they are not utilized (Fenenga & Jager, 2007). But CHMIS are often hampered by health care staff especially nurses who is expected to benefit from its use (Gladwin et al., 2003).

According to Odhiambo & Odero (2005) for every new CHMIS, there is need to assess its viability before it is implemented. This is done in the first phase of the implementation, where issues such as the ability to determine the level of readiness of the end user and whether the Organization designing and implementing CHMIS has developed and documented relevant policy objectives for the proposed information system.

Technology readiness has been defined as the propensity to embrace and use new technologies for accomplishing goals at work (Parasuraman & Colby, 2001). The level of readiness for technology, in this case CHMIS will be measured using the four traits; optimism, innovativeness, discomfort and insecurity identified by (Parasuraman & Colby, 2001).

The purpose of this study was to assess the level of readiness for CHMIS among nurses in KNH.

1.2 Problem statement

Many healthcare institutions are currently adopting CHMIS with a view of improving quality healthcare (Ammenwerth, 2004). KNH has proposed to implement an integrated CHMIS, which will include clinical systems, billings and revenue, finance, supplies,

human resources, ICT infrastructure, and communications. Specific projects within clinical systems include nursing care planning system, ward, theatre and bed management, pharmacy information system, laboratory information management system, computerized physician order entry, critical care system, registration, patient scheduling, patient bracelets, electronic medical record among others. Nurses are the largest group of health professionals in the hospital (KNH, 2007). Nurses offer direct care to the patients and carry a lot of documentation of the care process. Computerization of nursing process is expected to reduce the time taken in documenting care processes thus, increasing the time spent directly with the patient (Saba, 2001).

Low uptake for CHMIS adoption has been attributed to failure to assess readiness of the users before such technologies are implemented, insufficient infrastructure due to lack of required information communication technology (ICT) support, awareness among stakeholders, lack of expertise and computer skills, a drive to adopt new systems and resistance by the nurses (Watson, 2006).

Introduction of CHMIS in KNH will increase a potential to overcome existing healthcare system problems (e.g. loss of files, failure to provide medical legal evidence, delayed retrieval of records, laboratory and radiological reports among others). CHMIS are capable of providing current, reliable, valid and timely patient information, this making service delivery efficient, effective and safer (Saba, 2001).

However, for the benefits to be realized, CHMIS must be consistently and regularly used by nurses who work around patients for twenty-four hours a day. However, it is not known if nurses are ready for CHMIS and may not have skills to work effectively in an electronic environment (Simpson, 2000).

Traditionally, nurses provide care within the ordering scope of the physicians, and this traditional role has come to shape the historic public image of nurses as care providers and their thinking and technology level must match the modern world (American Nursing Association, 2007).

A person's technology readiness consists of four traits– two positives called " contributors" and two negatives called "inhibitors" (Parasuraman & Colby,2001). The first contributor is optimism, a positive view of technology and a belief that it offers people increased control, flexibility and efficiency in their lives. The second contributor is innovativeness, a tendency to be a technology pioneer and thought leader. The two inhibitors include discomfort, a perceived lack of control over technology and a feeling of being overwhelmed by it, and insecurity a distrust of technology and skepticism about its ability to work properly (Parasuaraman & Colby, 2001).

With technology readiness, nurses will be able to document patient care processes, electronic medication administration recording and the electronic medical record information system requirement for delivery of safe, effective and efficient health care (Simpson, 2000). Thus, the integration of CHMIS into the hospital could progress smoothly.

Without technology readiness, nurses could reject CHMIS or adopt it slowly, resulting to costly failures, difficulties operating the system, the outputs from the system may be poor and delays in implementation of CHMIS leading to poor service delivery (Simpson, 2000).

According to Odhiambo & Odero (2005) there is need to assess human, organizational skills, expertise, knowledge, commitments, values and norms.

1.3 Justification and significance of the study

KNH is in the process of implementing CHMIS. Lack of an integrated computerized system has affected negatively the delivery of efficient services, revenue generation and collection, and customer satisfaction.

Computerized systems of patient health information have been identified for improving the quality patient care, reducing medical errors associated with paper-based systems.

It is thus important to determine if nurses are ready to embrace this technology. Lack of readiness results to poor health care delivery and wastage of resources. In this regard, level of readiness remains a huge issue at least in health planning and policy developments in all parts of the world.

Few studies have been done in the area of technology readiness in health facilities in Kenya and most of them deal with the evaluation of health information systems. None has used technology readiness index (TRI) to assess readiness for CHMIS in KNH. The findings of this study will help fill gaps in knowledge of level of readiness for CHMIS, provide current data to decision makers for various purposes including policy setting, planning and the development of training programs. The data will facilitate decision making regarding success in CHMIS implementation.

The study will be useful to the management of the hospital since one of its mandate is to offer quality health care and participate in national health planning and policy.

Application of the findings could assist with improving adoption of new health information technologies into health system.

Results from this study could be useful to health managers, academic institutions, government agencies, health service providers, system developers, and decision makers

with responsibility for integrating health information technologies into health care. Analysis of results can provide theoretical constructs that could be used in the development of education and training programs for health professionals to assist with increasing TR and avoid rejection or resistance to new technologies. Assessing the level of readiness for CHMIS increases the chances of success in CHMIS implementation. When nurses are ready for CHMIS, they will use the system and contribute to its success and quality of health care.

Finally, it will provide a reference to those people who might want to undertake research in the area of technology readiness.

1.4 Research questions

(i) What is the level of readiness for CHMIS among nurses in KNH?

(ii) What are the demographic characteristics influencing CHMIS readiness among nurses in KNH?

(iii) What are the institutional characteristics influencing CHMIS readiness among nurses in KNH?

(iv) What is the influence of IT skills on CHMIS readiness among nurses in KNH?

1.5 Null hypothesis

(i) There is no relationship between demographic characteristics and CHMIS readiness among nurses in KNH.

(ii) There is no relationship between institutional characteristics and CHMIS readiness among nurses in KNH.

(iii) There is no relationship between the influence of IT skills and CHMIS readiness among nurses in KNH.

1.6 Objectives of the study

1.6.1 General objective

The main objective of the study was to assess the level of readiness for CHMIS among nurses in KNH.

1.6.2 Specific objectives

(i) To assess the level of readiness for CHMIS among nurses in KNH.

(ii) To determine the demographic characteristics influencing readiness for CHMIS among nurses in KNH.

(iii) To determine the institutional characteristics influencing readiness for CHMIS among nurses in KNH.

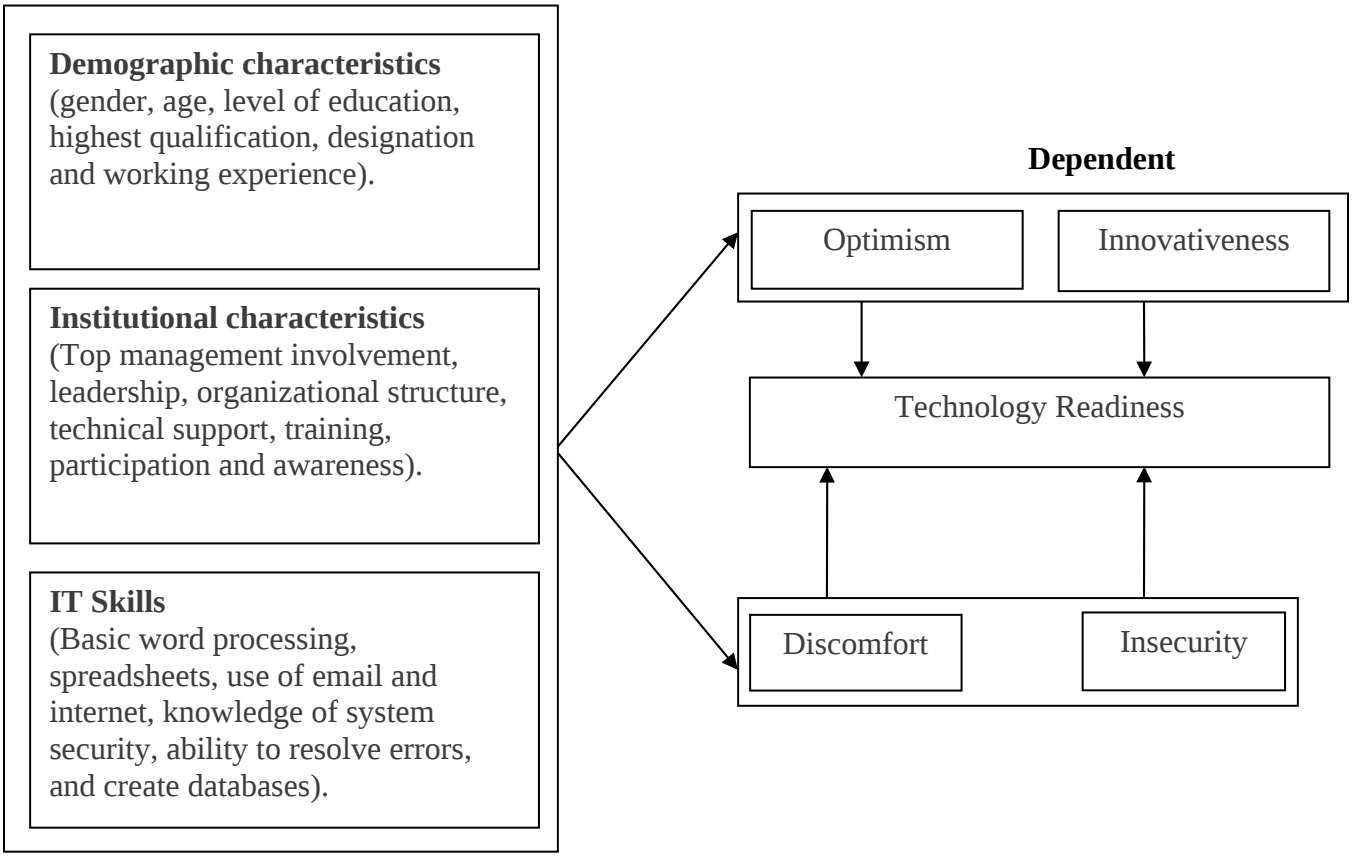
(iv) To determine the influence of IT skills on CHMIS readiness among nurses in KNH.

1.7 Conceptual framework

The conceptual framework shows the relationship between the independent and dependent variables. This study integrates personality traits of TR, demographic, institutional characteristics, and IT skills that can be used to explain nurses' level of technology readiness. The dependent variable was TR, which is a composite of four personality traits. The four are optimism, innovativeness, discomfort and insecurity (Parasuraman & Colby, 2001).

The independent variables were demographic characteristics (age, gender, level of education, highest qualification, work experience and designation), institutional characteristics (top management involvement, leadership, organizational structure,

technical support, training, participation and awareness) and IT skills (basic word processing, basic spreadsheets, use of email and internet, knowledge of system security, ability to resolve errors and create databases). Figure 1.1 shows the conceptual framework.



Source: Modified from Technology readiness index, Parasuraman and Colby, (2001)

Figure 1.1 Conceptual Framework

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The review of literature addresses the assessment of technology readiness (TR) and study objectives.

2.2 Overview of TR

The construct of TR has been defined as people's propensity to embrace and use new technologies for accomplishing goals in home life and work (Parasuraman & Colby, 2001). The construct pertains to "an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies. It is important to emphasize that it is an overall state of mind and not a measure of technology competence. Thus "it is a combination of technological –related beliefs that collectively determine a person's predisposition to interact with technology – based products and services (Parasuaraman & Colby, 2001).

Parasuaraman & Colby (2001) produced a continuum to illustrate their analysis of high and low levels that could be measured on a scale where resistance to technology was low and receptivity to technology was high. The higher the scores on a 5- point scale, the more the respondents are ready to use new technologies. The scores for discomfort and insecurity are reverse coded. They believed that optimism and innovativeness contributed to an individual TR, while insecurity and discomfort inhibited TR. Thus, the higher the scores on these dimensions the lower the overall readiness.

Parasuraman & Colby (2001) found that some consumers believed in technology while others feared or were confused. Based on insights from focus groups, researchers found that fearful consumers believed technology contributed to information overload, disseminated unreliable information. Overall, Parasuraman believed there was a need for a thorough assessment of customers TR, based on the tremendous growth of technology based products and services. He believed the examination of the scores produced on the TRI scale assisted organizations to answer questions germane to their technology strategy, management of customer-technology linkages.

2.2.1Technology readiness index

TRI is able to distinguish between two groups the stronger one in terms of more complex and more futuristic technologies and identify specific users for which discomfort and insecurity is likely to be significant. TRI emerged through an extensive research program in the United States of America. In this final 36 – item scale the four dimensions demonstrated, for purpose of group analysis, a sound reliability with Cronchbach's Alpha ranging from 0.74 to 0.81. A replication in Great Britain further strengthened the soundness of TRI and the same four factor structure with Cronbach's alpha ranging from 0.74 to 0.88 were extracted. Both studies obtained large national cross-sectional samples by conducting random based telephone interviews. Several researchers have empirically supported that type of technology that specific users affects customer attitude and usage of technology–based services. Parasuraman & Colby (2001) found that some consumers believed in technology while others feared or were confused.

Adoption of technology has been investigated through constructs such as usefulness and ease of use to predict individual's acceptance of technologies. However, such a

viewpoint may not afford understanding and clarification of the determinants of ease of use and usefulness perceptions when people accept technology (Davis, 1989).

Hence, more in-depth studies are required to explore this issue to propose better interventions to improve people's acceptance and use of technology. Various individual differences i.e. personality traits are often investigated (Bhattacherjee & Hikmet, 2007; Walczuch & Lemmink, 2007). If the influence of individual's personality traits on the adoption is ignored, then there is a risk that adoption models may be mis-specified and, inturn, influence people's adoption of technology, negatively.

Parasuraman (2000) asserted that TRI is conceptualized as a trait which is relatively stable descriptor of individuals. Most studies reveal that the TRI scores are different among different subjects in different context (Liljander et al., 2006).

Despite that, most studies support that TRI can predict the acceptance of new technologies, however, none of these studies are empirically validated in health care context which is more complex than other industries (Goldschmidt, 2005). Further, results of previous literature may also not be applicable in health care setting. Moreover, more studies are required to further investigate the ability of TRI in predicting people's acceptance of technology (Liljander et al., 2006). Since TRI is currently the most integrative measure of TR, it is both theoretically, appropriate and comprehensive to assess the nurses' readiness for CHMIS (Venkatesh & Davis, 1996).

In health care setting, previous studies have adopted Technology Acceptance Model (TAM) of differing information systems on hospital staff, including nurses (Chen et al., 2008). These studies employed different subjects, technologies, research methodologies etc. These differing research designs might have influences on the results, thus more in –

depth studies are required to accumulate and advance knowledge on technology readiness in health care context. Thus by adding personality traits constructs, demographics, institutional characteristics, and IT skills, may result in deeper understanding of level of readiness. Demographic, institutional characteristics and IT skills have been ignored in the previous research as antecedents of TR and better explain the level of TR (Walczuch & Lemmink, 2007).

By identifying demographic, institutional characteristics and IT skills that influence level of readiness for CHMIS, the study adds to scientific literature by adding better understanding of TR and adoption of new technology. In addition, by adding demographic, institutional characteristics, and IT skills to testing TR in health care settings cannot only help better understand their impact on nurses' level of readiness but also having benefits in developing general health information technology theories.

The impact of individual TRI on the adoption of technology is still scarce, especially in health care context (Lin & Hsier, 2007; Tung et al., 2008; Campbell et al., 2001).

2.3 Level of readiness for CHMIS

Parasuaraman & Colby (2001) in addition to measuring responses as high, and low, classified TR in the four distinct traits noted earlier of: optimism, innovativeness, insecurity and discomfort. They believed that optimism and innovativeness contributed to an individual's TR, while discomfort and insecurity inhibited TR. They referred to contributors and inhibitors as "drivers" of behaviors.

Optimism: "positive view of technology and a belief that it offered people increased control, flexibility and efficiency in their lives" (Parasuraman & Colby, 2001). This optimism was reflected by users who enjoyed using computers; felt that they

accomplished more and were doing more than they did a couple of years ago; felt mentally stimulated and looked forward to using new technology products and services. Younger users tended to be more optimistic than older individuals were and both males and females harbored some doubts (Parasuraman & Colby, 2001).

According to Parasuraman (2000), a technology optimist holds that new technology will render people more benefits such as increased control, flexibility, and efficiency in their work. According to Walczuch & Lemmink (2007), optimists use more strategies, which are usually more effective in realizing the expected results. In other words, optimists are less likely to focus on negative events and will accept technology freely. Thus, optimists perceive technologies as being more useful and easy to use in that they are less irritated about the negative outcomes of technology (Parasuraman and Colby, 2001). On the other hand optimism is a general construct that catches peoples specific feelings and indicates that technology is good (Tsikriktsis, 2004).

Innovativeness: "a tendency to be a technology pioneer and thought leader" (Parasuraman & Colby, 2001) and is regarded as an important determination of cognitive absorption which, in turn influences perceived ease of use and perceived usefulness (Agarwal & Karahanna, 2000).

Innovative individuals are open to learning new and different technologies; they like to keep up with the latest developments; they believe others come to them for advice regarding technologies; and are among the first to acquire a new technology in their group. Most of the innovative consumers are under the age of 50 years and the majority of the innovators are male (Parasuraman & Colby, 2001).

Individuals with high technology innovativeness have stronger intrinsic motivations to accept new technology and even enjoy the sensation of trying new technology (Tung et al., 2008). Agarwal & Prasad (1998) asserted that personal innovativeness is important when investigating the acceptance of innovative technology.

Insecurity: "distrust of technology and skepticism about its ability to work properly (Parasuraman & Colby, 2001). The insecurity regarding technology manifested itself in fears of being incapable of using new technologies and not wanting to provide information over the Internet because the individual did not believe it would go to the right place. Individuals who are insecure also believe that switching to a new technology is risky and that technology can fail at the worst time. Tsikriktsis (2004) found that it is only when people believe that they will acquire great advantage from using the new technology that they are willing to take the risk of such technology. According to Siegrist (2000), people who are high in insecurity are usually short of confidence about the security of new technologies and they often ask for assurance. That is, they may feel that some risks management exists when using new technology.

Discomfort: "Perceived lack of control over technology and a feeling of being overwhelmed by it" (Parasuraman & Colby, 2001). This represented a certain paranoia that individuals have regarding technology-based products and services. They believe technology excluded people rather than including them. They did not think technology is designed for ordinary people and that technical people strived to take advantage of individuals who did not understand technology, as well as they did.

According to Hackbarth et al., (2003), discomfort may lead to people having anxious feelings about use of technology, a similar construct to computer anxiety, which has been confirmed to have negative impact on technology.

2.4 Demographic characteristics influencing readiness for CHMIS

Agarwal & Prasad (1999) established that level differences such as education, similar prior experience, beliefs about information technology also had an impact on the acceptance of technology. These individual level differences are precisely what we see reflected in individual level of TRI scores. These differences also affected how employees learnt using the technology over time and had important implications for developing training programs. This was particularly relevant when mean TR scores are low and the management is embarking on programs to increase the probability of acceptance of the new technology (Parasuraman & Colby, 2001).

Research has shown that individual factors influence TR positively or negatively. Parasuraman & Colby, (2001) showed no significant differences in terms of technology across age but there are significant differences between TR and gender.

Venkatesh & Morris (2000) showed that men considered perceived usefulness largely than women in making decision regarding the use of a new technology, both in short and long term. However, perceived ease of use was more salient to women compared with men after initial training with the technology and over time with increased use of technology.

Ham & Kim (2003) also examined the relationship between innovativeness and personal characteristics. They too, found support that younger individuals with higher incomes

have innovative predispositions that lead to increased likelihood of new technologies adoption.

Steenkamp & Burgess (2002) showed that young people have stronger innovative tendencies than older people do, and men have a higher propensity to adopt new technologies than women do.

Tellis (2004) found that age, income, mobility, education, and gender were all predictors for levels of innovativeness.

Mick & Fournier (1998) found that decision makers should create a construct for technology administrators who are responsible for managing the introduction of new technologies into health system. Given the importance of the health system, there should be a societal imperative that analyses factors needed to maximize success regarding diffusion of new technologies into health. Measuring TR can assist with avoiding unexpected negative consequences and as a result, future generations can benefit from an improved health care system.

Mick & Fournier (1998) discussed paradoxical attitudes of individuals towards technology and their simultaneous conflicting feelings of wanting to use new technologies while at the same time being nervous or afraid of those same technologies. Understanding these paradoxes is critical to decision makers who seek to interpret the response of individuals in a workforce when confronted with change. Increased understanding of elements that contribute to either acceptance or rejection of technology can enable organizations to replicate successful introduction of new technologies, refrain from unsuccessful strategies, and improve decision-making.

Caison et al., (2008) found that male nurses reported significantly higher mean scores for innovation and positive about TR.

In Kenya, studies that have been conducted evaluate health management systems, (Ongalo, 2012; Odhiambo & Odero, 2005).

However, no studies have been documented in KNH to show the influence of demographic characteristics on readiness for CHMIS among nurses. The study aims to fill this gap.

2.5 Institutional characteristics influencing readiness for CHMIS

Factors such as leadership, management involvement, organizational structure, technology, technical support, education and training, participation and awareness, and resistance to change are important to consider before implementing the system (Wager et al., 2001).

Top management involvement

The role of top management in CHMIS implementation should include developing an understanding of the capabilities and limitations of CHMIS, exhibiting strong commitment to successful introduction of CHMIS, developing and communicating the IT strategy to all clinical staff. In addition to this, it is necessary to allocate resources to implementation efforts and clearly define goals for CHMIS (John et al., 2003).

Social learning theory posits that individuals sense through their interpersonal networks the support that existed throughout the organization. According to (Armenakis & Bedeian, 2007) there should be principal support from top management as well as local change agents.

Leadership

Strong leadership within the clinical setting in support of CHMIS is critical in successful implementation. These leaders, referred to as system champions are healthcare professionals, not necessarily providers, committed to adopting CHMIS to improve quality of care (Wager et al., 2001). System champions understand the benefits of CHMIS and will work towards this goal. These leaders are already accepted and considered leaders within their practices, will work with providers and staff to gain support, will learn the system, and will help explain CHMIS to ease any apprehensions. With the internal backing and commitment, other healthcare professionals are more likely to support, become involved with, and begin to integrate CHMIS into their daily work routine. Overall, the leader in support of CHMIS understood the impact that this new healthcare information technology has and may increasingly have on healthcare delivery, while understanding how to manage this impact (Lakovidis, 1998).

Organizational structure

The impact on organizational structure must be understood prior to implementation in order for CHMIS to succeed (Wager et al., 2001). CHMIS could conflict with the existing organization of the healthcare setting, especially when the system has been instituted without provider and staff input design (Lorenz & Riley, 2000).

Poor CHMIS design could lead to failure in implementation due to systems that are not practical for the daily functioning of the hospital (Berg, 1999).

A well-designed CHMIS, then, would be considerate of its users and their time constraints. Poorly designed CHMIS could lead to user dissatisfaction and feelings of being forced into changing their clinical structure and routine based upon a system that

would not compliment their practices. The users must be the driving force behind changes that take place within the clinical setting to ensure they did not threaten them (Kaihara, 1998).

Technical support

Technical support may be beneficial if received from multiple members of the practice itself. Internal sources of technical assistance have a strong understanding of the individual comprehension levels, and would thus be better equipped to train providers and staff (Wager et al., 2001). There is need for technical support and maintenance (Granger et al., 2002; Hakkarainen, 2001).

Training

Healthcare information technology cannot work without dedicated healthcare professionals who have had the opportunity to receive education and training necessary to use CHMIS and more easily integrate it into their unique setting. Follow-up training and on-site support were good steps to ensure that users, having differing levels of computer skill, become more comfortable with the software and use it successfully (Lorenz & Riley, 2000).

Kivuti & Chepchirchir (2011) found that training was important for computerization.

Participation and awareness

Lack of participation and awareness also led to unsuccessful introduction of CHMIS. This could be attributed to the lack of capacity and training available in the organization but also with the social and cultural issues affecting the organization. This often tended to be a lack of understanding of changes needed to accompany the innovation and

stakeholders not willing to participate into this process. For maximum success of CHMIS, participants are required to participate and view the system as adding value to existing systems (Gladwin et al., 2000). If the people using the system do not like, want, or support it, it will likely fail. There should be a mutual understanding of the meaning of CHMIS before introduction by the project managers. The project managers should then introduce this meaning to other people during awareness raising and training of the system. Sharing learning and experiences should be encouraged to improve understanding of the different similar ICT interventions. This is also important to get people participation in the use of the system, this is not something people are used to and changing in the way people viewed this is needed by awareness raising and training (Gladwin et al., 2000).

2.6 Influence of IT skills on readiness for CHMIS

According to Russell & Aipay (2000), a substantial number of nurses have not yet acquired adequate knowledge of information technology.

Several studies have addressed various issues of incorporating information technology in nursing profession. Sarento & Leion (1997) used the Delphi technique to identify and describe the computer skills required for nursing. The authors found that experts reached consensus in four content areas: The first area was system security, which included knowing the importance of passwords and knowing the laws concerning data security and patient' rights. The second area of consensus was the ability to resolve error issues, which includes being aware of viruses and knowing what difficulty error messages mean. The third area of consensus was obstacle and prerequisites of automated data processing, which included developing a positive attitude toward computers and being familiar with

ergonomic recommendation. The fourth consensus was the ability to use hospital information systems and knowing how to generate a nursing plan.

Russell & AIpay (2000) carried a study to determine what nurses used computer for, how they used it and what training needs were required. The authors discovered that the main use of the computer was for maintenance of medical records. Others used it to manage appointment system while others used it for their routine documentation. Training in basic skills appeared to be minimal as less nurses had received training in using the categories investigated including word processing, email, and internet (Simpson, 2000).

Studies have also shown that computer knowledge and skills of nurses were at moderate levels (Estabrooks et al., 2003; Liu et al., 2000). Higher computer experience among Australian nurses ranged between 64% and 90 % (Earley et al., 2009).

Elsewhere nurses who were older and those with senior rankings have been found to have better computer skills (Brumini et al., 2005).

Kivuti & Chepchirchir (2011) found Kenyan nurses to have moderate levels of computer skills and concluded that KNH management should consider facilitating low-cost, in-house training for its nursing staff since its strategic plan is to be ICT compliant and computerize its services, including nursing department.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Introduction

This section describes the procedure followed in conducting the study. In this chapter, the researcher discusses the research design, variables, location of the study, study population, inclusion and exclusion, sample size determination, sampling technique, construction and research instruments, pre- testing, validity, reliability, data collection techniques, data analysis, logistical and ethical considerations.

3.2 Research design

This study used cross sectional descriptive design using both quantitative and qualitative techniques aimed at gathering information to enable the researcher to accept or refute null hypotheses, which may lead to a snapshot presentation of the current study.

The research design was appropriate for this study because it is good for descriptive analysis. It is efficient at identifying association between demographic, institutional characteristics, IT skills and readiness for CHMIS among nurses in KNH. It is also a more practical option because it could provide results at a relatively low cost and in a shorter period.

3.3 Variables

3.3.1 Dependent variable

The dependent variable in this study was TR measured using four personality traits comprising of optimism, innovativeness, discomfort and insecurity (Appendix III). Optimism was measured using 10 items, innovativeness 7, discomfort 10 and insecurity

9. The responses were recorded on a five point likert scale ranging from 1-strongly disagree to 5-strongly agree.

3.3.2 Independent variable

The independent variables in this study were-

a. Demographic characteristics (gender, age, level of education, highest qualification, designation and working experience).

   Age was measured in years. Gender was male or female, level of education was either college or university, highest qualification was certificate, diploma or degree. Designation was enrolled nurse, nursing officer, Assistant chief nurse, deputy chief nurse, and chief nurse. Enrolled nurses had certificates in enrolled nursing, while nursing officers, Assistant chief nurses, deputy chief nurses, and chief nurse had diplomas or degrees. Work experience was measured in years.

b. Institutional characteristics (top management involvement, leadership, organizational structure, technical support, training, participation and awareness). Top management involvement was measured using three items. The responses were recorded on a five point likert scale ranging from 1- strongly disagree to 5 – strongly agree.

c. IT skills (Basic word processing, spreadsheets, use of email and internet, knowledge of system security, ability to resolve errors and create databases). IT skills were measured using 6 items. Respondents marked yes or no.

3.4 Location of the study

The location of the study was KNH (Appendix I). It is the largest national referral, teaching and research hospital in Kenya, and participates in national health planning and policy. KNH is at the apex of the referral system in health sector and plays a critical role in terms of Health information system. It is located in the Nairobi County along Hospital Road, upper hill, about 5km west of the Central Business District. It has a bed capacity of over 2000, attends to 80,000 inpatients and over 500,000 outpatients annually (health information department, 2012).

The researcher is an employee of the hospital, which made it easier for data collection.

3.5 Study population

The study population was nurses working in KNH who met the inclusion criteria. There are 1,709 (36.8 %) nurses out of 4,639 employees in the hospital. Female are 1,423 (83.3%) while male nurses are 286 (16.7 %). Female nurses dominate the profession. Nurses are health professionals registered and licensed by the nursing council of Kenya to practice and provide nursing care. Nurses acquire their training from medical training colleges and universities. Their training ranges between two to four years. On completion of training, they are awarded certificates, diplomas and degrees depending on their level of education. On employment, nurses are designated as enrolled nurse, nursing officer I-III, senior nursing officer, assistant chief nurse, deputy chief nurse and chief nursing officer. Nurses are employed at any age provided they have the required qualifications. The retirement age is 60 years. Their mobility from one designation to another depends on the number of years in that position and any other requirements stipulated by the human resource department. Nurses are deployed in the wards and clinics in the hospital.

Nurses perform critical role towards the treatment and recovery of patients. They closely work with the doctors to ensure that nursing care is given to the patients.

3.5.1 Inclusion

Nurses aged 20 and 60 years working in the wards and clinics. Those with one or more years of experience were eligible for the study because they were on permanent basis. Those that consented to participate and were present during the study.

3.5.2 Exclusion

Nurses less than 20 years old because they are still in college and those above 60 years because this is the retirement age. Those with less than one year experience because they were still on probation. Those who were not present during the study due to sickness leave or night/ weekend/public holidays off. Visiting nurses from other hospitals, nurses on internship or attachment in the hospital. Other employees of the hospital because they belong to other professions.

3.6 Sample size determination

The sample size was calculated using the formula by (Fisher et al., 1998). There was no estimate of the proportion in the population assumed to have the characteristics of interest, thus, p was 50%.

$$n = \frac{Z^2 PQ}{d^2}$$

Where:

Z = is the standard normal deviate at 95% CI (Z – value = 1.96)

P = proportion of the population with characteristics under investigation

Q = is the proportion without characteristics under investigation

d = is the degree of accuracy (p-value = 0.05)

$n = \frac{(1.96)^2 (0.50) (0.50)}{(0.05)^2}$

n = 384

The total population was 1709< 10,000.The formula to determine the sample size was as follows:

Therefore, $nf = \frac{n}{1+(n/N)}$

Where $nf = \frac{384}{1+(384/1709)}$

$nf = \frac{384}{1+0.225}$

$nf = \frac{384}{1.225}$ = 313 with additional 31(10%).

nf = 344

3.7 Sampling technique

Stratified sampling technique was used in this study. Stratification was based on gender and designation. There are 1423(83%) females and 286 (17%) males. The ratio of females and male nurses was reflected in the sample. A sample of 313 nurses was desired. Simple random sampling was used to select 260 female nurses and 53 male nurses. A research randomizer www.randomizer.org was used. An additional 31 (10 %), 26 females and 5 males to cater for non-responses and for spoilt questionnaires. The total number of questionnaires issued to the respondents were 344. The obvious advantage in stratified random sampling is that it ensures inclusion, in the sample, of subgroup, which

otherwise would be omitted entirely by other sampling methods because of their small numbers in the population.

3.7.1 Sampling the respondents

A sampling frame was drawn as shown in table 3.1. The table shows that females were 1423 (83.3%) and males were 286 (16.7 %). The total population was 1709 (100 %).

Table 3.1 Distribution in the nurse population

Designation	**Gender**		**Total**
	F	**M**	
Chief nurse	1 (0.1%)	0 (0.0%)	1 (0.1%)
Deputy chief nurse	2 (0.1%)	0 (0.0%)	2 (0.1%)
Assistant chief nurse	9 (0.5%)	1 (0.1%)	10 (0.6%)
Nursing Officers	1133 (66.3%)	225 (13.2%)	1358 (79.5%)
Enrolled Nurses	278 (16.3%)	60 (3.5%)	338 (19.8%)
Total	**1423 (83.3%)**	**286 (16.7%)**	**1709 (100%)**

Table 3.2 shows distribution in the sample. The table shows that females were 260 (83.1 %) and males were 53 (16.9 %). The sample was 313.

Table 3.2 Distribution in the sample

Designation	**Sex**		**Total**
	F	**M**	
Chief nurse	0 (0.0%)	0 (0.0%)	0 (0.0%)
Deputy chief nurse	0 (0.0%)	0 (0.0%)	0 (0.0%)
Assistant chief nurse	1 (0.3%)	1 (0.3%)	2 (0.6%)
Nursing Officers	208 (66.5%)	41 (13.1%)	249 (79.6%)
Enrolled Nurses	51 (16.3%)	11 (3.5%)	62 (19.8%)
Total	**260 (83.1%)**	**53 (16.9%)**	**313 (100%)**

Table 3.3 shows the distribution of the additional 31 (10%).

Table 3.3 Distribution of additional 10%

Designation	**Sex**		**Total**
	F	**M**	
Chief nurse	0	0	0
Deputy chief nurse	0	0	0
Assistant chief nurse	0	0	0
Nursing Officers	21	4	25
Enrolled Nurses	5	1	6
Total	**26**	**5**	**31**

3.7.2 Sampling focus group discussion

Focus group discussion was conducted to compliment quantitative survey. Purposive sampling was used to select participants for focus group discussion. The technique allowed the researcher to use cases that had the required information with respect to the objectives of the study. One focus group discussion with 10 Assistant chief nurses was conducted. The participants were better placed to highlight critical issues regarding the proposed CHMIS implementation.

3.7.3 Sampling the Key informants

Five head of departments were purposively selected as key informants. Those selected were the chief nurse, chief administrative officer, chief health information officer, finance manager and ICT manager. They offered in–depth information on the proposed implementation of CHMIS.

3.8 Construction and research instruments

3.8.1 Semi structured questionnaire

The questionnaire (Appendix III) had four parts. The first part included demographic characteristics. Participants responded by ticking the appropriate answer in the boxes provided. The second part included 36 –items used to assess technology readiness index (Parasuraman & Colby, 2001). The third part included items related to institutional characteristics. The fourth part included items related to IT skills, participants responded by indicating Yes/No.

3.8.2 Focus group discussion and key informant interviews

Focus group discussion and key informants interview guides (Appendix IV and V) were used to collect qualitative data. Focus group discussion and key informant interview guides were constructed using the objectives of the study. The general guideline for constructing Focus group discussion and key informants interview guides was followed. Focus group discussion guide had four parts. Part A contained the guideline for introduction, B contained the discussion guidelines, C contained the questions for discussion and D contained the guideline for closing. Focus group discussions make use of group dynamics to stimulate discussions, gain insights and generate ideas on the given topic of study. Key informant guide had three parts. Part A contained the guideline for introduction, Part B contained the questions for the interview, and part C contained the guideline for closing.

3.9 Pre - testing

Pre-testing of data collection tools was conducted at Mbagathi hospital, Nairobi County to ensure accuracy of the responses. The pre –test was conducted with 35 respondents, 5 participants for focus group discussion and 2 key informants. The researcher presented the research approval letter (Appendix VI) to the hospital superintendent in September, 2012. Authority was given to conduct research and the researcher introduced to the nursing officer in charge and the ICT officer. The researcher held a key informant interview with the nursing and ICT officer. The nursing officer agreed to give the questionnaires randomly to 35 nurses. A self-explanatory consent form was attached to the questionnaires for the nurses to read and accept / not accept to participate. The researcher collected the questionnaires after three days. The questionnaires were checked for completeness and for obvious errors. The questionnaires that were properly completed were put together for analysis and those not properly filled put aside. The questionnaires were analyzed and revised with the help of the supervisors. Data from key informants was organized according to key objectives of the study and analyzed. The procedure used in pre-testing the questionnaire was identical to that used during the actual study. The pre-test provided a check on the feasibility of the proposed procedure for coding, reliability, and validity of data collected from the final sample. Adjustments were made to rectify some errors noted in the questionnaire during pre-testing.

3.10 Validity and reliability

Validity is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. The researcher collected the data for the pre-test

and for the actual study without the use of research assistants. The researcher took time off from work to reduce fatigue during the study. The researcher relied heavily on the expert advice from the supervisors. Reliability is a measure of the degree to which a research instrument yields consistent results after repeated trials. A reliability coefficient (Cronbach alpha) was computed to indicate how reliable the data for technology readiness items was. The test showed high level of consistency ranging from 0.7 to 0.9.

3.11 Data collection techniques

Quantitative and qualitative data collection techniques used to collect data from the respondents, focus group discussion and key informant interviews. Quantitative technique produced quantifiable data while qualitative technique produced data in form of words. Both techniques supplement each other in that qualitative techniques provide the in-depth explanations while quantitative techniques provide the hard data needed to meet the required objectives and to test hypotheses.

3.11.1 Quantitative data collection technique

The quantitative data was collected from nurses working in the wards and clinics in KNH for two weeks in November, 2012. The researcher collected data using a self-administered questionnaire from nurses to establish the current level of readiness for CHMIS. The researcher used the list of nurses to locate the respondents. Nurses in KNH work for 24 hours shift in the wards and 8 hours normal shift in the clinics. The researcher collected data from respondents working in the wards in the first week. The researcher delivered the consent form for respondents (Appendix IIA) and the questionnaire (Appendix III) to the respondents and collected them from the nursing

officer in charge of the ward every day for the whole week. An additional 20 questionnaires were randomly given to nurses who were not included in the sample. The researcher checked the questionnaires for completeness and obvious errors every day. The questionnaires that were properly filled were put together and those not properly filled and with errors put aside. The researcher collected data from the respondents working in the clinics in the second week. The researcher delivered the questionnaires to the respondents and collected them the following day from the nursing officer in charge of the clinic for the whole week. An additional 11 questionnaires were randomly given to nurses who were not included in the sample.

3.11.2 Qualitative data collection technique

Qualitative data was collected from focus group discussion using (Appendix IV) and key informants using (Appendix V). Authority to meet the Assistant chief nurses was sought from their immediate supervisors. The focus group discussion was held in November, 2012. The Assistant chief nurses were informed of the meeting through their telephone extensions. They all agreed to attend the meeting in the seminar room at Accident and Emergency unit at the stipulated time. During the day of the meeting, the Assistant chief nurses were given consent forms (Appendix IIB) to give their consent before commencing the discussion. The information gathered from the discussion was recorded in a field notebook for analysis and formed part of the findings.

The key informant interviews were held in November 2012. The officers were informed of the interview through a telephone call to their offices. The officers agreed to participate and to attend the meeting. During the day of the meeting, the key informants were interviewed individually. The key informants were given the consent forms

(Appendix IIC) to give their consent before the interview began. The researcher noted the answers in a field notebook. The information was analyzed based on study objectives and formed part of the findings.

3.12 Data Analysis

Quantitative and qualitative data analysis was carried out.

3.12.1 Quantitative Data Analysis

Quantitative data was checked for errors before entering in the computer. The responses in the questionnaire were assigned numerical values according to data type. Data was entered into the computer using (SPSS version 19.0). Validation was done to ensure that wrong fields were not entered. Cleaning of the data was also done to ensure that what was entered was what was required. Descriptive and inferential statistics were analyzed. Mean, frequencies and percentages were used for descriptive statistics. Inferential results were analysed using Chi-square and linear regression. The level of confidence was set to 95% and the hypothesis testing was done, $p<0.05$. The purpose of descriptive statistics was to enable the researcher to describe the distribution of scores.

Results were presented in the form of frequency tables, figures and percentages. The likert scale was collapsed into two; agree and disagree, to give the scores for those who are ready and those who are not.

3.12.2 Qualitative data analysis

Qualitative data analysis seeks to make general statements on how categories of data are related. Field notes from the interviews were edited and cleaned up as data was being organized based on study objectives. Results were presented in narration.

3.13 Logistical and ethical considerations

Clearance of the study was sought from Graduate School (Appendix VI). The Ministry of Higher Education through the National Council for Science and Technology gave permit to conduct research (Appendix VII). KNH/UoN –Ethical review committee approved the proposal (Appendix VIII).

Informed consent was sought from the respondents, focus group discussion and key informants (Appendix IIA, IIB, and IIC respectively). Consent form for the respondents was attached together with the questionnaire. The consent form was self-explanatory and the respondent was required to accept or not accept to be a participant. Those respondents who accepted to take part filled the questionnaire; those who did not accept did not fill the questionnaire. The researcher conducted the informed consent process for focus group discussion and key informants interviews during the introduction. The participants for focus group discussion and key informants accepted to be part of the discussion and interview and completed the consent forms. Voluntary participation was encouraged and their choice to withdraw from the study had no repercussions whatsoever. Participants were assured of confidentiality and no names were used on data collection tools.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter reports on the results of the study. The objective of this section was to present quantitative and qualitative results. The response rate was 95%. Questionnaires were checked for completeness. Analysis was done using 313 questionnaires which were well completed.

4.2 Quantitative results

This section reports on quantitative results and hypotheses testing.

4.2.1 General characteristics of the respondents

This section reports on gender and work experience, age, highest level of education and designation of the respondents.

4.2.1.1 Gender and work experience

Table 4.1 shows that majority 260 (83.1%) of the respondents are females while 53 (16.9%) are males. 227 (72.5%) have work experience of less than 20 years experience and 86 (27.5%) have more than 20 years.

Table 4. 1: Gender and work experience

Characteristics	No of respondents	Percent
Gender		
Male	53	16.9
Female	260	83.1
Work experience		
1-20 years	227	72.5
More than 20 years	86	27.5

4.2.1.2 Cross tabulation of gender and work experience

Table 4.1.1 shows that 44 (14.1%) of the male respondents have work experience of less than 20 years while 9 (2.9%) have more than 20 years experience. 183 (58.5%) of the female respondents have worked for less than 20 years and 77 (24.6%) have more than 20 years.

Table 4.1.1: Cross tabulation of Gender by Work experience

Gender	Work experience		Total
	Less than 20 years	More than 20 years	
Male	44 (14.1%)	9 (2.9%)	53 (16.9%)
Female	183 (58.5%)	77 (24.6%)	260 (83.1%)
Total	227 (72.5%)	86 (27.5%)	313 (100%)

4.2.1.3 Age of respondents

Table 4.2 shows that 157 (50.2%) of the respondents are in the 35-44 age group, 63 (20.1%) are aged 34 years and below while 93 (29.7%) are aged more than 44 years.

Table 4.2 Age of respondents

Age	No of respondents	Percent
20 -29 years	25	8
30 - 34 years	38	12.1
35 - 44 years	157	50.2
45 - 49 years	42	13.4
50 years and above	51	16.3
Total	313	100

4.2.1.4 Highest level of education

Table 4.3 shows that 266 (85%) of the respondents have attained certificate/diploma as their highest level of education while 47 (15%) have degrees in nursing.

Table 4.3: Highest level of education

Highest level of education	No of respondents	Percent
Certificate/diploma	266	85
Degree	47	15
Total	313	100

4.2.1.5 Designation of respondents

Table 4.4 shows that 249 (79.6 %) of the respondents are nursing officers, 62 (19.8%) enrolled nurses and 2 (0.6%) Assistant chief nurses. The data indicates that nursing officers are the majority.

Table 4.4: Designation of respondents

Designation	No of respondents	Percent
Assistant chief nurses	2	0.6
Nursing Officers	249	79.6
Enrolled Nurses	62	19.8
Total	313	100

4.2.1.6 Distribution of respondents according to gender

Table 4.5 shows that majority 208 (66.5%) of the nursing officers are females, while 41 (13.1%) are males. There are 51 (16.3%) female enrolled nurses and 11 (3.5%) males.

Table 4.5: Designation by gender of respondents

Designation	Gender		Total
	Male	Female	
Assistant chief nurses	1 (0.3%)	1 (0.3%)	2 (0.6%)
Nursing officers	41 (13.1%)	208 (66.5%)	249 (79.6%)
Enrolled nurses	11 (3.5%)	51 (16.3%)	62 (19.8%)
Total	53 (16.9%)	260 (83.1%)	313 (100%)

4.3 Level of readiness for CHMIS among nurses

Table 4.6 shows the scores of level of readiness for CHMIS among nurses. The scores were calculated using the 36- items of TRI (Appendix III), the mean of each personality trait was calculated on a 5-point scale. The higher the mean for optimism and innovativeness, the more the respondents are ready for CHMIS. The mean for discomfort and insecurity is reverse coded. The higher the mean for discomfort and insecurity, the higher the discomfort and insecurity, and vice versa. The overall mean was 3.5.which is low, showing that the respondents are not ready to use CHMIS. The mean for optimism was high (4.0) indicating positivity of adopting CHMIS. The mean scores for

innovativeness was (3.3) which was leaning towards neutral. The mean for discomfort was (3.2) showing high levels of discomfort, the respondents are more likely to perceive CHMIS as being not easy to use. The mean for insecurity (3.4) was higher than the mean for discomfort, showing higher levels of insecurity.

Table 4.6: Scores showing level of readiness for CHMIS among nurses

Factors	Mean	Std. Deviation	Cronbach's alpha
Optimism	4.0	0.9	0.9
Innovativeness	3.3	0.8	0.7
Discomfort	3.2	0.9	0.8
Insecurity	3.4	0.9	0.7
Overall TR	3.5	0.9	0.9

4.4 Demographic characteristics influencing CHMIS readiness

Table 4.7 shows demographic characteristics of the respondents and the overall readiness.

Gender

Results showed that 110 (35.1%) of the respondents are ready for CHMIS, while 203 (64.9) are not, of those who are ready, 91 (29.1%) are females and 19 (6.1%) are males. Of those who are not ready, 169 (54.0%) are females and 34 (10.9%) are males.

Age

Respondents in the age bracket 35-44years are the majority, of which 56 (17.9%) are ready for CHMIS, while 101 (32.3%) are not. Those above 50years, 17 (5.4%) are ready for CHMIS, while 34 (10.9%) are not.

Highest qualification

Majority of the respondents with certificate and diplomas 99 (31.6%) are ready for CHMIS, while 167 (53.4%) are not.

Designation

Results showed that 100 (31.9%) nursing officers are ready for CHMIS, while 151 (48.2%) are not ready. Among the enrolled nurses, 10 (3.2%) are ready for CHMIS, while 52 (16.6%) are not.

Work experience

Results showed that 87 (27.8%) of the respondents with less than 20years of experience are ready for CHMIS, while 140 (44.7%) are not. Of the respondents with more than 20years experience, 23 (7.3%) are ready for CHMIS, while 63 (20.1%) are not.

The study found a significant relationship between designation and readiness for CHMIS among nurses (x2 (1) = 12.26, p = 0.000). However, there was no significant relationship between gender, age, level of education, highest qualification, work experience and overall readiness for CHMIS among nurses (x^2 (1) = 0.01, p = 0.90; x^2 (2) = 3.87, p=0.14; x^2 (1) = 0.15, p =0.702; x2 (1) = 3.34, p = 0.067; x2 (1) = 3.67, p= 0.055).

Table 4.7: Demographic characteristics and readiness for CHMIS

DEMOGRAPHIC CHARACTERISTICS		Readiness for CHMIS		Total	X^2
		Not ready (N=203)	Ready (N=110)		
Gender	Male	34(10.9%)	19(6.1%)	53(16.9%)	X^2 =0 .01 df = 1 P = 0.906
	Female	169(54.0%)	91(29.1%)	260(83.1%)	
Age	Up to 29 years	13(4.2%)	12(3.8%)	25(8.0%)	X^2 = 2.72 df = 4 P = 0.606
	30 - 34 years	25(8.0%)	13(4.2%)	38(12.1%)	
	35 - 44 years	101(32.3%)	56(17.9%)	157(50.2%)	
	45 - 49 years	30(9.6%)	12(3.8%)	42(13.4%)	
	50 years and above	34(10.9%)	17(5.4%)	51(16.3%)	
Level of education	College	166(53.0%)	88(28.1%)	254(81.2%)	X^2 =0.15 df = 1 P = 0.702
	University	37(11.8%)	22(7.0%)	59(18.8%)	
Highest qualification	Certificate / Diploma	167(53.4%)	99(31.6%)	266(85.0%)	X^2 = 3.34 df = 1 P = 0.067
	Degree	36(11.5%)	11(3.5%)	47(15.0%)	
Designation	Nursing officers	151(48.2%)	100(31.9%)	251(80.2%)	X^2 = 12.26 df = 1 P = 0.000
	Enrolled nurses	52(16.6%)	10(3.2%)	62(19.8%)	
Work experience	Less than20 years	140(44.7%)	87(27.8%)	227(72.5%)	X^2 = 3.67 df = 1 P = 0.055
	More than 20 years	63(20.1%)	23(7.3%)	86(27.5%)	

4.5 Institutional characteristics influencing readiness for CHMIS

Table 4.8 shows institutional characteristics (top management involvement, leadership, organizational structure, technical support, training, participation and awareness) and readiness for CHMIS.

Top management involvement

Majority of the respondents 189 (60.4%) agreed there is top management involvement while 124 (39.6%) disagreed.

Leadership

Majority of the respondents 181 (57.8%) agreed there are system champions, while 132 (42.2%) disagreed.

Organizational structure

Majority of the respondents 199 (63.6%) agreed that the organizational structure will change after CHMIS implementation while 114 (36.4%) disagreed.

Technical support

Majority of the respondents 189 (60.4%) agreed that technical support is available, while 124 (39.6%) disagreed.

Training

Results showed that 136 (43.5%) of the respondents agreed they have some training in IT, while 177 (56.5%) disagreed.

Participation and awareness

Results showed that 89 (28.4%) of the respondents agreed that they have been involved in the process of implementation and are aware of the proposed implementation, while 224 (71.6%) disagreed.

Findings show a significant relationship between institutional characteristics and readiness for CHMIS among nurses ($x2\,(1) = 41.69$, $p= 0.000$).

Table 4.8 Institutional characteristics and readiness for CHMIS

INSTITUTIONAL CHARACTERISTICS		Readiness for CHMIS		Total	X^2
		Disagree (N=203)	Agree (N=110)		
Top management involvement	Disagree	98(31.3%)	26(8.3%)	124(39.6%)	$X^2 = 18.11$ df = 1 P = 0.000
	Agree	105(33.5%)	84(26.8%)	189(60.4%)	
Leadership	Disagree	111(35.5%)	21(6.7%)	132(42.2%)	$X^2 = 37.05$ df = 1 P = 0.000
	Agree	92(29.4%)	89(28.4%)	181(57.8%)	
Organizational structure	Disagree	98(31.3%)	16(5.1%)	114(36.4%)	$X^2 = 35.052$ df = 1 P = 0.000
	Agree	105(33.5%)	94(30.0%)	199(63.6%)	
Technical support	Disagree	98(31.3%)	26(8.3%)	124(39.6%)	$X^2 = 18.11$ df = 1 P = 0.000
	Agree	105(33.5%)	84(26.8%)	189(60.4%)	
Training	Disagree	131(41.9%)	46(14.7%)	177(56.5%)	$X^2 = 14.98$ df = 1 P = 0.000
	Agree	72(23.0%)	64(20.4%)	136(43.5%)	
Participation and awareness	Disagree	161(51.4%)	63(20.1%)	224(71.6%)	$X^2 = 17.03$ df = 1 P = 0.000
	Agree	42(13.4%)	47(15.0%)	89(28.4%)	
Overall institutional characteristics	Disagree	139(44.4%)	68(21.7%)	207(66.1%)	$X^2 = 46.739$ df = 1 P = 0.000
	Agree	28(8.9%)	78(24.9%)	106(33.9%)	

4.6 Influence of IT skills on CHMIS readiness

Table 4.9 shows the influence of IT skills on CHMIS readiness (basic word processing, basic spreadsheets, and knowledge of system security, ability to resolve errors, use of email and internet and ability to create databases).

Basic word processing

Majority of the respondents 241 (77.0%) have skills in basic word processing, while 72 (23.0%) lacked the skill.

Basic spreadsheets

Minority of the respondents 130 (41.5%) have skills in spreadsheets, while 183 (58.5%) lacked the skill.

Knowledge of system security

Minority of the respondents 104 (33.2%) have knowledge of system security, while 209 (66.8%) lacked the skill.

Ability to resolve errors

Minority of the respondents 113 (36.1%) have the ability to resolve errors, while 200 (63.9%) lacked the skill.

Use of email and internet

Majority of the respondents 252 (80.5%) have the ability to use email and internet, while 61 (19.5%) lacked the skill.

Ability to create databases

Minority of the respondents 110 (35.1%) have the ability to create databases, while 203 (64.9%) lacked the skill.

Overall, 180(57.5%) of the respondents have IT skills, while 133(42.5%) lacked the skills.

There was a significant relationship between overall IT skills (basic word processing, basic spreadsheets, knowledge of system security, ability to resolve errors, use of email and internet, and ability to create databases) and readiness for CHMIS among nurses ($x^2(1) = 7.908$, $p = 0.005$).

Table 4.9 Relationship between IT skills and Overall readiness for CHMIS

IT SKILLS		Overall TR		Total	X^2
		Not ready(N=203)	Ready (N=110)		
Basic word processing	Yes	144(46.0%)	97(31.0%)	241(77.0%)	$X^2 = 11.98$ df = 1 P = 0.001
	No	59(18.8%)	13(4.2%)	72(23.0%)	
Basic spreadsheets	Yes	72(23.0%)	58(18.5%)	130(41.5%)	$X^2 = 8.75$ df = 1 P = 0.003
	No	131(41.9%)	52(16.6%)	183(58.5%)	
Knowledge of system security	Yes	58(18.5%)	46(14.7%)	104(33.2%)	$X^2 = 5.64$ df = 1 P = 0.018
	No	145(46.3%)	64(20.4%)	209(66.8%)	
Ability to resolve errors	Yes	69(22.0%)	44(14.1%)	113(36.1%)	$X^2 = 1.12$ df = 1 P = 0.291
	No	134(42.8%)	66(21.1%)	200(63.9%)	
Use of email and interment	Yes	152(48.6%)	100(31.9%)	252(80.5%)	$X^2 = 11.69$ df = 1 P = 0.001
	No	51(16.3%)	10(3.2%)	61(19.5%)	
Ability to create databases	Yes	58(18.5%)	52(16.6%)	110(35.1%)	$X^2 = 10.95$ df = 1 P = 0.001
	No	145(46.3%)	58(18.5%)	203(64.9%)	
Overall IT skills	Yes	84(26.8%)	96(30.7%)	180(57.5%)	$X^2 = 7.613$ df = 1 P = 0.006
	No	83(26.5%)	50(16.0%)	133(42.5%)	

4.7 Relationship between demographic characteristics and readiness for CHMIS

A hypothesis test was computed to accept or to reject the null hypotheses. Linear regression was computed for demographic characteristics, while Chi square test was computed for institutional characteristics and IT skills.

Hypothesis 1:

H_0 There is no relationship between demographic characteristics (gender, age, highest level of education, designation, work experience) and CHMIS readiness among nurses in KNH.

H_1 There is a relationship between demographic characteristics (gender, age, highest level of education, designation, work experience) and CHMIS readiness among nurses in KNH.

Table 4.10 shows there was no relationship between gender, age, highest level of education, designation, work experience and readiness for CHMIS (F (5, 307) = 1.485, p>0.05). Since the probability of the F statistic (p=0.195) was more than or equal to the level of significance (0.05), the null hypothesis that correlation coefficient (R) was equal to 0 was rejected. The null hypothesis that there was no relationship between the variables was supported.

Table 4.10 Relationship between demographic characteristics and readiness for CHMIS

Model		Sum of Squares	df	Mean Square	F	Sig.
1	**Regression**	1.846	5	0.369	1.485	.195
	Residual	76.34	307	0.249		
	Total	78.185	312			
a Predictors: (Constant), gender, age, highest level of education, designation work experience						
b Dependent Variable: Technology readiness						

4.8 Relationship between overall institutional characteristics and CHMIS readiness among nurses in KNH

Hypothesis 2:

H_0 There is no relationship between institutional characteristics and CHMIS readiness among nurses in KNH

H_1 There is a relationship between institutional characteristics and CHMIS readiness among nurses in KNH

Table 4.11 shows the relationship between institutional characteristics and readiness for CHMIS. The likert scale for institutional characteristics and readiness for CHMIS

(Appendix III) was collapsed into two; agree and disagree, to give the scores for those who are ready and those who are not. The probability of the chi-square test statistic (chi-square=46.739) was $p<0.01$, less than or equal to the alpha level of significance of 0.05. There is a statistically significant relationship between institutional characteristics and readiness for CHMIS. Therefore, the null hypothesis that there is no relationship between institutional characteristics and CHMIS readiness among nurses in KNH is rejected.

Table 4.11 Relationship between institutional characteristics and readiness for CHMIS

Institutional characteristics	Readiness for CHMIS		Total	Chi Square
	Disagree	Agree		
Disagree	139(44.4%)	68(21.7%)	207(66.1%)	$X^2 = 46.739$ df = 1 p = 0.000
Agree	28(8.9%)	78(24.9%)	106(33.9%)	
Total	167(53.4%)	146(46.6%)	313(100%)	

4.9 Relationship between IT skills and CHMIS readiness among nurses in KNH

Hypothesis 3:

H_0 There is no relationship between IT skills and CHMIS readiness among nurses in KNH

H_1 There is a relationship between IT skills and CHMIS readiness among nurses in KNH

Table 4.12 shows the relationship between IT skills and readiness for CHMIS. The probability of the chi-square test statistic (chi-square=7.613) was $p<0.05$, is less than or

equal to the alpha level of significance of 0.05. There is statistically significant relationship between IT skills and readiness for CHMIS. The null hypothesis that there is no relationship between IT skills and CHMIS readiness among nurses in KNH is rejected.

Table 4.12 Relationship between IT skills and readiness for CHMIS

IT skills	Readiness for CHMIS		Total	Chi Square
	Disagree	Agree		
Yes	84 (26.8%)	96 (30.7%)	180 (57.5%)	$X^2 = 7.613$
No	83 (26.5%)	50 (16.0%)	133 (42.5%)	df = 1
Total	167 (53.4%)	146 (46.6%)	313 (100%)	p = 0.006

4.10 Qualitative analysis

Information was analysed in a systematic way to make general statements on how categories of data were related. Qualitative data was collected from focus group discussion and key informant interviews.

4.10.1 Analysis from focus group discussion

The analysis was based on the questions in the discussion guideline.

Perception of participants in focus group discussion on CHMIS implementation

The focus group discussion perceived that the top management was not committed towards the success of CHMIS implementation. Sensitization has been done to a small number of nurses and the goal of implementation is not clearly communicated. Therefore, participation in the process among nurses was lacking. However, the focus group discussion felt that if the top management committed itself more to the implementation, CHMIS will succeed and bring efficiency in their work.

Training

The top management has not organized for nurses training in IT. Those who have IT knowledge and skills got them through their own initiatives, thus the feeling that all nurses should be taken through an IT training programme.

Infrastructure

Sufficient infrastructure is lacking in the hospital. There is only stand-alone computers in some offices which are being used for administrative purposes. The computers are not sufficient and there are no computers at the nurses' desk. There is no software in place and networking has not been done.

System champions

According to the focus group discussion, there are no system champions in nursing.

Top management involvement

Top management involvement is lacking. This is attributed to the fact that the top management has not communicated the IT strategy to nurses.

Programmes and strategies recommended in the focus group discussion

Sensitization and awareness to be done to all nurses on the proposed CHMIS implementation, training of system champions from nursing department,installation of computers and software,networking, and training of nurses in IT skills.

4.10.2 Key informant interviews

Analysis from the key informant interviews was based on the questions in the guideline.

Perception of key informants on CHMIS readiness

The key informants are very optimistic that the CHMIS implementation will succeed. However, they all agreed that the hospital was facing many challenges which may hinder the implementation.

Infrastructure

According to the key informants the hospital has not put the infrastructure required for CHMIS.There are no computers for CHMIS, the software has not been procured, and networking has not been done.

Training programmes in IT

The key informants felt that the hospital has not done enough in terms of training in IT. Training programmes have not been initiated to enable nurses to be IT compliant. However, the key informants agreed that this should be started immediately.

Challenges identified by Key informants

Some of these challenges mentioned are lack of infrastructure (hardware and software), lack of networking, lack of IT training among employees and especially nurses who do alot of documentation,lack of capacity for ICT department, insufficient funding to support the implementation and ICT master plan is still on draft form. The key informants recommended the same strategies as focus group discussion and also added that ICT master plan be implemented.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter discusses the findings of the study, conclusions, recommendations, and proposes further research.

5.1 Discussion

The study was conducted with the objective of assessing the level of readiness for CHMIS among nurses in KNH. Readiness for CHMIS enables nurses to adopt to CHMIS. Lack of readiness for CHMIS hinders efficient use of the system, resulting to failure and wastage of resources. The results therefore came at a time when there is a need for the top management to embark on education and training programs to enhance the levels of readiness for CHMIS.

5.1.1 Level of readiness for CHMIS among nurses

The findings showed that nurses are high at optimism (4.0), moderate in innovativeness (3.3), high in insecurity (3.4) and discomfort (3.2). The overall mean for (TR) was (3.5). Overall, 110 (35%) are ready for CHMIS while, 203 (65%) are not. The overall results showed that nurses are not ready for the proposed CHMIS. Optimism score was high, innovativeness was moderate, while insecurity and discomfort was high. Thus, the overall score was low. According to Parasuraman and Colby (2001), scores for optimism and innovativeness should be high while scores for insecurity and discomfort should be low. This is intended to ensure that the TR levels are high, thus ensuring adoption of CHMIS.

Results from focus group discussion and key informant interviews supported these findings. The participants for focus group discussion and key informants are optimistic that CHMIS would bring about efficiency and effectiveness. However, they are in agreement that the hospital has many challenges in terms of CHMIS implementation.

The results are in agreement with those of (Walczuch & Lemmink, 2007) who found that optimism concerns the possession of positive attitude toward technology such as people's beliefs of level of control, flexibility, convenience and efficiency. Walczuch & Lemmink, (2007) found that in nursing, technological optimists advocate the use of technology as an important opportunity to broaden their professional field. Thus, technology can be readily assimilated into humanistic nursing practice; nursing will be socially be advantaged by technology. Results are also in agreement with those of (Parasuraman, 2000) who found that it is important that people can assure that technology is under control. Results further showed that innovativeness was moderate. Results differ with previous research that showed higher innovativeness (Walczuch & Lemmink, 2007). Results also differ with those of Agarwal & Prasad, (1999) who confirmed that the higher individual's personal innovativeness, the more nurses become familiar with new technologies. This implies that nurses in KNH are not eager to try using CHMIS and may not believe that CHMIS will provide additional attractive or useful functions.

Results of this study indicated that nurses have higher insecurity. Results are in agreement with those of Walczuch & Lemmink (2007) who found that the more insecurity that nurses possessed, the less they will be eager to use CHMISAs a result, nurses in KNH may belief that switching to CHMIS is risky and it could fail at the worst time when they are carrying out nursing care. Results also showed that nurses have

higher discomfort. Results are in agreement with those of (Venkatesh & Davis, 1996) who found that nurses will be more likely to perceive CHMIS as not being easy to use. Thus, nurses may subconsciously reject the use of CHMIS. Results are in agreement with those of Venkatesh & Bala (2008) who found that when nurses feel unfamiliar with CHMIS, they might not use it comfortably. Thus, KNH nurses may be having a belief that CHMIS is not meant for them. Several implications for researchers can be drawn from this study. From a theoretical perspective, this study has contributed to the knowledge of applying TR to predict nurses' level of readiness. Moreover, this study extended previous studies of the level of TR for CHMIS among nurses and providing a greater insight into CHMIS adoption at the basis of four personality traits of TR.

Nurses are known to spend most of their time on face to face with patient care activities, such as medication administration, nursing assessment as well as variety of patient treatments. They often resist information systems because they have not been sensitized on the new technologies nor participated in the process. Nurses also resist because according to them, the top management has not communicated the goals and IT strategy to them to enable them to accept the system and eventually use it. Further, when they perceive that the hospital has not put in place the infrastructure, they develop some discomfort about the system implementation. They have discomfort because they feel that they lack the skills to use the system and develop insecurity because they lack ability to resolve errors and because they lack knowledge in system security. According to Kirkley & Stein (2004), they resist information system because they have to spend extra time on lengthy and trivial computer recording jobs during busy caring period. Examination of

the scores produced on the TRI scale will assist KNH to answer questions germane to their technology goals and implementation strategy (Parasuraman, 2000).

5.1.2 Demographic characteristics influencing readiness for CHMIS

Results from the study showed that 83% of the nurses are females and 17% are males. 58.5% of the females have experience of up to 20 years, while 24.6% have more than 20 years. 14.1% of the nurses have up to 20 years experience, 2.9% have more than 20 years. Majority of the nurses 50.2% are aged between 35-44 years, of which 85% have certificates and diplomas. Majority 79.6% are nursing officers, while 19.8% are enrolled nurses. Overall, nursing officers and enrolled nurses are 99.4% compared to ACNs who are 0.6%. The study further found that there was a significant relationship between designation and overall level of readiness for CHMIS. Findings showed no significant relationship between gender, age, level of education, highest qualification and experience. Results of this study therefore, showed that there is no difference between females and males nurses in making their decision regarding the use of new technology. The null hypothesis supported that there is no relationship between the variables and readiness for CHMIS. However, designation of nurses has proved to have an impact on readiness for CHMIS.

Results differ with those of Agarwal & Prasad (1999) who found that age, gender, education, and experience have an impact on the acceptance of technology. Results also differ with those of Venkatesh & Morris (2000) who showed that men perceived usefulness largely than women in making decision regarding the use of new technology. Results further, differ with those of Parasuraman & Colby (2001) who found no significant differences among age groups and gender regarding their perceived TR and

optimism. Results also differ with those of Steenkamp & Burgess (2002); Tellis et al. (2004) who found that age, mobility, education, and gender were all predictors for level of innovativeness.

5.1.3 Institutional characteristics influencing readiness for CHMIS

Findings showed that on overall, 34% of the nurses agreed that the top management was involved, system champions are in place, Organizational structure will change after the proposed computerization, technical support will be availed, training has been conducted, awareness raising has been done and nurses have participated in the implementation process, while 66% disagreed. Results from focus group discussion and key informants showed that only a small number of nurses have been sensitized on the proposed implementation of CHMIS; the top management has not provided training in IT, and those with IT skills acquired them through their own initiatives; infrastructure is insufficient and system champions are lacking. Results also found a significant relationship between institutional characteristics and readiness for CHMIS among nurses ($x2\,(1) = 46.739$, $p = 0.000$).

The null hypothesis that there was no relationship between overall institutional characteristics and readiness for CHMIS is rejected.

Results are in agreement with those of (John et al., 2003) who found that top management should clearly define goals for CHMIS and that principal support from the top management is required. Results are also in agreement with those of Wager et al., (2001) who found that system support was necessary and that the impact of Organizational structure must be understood prior to implementation. Results further agree with those of Lorenz & Riley (2000); Berg, (1999) who found that there could be

conflict with the existing Organizational health care setting, and that poor CHMIS design could lead to failure in the implementation.

Results are also in agreement with those of Wager et al., (2000); Gladwin et al., (2000) who found that technical support will be required to help nurses to use CHMIS and that lack of participation and awareness lead to unsuccessful introduction of new technologies. Results further agree with those of Kivuti & Chepchirchir (2011) who showed that training was important for computerization.

Results further showed that KNH has not finalized the ICT master plan. CHMIS implementation will only succeed if the ICT master plan is finalized and implemented. Based on the findings, nurses in KNH may not engage the CHMIS and IT investments will be wasted (Venkatesh & Bala, 2008).

5.1.4 Influence of IT skills on readiness for CHMIS

Findings showed that 57% have the skills in IT, while 43% lacked the skills. Hypothesis testing showed a statistically significant relationship between overall IT skills and readiness for CHMIS, $P< 0.05$. Results from focus group discussion and key informants showed that the top management of the hospital has not trained nurses on IT. Results are in agreement with those of (Simpson, 2000) who found that training in basic skills appeared to be minimal as less nurses have received training in using the categories investigated including word processing, email, and internet. Results are also in agreement with those of Estabrooks et al., (2003); Liu et al., (2000) who have shown that computer knowledge and skills of nurses were at moderate levels. Results further agree with those of Kivuti & Chepchirchir (2011) who found that Kenyan nurses have moderate levels of computer skills. However, results differ with those of Earley et al., (2009) who found

higher computer experience among Australian nurses that ranged between 64% and 90 %. This result implies that KNH nurses have minimal IT skills and this will hinder them from efficient use of the new technology, resulting in failure to use the system and wastage of capital resources.

5.2 Conclusion

The study was done with the objective of assessing the level of readiness for CHMIS among nurses in KNH. Assessing the level of readiness for CHMIS enables the top hospital management to know whether the nurses are ready for the proposed CHMIS implementation and to make concrete decisions on the education and training programmes required to raise TR levels thus ensuring adoption of CHMIS.

5.2.1 Level of readiness for CHMIS among nurses

The study has identified that the level of readiness for CHMIS among nurses is low and nurses are not ready for CHMIS. Based on the personality traits, insecurity is the highest, followed by discomfort. A high score on these dimension reduce overall TR. Innovativeness is also moderate and lower than optimism. High scores on these dimensions increase the overall TR. The study found that the top management has not put strategies in place to ensure that nurses are ready to use CHMIS.

The model used in this study considers personality traits as being influenced by demographic, institutional characteristics and IT skills but usually ignored in previous TR research.

5.2.2 Demographic characteristics influencing readiness for CHMIS

The study has established that designation has a significant relationship with readiness for CHMIS, while age, gender, highest level of education, and work experience has no significant relationship with readiness for CHMIS. However, fewer nurses (0.6%) are at the higher designation. Mobility has been found to be a predictor for innovativeness and therefore reduces the level of readiness for CHMIS. The top management should device a method of ensuring mobility; this may increase the level of innovativeness. Finally, gender bias due to the sample of 83% females should be noticed when citing results.

5.2.3 Institutional characteristics influencing readiness for CHMIS

The study has established from quantitative and qualitative results that the top management has not communicated the goals for CHMIS and the IT strategy to nurses. System champions in nursing have not been identified, training in IT skills has not been carried out, awareness and participation in the CHMIS implementation process is lacking. The hospital has insufficient infrastructure for CHMIS implementation. Lack of top management commitment, system champions, technical support, training, awareness and participation, and poorly designed CHMIS lead to unsuccessful introduction of CHMIS.

5.2.4 Influence of IT skills on CHMIS readiness

The study has established that almost half of the nurses lack IT skills. Majority lacked knowledge in system security, ability to resolve errors and create databases. The study found that adequate measures have not been taken to ensure that nurses have sufficient skills in IT to enable them acquire knowledge in system security, ability to resolve errors and ability to create databases. Knowledge and skills in IT will reduce the insecurity

nurses have and the discomfort of adopting CHMIS. This will increase the scores in optimism and innovativeness traits.

5.3 Recommendations

a. Based on the findings, the top hospital management should fully assess nurses level of readiness and other requirements prior to implementing CHMIS to ensure that CHMIS implementation succeeds and meet real needs of nurses. This will ensure that nurses are ready to use CHMIS upon implementation.

b. Kenyatta National hospital should strive to ensure mobility of nurses so that they can move to higher designations. This further increases the propensity to adopt CHMIS.

c. Kenyatta National Hospital should fully commit itself to successful implementation of CHMIS. The top hospital management should develop and communicate IT strategy to all nurses, identify system champions among nurses, explain the impact of organizational structure prior to implementation of CHMIS, provide technical support, education and training, awareness and participation. The hospital should also ensure that computers and software are adequate, and networking of the service points be done.

d. The hospital should also finalize and implement the ICT master plan.

e. The hospital to develop training programmes on IT and ensure that all nurses have the skills required for use in CHMIS to mitigate their worry and resistance about the use of CHMIS.

5.4 Further research

a. Longitudinal studies should be carried out in future. This is because the study was conducted in a cross sectional perspective, which may lead to a snapshot presentation of the current study.

b. While the current study was conducted on nurses level of readiness for CHMIS, Future studies could investigate the level of readiness of different health professionals in order to gain a better knowledge of the level of readiness for CHMIS.

c. Future research could investigate which new constructs such as high innovativeness, low insecurity and discomfort could add to the explained levels of TR.

d. The study could be conducted in different settings to compare the results.

e. Future studies could evaluate the challenges affecting CHMIS implementation.

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APPENDICES

Appendix I: Map of Kenya

Source Google Maps 2012

Location of KNH

Appendix II: Consent Forms

Appendix IIA: Informed Consent Form for respondents

My name is Olive Mirai Mucheneh a Post Graduate Student in Kenyatta University. I intend to conduct a research proposal entitled “Assessing the level of readiness for computerized Health Management Information System (CHMIS) among nurses in KNH”.

I kindly request you to participate in this study that will form part of the requirement for award of Degree of MSc. Health Information Management of Kenyatta University. Your participation is voluntary and your choice to withdraw from the study at any stage will be accepted. Anonymity will be ensured, as names will not be indicated in the questionnaire. The information provided will be very confidential and used for the purpose of the study only. The study will benefit the hospital, as programmes to help users adopt/accept CHMIS will be developed to ensure success of the implementation.

Tick if you **accept/do not accept t**o be part of the study.

Participant / Respondent

Signature…….Date……

Appendix IIB: Consent form for focus group discussion

My name is Olive Mucheneh a postgraduate student at Kenyatta University. The purpose of this study is to assess the level of Readiness for Computerized Health Management Information System (CHMIS) among nurses in Kenyatta National Hospital. Your name will not be recorded anywhere in the interview guide, instead a unique identifier will be used. The information provided will be used for the purpose of the study and confidentiality will be maintained.

Participation will be voluntary and you will be free to withdraw from the study at any stage of the interview. The researcher will answer any of your concerns during the study or thereafter.

I, the participant of FDG confirm that I have understood the purpose of the study and hereby **give consen**t/**do not give consent** (kindly tick the appropriate) to participate in the study.

Participant

Signature……..Date…….

Appendix IIC: Consent form for key informants

My name is Olive Mucheneh a postgraduate student of Kenyatta University. I intend to conduct a study entitled “Assessing the level of readiness for computerized health information system (CHMIS) among nurses in KNH.

I wish to request your permission to participate as a key informant in the study that will form part of the requirement for award of Degree of MSc. Health Information Management of Kenyatta University.

Your participation is entirely voluntary. You may withdraw from the study at any stage of the interview. The information given will be treated with confidentiality and used for the purpose of the study only.

The results of the study will be used to highlight to KNH Management on factors influencing readiness for CHMIS among nurses in the hospital, hence the information gained will be used to plan for effective education programmes and other strategies to ensure acceptance/adoption towards the success of the proposed CHMIS implementation.
I confirm that I have understood the key elements of the study and do hereby **give consent**/**do not give consent** (tick the appropriate) to participate in the study.

Key informant

Signature…….Date……..

Appendix III: Questionnaire for respondents

Questionnaire on level of readiness for computerized Health Management Information System (CHMIS) among nurses in KNH.

Part 1: Demographic/ Individual characteristics

Please tick (√) in the appropriate boxes

1. Gender
a) Male ☐
b) Female ☐

2. Age in years
a) 20 – 24 ☐
b) 25 – 29 ☐
c) 30 – 34 ☐
d) 35- 39 ☐
e) 40 – 44 ☐
f) 45-49 ☐
g) 50 and above ☐

3. Level of education
College
University

4. What is your highest qualification?
Certificate
Diploma
Higher Diploma
BSC. Nursing
Masters (specify) …….
Others (specify) ……

5. What is your designation?
   a) Director of Nursing
   b) Deputy Director of Nursing
   c) ACN
   d) SNO
   e) NO III-I
   f) Senior Enrolled Community Nurse
   g) Enrolled Community Nurse III - 1

6. Working Experience in years since confirmation.
   i. 1 – 5
   ii. 6 – 10

iii. 11 – 15
iv. 16 – 20
v. 21 – 25
vi. above 25

Part 2: Level of Technology Readiness Index

Rate your degree of readiness for computerized Health Management Information System by ticking in the box provided as shown in the 5 – point likert scale where 1=Strongly Disagree, 2= Disagree, 3=Neutral, 4= Agree, and 5=Strongly Agree

	Readiness Scales	**1**	**2**	**3**	**4**	**5**
7	Technology gives people more control over their daily lives.					
8	Products and services that use the newest technologies are much more convenient to use.					
9	You like the idea of doing business via computers because you are not limited to regular business hours.					
10	You prefer to use the most advanced technology available.					
11	You like computer programs that allow you to tailor things to fit your own needs.					
12	Technology makes you more efficient in your occupation.					
13	You find new technologies to be mentally stimulating.					
14	Technology gives you more freedom of mobility.					
15	Learning about technology can be as rewarding as the technology itself.					
16	You feel confident that machines will follow through with what you instructed them to do.					
17	Other people come to you for advice on new technologies.					
18	It seems your friends are learning more about the newest technologies than you are.					
19	In general, you are among the first in your circle of friends to acquire new technology when it appears.					
20	You can usually figure out new hi-tech products and services without help from others.					
21	You keep up with the latest technological developments in your areas of interest.					
22	You enjoy the challenge of figuring out hi-tech gadgets					
23	You find you have fewer problems than other people in making technology work for you.					
24	Technical support lines are not helpful because they don’t explain things in terms you understand					
25	Sometimes, you think that technology systems are not designed for use by ordinary people.					
26	There is no such thing as a manual for high tech product or service that’s written in plain language.					
27	When you get technical support from a provider of a high-tech					

	Readiness Scales	1	2	3	4	5
	product or service, you sometimes feel as if you are being taken advantage of by someone who knows more than you do.					
28	If you buy a high-tech product or service, you prefer to have the basic model over one with a lot of extra features.					
29	It is embarrassing when you have trouble with a high-tech gadget while people are watching.					
30	There should be caution in replacing important people-tasks with technology because new technology can breakdown or get disconnected.					
31	Many new technologies have health or safety risks that are not discovered until after people have used them.					
32	New technology makes it too easy for governments and companies to spy on people.					
33	Technology always seems to fail at the worst possible time.					
34	You do not consider it safe giving out a credit card number over a computer.					
35	You do not consider it safe to do any kind of financial business online.					
36	You worry that information you send over the Internet will be seen by other people.					
37	You do not feel confident doing business within a place that can only be reached online.					
38	Any business transaction you do electronically should be confirmed later with something in writing.					
39	Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes.					
40	The human touch is very important when doing business with a company.					
41	When you call a business, you prefer to talk to a person rather than a machine.					
42	If you provided information to a machine or over the Internet, you can never be sure if it really gets to the right place.					

Part 3: Institutional characteristics

To what extent do the following institutional factors affect the attainment of computerized patient health information system in KNH? Use a scale of 1-5, where 1=strongly disagree, 2=somewhat disagree, 3=neutral, 4=somewhat agree, and 5=strongly agree

	Institutional factors	1	2	3	4	5
43	The top management is committed towards the success of CHMIS					
44	The top management has clearly defined the goals of CHMIS					
45	The top management has communicated the I.T strategy to staff					

	Institutional factors	**1**	**2**	**3**	**4**	**5**
46	There are Project or System Champions in KNH					
47	The organizational structure is likely to change after the implementation of CHMIS					
48	The hospital has the infrastructure for proposed CHMIS					
49	The computer software for CHMIS is installed					
50	The departments have been interlinked for proposed CHMIS					
51	There is technical support from ICT Department					
52	You have the training necessary for CHMIS					
53	You have participated in the proposed CHMIS					

Part 4: I.T Skills among nurses in KNH

Kindly indicate your I.T skills by ticking **Yes** or **No** in the table provided

	I.T Skills	**YES**	**NO**
54	Basic word processing		
55	Basic spreadsheets		
56	Knowledge of system security		
57	Ability to resolve errors		
58	Use of email & internet		
59	Ability to create databases		

Appendix IV: Discussion guide for focus group

General guide for leading the focus group

A. Introduction (10 minutes)

- Welcome participants and introduce self
- Conduct the informed consent process of the discussion and why the participants were chosen,
- Discuss the purpose and process of focus groups
- Outline general ground rules of focus groups
- Outline general ground rules and discussion guidelines such as importance of everyone speaking up, talking one at a time.
- Address the issue of confidentiality.
- Inform the group that information discussed is going to be analyzed as a whole and that participant names will not be used in any analysis of the discussion.
- Read a protocol summary to the participants.

B. Discussion Guidelines (10 minutes)

- This study is intended to assess the level of readiness for computerized health management information system (CHMIS) among nurses in Kenyatta National Hospital (KNH).
- The discussion will be informal. I am here to ask questions, listen and make sure everyone has a chance to share.
- No one outside this room will have access to this information.

- The researcher will be taking notes as discussion progresses.

C. Focus group discussion (50 Minutes)

- What are the most positive things about CHMIS in KNH?
- What are the most negative things about CHMIS in KNH?
- What provisions has the hospital provided in terms of time / training and or monetary investments necessary for staff to adequately learn how to use the new system?
- What infrastructure has been put in place to ensure success in the proposed implementation of CHMIS?
- Are there project champions spearheading the proposed computerization?
- In your opinion, is the top hospital management committed towards successful implementation of CHMIS?
- What programs / strategies would you recommend the top management to put in place?

D. Closing (10 Minutes)

- Closing remarks
- Thank the participants

Identifier No……

Appendix V: Key informant interview guide

General guide that the researcher used to lead the key informant interviews.

A. Introduction (10 minutes)

- Introduce self
- Conduct the informed consent process
- Explain the general purpose of the interview discussion and why the participant was chosen.
- Address the issue of confidentiality
- Invite the participant to introduce himself / herself
- Read a protocol summary to the participant
- The researcher will be taking notes as discussion progresses.

B. Interview (60 minutes)

1. What is your opinion about computerized health management information system?
2. Would you say that there are any individual differences in terms of age, gender, level of education, income among others? Kindly explain.
3. What infrastructure is in place for the proposed CHMIS?
4. What training programs / strategies have been developed by top management?
5. In your opinion, are there any project champions in the hospital? If so, who are they?

6. In your opinion, has the top hospital management addressed change management? Kindly explain.
7. What challenges is the hospital experiencing in terms of the proposed CHMIS?
8. How will the hospital management ensure there is sustainability?

C. Closing (5 minutes)

Thank you for participating in this discussion.

Appendix VI: Research Approval by Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School DATE: 14th July, 2012

TO: Olive Mirai Mucheneh REF: P57/PT/12213/2009
C/o Health Management and Informatics

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board, at its meeting of 9th July, 2012, approved your Research Proposal for the M.Ph Degree Entitled "Assessing the Level of Readiness for Computerized Health Management Information System (CHMIS) among Nurses in Kenyatta National Hospital(KNH)".

You may now proceed with data collection.

Thank you.

JOSEPHINE K. NJAGI
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Department of Health Management and Informatics

Supervisors:

1. Dr. George Ochieng Otieno
   Department of Health Management and Informatics
   Kenyatta University

2. Dr. Isaac Mwanzo
   Department of Community Health
   Kenyatta University

JKN/rwm

Appendix VII: Research Permit by NCST

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349
254-020-310571, 2213123, 2219420
Fax: 254-020-318245, 318249
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: **NCST/RCD/13/012/56**

Date: **27th August 2012**

Olive Mirai Mucheneh
Kenyatta University
P.O.Box 43844-00100
Nairobi.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "***Assessing the level of readiness for Computerised Health Management Information System (CHMIS) among nurses in Kenyatta National Hospital (KNH),***" I am pleased to inform you that you have been authorized to undertake research in **Nairobi Province** for a period ending **31st December**, *2012.*

You are advised to report to **the Director, Kenyatta National Hospital** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

DR. M. K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to:

The Director
Kenyatta National Hospital
Nairobi.

Appendix VIII: Research Authorization by KNH /UoN ERC

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

KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke
Link:www.uonbi.ac.ke/activities/KNHUoN

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/274

20th September 2012

Olive Mirai Mucheneh
Reg. No.P57/PT/12213/2009
School of Public Health
Kenyatta University

Dear Olive

Research proposal: "Assessing the level of readiness for computerized Health Management Information System(CHMIS) among Nurses in Kenyatta National Hospital (KNH)" (P439/07/2012)

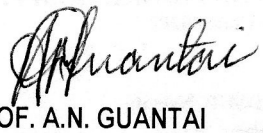
This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above revised proposal. The approval periods are 20th September 2012 to 19th September 2013.

This approval is subject to compliance with the following requirements:

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

For more details consult the KNH/UoN ERC website **www.uonbi.ac.ke/activities/KNHUoN**

Yours sincerely



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