TECHNOLOGICAL DYNAMICS IN NURSING AND THEIR CHALLENGES ON NURSE PRACTICING SKILLS IN KENYATTA NATIONAL HOSPITAL

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DECLARATION

This research project is my original work and has not been presented for a degree in any other university.

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DEDICATION

To my family: My husband Joshua Mboga Oliech, my son Ethan Geno Oliech, my daughter Natalie Gweth Oliech and my parents Jane and Philip Okeyo.

To all nurses in Kenya

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This research project has been made possible by a number of people to whom I am very grateful.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACNO   Assistant Chief Nursing Officer

AMREF   African Medical and Research Foundation

ART   Assisted Reproductive Technology

CBD   Central Business District

EHR   Electronic Health Record

EMAR   Electronic Medication Administration

ICT   Information Communication and Technology

IT   Information Technology

KEMRI   Kenya Medical Research Institute

KMTC   Kenya medical Training College

KNH   Kenyatta National Hospital

KNH/ERC   Kenyatta National Hospital/ Ethics Research Committee

MEAK   Medical and Educational Aid to Kenya

MOH   Ministry of Health

NACC   National AIDS Control Council

NASCOP   National AIDS and STDs Control Program

NBTS   National Blood Transfusion Services

NCK   Nursing Council of Kenya

NO   Nursing Officer

PRIDE   Poverty Reduction through Information and Digital Employment

SACNO   Senior Assistant Chief Nursing Officer

SNO   Senior Nursing Officer

SPSS	Statistical Package for Social Sciences
UK	United Kingdom
USA	United States of America
VVF	Vesico Vaginal Fistula

DEFINITION OF TERMS

Technological dynamics of Nursing are the changing aspects of nursing as a result of incorporation of technological innovations in nursing care.

Practicing skills are the skills that the nurse uses in carrying out their function and which enhance professionalism of the practice.

Nurse practitioners refer to the qualified professional nurses who are carrying out the nursing functions.

Technological skills are the skills that enable one to use technological equipment and to apply the use of ICT in their work.

Digital divide is the gap between those who have and those who do not have access to online information.

Patient acquired information is the information that the patients have about their health condition which they have sought for by themselves from any source including online sources.

Biometrics the science of identifying people through physical characteristics such as fingerprints, handprints, retinal scans, palm vein prints, voice recognition, facial structure, and dynamic signatures, is often suggested as a solution to the information access problem

CPOE-Computerized Physician/Provider Order Entry is a clinical software application designed specifically for providers to write patient orders electronically rather than on paper

Clinical decision support system is a process for enhancing health-related decisions and actions

with pertinent, organized clinical knowledge and patient information to improve

health and healthcare delivery

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EXECUTIVE SUMMARY

Title -Technological dynamics in nursing and their challenges on nurse practicing skills in Kenyatta national hospital.

Background- Technological trends in nursing have affected the practice of nursing and have brought about versatility and challenges in adaptation. Kenyatta national Hospital (KNH) introduced the use of technology in nursing but the uptake seems to be slow. Certain challenges may be associated with incorporation of technology that has resulted in the slow uptake.

Aim-This study aimed at establishing the trends in technology in the field of nursing and the challenges they pose on the practicing skills of nurses in KNH.

Significance of the study-Incorporation of technology in nursing is inevitable and has been reported to improve efficiency of nursing service and patient care delivery. Nursing ICT in KNH was commenced in 2013 and up to now the uptake is low. Challenges brought about by technological advances within nursing practice causing low uptake and continued inefficiency of care delivery have not been studied.

Study methodology-The study adopted a cross-sectional descriptive design. It was conducted in KNH, among qualified nurses who met the inclusion criteria. Simple random sampling technique was used to select 91 participants after applying fishers' formula. Purposive sample was used to select 5 nurse managers as key informants. A questionnaire focusing on demographic data, ways of utilization of technology in nursing, Influence of patient exposure to technology on nursing, challenges in technological skills application and the coping strategies was used to collect data. Interview Schedules were used on key informants. Analysis of data was done by verification and coding into an electronic system and use of Statistical Package for Social Sciences (SPSS) version 22.0. Statistical significance of the findings was analyzed using inferential statistics where association between variables was determined through chi square at confidence level of 95% at a p-value of 0.05. Presentation of the data was done using means, percentages and frequency distribution tables, pie charts and bar graphs.

Study Results- The study found that EHR was the most commonly used technological application in nursing for billing (100%) and ordering of supplies (78%). The study found a significant relationship between nurses' perception of the impact of online patient-acquired health information and nurses' felt need for additional skills (Chi= 8.4, DF=1, P= 0.004). and also a significant relationship between nurses' rating of patient's level of online acquired health

information and nurse's application of technology (Chi= 8.2, DF= 3, P= 0.042). The study also found a significant relationship between the level of usage of EHR and the challenge of lack of computer navigation skills (Chi =16.8, DF=3, P=0.001) and the challenge of Non-conversance with computer vocabularies/language (Chi= 11.8, DF=3, P = 0.008).

Conclusion and Recommendations- Study established that nurses who reported not having adequate technological skills reported more problems with computer navigation skills (Chi = 7.2, DF=1, P=0.007) and lacking necessary nursing application software in the system (Chi =9.1, DF=1, P=0.003). It also established that online patient acquired health information led to the need for more patient education skills (Chi= 8.4, DF=1, P= 0.004) and more use of technology by nurses. Therefore statistically technological dynamics had effect on nurse practicing skills at a confidence level of 95% p=0.005, rejecting the null hypothesis. Recommendations were that a survey on nurses level of skills in computers be done and be used as a guide for computer training. Also addressing of organizational, technological and user related challenges which could be done better through the establishment of a nursing informatics department to spearhead. Similar studies should also be done among nurses in different public and private hospitals and possibly compare the findings of these studies.

CHAPTER ONE: INTRODUCTION

1.1 Background Information

Since early times nursing has developed in response to the changing needs of the society. As the structure of society alters, new nursing habits, customs, values and knowledge emerge in response to the composition and health of the population (Veitch & Christie 2007). Nursing practice as was done in the early 18th century has been evolving over time and there are a lot of changes in nursing practice today as compared to what was done years before (Brooker & Waugh 2007). Many inevitable factors can be attributed to these changes. Most of the changes have been unavoidable and necessary to the contribution of growth and development in the nursing profession.

Health and Social care provision worldwide has been affected by trends in society that have called for the restructuring of various service providing organizations. A lot of attention has been focused on development of new ways to handle changes in society which affect the way health care is delivered (Brooker & Waugh 2007). Some of the changing trends affecting health care delivery are: demographic changes, economic and political changes, epidemiological trends and consumer wants and technologic trends.

Trends in consumer wants have seen an increase in well- informed, demanding customers with access to IT-based information. Consumers nowadays uphold choice as a fundamental right and there is empowerment of the client, (Warner et al, cited in Brooker & Waugh 2007). All these have necessitated a new way of thinking and have seen the health care systems all over the world being restructured in order to meet the ever changing requirements of the health-seeking clients. Advances in technology have re-defined the way health care services are delivered. Health care

delivery today is experiencing better accuracy in results, efficiency in time and resources management, new discoveries and innovations in health care and even new opportunities for science and research have emerged.

In the field of nursing, technology has brought about high fidelity, robotic simulation used in nursing education to supplement clinical nursing experiences. The newest simulation robots sweat, cry, turn cyanotic, and speak. The application of simulation in nursing education certainly could be safer for patients and could eliminate the scramble to find enough clinical facilities. The nursing leadership challenge, however, is to determine how much simulation may be too much and the degree of real human interaction needed for students to develop the art of professional nursing (Huston 2013).

Even health records continue to evolve as a result of technology. Any changes in documentation of care have a significant impact on nursing practice. The electronic health record (EHR) is a digital record of a patient's health history that may be made up of records from many locations and/or sources, such as hospitals, providers, clinics, and public health agencies (Huston 2013). Despite the challenges that continue to exist in understanding and demonstrating meaningful use; capturing the relevant data electronically as part of clinical workflows; and not having the appropriate certified technology (Milliard, Bru & Berger 2012), EHR is fast becoming part of health care delivery and all health workers nurses included must become well versed with it and adopt it in their daily nursing practice.

Increase in medical information and its ready availability to the client has influenced the delivery of nursing care. The internet and social media have changed how patients access information and nurses need to not only understand the impact and implications of this but also incorporate it in

the way they deliver care. Care must now go beyond the "traditional" nursing model. Nurses should adhere to local and national guidelines when giving patients more choices and opportunities about what they can do to manage their health. A nurse who is both confident and competent in the use of the internet for healthcare can empower and facilitate patients to become safe, active participants in their own healthcare (MacCabe & Hull 2014). Nurses need to be well informed on decision aids enhanced with information technologies that have potential to improve the outcomes of genetic counseling by providing tailored information and facilitating active engagement of patients in information uptake.

Websites and social media, such as Facebook, YouTube, Twitter, Myspace, Yahoo Answers, LinkedIn and Wikipedia, along with blogs, online forums, message boards and chat rooms, have become important channels for disseminating and sharing health information, and for learning about health. Rozenblum and Bates (2013), state that patients are becoming more engaged in their healthcare and use the internet to share and rate experiences. Patients often access incorrect and misleading facts online, and it is difficult for them to decide what is reliable. Although they should not be discouraged from accessing the internet, they should be advised to exercise caution because information can be confusing and may increase anxiety (MacCabe & Hull 2014).

The internet has a huge potential impact on professional practice, (Giles 2007). However, as MacCabe notes, it is important that nurses continue to provide patients with reliable information, supported by scientific evidence and provided by authors with no interest in anything other than patients' health. Information from the internet should complement but not replace that from the clinical team, (MacCabe 2014). Clinical staff can help patients put information in perspective and personalize concerns that arise from accessing information on the internet. The team should

be proactive and always remind patients that it is wise and safer to discuss any information from unofficial sources with a nurse or doctor.

The first International Working conference on Health Informatics in Africa was held April 19-23, 1993 at Ile-Ife, Nigeria (Onu & Agbo 2013). Since then ICT has been gaining foot in Africa health systems, with technology enabled programs emerging at the rate of 60% in sub-Saharan Africa in all areas of health particularly in HIV/AIDS, general primary care and maternal and child health (WHO 2012). Yet ICT has continued to be underutilized in most hospitals which are considered to apply use of ICT. For example in Ebonyi State of Nigeria though some hospitals and nursing institutions have computer or IT units, they serve primarily to support word processing for typing pools and offices (Onu & Agbo 2013).

The question often asked is how organizations can be better ready to respond to emerging technologies and changes such as those described above. Part of the answer to this question, is forecasting what skill sets will be needed to meet these emerging technologies and proactively addressing any skill set deficits of the human capital employed in those organizations (Huston 2013). The nursing profession has been sluggish in embracing change and with the new requirements in the health field due to the inevitable changes that have occurred in this field, it is important to establish whether nurses in practice possess the required skills to be able to deliver quality care that is up to date and whether they need to acquire more and newer skills to be able to deliver and maintain professionalism in nursing practice today. To establish the ways in which nurses are using technology in everyday practice and how the use of technology has affected their work, the challenges it has caused and also to establish in what ways they can be supported to incorporate more use of technology in their practice.

1.2 Problem statement

Caring for patients in a technologically advanced setting has become more complex and has transformed the concept of nursing delivery all over the world. Since the establishment of nursing as a profession in the latter part of the 19th century, the role of technology in nursing and its place in caring for patients has been a debate because its high-tech characteristics cannot replace the human touch which is an important aspect of caring. This has served to work against the systematic incorporation of technology into nursing practice to improve patient outcomes (Powell-Cope & Nelson & Patterson 2008). Even so technology still remains a vital part of nursing in the current times. Besides, technology has made information readily available, therefore clientele are very knowledgeable (MacCabe & Hull 2014), more so in Africa, where many African countries have begun incorporating technology in health care delivery.

Despite the presence of ICT in nursing in KNH since 2013, there is still a lot of inefficiencies in nursing care delivery and underutilization of computers and technology at large in nursing. Most nurses only use the computer to carry out a few functions like billing. Many other nursing functions suggested previously through other studies that could be done by the help of technology are still done manually. This has contributed to redundancy of work that could otherwise be taken care of by technology for example generation of nursing reports, ordering of medication, history taking etc. Presence of technology has not addressed redundancy of work and inefficiencies in delivery of many nursing functions.

This study's aim was to identify challenges nurses are facing in delivering services in a dynamic and technologically advancing setting with an exposed and well-informed clientele, an area that

has not been fully assessed. The study also aimed at investigating the strategies nurses have used to cope with the challenges due to a technologically dynamic working environment.

1.3 Research Questions

1. In which ways do nurses use technology in their daily nursing practice?
2. What is the influence of patient-acquired information from online sources on nursing practice?
3. What are the challenges faced by nurses in handling technological changes in nursing practice affecting their skills?
4. What are their coping strategies?

1.4 Objectives of the study

1.4.1 General Objective

To establish the technological trends in nursing and challenges they pose on the practicing skills of the nurse in KNH.

1.4.2 Specific Objectives

1. To establish the ways in which nurses use technology in their daily nursing work.
2. To determine the influence of patient-acquired information from online sources on nursing practice.
3. To identify the challenges and coping strategies used by nurses in dealing with the technological trends in nursing.

1.5 Study Hypothesis

Technology trends in nursing practice have had no effect on nurses' practicing skills in Kenyatta National hospital.

1.6 Justification of the study

According to the WHO (2010), 20-40 per cent of all health spending in Africa was wasted due to inefficiencies which could be resolved through the use of ICT. Investment in ICT had the potential to reform health systems, extend services to underserved areas, and reduce waste and redundancy. A survey in 2011 by Global Observatory for e-Health (GOe) showed that 83 per cent of 112 African countries could identify at least one ongoing m-Health program, indicating an advancing level of African tele-nursing, this justifying a critical study of its history, current applications and impact.

Prior to ICT design and implementation in KNH in 2012, studies done in 2009 and 2011, indicated that 98% of nurse managers had positive attitudes towards computers (Kivuti-Bitok 2009) and KNH nursing sector was ready for computerization with 51% of nurse managers having self-acquired competence a positive indicator of their anticipation for use of ICT (Kivuti & Chepchirchir 2011). ICT Implementation in KNH which begun in April 2013 has so far seen wards being installed with at least three networked computers and training of nurses is ongoing. Nurses so far, only carry out online billing and ordering of supplies and the uptake of the ICT implementation process is estimated to be about 30% (KNH, ICT Master plan 2014). Use of computerization is limited to non-clinical departments such as finance and procurement (Kipturgo et al 2014) Not much has been reported about the use of technology, the low uptake and the challenges technology has brought on the nurses' practicing skills in KNH.

This research was expected to generate knowledge that would be helpful to policy makers in nursing ICT at KNH and to the policy makers of nursing education. The findings will facilitate formulation of policies that will be beneficial for the regulation and incorporation of technological skills in nursing to ensure efficiency of nursing care. It was also hoped that the research would generate information that would facilitate a discussion on current technological issues affecting nursing practice and elicit an interest in further research on the technological dynamics in nursing and their impact on nurse practicing skills.

1.7 Scope of the study

This study sought to understand the changes in technological applications in nursing practice today. This was in support of the fact that nursing practice is evolving and new technological developments and requirements for health care delivery keep coming up. Health care professionals are required to keep abreast with every new discovery affecting their field of practice. The focus of the study was on technological skills, knowledge and information acquiring and dispensing skills, communication skills and the practicing skills which the nurse should have while practicing nursing in these current times and the challenges they face in applying these skills. The study was to be carried out on nurses working in Kenyatta national hospital.

1.8 Limitations of the study

On limitations, the sample obtained from KNH may not have been representative of all nurses working in Kenya more so those in the private sector whose working conditions may be quite different from those in the public facilities. This was to be minimized by obtaining a representative sample from the medical and surgical units of the hospital.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of technology in nursing practice

History has shown that cultures are radically altered by the revolutionary changes in science and technology. New technology means enhancing our ability to measure, predict, control, or direct and simultaneously create new possibilities as a result of uncertainty and unpredictability (Mesthene, cited in Locsin 2001). The profession of nursing has from time to time experienced changes in nursing care delivery and skill development in order to ensure enhancement of ability to perform functions aligned with the new possibilities in an ever changing and unpredictable environment.

The most influential trend in the field of nursing is the rapid development of knowledge and information fueled by the expanding communication technology and the internet which has precipitated expectations for nearly instant access and response to almost everything. This has created a related trend in terms of increasing urgency for competence, focused on specified outcomes validated through objective performance assessment methods which are now a requirement and are stringent to safeguard consumers, nurses and employers (Cherry & Jacob 2002).

Nurses are knowledge workers and are therefore information dependent. In an ever evolving health care delivery and increasingly competitive information marketplace, the knowledge workers must be prepared to make significant contributions by harnessing appropriate and timely information (McGonigle & Mastrian 2009). Studies have indicated that depending on the setting, nurses can spend between 25%-50% of their day managing and recording clinical information

and seeking knowledge to inform their practice. They gather atomic level data e.g., blood pressure or blood glucose, aggregate data to derive information and apply the knowledge.

Although for most nurses the role of ICT as well as its relevance and the importance of its work in nursing remains basically obscure and misunderstood, nurses have a role to play in ICT. They are required to articulate meaningful clinical nursing data and information structures that can be coded and processed to identify information processes associated with nurses' work and determine ways in which ICT can be utilized to support the capture, retrieval, and use of data, information and knowledge (McGonigle & Mastrian 2009).

This study is aimed at establishing the technological changes in nursing care delivery and their challenges on the skills of the nurses who are facing these changes. Most of these changes are reflected on the client seeking nursing services, on the systems involved in nursing care delivery and also on the growth and development of the profession (Cherry & Jacobs 2002). Nurses are expected to be well prepared with skills to handle any changes and new developments in their practice.

2.2 Development of Technology in nursing

Development of nursing has been hampered by the insufficient explanation of use of technology and experience with technology in nursing (ed. Locsin 2001). Issues to do with technology have rarely been stated in terms of changes to nursing goals, technological dominance or alterations in nursing practice (Sanford cited in ed. Locsin 2001).

Nurses have not been active in enhancing their own development and have shown little interest in questioning the prestige and power of science and technology. In addition, they have shown no resistance to assuming responsibility for all manner of tasks and knowledge associated with the emergence of technology. Therefore, they have subsequently absorbed roles and responsibilities into their professional practice (Castledine et al, cited in ed. Locsin 2001). As a consequence medicine has delegated time consuming and repetitive tasks to nurses; tasks associated with routine treatment, monitoring, observation and investigation, (Brown et al, cited in ed. Locsin 2001)

Nurses are usually most instrumental in the implementation of new medical technology, e.g., during the invention of the iron lungs i.e., ventilator back in the first part of the 20th century in America when there was the polio epidemic. The brave and resourceful nurses who cared for the patients in the iron lungs became technologically proficient. However often the goals of keeping their patients alive and attending to multiple physiological needs, compounded by large numbers of very ill patients during the epidemics, appropriately takes precedence such that these technological ideas take too long to be mainstreamed into nursing curricula (ed. Locsin 2001).

Advancements in technology and nursing knowledge have enabled nurses to concentrate on assessing and caring for patients' needs with a higher degree of sophistication. Technology in nursing has enabled delegation of the non-value and repetitious tasks to machines and therefore increased the nurses' time for critical thinking and bedside activities which cannot be replaced by technology. The critical care unit represents a harmonic convergence of caring and technology (Walters cited in ed. Locsin 2001). Technology is perceived as an enhancement to nursing rather than an alienation from caring.

2.3 Technology application in Nursing

Nursing practice has inevitably continued to be transformed by a surplus of sophisticated technologies such as smart devices, patient-monitoring systems and real-time location systems. In some developed countries like the United States, an executive order was issued by President George W Bush in 2004 to develop a nation-wide interoperable EHR within 10 years (McGonigle & Mastrian 2009). This is because it was noted that computerization of health records could avoid dangerous medical mistakes, reduce costs, and improve care.

EHR plays a role as a possible solution to improve the quality of care and to simultaneously control costs of health care. The EHR has eight essential components in health care which are also eight functions that promote patient safety. These are: Health information and patient data required to make sound clinical decisions, result management i.e., laboratory and radiology both current and historical, order entry management, decision support systems e.g., reminders and alerts, Electronic Communication and connectivity e.g., e-mail, web messaging and telemedicine, Patient support where patients can have patient education and self-monitoring tools like home tele-monitoring, administrative processes like electronic scheduling, billing and claims management systems, Reporting and population Health Management.

Bar-code electronic medication administration (Bar-code eMAR) technology as part of EHR is a system that has been incorporated in some advanced systems to ensure that nurses administer the correct medication at the correct dose, at the correct time to the correct patient. The traditional manual method of medication administration is sometimes associated with medication errors which may be fatal to the patient. Bar-code eMAR has added an additional layer of safety by requiring nurses to scan the bar codes on the patient's wristband and on the medication before

administration (Poon et al 2010). Administration is then automatically documented if dose scanned corresponds to approved prescription and the patient is due for it. However if there is no correspondence a warning is issued.

A study done in 2005 in medical, surgical, and intensive care units of an academic medical center in UK found that bar-code eMAR technology improved medication safety by reducing medication administration errors and transcription errors. The use of bar-code eMAR led to 41% reduction in non-timing administration errors and in turn a 51% reduction in potential adverse drug effects from these errors. It also led to 27% reduction in timing of medication administration errors. The bar-coded eMAR also completely eliminated transcription errors and its associated potential adverse drug effects (Poon et al 2010).

Another study conducted among registered nurses working in acute care unit of a large teaching hospital in USA in 2012, found that application of information technology in form of nursing care reminders aligned to the workflow of nurses, helped in prevention of healthcare errors in form of missed nursing care. This in turn reduced the cost of health care (Piscotty, Kalisch & Gracey-Thomas 2015). Application of clinical decision support systems (CDSS) by nurses in form of the electronic nursing care reminders has been associated with decreased reports of lack of attention by nurses or omission of nursing care. Nurses who frequently used the electronic nursing care reminders reported fewer omissions in care. The electronic nursing care reminders improved nurses' efficiency in nursing activities like turning of patients, feeding of patients' ambulation of patients etc., thus reducing complications which could be associated with missed care like pressure sores which in turn led to prolonged hospital stay and increased cost of patient

care (Piscotty et al 2015). A study conducted by Wilson et al in 2011 found that the use of computerized reminders by hospital nurses for a period of 6 months reduced the development of pressure sores by 5% (Wilson et al as cited in Menachemi & Collum 2011).

Other studies have shown that EHR in the outpatient department helped to increase adherence to protocol-based or recommended care. This ensured efficiency in care in terms of reduction of waste of resources like supplies, equipment, ideas and energy. EHR was shown to reduce redundancy in diagnostic testing such as a blood test. Computerized reminders of previous blood tests reduced unnecessary repetition of tests (Nies et al as cited in Menachemi & Collum 2011).

A study conducted at Moi teaching and referral hospital in Eldoret Kenya revealed that use of EHR computer-generated clinical reminders by doctors and nurses improved efficiency of care by improving adherence to protocol. The reminders about overdue tests yielded almost 50% increases in appropriate ordering of CD4 blood tests this improving the management of HIV patients (Were 2011).

Researchers have indicated that EHR has been useful in "accurately capturing patient charges in a timely manner" it has helped to reduce many billing errors and in turn increased revenue. Besides EHR has enabled improved cash flow, reduced costs related to supplies needed to maintain paper files, decreased transcription costs and costs related to printing (Menachemi & Collum 2011).

A study conducted in USA Massachusetts, found that EHR enabled reduction of malpractice of health workers by 4.7%. This is pegged on the fact the EHR enables increased communication

among health practitioners, increased legibility and completeness of data and increased adherence to clinical guidelines. This led to the conclusion that EHR enhanced security of patient information and confidentiality through controlled and auditable provider access (Menachemi & Collum 2011).

Many researchers have concluded that EHR has benefits in three major areas i.e., in clinical, organizational and societal benefits. In the clinical benefits, EHR has led to improved quality of care, reduction of clinical errors and improvements in appropriateness of patient-care. In the organizational benefits, EHR has led to increased financial and operational performance and better satisfaction among patients and health workers. As for the societal benefits, EHR has enabled better research and improved population health (Menachemi & Collum 2011).

2.4 Information access by patients on the internet and other sources

Internet use in Kenya was 43% of the total population according to the World Bank world development indicators for the year 2014. Majority of the internet users are young people who make up the majority of our population. A study conducted in 2012 on the current status of e-health in Kenya indicated that e-health solutions and applications are at their infancy yet patients are increasingly turning to the internet for medical solutions leading to better informed patients and at the same time many patients are misinformed thus a lot of time is spent correcting them (Juma, Matoke, Wanyembi, Waliaro & ogao 2012).

Despite the growth in literature base, there is still limited information describing how and why people use online health information, or the effect of this on health status, (Powell, Inglis, Ronnie & Large 2011). Use of the internet as a source of health information has been acknowledged as a tool to support the emergence of the informed and empowered health

consumer and has also tried to bridge the knowledge power gap between patient and the professional health care provider. It has also raised concerns about the quality of information, the potential for misadvise by peer-interaction and the exclusion of those who have no access to the internet (Powell et al 2011).

A study conducted by Powell et al (2011), in the UK in 2009, concluded/indicated that younger females who had a higher level of education were associated with more frequent use of the internet for health related issues. It also found that generally people with all kinds of health problems i.e., acute and chronic, mild and serious looked up information online and not just particular chronic problems. Besides they used it for both themselves and on behalf of other family members.

Some of the reasons stated by the respondents in the study for use of internet included: to get other opinions apart from the doctor's opinion, it provided a slower time for study on the areas that the doctor had not fully explained, helped to verify or to substantiate the kind of treatment prescribed by the doctor, no need for appointments and for travelling and paying to see a doctor, it was personal and there was the aspect of confidentiality, it eased their fears and provided reassurance and relief from anxiety, (Powell et al 2011).

The study indicated that the benefits of online health information seeking as convenience ; Public education, Public empowerment supporting informed consumers engaged in their own care, Connect people with others who have similar problems, Online social support, Reduce barriers (time, location, and cost) to accessing information and services, Avoid the stigma of real-world consultation for certain problems, Deliver interactive interventions, as well as information,

Integrated health services such as shared electronic records, Reduced travel and carbon emissions (Powell et al 2011). In this information age there is consumer empowerment. People want to be informed of what is new and they demand for information. More and more people are not satisfied being solely dependent on healthcare givers to supply them with information. They want to obtain the information themselves in order to be in control of their own health (McGonigle & Mastrian, 2009).

A survey done by pew international and American life project, indicated that 8 in 10 Americans who are online have searched for health information.64% for the searches were related to specific diseases or medical conditions that they or other family members had, 51% of searches were on medical treatments or procedures, 49% were on nutrition and diet, 44% on exercise or fitness, 37% were on drug information. The searches had both negative and positive impacts on the consumers, for 58% it affected decisions on their care, for 55% the searches changed their approaches to overall health maintenance, for 54% the searches aided in providing materials for asking questions of their health care providers, 25% felt overwhelmed by the information obtained, 18% felt confused by the materials they found online (Fox, cited in McGonigle & Mastrian 2009).

Internet searching of information has also brought about the issue of the digital divide which describes the gap between those who have and those who do not have access to online information. This is important for nurses to know as they provide nursing care. In order to ensure that the different categories of patients receive the right kind of health information that they need in a manner that will interest them and that they easily comprehend (McGonigle & Mastrian 2009). Informed patients have better outcomes and pay more attention to their overall health and changes in their health than those who are poorly informed. A study conducted by Glassman

(2008) on the economic impact of health literacy concluded that those with low health literacy have less ability to properly manage a chronic illness and tend to use more healthcare services than those who are more literate.

Patients are increasingly turning to the internet as a source of instant information about their health conditions. It is imperative for nurses and other health care workers to embrace the internet as a source of health information for patient education and health literacy. Nurses need to be prepared to arm their patients with skills to identify credible websites. They also need to be involved in the development of well-designed, easy to use health education tools. Nurses also need to be involved in promotion of health education and its powerful impact on health (McGonigle & Mastrian 2009).

2.5 Challenges of handling patients who have acquired information from other sources

Patients are increasingly looking up to the internet to gather information about medical conditions or treatment. Some surveys suggest that they do this even more than they communicate with their doctors about their health matters. Both doctors and patients may not be aware of the clinical accuracy of the information acquired from the internet and its potentially harmful advice to the patients (Greene, Choudhry, Kilabuk & Shrank 2010).

Facebook has become important for online social networking with over 400 million registered users worldwide. There has been a development of sites for disease-specific groups which act as important sources of information, support, and engagement for patients who are suffering from the same chronic illnesses e.g., for patients with diabetes. However up until now there has been little research to explore the information that patients request, the unsolicited information that is

provided and the nature of the virtual communities that congregate on Facebook (Greene et al. 2010).

A study done by Powell et al (2011), suggested that the challenges of online health information use include: Misinformation leading to harm, Misuse of accurate information or services such as e-pharmacy, Exacerbation of inequalities in health caused by the digital divide, Challenges to the authority of health professionals, Disruptive behavior in virtual communities, Social isolation of users, internet addiction of users, ergonomic effects of computer use and reduced physical activity (Powell et al. 2011).

Another study conducted by Bessie're & Pressman & Kraut, between 2000 and 2002, indicated that those who used the internet for purposes of obtaining health information were likely to develop small but significant increases in depression as opposed to those who used the internet for communication with friends and family who were likely to experience decreases in depression. This was attributed to increased thoughts or contemplations, unnecessary alarms, and over-attention to health problems. Besides users who are more prone to health anxiety or those with unmeasured problems were likely to self-select online health resources others which may not be suitable. Nearly one quarter (24%) of posts shared sensitive aspects of diabetes management unlikely to be revealed in doctor-patient interactions.

A study done by Greene et al (2010) stated four prominent themes concerning internet use for groups of people suffering similar chronic illnesses. The internet acted as a platform for information sharing where users got a chance to shares personal experiences with diabetes management. Users used their own illustrations as an addition or integration into other forms of diabetes related information. In line with this, the study participants indicated that internet-based

communication was valuable whereas the guidance provided by health providers and formal patient advocacy organizations such as the American Diabetes Association was questionable. The users went on to describe many physicians as being limited sources of information and being more interested only in managing the condition as opposed to the internet which is full of current information such as the progress in the search for a "cure for diabetes".

The other theme that emerged from the study was the development of patient-centered management where the users of the internet shared sensitive aspects of diabetes management which they were not likely to reveal to their doctors when interacting with them. For example there were people who shared how to extend alcoholic drinking sessions without risking ketoacidosis by using a formula to count carbohydrates in type I diabetes. Others discussed other forms of highly specialized forms of experiential knowledge on the metabolic needs of diabetic triathletes which was not available to primary care physicians or even many endocrinologists but was readily available to the internet users through the discussion threads of the diabetic patients who had performed multiple triathlons (Greene et al 2010).

Patients with chronic illnesses such as diabetes found it favorable to use the internet as a source of care with patient-centered goals as opposed to physician- centered goals. This was because they were able to identify with the limitations expressed by others, unconditional emotional support, and the encouragement of achieving smaller, self-defined goals. From the study it also emerged that people with chronic conditions who were users of the internet had interpersonal support and formed communities through the net. Newly diagnosed users would most times initiate the discussions and the seasoned patients would reply them helping them to frame their expectations, encouraging them and also warning them of the routine difficulties expected (Greene et al 2010).

The study also revealed that advertising was prominently done across the specific illness discussion threads and wall posts. In more than a quarter (27%) of all the discussions there was promotion of products mostly dietary supplements and natural cures for diabetes. A few other posts advertised exercise, diet, counselling services and books for managing diabetes. The promotional materials exclusively took the form of first-person testimonials by sharing personal opinion to propose claims of efficacy and unproven mechanism of action making it difficult to know the authenticity of a subjective claim when a product or service is promoted. The idea of checking up the validity of the products would come up occasionally being prompted by the Facebook marketers to create a sense of authenticity and excitement around a product or a website. This complicated the matter as it was unclear to what extent companies could be held liable for misleading or unsupported claims that were phrased as personal experiences of a community member (Greene et al 2010).

Table 2.1: Characteristics, potential benefits and challenges of using the internet as a source of health information

Characteristics of the health internet	Potential Public Health benefits	Potential challenges to public health
Vast quantity of information	Public Education	Misinformation leading to harm
Unregulated	Public Empowerment supporting informed consumers engaged in their own care	Misuse of accurate information or services such as e-pharmacy
Always on	Connect people with others who have similar problems	Exacerbation of inequalities caused by the digital divide
Accessible from anywhere	Online social support	Challenges to the authority of health professionals
Interactive	Reduce barriers(time, location and cost) to accessing information and services	Disruptive behavior in virtual communities
Information can be captured, archived, and retrieved	Avoid the stigma of real world consultation for certain problems	Social isolation of users
Content from both expert sources and user-generated sources	Deliver interactive interventions, as well as information	Internet addiction of users
Users can organize in virtual communities	Integrated health services such as shared electronic records	Ergonomic effects of computer use and reduced physical activity.
	Reduce travel and carbon emissions	

Source: The Journal of Medical Internet Research Jan-Mar; 13(1): e20. ISSN 1438-8871

2.6 Challenges faced and coping strategies used by nurses in handling technological trends in nursing practice

One of the main problems faced with introduction of new technologies or innovations in health is that professionals do not automatically use them as intended by the developers (De Veer,

22

Fleuren, Bekkema & Francke 2011). Thus the intended outcome of increasing quality of patient care, reducing healthcare costs and/or solving workforce problems is not successfully realized.

A study conducted among nursing staff working in Dutch hospitals, psychiatric organization, home care organizations and nursing homes in the year 2011 on successful implementation of new technologies in nursing care, concluded that challenges to the introduction and successful integration of technology to nursing practice were related to three determinants. i.e., the technology itself (57.1%), the organization/political context (24.1%), the potential user who is the nurse in this case (18.7%)

Technology that was perceived to be advantageous to the nurse in terms of professionalism, time saving, financial or increased job satisfaction was easily up taken. Perceived difficulty in use and irrelevance to patient care or lack of benefit of the technology to patients led to slow uptake. Challenges related to the user were stated as lack of support from colleagues, lack of required skills and lack of support from other health professionals. In the challenges related to the organizational and political context, participants cited lack of involvement of nursing staff in the decision making process about the new technology, lack of sufficient time for nurses to adopt, train and use the new technology and a lack of sufficient resources e.g., lack of enough computers to utilize the electronic patient records (De Veer et al 2011). The respondents who reported about challenges with the introduction of electronic information system most often talked of challenges relating to the organizational context such as not enough computers to use in the new system.

The suggestions in the study about how to handle these challenges and facilitate better uptake of technology were; (56.3%) adequate training and coaching, (13.5%) presence of a support system

like a helpdesk, (10.6%) opportunities for nurses to evaluate the new technology and possibly to share their experiences, (5.5%) avail simple, effective instruction materials readily, (4.2%) active promotion of the new technology by leading figures. It was also suggested that pro-active visits to answer possible questions from nurses about new technologies was invaluable (De Veer et al 2011).

2.7 Theoretical Framework

2.7.1 Philosophy of science and caring by Jean Watson

Health is not attainable without caring. Caring is the essence of nursing and it connotes responsiveness between the nurse and the person receiving care. This notwithstanding, modern nursing seems to be responding to various demands of the machinery and having less concerned for the person attached to the machinery. Watson asserts that in caring the nurse has to co-participate with the person who needs care and assist the person to gain control, become knowledgeable and to promote health changes. She asserts that a caring attitude is not transmitted from generation to generation by genes but by the culture of the profession as a unique way of coping with its environment.

Watson describes the transpersonal concept as "an intersubjective human-to-human relationship in which the nurse affects and is affected by the person of the other. Both are fully present in the moment and feel a union with the other; they share a phenomenal field that becomes part of the life story of both" (Watson 1999). In line with this, she came up with ten 'carative factors' which she termed as the guide for the core of nursing.

Watson's theory is laudable and applicable to the study because she emphasizes on the importance of the nurse patient relationship rather than a practice confined with technology. Even though she emphasizes on the nurse having a personal relationship of caring with the patient she also recognizes that it is undeniable that technology has already become part of nursing's whole paradigm with the evolving era of development.

Most health care systems in the world are undergoing major administrative restructuring and there is the risk of dehumanizing patient care which is the core of nursing. Some argue that changes in health care delivery systems have intensified nurses' responsibilities and workloads. Nurses now have to deal with the increased acuity and complexity in patients with regard to their health care situation. Watson's theory is indispensable all in all, whatever the case may be nurses are called upon through this theory to find ways to preserve their caring practice. The theory allows nurses to return to their deep professional roots and values despite the trends and technological advancements and it endorses the nurses' professional identity. Its significance is also elucidated by giving the nurse an opportunity to find meaning in their work and a sense of gratification (Cara n.d).

The theory is relevant in this study because it reiterates the importance of the nurses' participation in designing and implementation of ICT in order to ensure that the integrity of the core of nursing practice is maintained despite all the technological advancements that may be developed. Technology must be used by the nurse to make their work easier so as to allow them to fully engage and concentrate in the core reason of the practice of nursing which is caring. The nurses must be involved in ICT advancements in health.

2.7.2 Change Management Theory by Kurt Lewin (1890-1947)

Kurt Lewin defines behavior as "a dynamic balance of forces working in opposing directions". His theory is based on a model called the 'Force field analysis' which has three major concepts: driving forces (Push factors), restraining forces (Counteractive factors), and equilibrium (Driving forces =restraining forces).

Lewin's theory is encompassed in three distinct phases known as unfreezing, change/moving, and refreezing/freezing. Unfreezing is the process which involves finding a method of making it possible for people to let go of an old pattern that was somehow counterproductive. The change stage, which is also called "moving to a new level" or "movement," involves a process of change in thoughts, feeling, behavior, or all three, that is in some way more liberating or more productive. The refreezing stage is establishing the change as the new habit, so that it now becomes the "standard operating procedure." Without this final stage, it can be easy for the person or organization to go back to old habits (Petiprin 2015).

This theory is very relevant to this study because currently, the busy health-care environment is experiencing rapid technological advancements. Computer assisted devices which are being integrated into the health care system, can challenge nurses in many ways and have often led to uncertainty/anxiety or fear of failure and often resistance to change. Nurses are expected to keep up with modern integrated technology, often with little say on how it affects them (Bozak, cited in Sutherland 2013).

The theory is useful in helping us to understand human behavior as it relates to change and patterns of resistance to change (Sutherland 2013). The goal of this theory is to identify factors that can impede technological change from occurring. This is crucial because when nurses fully

understand what behaviors drive or oppose change, then they are able to work to strengthen the positive driving forces and enable change to occur successfully (Bozak, cited in Sutherland 2013). This way they will willingly acquire skills to take part in development of ICT and any other skills that will enable them to be involved in new technological developments in their profession and integrate it with their day to day nursing activities.

It also shows the ways in which nurses need to handle change that has become inevitable and must be accommodated in the nursing profession. Use of this theory can help reduce resistance and fear of technological change among the nurses through the development of relevant technological skills and a well thought plan to enable active participation in the implementation of any technological change affecting nursing practice and improve on efficiency.

2.8 Conceptual Framework

This research involves determining the technological trends in nursing and the challenges nurses at KNH are experiencing on their practicing skills as a result of new technological developments in nursing. The relationship between the independent variable which is the current technological trends in nursing practice i.e., use of information technology in nursing and technological equipment, patient exposure to technology and online health information, new ICT skills and their influence on the dependent variable which is the practicing skills of nurses are to be investigated.

The incorporation of technology into nursing practice has resulted in a dynamic interplay of the contemporary factors which is use of technology and the historical factors which is application of manual systems in nursing. The core of nursing practice which is caring is influenced by developments of technology in nursing. Advancing technologies require the nurses to develop

skills in use of technological equipment and gadgets used in care of patients, skills in use of electronic health records and in use of ICT generally.

For this to succeed there has to be capacity building through research, necessary leadership to create nurse friendly technological systems and acquisition of knowledge and skills in use of ICT through training. This should be accompanied by creation of an enabling environment by availing the necessary technology and proper ICT policies, building a critical mass of nurses with the required skills and knowledge in technology and researching to establish the knowledge and skills gap. This makes up the intervening variables which influence the processes and outcome of the health system as a result of creating a nurse with the required technological practicing skills i.e., the dependent variable.

Independent Variables

Technological trends

Technology used at work.

-Online nursing functions

-Digital equipment

Dependent variable

Increase in required technological skills

Patients exposed to technology

-Increased health knowledge

-Increase in consumer rights

ICT skills in practice

-Communication skills

-Computer skills

Intervening Variables

-Training on ICT use

-Pre-existing technological skills

- Leadership in Nursing ICT

-Participation of nurses in ICT

Figure 2.1: Conceptual Framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

The research design was a cross-sectional descriptive design that established effects of technological trends in nursing on the practicing skills of the nurses at Kenyatta national hospital. Research study design is the conceptual structure which describes what will be used in conducting the research, where the research will be conducted, when it will be conducted, how much will be used for the research and basically the framework within which the research will be conducted to meet objectives in the most economical manner (Kothari 2006).

Cross-sectional descriptive research design was suitable in this study because of its appropriateness in establishing relationships between variables and facilitating the collection of information for determining the population parameters. Descriptive studies are not only restricted to fact finding, but may often result in the formulation of important principles of knowledge and solutions to significant problems (Kerlinger 1969). They provide deeper understanding of social phenomena and can be used when collecting information about people's attitudes, opinions, habits or any of the variety of education or social issues (Orodho & Kombo cited in Kombo & Tromp 2006).

The researcher was interested in describing the existing phenomenon or state of affairs of technology's effect on the professional practicing skills of the nurses as it is without any manipulation of the variables. The researcher was interested in collecting information about the relevance of the practicing skills that nurses have in coping with the new technological advances in nursing practice in kenya today. Information required was on the skills in use of technology

and in application of technology at different levels e.g., in development of technology that will make nurses' work easier.

This design was preferred because the findings of the study were to be generalized to the whole population. Besides, the design would enable better understanding of technological dynamics in nursing practice and the challenges posed for nurses' professional practicing skills. This is an area that has not been receiving much attention and not much has been documented about it.

3.2 Site Description,

Kenyatta National Hospital is East Africa's largest teaching and referral hospital; it is a public health facility that was established in 1901 as a Native Civil Hospital, with a 40 bed capacity and a two-ward bed facility for European settlers in Kenya. It was later relocated to its present location as medical training college under the name Kenya Medical Training College in 1922. It offered in-patient services only. In 1952, the Hospital was renamed King George VI Hospital. Following Kenya's independence in 1963, the hospital took its present name, in honor of the founding president of the Republic of Kenya, the late Mzee Jomo Kenyatta. It became a state corporation on 6th of April 1987 through legal notice No. 109. The core business of the hospital is provision of quality health-care, training and medical research.

KNH is the apex of hospital referral system in Kenya; in its planning, development and provision of health-care services; it is guided by the Kenya governments' policies on health, and caters for the health needs in Kenya as well as the East and Central African region in referral cases. The institution works closely with other public institutions like, Kenya Medical Training College (KMTC), University of Nairobi's College of Health Sciences, Kenya Medical Research Institute (KEMRI), Government chemist, National Radiation Protection Center, National Public Health

Laboratories, National AIDS and STDs Control Program (NASCOP), National AIDS Control Council (NACC), National Blood Transfusion Services (NBTS) and African Medical and Research Foundation (AMREF). It provides facilities and resources for training, teaching and research to the College of Health Sciences- University of Nairobi, and other training institutions, both local and international. It is a major training institution for health-care personnel in various disciplines and for post-graduate medical doctors in various specialties; it also provides internship for health professionals.

The Hospital has established linkages and collaborations with other institutions in providing various clinical services, outreach programs and research. Collaborations have been established with Operation Smile International, Neurosurgical Mission of St. Louis USA, Plastic Surgical Project of the late Professor Platt, Open Heart Surgery through Medical and Educational Aid to Kenya (MEAK) of Guys Hospital (UK), Renal Transplant Programme of University of Barcelona, Vesico Vagina Fistula (VVF) Project with AMREF and Spinal Surgery among others Outreach Programmes include Nyeri Neurosurgical Programme and Cancer Treatment Programme in Mombasa and Kisumu. There are various research projects with University of Washington.

KNH covers an area of 45.7 hectares and is located approximately 1.5 kilometers to the south of the CBD. There are about 6,000 employees, composed of both administrative and clinical staff. The population and staffing of the institution as per cadres is as follows;

Table 3.1: Population and staffing of employees at Kenyatta National Hospital

CADRES	NO. AVAILABLE
Administration staff	201
Doctors, dentists and Pharmacists	271
Paramedics; Nurses, clinical officers and other medical staff	2155
Professional Support Services; social workers, public health, record officers, mausoleum, physiotherapists	245
Other cadres; cooks, security guards, drivers, clerks ,plumbers, carpenters, electricians, technicians, secretaries, store men etc.	957
Auxiliary Staff; porters, different types of assistants and attendants	222
Support Staff	904
Grand Total	4955

Source: Kenyatta National Hospital, Strategic Plan 2013-2018

Currently, Kenyatta National Hospital has 50 wards, 22out-patient clinics, 24 theaters (16 specialized) and Accident & Emergency Department. Out of the total bed capacity of 1800, 209 beds are for the Private Wing. The hospital offers quality specialised health care services to patients including open heart surgery, neurosurgery, orthopaedic surgery, reconstructive surgery, burns management, critical care services, new born services, ophthalmology (cornea transplant), oncology, palliative care and renal services (including kidney transplantation) besides other services.

The choice of Kenyattta National Hospital as the area of study was influenced by various factors. KNH has a large population of qualified and registered nurses who make the required population for the study. Also the incorporation of technology in nursing care is on going in KNH an area which the researcher was keen on studying. Thirdly, Gay (1992) observed that factors such as farmiliarity to an area, limitations of time, effort and money may influence the researchers' choice of locale. Kenyatta National hospital was familiar to the researcher. Moreover, no studies

have been carried out in KNH to establish how the practicing skills of the nurses have been affected by the technological trends in nursing practice. The researcher endeavoured to close this research gap.

3.3 The Study Population,

The target population in this study comprised of all the nurses working in KNH. The population is defined as all members of a real set of people, events or objects with some common characteristics, to which the researcher wishes to generalize the results of the research (Kothari 2006).

3.4 Inclusion criteria

The participants were qualified nurses of all cadres working in KNH who were on duty on the day of data collection. They must have been registered by the nursing council of Kenya. They must have been willing to participate and showed this through a written consent.

3.5 Exclusion criteria

Nurses who were not willing to participate in the study, and did not consent by writing were excluded from the study. Also nurses who were not on duty on the days of data collection and those who were on leave were excluded from the study.

3.6 Sample size determination and Sampling Techniques,

3.6.1 Sample Size determination,

The sample size was calculated based on Fisher's formula for estimating the minimum sample size that is best representative of the population.

The Fisher's et al. 1998 formula

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

n= the desired sample size (if the target population is greater than 10,000)

z= the standard normal deviate at the required confidence level.

p= the proportion in the target population estimated to have characteristics being measured.

q= 1-p

d= the level of statistical significance set.

$$n = \frac{(1.96)^2(0.5)\ (1-0.5)}{(0.05)^2}$$

= 384.16

=384

If the target population is less than 10,000, the required sample size will   be smaller. In this case the sample estimate is calculated using the formula:

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

Where: nf= the desired sample size (when the population is less than 10,000).

n= the desired sample size (when the population is more than 10,000).

N=the estimate of the population size.

$$nf = \frac{384}{1+ (384/120}$$

$$= \frac{384}{1+3.2}$$

=91.4

Therefore, the study participants were 91 Nurses

3.6.2 Sampling Technique,

The researcher applied the simple random sampling technique when selecting the nurses to participate in the study. The researcher obtained a list of all the nurses working in the medical and surgical departments in the hospital. The researcher then randomly selected a ward in each department whereby the researcher again used simple random sampling technique to select a nurse in the selected wards. Selection of the nurse depended on their availability i.e., if they were on duty on that day and they were not busy carrying out a procedure at the time that the researcher went to their ward to collect the data. This method was the best to use because it gave every nurse an equal chance of being included in the study and thus minimized bias and allowed for generalization to the entire population of nurses in all the departments of KNH.

The purposive sampling technique was useful in sampling the key informants for the study. This method was suitable because the researcher targeted a group of people believed to be reliable for the study due to the rich information they had which would be useful for in-depth analysis of the central issues in the study (Kombo & Tromp 2006) which was, the effects of the technological trends in nursing on the practicing skills of the nurses in KNH.

3.7 Definition of cases

In this study the case under study was the effects of the technological trends in nursing practice on the practicing skills of the nurse. The main area of concern was the practicing skills in use of technology, information acquiring, and consultancy, communication and research skills.

A case definition is "that which the study attempts to understand" (Babbie 1995). It is the entity, object, event about which or who a researcher gathers information. This includes individuals,

social roles, positions and relationships in organizations and social grouping. The study included nurses at the ward level and nurse managers

3.8 Recruitment and Consenting procedures

The researcher took one day to train the two research assistants on how to recruit and conduct interviews of the nurses who were to participate in the study. The interviewers who were the researcher and the two assistants then went to the wards which were randomly selected. They randomly approached the nurses who were on duty and introduce themselves, where they came from and their purpose for going to the wards which was to conduct the study which they introduced to the nurses. They explained to the nurses the amount of time they were likely to take for filling the questionnaires and the interview which was about 30-40 minutes. For the nurses who agreed, the researcher then explained to them the requirements before getting involved in the study which was to read the participant information sheet, to seek clarification where not understood and then consent by signing the consent form at the end of the information sheet. The nurses who agreed to meet this requirement were involved as participants in the study.

3.9 Data Collection Procedures

Methods of data collection that the researcher used in this study included both quantitative methods and qualitative methods. For the quantitative data collection, the researcher used questionnaires containing both closed-ended and open-ended questions to obtain answers from the eligible nurses. The researcher thoroughly explained the study to the participants and addressed any questions and concerns related to the study procedure before requesting them to give a written informed consent. The ones who gave consent were asked to fill the questionnaire. Assistance was provided where the participant did not understand and needed help.

Qualitative data collection methods relied heavily on the interactive interviews that were carried out by the researcher on the nurses touching on particular issues of interest, clarifying concepts and checking the reliability of data. Research techniques that were used to generate data in this study included questionnaires and interview schedules.

3.10 Key informants Interviews

The research also involved in-depth interviews with key informants to gather qualitative data. These are the people who had first-hand information about what changes have been taking place in the nursing fraternity in KNH and the challenges they may have posed on the practicing skills of the nurses. These will include the Senior Acting Chief Nurses (SACN), the nurse in charge of nursing IT in KNH. Five key informants were to be selected through purposive sampling technique which targeted the participants with the required information.

3.11 Data Collection Instruments

3.11.1 Questionnaire

Semi structured questionnaires were used to collect both qualitative and quantitative data in a chronological order. The questionnaire enabled the collection of detailed information on the effects of the technological trends in nursing on the practicing skills of the nurses in KNH. They were less expensive, saved on time and provided greater anonymity which encouraged participants to give detailed information.

3.11.2 Interview Schedule

The researcher used an oral interview guide to conduct interviews. This enabled the researcher to ask questions or make comments that were intended to guide the respondents to give information

that would help in meeting the objectives of the study. The interview schedule was used on the key informants and the nurses. Objective of the interview was to gather Information on use of technology and challenges for the nurses' practicing skills that have been brought about by the technological trends in nursing practice.

3.12 Data management

3.12.1 Data preparation

After collection of the questionnaires, the researcher read through to ascertain their numbers and to see how all the items were responded to. The researcher then entered the data into the system and pre-process by organizing and cleaning the data to enable elimination of unusable data, interpretation of ambiguous answers and identification of contradictory data. The researcher then coded the data to SPSS format and stored the data electronically. Security and quality of the data was assured by maintaining the data as a read only document which could only be accessed through a password that is known only to the researcher.

3.12.2 Data Analysis

Qualitative data in form of words from the interview schedules were subjected to content analysis and were reported and quoted where necessary. Qualitative data in form of open ended items in the questionnaires were analyzed by developing themes from the responses which were then coded in statistical package for social sciences (SPSS) and analyzed quantitatively. The results were then tabulated. Responses on similar themes or objectives, emanating from different respondents were compared to find out if the various respondents concurred on various issues and if not, the researcher tried to find out possible reasons for the observed discrepancies. SPSS

was used to facilitate quantitative data analysis. Statistical significance of the findings was analyzed using descriptive and inferential statistics. Association between variables was determined through chi square test of significance at confidence level of 95%, at a p-value of 0.05. Consequently the analyzed data was presented using frequencies and percentages tables, pie charts and bar graphs.

3.13 Ethical Consideration

Permission to undertake this study was obtained from University of Nairobi-Kenyatta National Hospital Ethics Research Committee (UoN-KNH/ERC) and KNH management. Participation in the study was on a voluntary basis. Participants who were eligible and had been selected for the study had to sign consent to participate. Confidentiality, privacy, anonymity and justice were assured in handling information given by the participants. It was made clear to the participants that there would be no incentives or material gain from participating in the study.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 Introduction

Data for this study was collected in KNH from nurses in medical and surgical departments. A total of 91 questionnaires were used for data collection and confirmed to be completely filled and accurate. This was done concurrently with data verification where the researcher was checking each and every questionnaire filled by the research assistants before moving to the next participant. The data was then entered by coding into statistical package for social sciences (SPSS) software and analyzed to capture the specific objectives of the study. The research findings were as follows:

4.2 Socio-demographic characteristics of the respondents

Majority of the nurses (36.3%, n = 33) were between the age 20 – 30 years followed by 41 – 50 years at 29.7% (n = 27). This is shown in figure 4.1
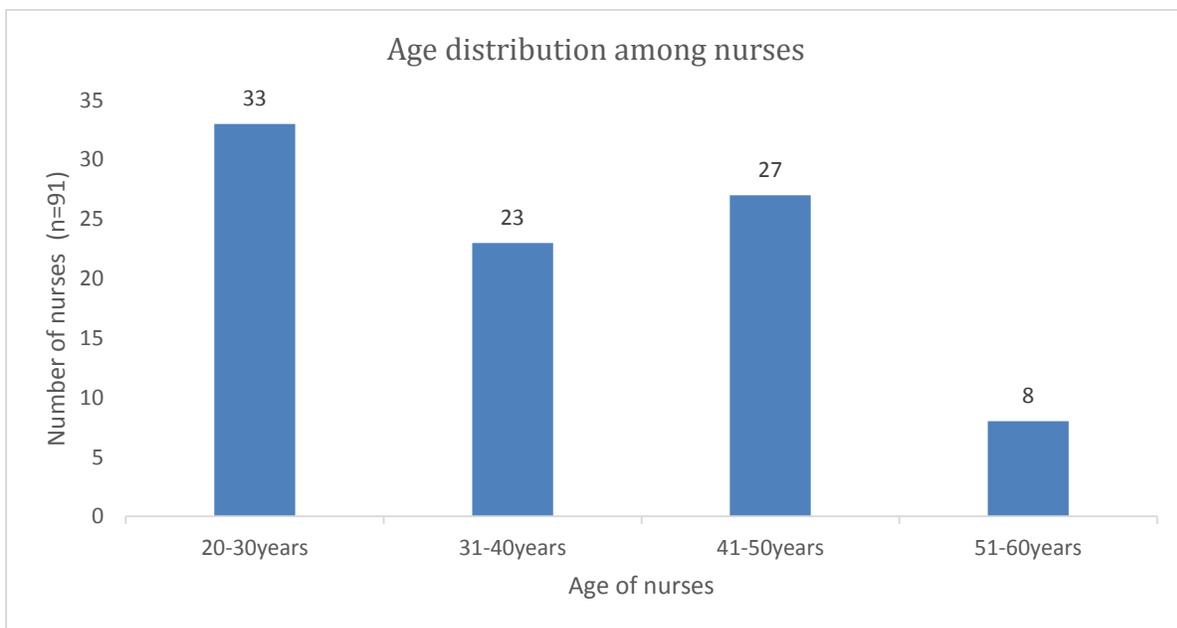
Figure 4.1: Age distribution of nurses working in KNH

The majority of the respondents were females at 64% (n = 58) as shown in Figure 4.2.

Distribution of gender among participants
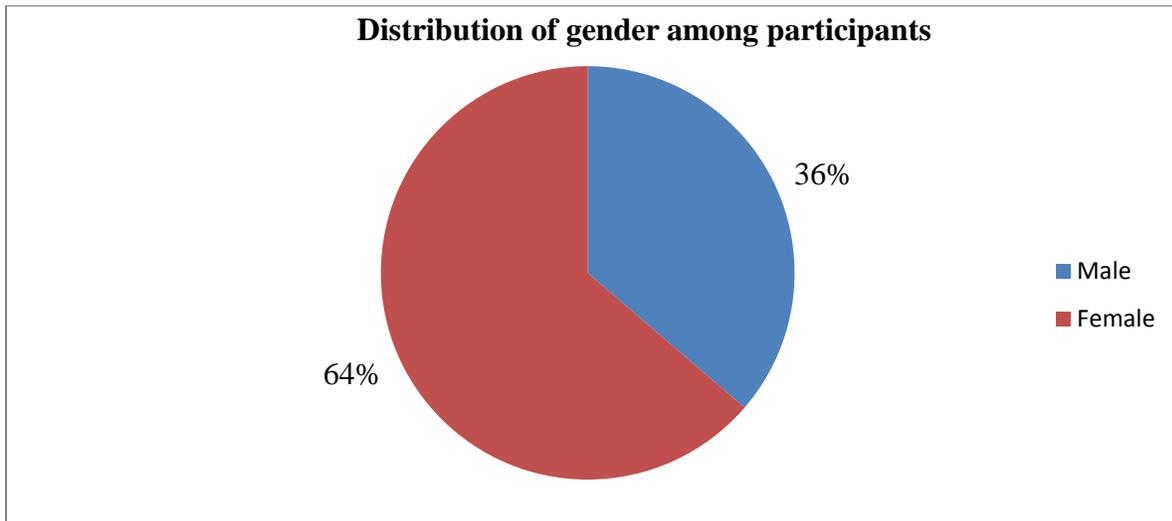
Figure 4.2: Distribution of gender among the nurses

Majority of the nurses (61%, n = 55) were diploma holders with 36% (n = 33) being degree holders and only 3% (n = 3) were certificate holders as shown in Figure 4.3.

Level of qualification
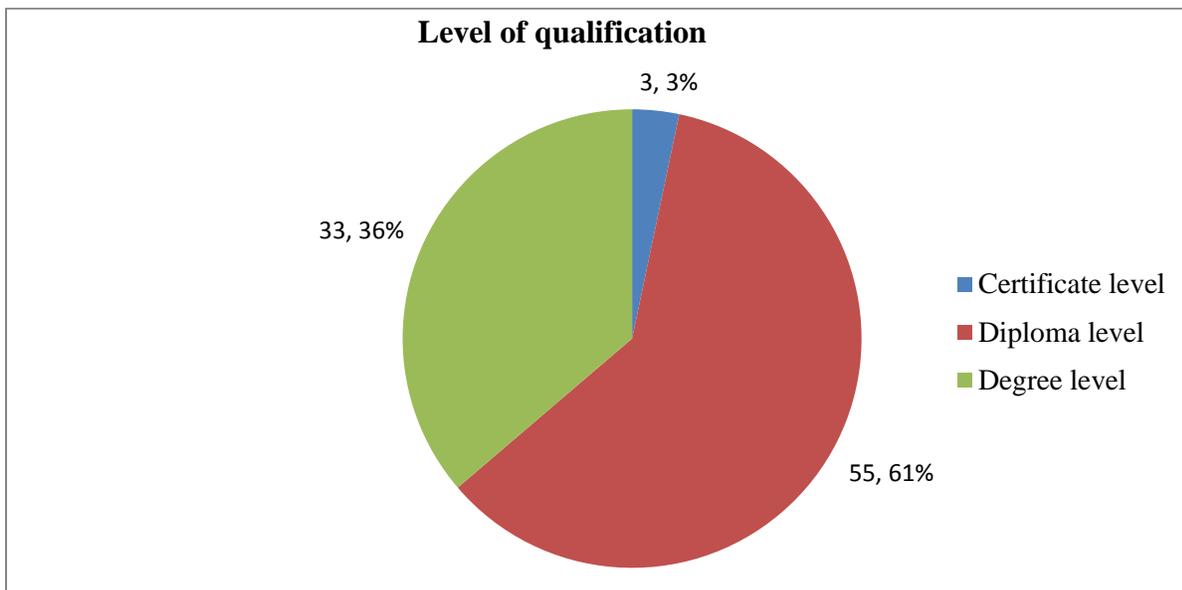
Figure 4.3: Level of qualification of the nurses

Most nurses (54%, n = 49) had worked in KNH for between 1 – 10 years followed by 11 – 20 years at 30% (n = 27) as shown in Figure 4.4.
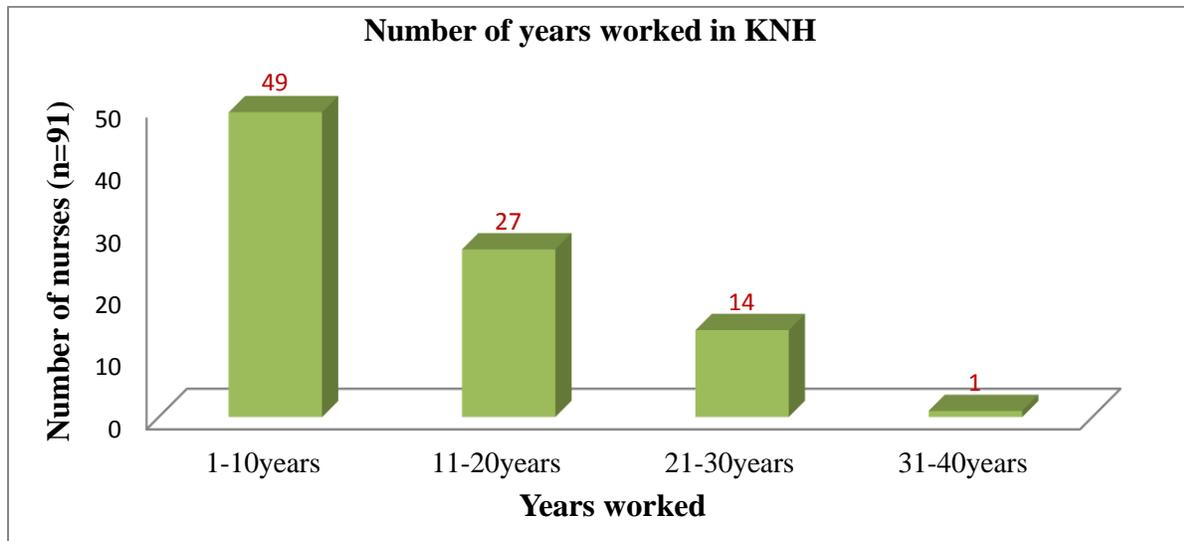
Figure 4.4: Number of years worked in KNH

The study found that most of the nurses 34.1% (n = 31) were senior nursing officer. These were the cadres of nurses who were mostly in-charges or team leaders.

Majority of the nurses (54.9%, n = 50) had a certificate in computer with a significant percentage (33.0%, n = 30) having no training on computer skills. This is shown in Table 4.1.

Table 4.1: Nurses' job group and level of training in computer skills

N=91

Job Group	Frequency	Percent
Nursing officer I	24	26.4
Nursing officer II	10	11.0
Nursing officer III	20	22.0
Senior Nursing officer	31	34.1
Enrolled Nurse	3	3.3
Senior Enrolled Nurse	3	3.3
Level of training		
No training	30	33.0
Certificate level	50	54.9
Diploma level	11	12.1
Higher diploma level	0	0.0
Degree level	0	0.0

Among the nurses, 89% (n = 81) who reported that they had computer application skills, which they had acquired either through training or through self-practice, also reported different levels of knowledge in computer skills as shown in Figure 4.5.

N=81
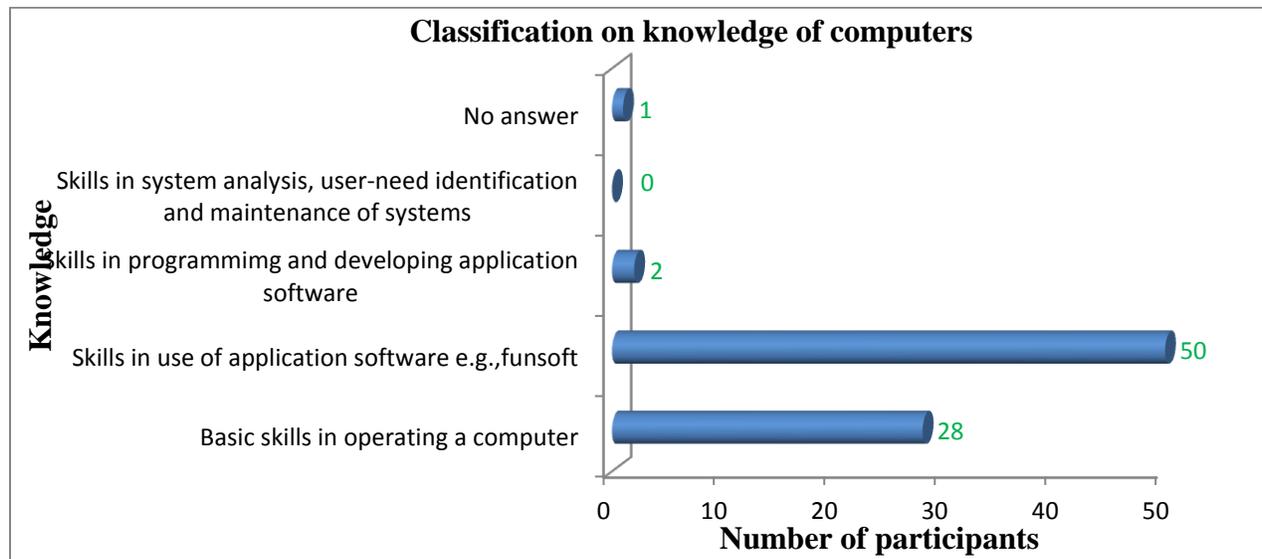
Figure 4.5: Classification of nurses' level of knowledge of computers

Regarding the skills level which the nurses' thought were necessary for at least every nurse to have, majority (51.6%, n = 47) indicated that basic skills in handling and operating computers and skills in use of application software like fun soft were the most important for nurses to have. As shown in Figure 4.6.
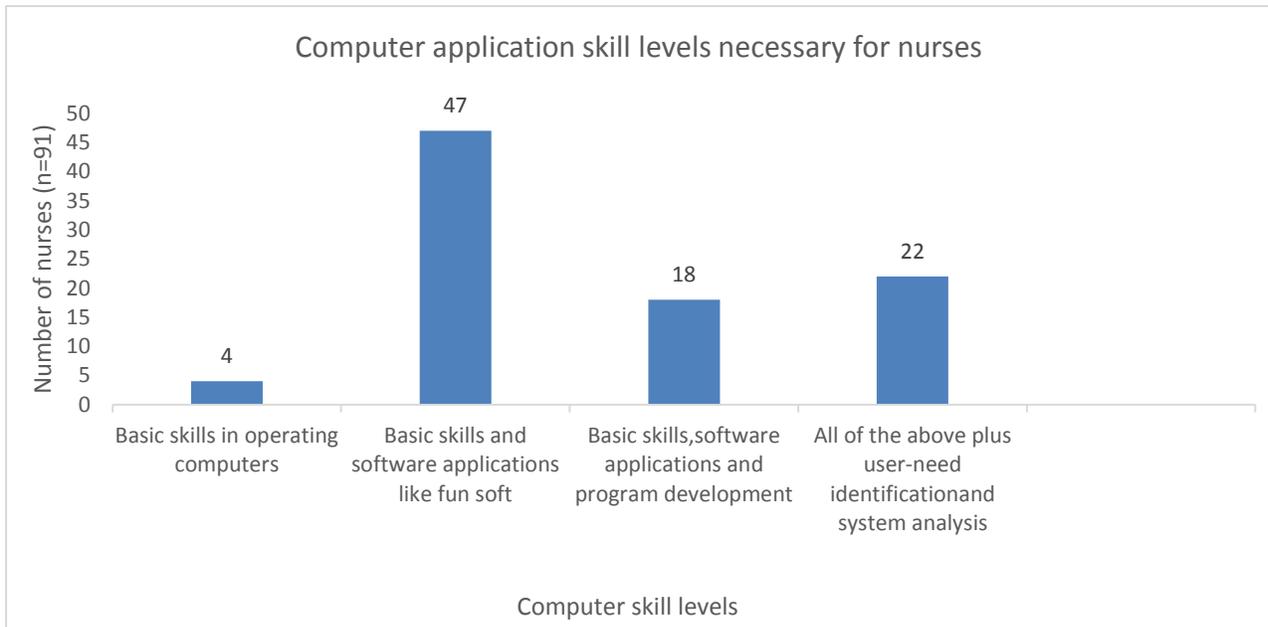
Figure 4.6: Computer application skill level that nurses should have

4.3 Ways of utilization of technology in nursing

For specific computer technological application in use at their work place, the nurses indicated that electronic health records was mostly used (51.6%, n = 47). However, a significant number (20.9%, n = 19) indicated that they did not know the computer technological application used in their work place. This is shown in table 4.2.

Table 4.2: Computer application technology used at the work place

Technological application	Frequency	Percent
Biometrics(use of electronic identification) in health	15	16.5
Electronic medical records	47	51.6
Computerized physician/provider order entry (CPOE)	9	9.9
Clinical decision support	1	1.1
Bar-coded electronic medication administration (Bar-code eMAR)	0	0
Don't know	19	20.9
Total	**91**	**100.0**

Regarding the areas where computer technology was used in nursing practice specifically, most nurses indicated: billing patients (100%, n = 91), ordering of supplies (78%, n = 71), ordering of drugs (59.3% n = 54). This is shown on table 4.3

Table 4.3: Areas in which Computer technology is used in nursing practice

N=91

Computer use	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Billing patients	*91*	*100*	*0*	*0*
Admission of patients	33	36.3	58	63.7
Drug dosage calculation	6	6.6	85	93.4
Ordering of supplies	*71*	*78*	*20*	*22*
On/off duty rosters	31	34.1	60	65.9
Computer assisted instructions	9	9.9	82	90.1
Drug ordering	*54*	*59.3*	*37*	*40.7*
Ward reports	8	8.8	83	91.2
History taking guidelines	4	4.4	87	95.6
Nursing care plans	2	2.2	89	97.8
Nursing cardex	1	1.1	90	98.9
Observation and vital signs	16	17.6	75	82.4
Health education to patients	7	7.7	84	92.3

Most nurses (70.3% n = 64) reported that they knew how to maintain patients' health information confidentiality and security when using electronic health records. However, most nurses did not know bar-coded electronic medication administration system (bar-code eMAR) neither had they ever used it. Only 24.2% (n = 22) knew about it and only 3.3% (n = 3) knew how it is used. This information is presented in Table 4.4.

Table 4.4: Knowledge of electronic health records

N=91

Knowledge of Application	Response	Frequency	Percentage
Maintenance of confidentiality and security of patients' information in HER	Yes	64	70.3
	No	27	29.7
Awareness about bar-code electronic Medication Administration system.(bar-code eMAR)	Yes	22	24.2
	No	69	75.8
How bar-code eMAR is used	Yes	3	3.3
	No	88	96.7

The percentage use of electronic health records was rated at an average mean of 47.25%. Majority of the nurses (44% n = 40) rated their percentage use of the electronic health records at 60% followed closely by 39.6% (n = 36) who rated electronic health use at 30%. This is presented in figure 4.7
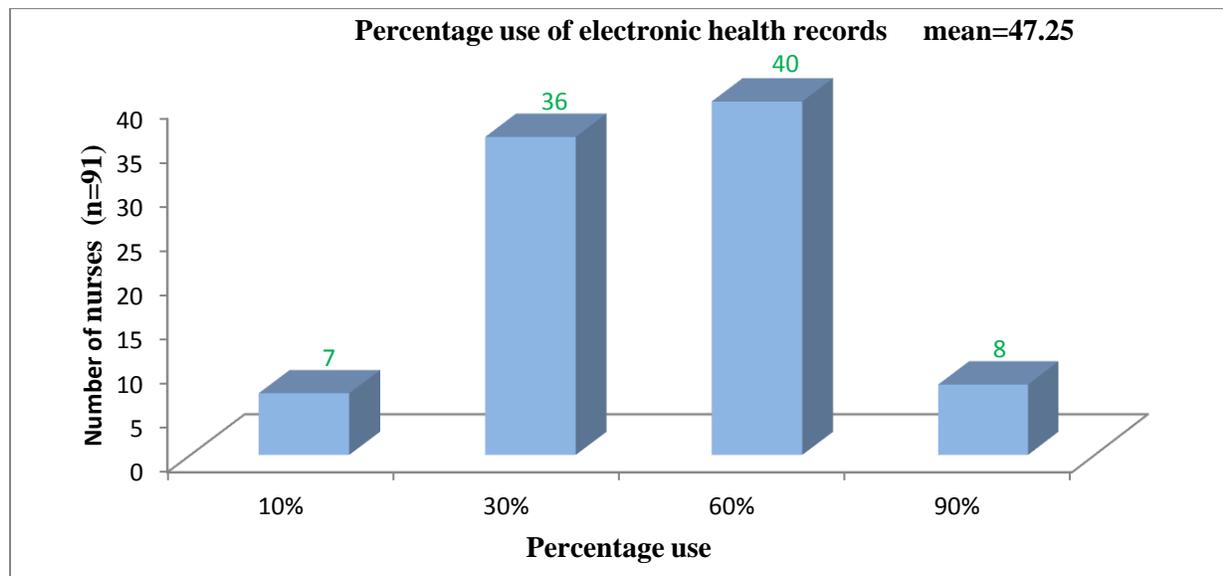
Figure 4.7: Estimated percentage use of electronic health records

Regarding use of medication administration technology, the nurses acknowledged that sometimes errors do occur in medication administration. Majority of them (45.1%, n = 41) reported that only 10% of such errors do occur (Figure 4.8). They also acknowledged that use of

technology like bar-code eMAR could help to reduce errors with an approval rate of 70% (n = 64) as shown in Figure 4.8.
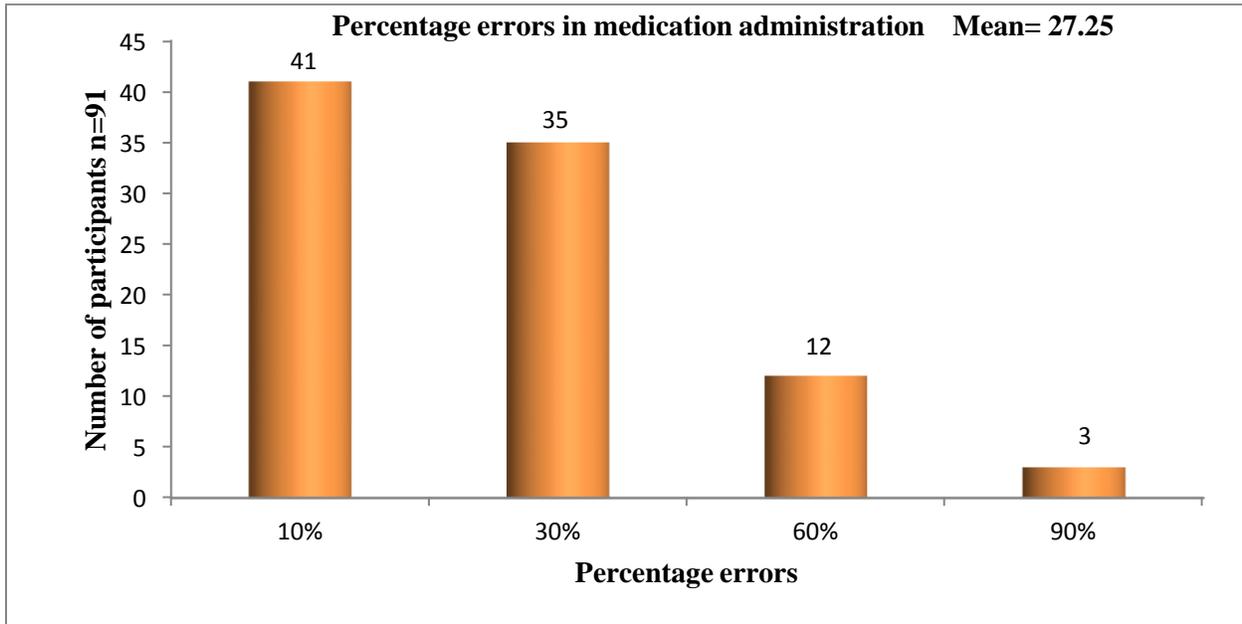
Figure 4.8: Estimated percentage errors in medication administration

4.3.1 Socio demographics and level of EHR use

A Pearson chi-square test was conducted to examine whether there was a relationship between demographic factors and level of use of EHR. The results revealed that there was no significant relationship between the two variables. The nurses showed no significant difference in level of use of EHR due to age (Chi square value =9.7, DF =9, P=0.372), gender (Chi square value =2.8, DF =3, P=0.431) their nursing qualification (Chi square value =1.8, DF =6, P=0.941), computer training level (Chi square value =3.8, DF =6, P=0.709), duration of employment (Chi square value =3.5, DF =6, P=0.943), their designation (Chi square value = 12.5, DF =15, P=645) and the department they worked in (Chi square value =1.3, DF =3, P=719). (See table 4.5)

Table 4.5: Socio demographic characteristics of nurses in KNH and reported level of EHR use

	Level of use of EHR					
	10%	**30%**	**60%**	**90%**	**Chi (DF)**	**P**
Age						
20-30yrs	4(12.1)	13(39.4)	12(36.4)	4(12.1)	9.7(9)	0.372
31-40yrs	0(0.0)	9(39.1)	13(56.5)	1(4.3)		
41-50yrs	3(11.1)	12(44.4)	11(40.7)	1(3.7)		
51-60yrs	0(0.0)	2(25.0)	4(50.0)	2(25.0)		
Gender						
Male	1(3.0)	16(48.5)	13(39.4)	3(9.1)	2.8(3)	0.431
Female	6(10.3)	20(34.5)	27(46.6)	5(8.6)		
Nursing qualification						
Certificate level	0(0.0)	1(33.3)	2(66.7)	0(0.0)	1.8(6)	0.941
Diploma level	5(9.1)	20(36.4)	25(45.5)	5(9.1)		
Degree level	2(6.1)	15(45.5)	13(39.4)	3(9.1)		
Computer training						
No training	4(13.3)	12(40.0)	12(40.0)	2(6.7)	3.8(6)	0.709
Certificate level	3(6.0)	20(40.0)	23(46.0)	4(8.0)		
Diploma level	0(0.0)	4(36.4)	5(45.5)	2(18.2)		
Duration of employment in KNH						
0-10years	4(8.2)	20(40.8)	21(42.9)	4(8.2)	3.5(6)	0.943
11-20years	3(11.1)	10(37.0)	12(44.4)	2(7.4)		
21-30years	0(0.0)	6(42.9)	6(42.9)	2(14.3)		
Designation						
Nursing Officer I	2(8.3)	8(33.3)	9(37.5)	5(20.8)	12.5(15)	0.645
Nursing Officer II	1(10.0)	4(40.0)	5(50.0)	0(0.0)		
Nursing Officer III	1(5.0)	8(40.0)	9(45.0)	2(10.0)		
Senior Nursing Officer	3(9.7)	15(48.4)	12(38.7)	1(3.2)		
Department						
Department of Medicine	3(7.5)	17(42.5)	18(45.0)	2(5.0)	1.3(3)	0.719
Department of Surgery	4(7.8)	19(37.3)	22(43.1)	6(11.8)		

4.4 Influence of online patient acquired health information on nursing practice

There was low rating of the patients' knowledge about their condition. Most nurses (68.1%, n = 62) rated their knowledge at a scale of 2.5 – a little knowledge, on a scale of 1-(No knowledge) to 10- (A lot of knowledge). As shown in figure 4.9.
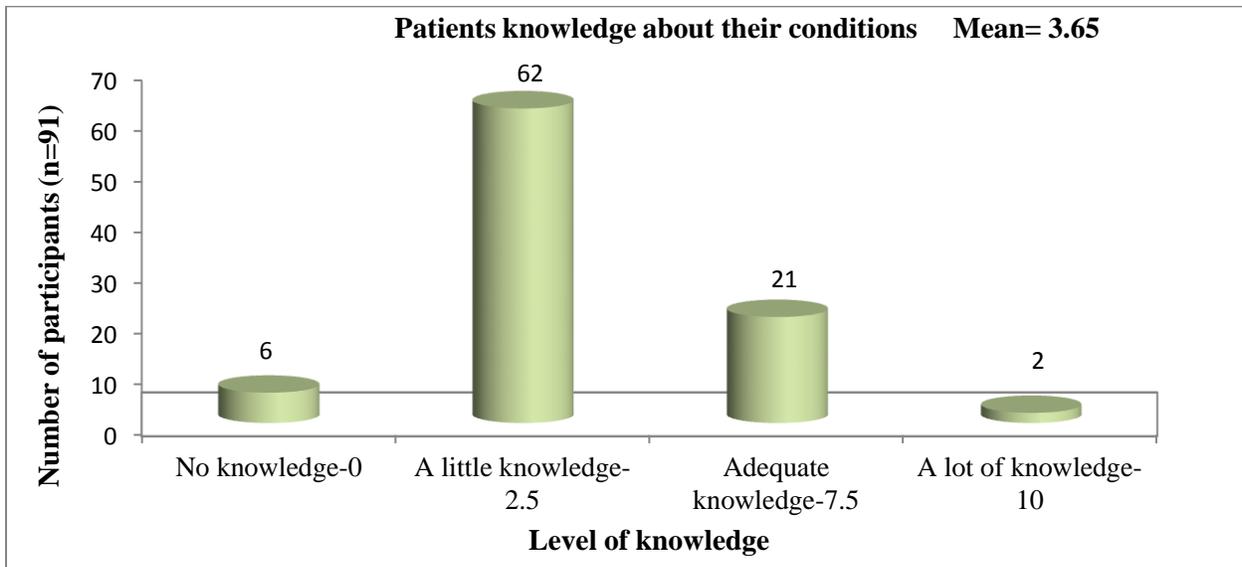
Figure 4.9: Nurses' rating of patients' knowledge about their condition

Most nurses (78%, n = 71) also acknowledged that the level of health condition knowledge of a patient had an impact on his/her treatment outcome. Some nurses 20% perceived the information to have no impact and 2% did not know whether or not it had an impact. As shown in Figure 4.10

51
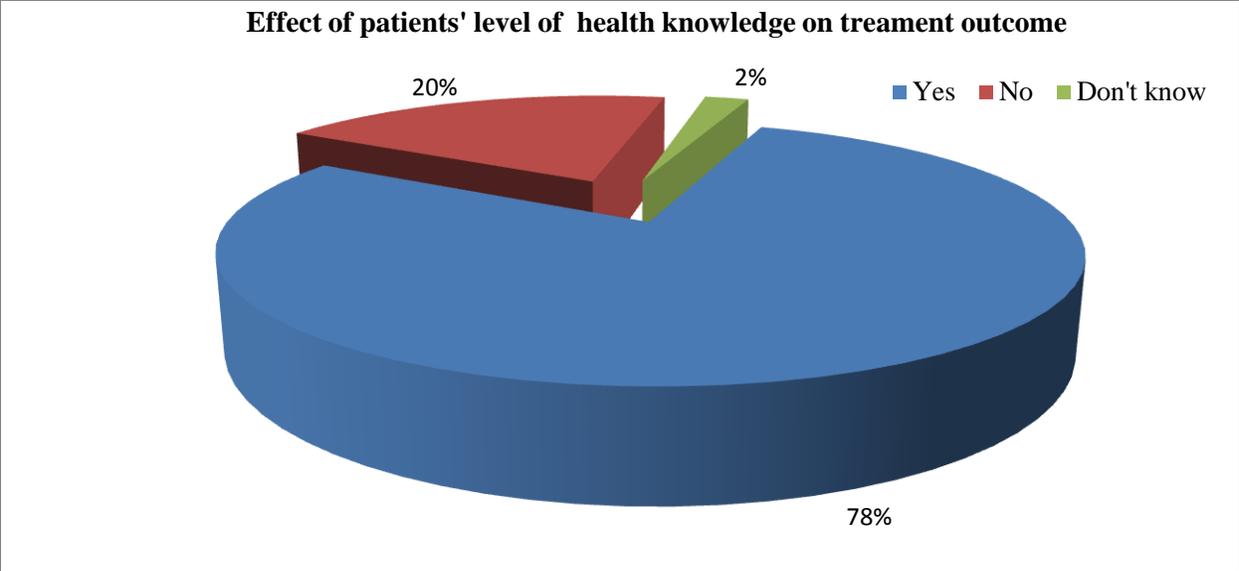
Figure 4.10: Effect of patient's level of health Knowledge on treatment outcome

The nurses who perceived the information to have an impact were asked to state the kind of impact it was. Similar impacts were grouped together to form themes. 35.2% (n = 32) indicated that there was positive impact while 29.7% (n = 27) indicated that there was negative impact (see Table 4.6).

Table 4.6: Impact of online sources of health information on patients' treatment

Impact	Frequency	Percent
Positive impact	32	35.2
Negative impact	27	29.7
No answer	20	22.0
No impact	6	6.6
Both positive and negative impact	6	6.6
Total	**91**	**100.0**

Majority of the nurses 44% (n = 40), also perceived that patients preferred other sources for health information rather than the health practitioners. Subsequently, majority of them (70.3%, n

= 64) acknowledged that information acquired from internet and other sources affected their work. As shown in table 4.7.

Table 4.7: Preference and effects of online sources of health information

N=91

Statement	Response	Frequency	Percentage
Patients prefer other sources of health information rather than health practitioner?	Yes	40	44
	No	51	56
Information acquired from other sources affect your work as a nurse	Yes	64	70.3
	No	27	29.7

Regarding how patient acquired health information from online sources affected nurses' work, most nurses (44%, n = 40), agreed that it made patients' education to become more difficult because patients developed an attitude. This is shown in table 4.8

Table 4.8: Effects of patient-acquired online health information on nurses' work

N=64

How information affects nurses' work	Frequency	Percentage
Patients do not follow retreatment directives	15	16.5
Patient's education becomes more difficult because they develop a "know it all" attitude	40	44
More health complications as a result of wrong self-diagnosis and treatment	28	30.8
Many patients develop depression from the information and they need special care	15	16.5
Too many questions from the patients therefore more time spent on one patient	30	33
Patients are more co-operative in their health care	17	18.7

4.4.1 Online patient-acquired information and nursing practice

A Pearson chi-square test was conducted to examine whether there was a relationship between nurses' rating of level of online patient acquired health knowledge and the nurses' application of technology in practice. The results revealed that there was a significant relationship between the two variables (Chi square value = 8.2, DF= 3, P= 0.042). Nurses who rated patients as having adequate (7.5) or a little (2.5) online health knowledge, were themselves significantly more likely to apply technology in nursing practice (7versus 31.8%) and (12versus 54.5%) respectively as compared to nurses who rated patients as having no online acquired knowledge (1versus 4.5%). (See table 4.9).

Table 4.9: Association between nurses' rating of online patient-acquired health knowledge and nurses' application of technology in practice

	Level of online patient-acquired health knowledge						
	0.0 (6.6%)	2.5 (68.1%)	7.5 (23.1%)	10 (2.2%)	**Chi**	**DF**	**P**
Number of nursing practice areas that nurses reported applying technology (n = 9)							
<5 tasks	5(7.2)	50(72.5)	14(20.3)	0(0.0)	8.2	3	0.042
5 or more tasks	1(4.5)	12(54.5)	7(31.8)	2(9.1)			

Regarding the skills to use in order to handle the patients who have a lot of knowledge about their health condition, most participants (67%, n = 61) mentioned communication skills as the most appropriate skill required (see Figure 4.11).
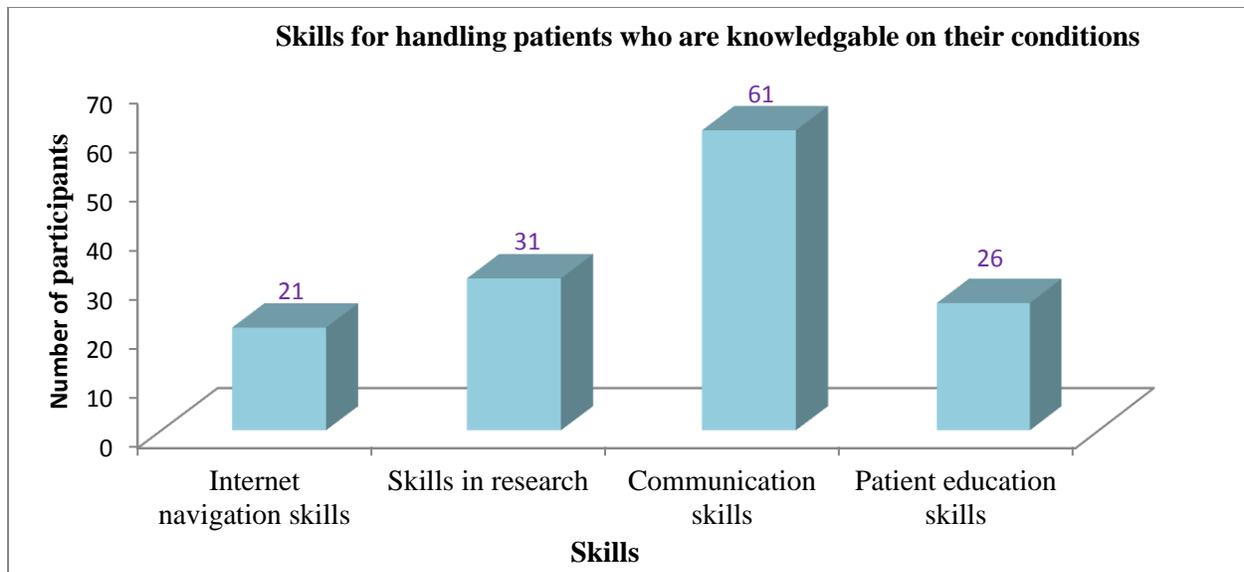
Figure 4.11: Skills for handling patients who are knowledgeable on their conditions

Information obtained from the qualitative interviews affirmed that communication skills were of great importance for the nurses to handle knowledgeable patients in these ICT driven times as the hospital was already involved in conducting customer care trainings which included training in communication skills.

"you have to be alert because you are dealing with somebody who knows what you are doing...., you have to upgrade your skills through the CPDs(continuous professional development), you have to be smart in communication that is why you are seeing that even as a hospital we are stressing so much on customer care"(Key informant no.2).

4.4.2 Online patient-acquired health information and nurses' skills

A Pearson chi-square test was conducted to examine the relationship between nurses' perception of online patient acquired health information on nursing practice and their felt need for more practicing skills. The results revealed that there was a significant relationship between the nurses' perception of impact of online patient acquired health information and the need for more

patient education skills (Chi square value= 8.4, DF=1, P= 0.004). Nurses who felt that online information sources impacted nursing practice also felt greater need for patient education skills (37.5%) compared to those who did not consider online information sources to have an impact on nursing practice (7.4%). (See table 4.10).

Table 4.10: Association between effects of online patient acquired health information on nursing practice and nurses' skills requirement.

	Online patient-acquired health Information affects nursing practice		Chi	DF	P
	Yes	No	Chi	DF	P
Internet navigation skills					
Yes	15(23.4)	6(22.2)	0	1	0.9
No	49(76.6)	21(77.8)			
Skills in research					
Yes	23(35.9)	8(29.6)	0.3	1	0.562
No	41(64.1)	19(70.4)			
Communication skills					
Yes	43(67.2)	18(66.7)	0	1	0.961
No	21(32.8)	9(33.3)			
Patient education skills					
Yes	24(37.5)	2(7.4)	8.4	1	0.004
No	40(62.5)	25(92.6)			

4.5 Challenges faced by nurses in dealing with technological trends in nursing practice.

4.5.1 Challenges related to technological skills

Most nurses (53%, n = 48) reported that they did not have adequate technological skills to effectively practice nursing today with the new technological developments in nursing as shown in Figure 4.12.
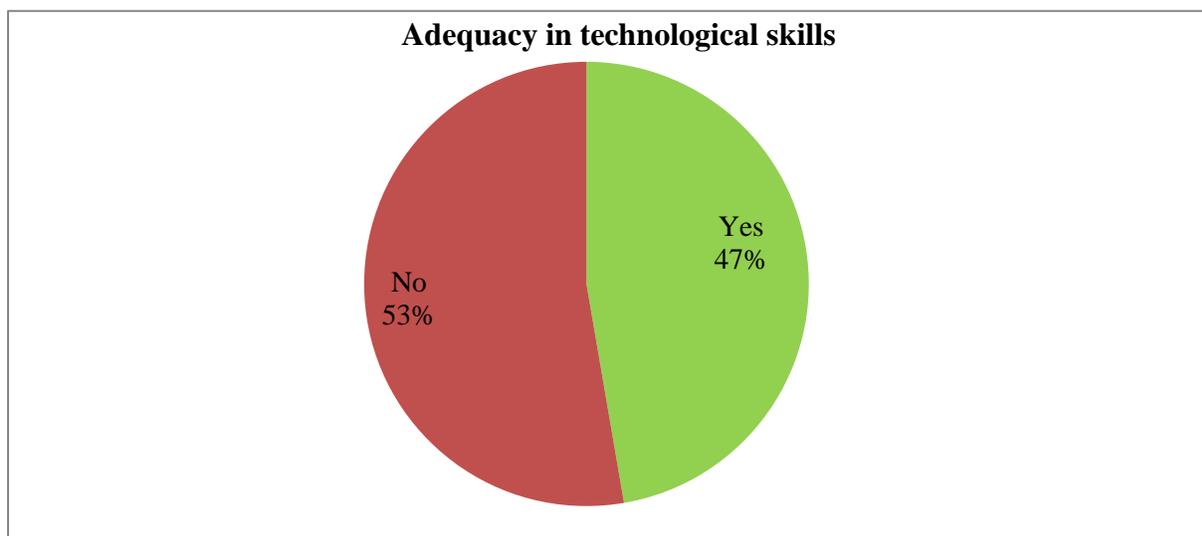
Figure 4.12: Adequacy in technological skills

Majority of the nurses (62.6%, n = 57) reported that they had been challenged by the technological developments in their departments. 35.2%, n=32, reported that they had to upgrade their skills to incorporate technological changes. This was closely followed by the challenge of nurses feeling the need to acquire more skills in technology in order to be effective (33%, n = 30). As shown in table 4.11

Table 4.11: Challenges of technological development on nurses' skills

Technological development challenge	Frequency	Percent
Nurse no longer uses some skills because they have become unnecessary due to technology	8	8.8
Nurse has had to upgrade some skills to incorporate technological changes	32	35.2
Nurse is able to use just a few of the skills she acquired in training	5	5.5
Nurse feels he/she needs to acquire more skills to be effective	30	33.0
Other stated challenge e.g. takes too much time	1	1.1
No answer	15	16.5
Total	**91**	**100.0**

Those who indicated that they did not have adequate skills, specified areas where they thought they needed to acquire more skills in order to use technology more frequently at work as shown in table 4.12.

Table 4.12: Areas to acquire   additional skills

N=48

Areas	Frequency	Percentage
Operating the computers and laptops	22	45.8
Health software e.g. fun soft	24	50
Electronic health records	22	45.8
Digital equipment like glucometers, BP machines etc.	11	22.9

4.5.2 Challenges related to the introduced technology

The Nurses responded to challenges they experienced in using new technology as shown in Table 4.13. From the table, network connection being off most of the times was listed as the

most common challenge (81.3%, n = 74) followed by few computers therefore limited access 56% (n = 51).

Table 4.13: Challenges of using computer technology

N=91

Challenges	Frequency	Percentage
Lack of navigation skills on the computer and other technological gadgets	15	16.5
Network connection is off most times	74	81.3
There are few computers therefore no access	51	56
Lack of necessary nursing application software in the system	31	34.1
Cannot quantify some nursing care given into quantities in the computer system	27	29.7
Nurse not conversant with computer vocabularies and language	9	9.9
There is not enough time to operate the computers as one is nursing	38	41.8

4.5.3 Association between challenges faced and level of EHR usage

A Pearson chi-square test was conducted to examine whether there was a relationship between the type of challenge the nurse was facing and their level of use of EHR. The results revealed that there was a significant relationship between lack of computer navigation skills and level of usage of EHR (Chi square value=16.8, DF=3, P=0.001). Nurses who reported that they lacked skills in navigation of computer and technological gadgets were significantly more likely to report low usage of EHR (2.6 versus 33.3%) while those who had skills reported higher usage (47.4 versus 26.7%).

The results also revealed that there was a significant relationship between non-conversance with computer vocabularies and language and the level of usage of EHR (Chi square value= 11.8, DF=3, P = 0.008). Nurses who were not conversant with computer vocabularies and language were significantly more likely to report lower usage of EHR (4.9 versus 33.3%) as compared to those who reported that they were conversant who were more likely to report higher usage (42.7 versus 55.6%). (See table 4.14).

Table 4.14: Association between challenges faced and the level of use of EHR

	Level of use of HER				Chi(DF)	P
	10%	30%	60%	90%		
Lack of skills on how to navigate on the computer and other technological gadgets						
Yes	5(33.3)	5(33.3)	4(26.7)	1(6.7)	16.8(3)	0.001
No	2(2.6)	31(40.8)	36(47.4)	7(9.2)		
Network connections is off most times						
Yes	6(8.1)	26(35.1)	35(47.3)	7(9.5)	3.3(3)	0.354
No	1(5.9)	10(58.8)	5(29.4)	1(5.9)		
Few computers therefore no access						
Yes	3(5.9)	22(43.1)	22(43.1)	4(7.8)	1(3)	0.8
No	4(10.0)	14(35.0)	18(45.0)	4(10.0)		
Lack of necessary nursing application software in the system						
Yes	3(9.7)	11(35.5)	15(48.4)	2(6.5)	0.9(3)	0.815
No	4(6.7)	25(41.7)	25(41.7)	6(10.0)		
Cannot quantify some nursing care given into quantities in the computer system						
Yes	1(3.7)	8(29.6)	14(51.9)	4(14.8)	3.9(3)	0.275
No	6(9.4)	28(43.8)	26(40.6)	4(6.3)		
Not conversant with computer vocabularies and language						
Yes	3(33.3)	1(11.1)	5(55.6)	0(0.0)	11.8(3)	0.008
No	4(4.9)	35(42.7)	35(42.7)	8(9.8)		
There is not enough time to operate the computers as one is nursing						
Yes	3(7.9)	14(36.8)	17(44.7)	4(10.5)	0.4(3)	0.949
No	4(7.5)	22(41.5)	23(43.4)	4(7.5)		

4.5.4 Association between challenges experienced and technological skills

A Pearson chi-square test was conducted to examine whether there was a relationship between the challenges nurses were facing and their reported presence of effective technological skill. The results revealed that there was a significant relationship between lack of navigation skills on the computer and reported presence of effective technological skills (Chi square value= 7.2, DF=1, P=0.007). A significant number of nurses who reported that they had adequate technological skills for effective practice also reported that they did not experience the challenge of lacking computer navigation skills (56.6%) as compared to those who reported not having adequate technological skills who also reported that they experienced a challenge of navigation on the computer (6.7%)

The study results also revealed a significant relationship between reported presence of effective practicing technological skills and the challenge of lacking necessary nursing application software (Chi square value=9.1, DF=1, P=0.003). A significant number of nurses who reported that they had adequate technological skills for effective practice also reported that they did not experience the challenge of lacking necessary nursing application software (51.7%) as compared to those who reported not having adequate technological skills who also reported that they experienced a challenge of lacking the necessary nursing application software(16.1%). See table 4.15.

Table 4.15: Association between challenges experienced and perceived presence of effective technological skills

	Individual assessment of technological skill to effectively practice nursing		Chi	DF	P
	Yes	No			
Lack of skills on how to navigate on the computer and other technological gadgets					
Yes	14(93.3)	1(6.7)	7.2	1	0.007
No	43(56.6)	33(43.4)			
Network connections is off most times					
Yes	48(64.9)	26(35.1)	0.8	1	0.359
No	9(52.9)	8(47.1)			
Few computers therefore no access					
Yes	33(64.7)	18(35.3)	0.2	1	0.645
No	24(60.0)	16(40.0)			
Lack of necessary nursing application software in the system					
Yes	26(83.9)	5(16.1)	9.1	1	0.003
No	31(51.7)	29(48.3)			
Cannot quantify some nursing care given into quantities in the computer system					
Yes	18(66.7)	9(33.3)	0.3	1	0.606
No	39(60.9)	25(39.1)			
Not conversant with computer vocabularies and language					
Yes	8(88.9)	1(11.1)	2.9	1	0.086
No	49(59.8)	33(40.2)			
There is not enough time to operate the computers as one is nursing					
Yes	21(55.3)	17(44.7)	1.5	1	0.218
No	36(67.9)	17(32.1)			

4.5.5 Association between socio demographics and challenges faced

A Pearson chi-square test was conducted to examine whether there was a relationship between the demographic factors and the challenges faced due to technology. The results revealed that there was a significant relationship between age of the nurse and lack of skills to navigate on the computer and other technological devices (Chi square value=8, DF=3, p= 0.046). A significant number of nurses aged 41-50 years 9(33.3%) were more likely to report that they lacked skills on how to navigate on the computer and other technological gadgets compared to those aged 20-30 years 3 (9.1%) and 31-40 years 2 (8.7%) (See table 4.16)

Table 4.16: Association between socio demographics and skills on how to navigate on the computer and other technological gadgets

	Lack of skills on how to navigate on the computer and other technological gadgets				
	Yes	No	Chi	DF	P
Age					
20-30yrs	3(9.1)	30(90.9)	8	3	0.046
31-40yrs	2(8.7)	21(91.3)			
41-50yrs	9(33.3)	18(66.7)			
51-60yrs	1(12.5)	7(87.5)			
Nursing qualification					
Certificate level	0(0.0)	3(100.0)	3	2	0.219
Diploma level	12(21.8)	43(78.2)			
Degree level	3(9.1)	30(90.9)			
Computer training					
No training	8(26.7)	22(73.3)	3.4	2	0.18
Certificate level	6(12.0)	44(88.0)			
Diploma level	1(9.1)	10(90.9)			
Duration of employment in KNH					
0-10years	5(10.2)	44(89.8)	3.6	3	0.308
11-20years	7(25.9)	20(74.1)			
21-30years	3(21.4)	11(78.6)			
Designation					
Nursing Officer I	7(29.2)	17(70.8)	6.8	5	0.239
Nursing Officer II	0(0.0)	10(100.0)			
Nursing Officer III	2(10.0)	18(90.0)			
Senior Nursing Officer	6(19.4)	25(80.6)			

The test also revealed that there was a significant relationship between age of the nurse and difficulties experienced in quantifying nursing care in the computer system while billing (Chi square value= 11.5, DF=3, P= 0.009). The difficulties increased significantly with age from 5 (15.2%) in nurses aged 20-30 years to 6 (75%) among nurses 51-60 years. (See table 4.17)

Table 4.17: Association between socio demographics and nurses' ability to quantify nursing care in the computer system (Billing)

	Cannot quantify some nursing care given into quantities in the computer system				
	Yes	No	Chi	DF	P
Age					
20-30yrs	5(15.2)	28(84.8)	11.5	3	0.009
31-40yrs	8(34.8)	15(65.2)			
41-50yrs	8(29.6)	19(70.4)			
51-60yrs	6(75.0)	2(25.0)			
Nursing qualification					
Certificate level	2(66.7)	1(33.3)	2.1	2	0.345
Diploma level	15(27.3)	40(72.7)			
Degree level	10(30.3)	23(69.7)			
Computer training					
No training	8(26.7)	22(73.3)	0.4	2	0.832
Certificate level	15(30.0)	35(70.0)			
Diploma level	4(36.4)	7(63.6)			
Duration of employment in KNH					
0-10years	11(22.4)	38(77.6)	6.4	3	0.095
11-20years	8(29.6)	19(70.4)			
21-30years	7(50.0)	7(50.0)			
Designation					
Nursing Officer I	8(33.3)	16(66.7)	11.7	5	0.039
Nursing Officer II	1(10.0)	9(90.0)			
Nursing Officer III	3(15.0)	17(85.0)			
Senior Nursing Officer	11(35.5)	20(64.5)			
Enrolled Nurse	3(100.0)	0(0.0)			

The test results also revealed that there was a significant relationship between age of the nurse and non-conversance with computer vocabularies and language (Chi square value = 9.4, DF=3, P = 0.024). A significantly larger proportion of the nurses aged 20-30 years (90.9%) and 31-40

years (100%) were more conversant with computer vocabularies and language as compared to older nurses aged 41-50 years (88.9%) and 51-60 years (62.5%). As shown in table 4.18.

Table 4.18: Association between socio demographics and nurses' conversance with computer vocabularies and language

	Not conversant with computer vocabularies and language				
	Yes	No	Chi	DF	P
Age					
20-30yrs	3(9.1)	30(90.9)	9.4	3	0.024
31-40yrs	0(0.0)	23(100.0)			
41-50yrs	3(11.1)	24(88.9)			
51-60yrs	3(37.5)	5(62.5)			
Nursing qualification					
Certificate level	0(0.0)	3(100.0)	0.4	2	0.812
Diploma level	6(10.9)	49(89.1)			
Degree level	3(9.1)	30(90.9)			
Computer training					
No training	3(10.0)	27(90.0)	1.5	2	0.483
Certificate level	6(12.0)	44(88.0)			
Diploma level	0(0.0)	11(100.0)			
Duration of employment in KNH					
0-10years	3(6.1)	46(93.9)	3	3	0.388
11-20years	3(11.1)	24(88.9)			
21-30years	3(21.4)	11(78.6)			
31-40years	0(0.0)	1(100.0)			
Designation					
Nursing Officer I	4(16.7)	20(83.3)	5.2	5	0.387
Nursing Officer II	2(20.0)	8(80.0)			
Nursing Officer III	0(0.0)	20(100.0)			
Senior Nursing Officer	3(9.7)	28(90.3)			
Enrolled Nurse	0(0.0)	3(100.0)			

There was evidence from qualitative interviews that challenges in computer skills were mostly experienced more among the older nurses than it was among the younger nurses.

"I think there are a few who have the skills problem and mostly you find they (the ones with the challenges) are people who are aged; who are about to retire, majority are okay. In fact even the ones doing locum they are even the best, the young ones. They are even doing better than the older generation so I don't want to say that that challenge is much. Because if there was an application they were not able to do then I would say there is a challenge."(Key informant no. 2)

Nurses who cannot use the IT are very few and it is mostly the ones who are elderly and about to go home /retire" (Key informant no. 2)

4.5.6 Effect of technology on nursing work

Most participants reported that despite the challenges, computer technology had helped to make their nursing work easier as shown in Figure 4.13.

Ease of nursing work due to computer technology

No 20%

Yes 80%
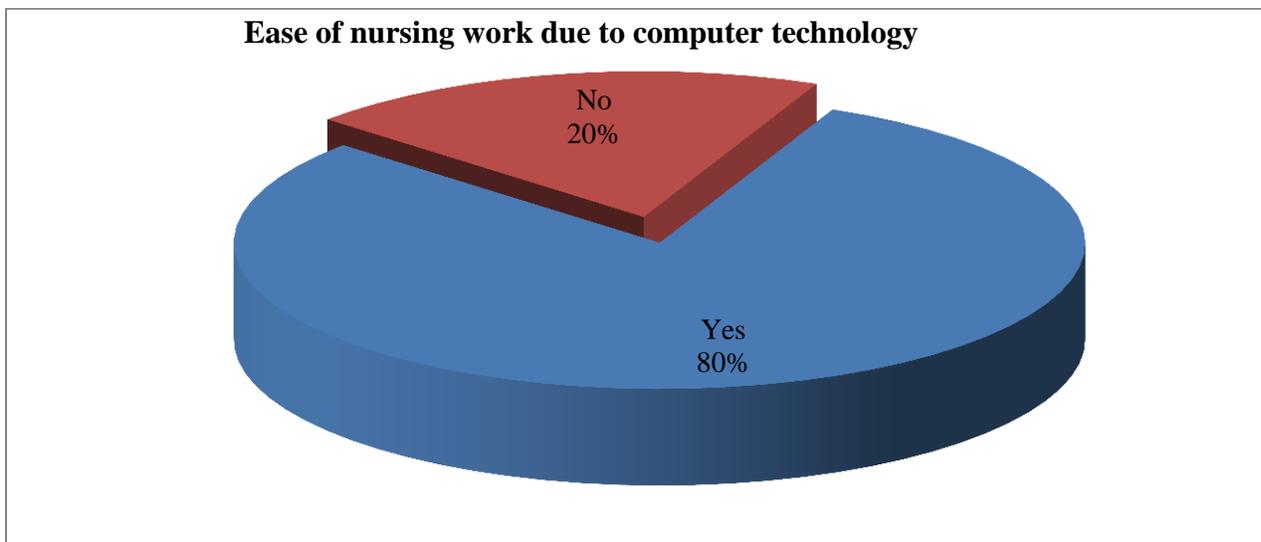
Figure 4.13: Effect of computer technology on nursing work

Regarding areas that computer technology had helped to make nursing work easier, most nurses reported areas like, billing patients (87.7%), ordering of supplies (75.3%) and ordering of drugs (41.1%). As shown in table 4.19

Table 4.19: Areas where nursing work has been made easier by use of computers

N=88

Areas	Frequency	Percentage
Admission of patients	29	39.7
Drug dosage calculations	6	8.2
Ordering of supplies	55	75.3
Off/on duty rosters	23	31.5
Computer assisted instructions	8	11
Drug ordering	30	41.1
Wards report	2	2.7
History taking guidelines	2	2.7
Nursing care plans	3	4.1
Nursing cardex	1	1.4
Observation and vital signs	5	6.8
Health education to patients	9	12.3
Billing patients	64	87.7

4.5.7 Coping strategies

Some of the reported strategies which nurses used to handle challenges brought by technology were grouped into themes. They were as presented in Table 4.20.

Table 4.20: Strategies that nurses have used to handle technological changes in nursing

Strategy	Frequency	Percent
Getting more knowledge/skills, e.g., through attending seminars and conferences, getting exposure to use of technology	37	40.7
Reporting any technical defaults to ICT department/asking for their help	8	8.8
Consulting the Nursing ICT champions in KNH	9	9.9
Practicing more on computer use	12	13.2
Continue using manual skills	4	4.4
Building a teamwork/Co-operate/consulting with fellow nurses to handle the technical issues	7	7.7
No answer	14	15.4
Total	**91**	**100.0**

Subsequently, measures which they thought could be taken by the hospital to enhance ICT integration were classified into themes. The most reported measures to be taken to enhance integration of technological trends in nursing practice in KNH were: comprehensive computer training for nurses (49.5%, n = 45) and availing resources e.g. increase number of computers and employing more nurses 18.7%, n = 17). As shown in table 4.21.

Table 4.21: Measures to be taken by KNH to enhance integration of ICT in nursing practice

Measures to be taken	Frequency	Percentage (%)
Making resources available, increase no. computers, employ more nurses	17	18.7
Create a backup system	2	2.2
Comprehensive computer training for nurses	45	49.5
Create a system that is nurse-friendly and has all the applications that nurses need	9	9.9
No response	4	4.4
Improve ICT system/ Get a better service provider	4	4.4
Appoint some nurses to be checking practicability of some applications/ Nurses to advance in the field of ICT	3	3.3
Staff motivation and training	5	5.5
Introduce computer stations in every department/create help desks	1	1.1
Implementation to start from top to bottom with proper communication	1	1.1
Total	**91**	**100.0**

4.5.8 Importance of computer technology as part of nursing education curriculum

Almost all participants (98.9%, n = 90) thought that computer and technology applications should be included in nursing education curriculum as requirement for nursing practice.

4.6 Summary of information from Key informants

The study intended to include five key informants but due to their tight schedules, the researcher managed to recruit four key informants as participants in the in-depth interviews. According to

the key informants the most prominent technological change that had occurred in nursing practice in the hospital was the introduction of computer use by the nurses and other health care workers in the hospital. Other technological changes that had occurred in the hospital included the use of digital equipment which earlier on were not digital for example the use of digital BP machines, digital thermometers, use of printers, ultrasound machines, magnetic resonance machines etc. Also the use of advanced communication gadgets like the cell phones (smart phones and iPhone) had improved the speed of communication between nurses, doctor and other health practitioners.

As for the specific use of technology among the nurses, the key informants concurred on billing of patients as one of the major functions performed by most nurses involving technology. Other functions like ordering of supplies and ordering of Dangerous Drugs Act (DDA) drugs were also done by nurse team leaders. In some wards, the nurses further used the computers to prepare their ward duty rosters. In some wards, nurses were also involved in use of the internet for research and referencing purposes as they did their own studies and also for continuous medical education (CME) in the wards whereby some also included the use of power point presentations to conduct the CMEs.

"The hospital Introduced the IT application, although it is still gradual they have not fully implemented it, like there are some packages e.g., if you look at the nursing side, there are some packages that are still dormant and are not fully used. "There are many packages still lying dormant e.g., accessing the lab results online, maybe drug requisition; pharmacy, is still using the S11. The lab stores I think, is still using S11. So not all packages have been digitalized or have been implemented." "Most of the reports we are still doing hardcopy whether it is the

departmental reports, or hospital wide like the one of 108 reports" "in the day to day nursing activities the IT use is still very very minimal" (Key informant no.2).

Key informant number two particularly stated that some nurses in their department had formed a team involved in doing a lot of data analysis from data gathered on the processes of nursing like monitoring of admissions by nurses and analysis of the turnaround time in nursing processes. The informant also stated that the training department of Kenyatta in Rahimtulla involved a lot of use of technology by the nurses who worked there as trainers of nursing students for research and presentations. Key informant number three also stated that there was use of computerized physician/provider order entry (CPOE) going on at the doctors' plaza of KNH.

All key informants agreed that the technological changes had an effect on the skill of the nurses using the technology and they all concurred that the skills the nurses had were not adequate to fully utilize the new technology in place for use by the nurses. The effects were both positive and negative effects. On the positive side, they said some technology had served to make work easier e.g. the digital equipment, quick referencing and even clearing of patients was made easier due to online billing, but on the negative side, key informant three stated that the billing process was time consuming for the nurse because it had not been packaged well for ease of use by the nurses. Key informant number four even suggested that inclusion of billing clerks would serve to make online billing procedure less burdensome for the nurses.

"It is affecting, okay the one of the BP machine, it makes work faster; reduces the amount of time. But The one of the billing on fun soft, I have issues with it, unless, now probably, what we

are working on when we compress the nursing activities but when we are now writing one by one, one by one,…….. It is time consuming. In fact I think in an ideal situation we should have a billing clerk in the ward" (key informant no.3)

As for the level of knowledge of the patients about their health conditions as a result of exposure to technology, the key informants rated the level of knowledge of the patients to be ranging from average to low, with informant number four rating their health knowledge level at six on a scale of one to ten and informant number three rating them at three.

"IT has revolutionized the kind of clients we have, they know their rights, they know the conditions they are suffering from, and they even know the management" (Key informant no.2)

They stated that majority of clientele seeking services in KNH were not very much exposed to technology though there was a portion of them who were very much exposed and these were mainly the younger clients who came from the urban areas.

"Why I'm saying like that is because for example is if you went around the entire medicine department you will not find any patient with a laptop or even a smart phone well maybe very few with a smart phone. But the majority you will find them on WhatsApp and a few things like social media not looking for information. Level of knowledge is low". (Key informant no.3)

Informants seemed to agree on the fact that Patients' exposure to technology and health information on the internet and other sources indeed had an effect on the work of the nurse. The

effect could either be positive or negative depending on how the patient took it and on the credibility of the sources of the information they got.

"Those who have read, I think they challenge because they ask about for example a diagnosis and if a nurse is not well informed they say, that one I think you can ask the doctor"(Key informant no.3)

According to the informants, some nurses were able to handle well the very exposed and more knowledgeable patients because they were keeping up with technological developments and thus had adequate skill to handle them. Key informant number four noted that the adequacy of skills of a nurse in handling the very knowledgeable clients was related to the level of education of the nurse because the nurses who were more educated for instance those with degrees seemed to have required skills in handling the clients who were more exposed to information and technology and were well informed about their health conditions.

As for the challenges on nurse practicing skills as a result of technological changes in nursing, the key informants concurred on some common challenges like low literacy levels in computer skills among the nurses. Most nurses especially the older nurses did not have adequate technological skills to accommodate the transition to technology application in nursing. The challenge of insufficient resources and slow network were also mentioned as key factors.

"Although I'm not sure if the system will cope because right now with the few applications they are working on we are already seeing congestion and all that". (Key informant 4)

The challenge of the workload of the nurses being too much to allow time for proper utilization of introduced technology. Informant number one state that the three day training on computer application for nurses conducted by the hospital was inadequate.

"The training is more effective for the people who are already exposed because it is on a small scale, when you come to top up, because you see, people who have not been exposed to computerization at all, they want to be taken slowly, but sometimes there they've got targets, they want to clear a certain number of people. So some people they go there and they keep quiet or they don't learn much but it is counted they were there". (Key informant no.2)

Informant number four also stated that many nurses had issues with their attitude towards technology that brought about challenges in uptake. According to the informant number four, some nurses about 1% experienced no change in their skills even after the training due to their negative attitude. The informants also stated that the training conducted by the hospital was effective only for the ones who already had computer knowledge. Other challenges mentioned included, frequent power failures and dragging of some procedures like online billing of patients.

"Some procedures take longer than they could have taken …" (Key informant no. 1)

"What I have seen that might lead to a challenge that people want to finish procedures very fast, so that… they know there is a task ahead which is more challenging. So that might deny the patient from being given the best" (key informant no.3)

According to the informants, measures that can be undertaken to enhance integration of technology in nursing include; to intensify the trainings for nurses on computer use, to install more computers and increase the necessary resources like technological equipment, increase nurse staffing ratios, improve on the network and power, introduce computer stations/ help desks in the wards and nursing leadership to be more involved in spearheading the technological changes in nursing.

"We have to become creative from the top; from our leadership honestly I feel maybe the leadership is lacking" (Key informant no.2)

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS.

5.1 Discussion of study findings

5.1.1 Socio-demographic findings

Findings of the study indicated that majority of the participants i.e., 36.3% were between the ages of 20-30 years, an age group that was advantaged in exposure to ICT and other available technology. There was a significant relationship between the age of the nurse and the challenges they faced due to technology. Younger nurses between ages 20-40 years were more conversant with computer vocabularies (Chi square value = 9.4, DF=3, P = 0.024), were more able to quantify nursing care in the computer system during billing (Chi square value= 11.5, DF=3, P=0.009), and were more able to navigate on the computer and other technological gadgets (Chi square value=8, DF=3, p= 0.046). They therefore experienced less challenges as compared to the older nurses.

Majority of the nurses 64% were female. Gender of the respondents was also important to consider as a factor that could be linked to the slow uptake of technology. Although there was no relationship established in the study between gender and level of use of EHR (Chi square value =2.8, DF =3, P=0.431). This did not concur with suggestions that presence of female dominance in the nursing profession could be a contributing factor to slow uptake of technology because women are not considered as active users of technology compared to men (Moody et al as cited in Kivuti-Bitok 2009).

5.1.2 Ways of utilization of technology in nursing

Electronic health records was indicated as the most widely used technological application by 51.6% of the nurses, followed by biometrics (use of electronic identification) in health by 16.5%. A significant proportion of the nurses i.e. 20.9% indicated that they did not know of any technological application in use at their work place. This reflected their inadequacy in understanding of technological applications and terms in daily use at their work place. On areas where computer technology was used mostly in nursing, all nurses (100%) indicated that billing was done online. This concurred with studies that had indicated that EHR had been used in billing and had helped in reducing charging errors by capturing patients' charges accurately and timely (Menachemi & Collum 2011). Among the participants, 78% indicated ordering of supplies and 59.3% indicated drug ordering was done online. A few others 36.3% used them for admission of patients and 34.1% for duty roster preparation.

While electronic health records were the most widely used technological application, only 70.3% knew how information confidentiality and security of information was maintained. This indicated the risk of exposure of patient information. Findings from a study by Menachemi, 2011 indicated that EHR enhanced security of patients' information and confidentiality through controlled and auditable provider access. This may not be the case with security of patient information at KNH if nurses did not know how to maintain it. The level of usage of the EHR was rated at an average mean of 47.25% which was not very far from the 30 % usage of EHR report of the strategic management team in KNH. (KNH, ICT Master plan 2014)

Regarding medication administration technology 70% of participants agreed that use of electronic medication administration system would help to reduce medication errors which they had acknowledged existed on an average mean of 27.25%. Findings from a study on electronic medication administration bar-code eMAR indicated that it helped to reduce non-timing administration errors and in turn reduced potential adverse drug effects from these errors. It also led to reduction in timing of medication administration errors. The bar-coded eMAR also completely eliminated transcription errors and its associated potential adverse drug effects (Poon et al 2010)

5.1.3 Influence of online patient-acquired information on nursing practice

Findings were that health knowledge level of the patients as a result of exposure to technology was rated at a mean of 3.65 on a scale of 1-10. Most participants 78% acknowledged that the level of health knowledge of a patient had an effect on the outcome of their treatment. Findings show that 56% of the nurses indicated that their patients preferred to get health information on their conditions from the health practitioners and 44% preferred to get it from other sources like the internet. This did not concur with findings from surveys that suggested that patients increasingly looked up for information on their health conditions from the internet more than they communicated with their doctors and perceived their doctors to be limited sources of information. (Greene, Choudhry, Kilabuk & Shrank 2010). This could be attributed to the different settings of the populations under study. Most of the patients who sought health care in KNH came from a low socioeconomic background as had been reported by some key informants and may not have access to technology and the exposure.

The study also found that 70.3% of the participants acknowledged that information from internet and other sources affected their nursing work. There was a significant relationship between nurses' rating of level of online patient acquired health knowledge and the nurses' application of technology in practice (Chi square value = 8.2, DF= 3, P= 0.042). Nurses who rated patients as having adequate (7.5) or a little (2.5) online health knowledge, were themselves significantly more likely to apply technology in nursing practice (7versus 31.8%) and (12versus 54.5%) respectively as compared to nurses who rated patients as having no online acquired knowledge (1versus 4.5). Majority 44% of nurses also thought that information acquired from internet and other sources made patient education more difficult due to developed attitude from the patients. This concurred with findings of a study by Powell et al (2011) which suggested that challenges of online health information included challenges to the authority of health professionals. A good number of participants, 33% suggested that it made the nurse to spend more time on one patient because they had too many questions. This concurred with a study which indicated that information from the internet led to better informed patients and at the same time many patients were misinformed thus a lot of time was spent correcting them (Juma et al 2012).

Despite this, majority of the nurses 35.2% reported that online patient acquired information had a positive impact on their treatment citing reasons like it helped the patients to understand their conditions better and thus co-operate more, in their treatment. Findings from a study done by Powell et al in 2011 suggested that online health information seeking behavior had the benefit of creating informed and empowered consumers who engaged in their own care. There were 29.7% nurses who reported that it had a negative impact on their treatment citing reasons like

misunderstanding of what was documented in relation to their real-life situations and credibility of the source. Similar findings of both positive and negative impacts on patient treatment were also reported by a survey conducted among American patients who searched for health information online (Fox, cited in McGonigle & Mastrian 2009). Among the negative effects reported were that 25% of the searchers felt overwhelmed by the content they found and 18% felt confused by the content they found online.

Findings also indicated that most nurses did not have adequate skills in handling the very knowledgeable and exposed patients. This was reported by the key informants and 61% of the nurses indicated that they felt they needed to acquire more communication skills, and a significant number also indicated that they needed skills in research and patient education. There was a significant relationship between nurses' perception of impact of online patient acquired health information and the need for more patient education skills (Chi square value= 8.4, DF=1, P= 0.004). It was as a result of the challenge of handling knowledgeable patients.

Findings indicated presence of a digital gap among patients in KNH. Nurses indicated that 68.1% of their patients had a little knowledge of the health conditions. The key informants significantly reported that a good number of their patients were not knowledgeable about their health conditions due to their social, cultural and economic background. Even so, there were others who had a lot of health knowledge on their conditions and were well exposed. It is important for nurses to ensure that the different categories of patients receive the right kind of health information that they need in a manner that will interest them and that they easily comprehend (McGonigle & Mastrian 2009).

5.1.4 Challenges faced and coping strategies used by nurses in dealing with technological trends in nursing

The study found that the challenges faced by nurses due to technology could be classified as challenges related to nurses technological skills and challenges related to the introduced technology. The challenges related to the technology itself were more reported by majority of the nurses. For example (81%) reported that network connection was off most of the time, 56% of the nurses reported that there were few computers therefore limited access, 41.8% indicated that there was limited amount of time to work on the computers due to the workload. Study findings concurred with findings by De Veer et al 2011, in which the respondents who mostly reported about challenges with introduction of electronic information system most often talked of challenges relating to the organizational and technology context such as network problems and lack of enough computers more than the challenges related to the users.

Challenges related to nurses technological skills were indicated by 53% of the nurses who indicated that they did not have adequate technological skills to apply and would have wished to acquire more skills in use of computers and laptops, use of soft wares, and digital equipment at work, and mostly in use of EHR. The study found a significant relationship between lack of computer navigation skills and level of usage of EHR (Chi square value=16.8, DF=3, P=0.001) and also between non-conversance with computer vocabularies and language and the level of usage of EHR (Chi square value= 11.8, DF=3, P = 0.008). Nurses who reported that they lacked computer navigation skills were significantly more likely to report low usage of EHR (2.6%) while those who had skills reported higher usage (26.7%). Similarly, nurses who were not

conversant with computer vocabularies and language were significantly more likely to report lower usage of EHR (33.3%) as compared to those who reported that they were conversant who were more likely to report higher usage (55.6%).

Therefore to increase the level of use of EHR nurses had to acquire more skill. They experienced challenges with the EHR system and had low usage levels because they did not have necessary skills. This was also proven through the chi square test which showed a significant relationship between reported presence of effective technological skills and lack of navigation skills on the computer (Chi square value= 7.2, DF=1, P=0.007) and another significant relationship between reported presence of effective practicing technological skills and the challenge of lacking necessary nursing application software (Chi square value=9.1, DF=1, P=0.003). Nurses who reported that they had adequate technological skills for effective practice also reported not experience the challenge of lacking computer navigation skills (56.6%) and also reported not experience the challenge of lacking necessary nursing application software (51.7%) and those who reported not having adequate technological skill also reported that they experienced a challenge of navigation on the computer (6.7%) and they also experienced a challenge of lacking the necessary nursing application software(16.1%). This indicated that having the required technological skills made nurses to experience less challenges because those who had the skills experienced less challenges. Other studies indicated that challenges related to users included lack of required skills and technology that was perceived by the nurses to be difficult to use was not easily up taken (De Veer et al 2011).

Despite the challenges, 80% of the participants reported that computers had helped to make their work easier especially in the areas of billing patients 87.7% and ordering of supplies 75.3%

concurring with findings that EHR had been useful in accurately capturing patient charges in a timely manner (Menachemi & Collum 2011).

On the strategies to handle technological changes in nursing work, majority 40.7% responded that they had to acquire more skills in technological applications mostly out of their own initiative through seminars and conferences and doing a lot practicing on the computers. Significantly, a small number of participants 4.4% stated that they had continued to use manual skills despite the introduction of computers for the selected processes. This could be interpreted as existence of some resistance to technological changes in the nursing practice.

Most nurses (49.5%) recommended for comprehensive computer training for nurses by KNH and 18.7% recommended for availing of resources e.g. increasing number of computers and employing more nurses as measures to be taken to enhance integration of technological trends in nursing practice in KNH. Almost all participants (98.9%) agreed to the inclusion of nursing informatics, computer and technological applications as part of the nursing education curriculum.

5.2 Conclusion

Electronic health records (EHR) in billing and ordering of supplies were the most commonly used technology among the nurses and the reported usage levels were averagely low.

From the findings of the study it can be concluded that there was an established relationship between age of the nurse and the challenges of computer navigation skills, conversance with computer vocabulary/language and difficulties in quantifying nursing care while billing. The

study established that older nurses experienced more of these challenges in using technology as compared to the younger nurses.

The study also found that challenges of lack of computer navigation skills and non-conversance with computer vocabularies led to reduced usage of the EHR. There was an establish relationship between lack of computer navigation skills and reduced usage levels of EHR. Also between non-conversance with computer vocabularies/language and reduced usage levels of EHR. We can therefore conclude that challenges with computer skills and conversance led to reduced use of EHR.

The study established a significant relationship between nurses' subjective reports on their technological skills and the challenges they faced. Nurses who reported that they had technological skills also reported that they did not experience some of the challenges like lack of navigation skills and lack of necessary nursing application software in the system whereas those who reported not having technological skills were more associated with the above challenges. We can therefore conclude that having technological skills led to having less challenges.

Majority of nurses reported experiencing more of organizational and technological challenges like network issues, computer resource issues and workload of nurses more than user related challenges. Findings also pointed towards some resistance to technological changes with some nurses continuing with the manual system.

Findings also established that there was a significant relationship between online patient-acquired information and the likelihood that a nurse would apply technology in practice. The study established that nurses who perceived patients to have a lot of online acquired health information most likely applied technology in their practice and also felt greater need to acquire

more technological skills. Therefore we can conclude that online patient- acquired health information had an influence on the practice of nursing.

With regard to the above findings and conclusions, we can conclude that the technological trends in nursing indeed had an effect on the practicing skills of the nurses in KNH and therefore reject the null hypothesis.

5.3 Recommendations

5.3.1 Action recommendations

The researcher made the following recommendations:

1. A survey on the technological or computer skill level among nurses to be conducted by KNH management and used as a guideline for effective training of the different groups of nurses as shall be indicated by the survey as opposed to training being conducted generally for every nurse regardless of previous knowledge of computers.

2. Challenges related to organizational/ political context like ICT policies to be addressed by management first as this will encourage a more positive attitude in the uptake of technological changes in nursing.

3. Challenges to do with the technology itself should be addressed. For example, by inclusion of applications which are nurse friendly and nurse oriented and which enable nurses to spend less time operating the computers and more time attending to patients' needs.

4. Setting up a nursing informatics department should be considered and established as it will enable nurses to actively participate in identifying nurse user needs and to participate in system analysis in order to streamline technology application in nursing processes.

5.3.2 Recommendations for further study

The study was conducted to establish the application of technology in nursing practice in KNH and the challenges it has caused on the practicing skills of the nurses in KNH. There is need to carry out a research on the impact of the ICT trainings for nurses being conducted by the hospital ICT team and further on more areas that technology can be applied in nursing in KNH.

The study only covered the nurses working in KNH; similar studies should be conducted in a different public hospital which is engaging the use of technology in nursing and also in private hospitals using technology applications in nursing and possibly make comparisons of the ways of application and the challenges experienced.

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APPENDICES

APPENDIX I: PARTICIPANT INFORMATION SHEET AND CONSENT FORM

Title: Technological dynamics in nursing and their challenges on nurse practicing skills in Kenyatta national hospital, Nairobi Kenya.

Investigator: Sharon Mina Okeyo

University of Nairobi

School of Nursing Sciences,

P. O. Box 19676, Nairobi

Introduction: I am a student at the School of Nursing Sciences, University of Nairobi pursuing a Master of Science Degree in Nursing. I am conducting a study titled**: Technological dynamics in nursing and their challenges on nurse practicing skills in Kenyatta national hospital.** This will be a cross-sectional descriptive study which will be conducted in Kenyatta National Hospital, Nairobi, Kenya.

The purpose of this information is to give you details pertaining to the study that will enable you make an informed decision regarding participation. You are free to ask questions to clarify any of the aspects we will discuss in this information and consent form. I will also ask you questions regarding the study before you sign the consent form to ascertain your comprehension of the information provided.

Background and objective: The purpose of this study is to identify the technological trends in nursing and the challenges on the nursing skills that have resulted from the introduction of technology in nursing services with a view of coming up with suggestions as to the ways of dealing with the challenges and the necessary skills required by nurses to incorporate technology in nursing care delivery. The finding from this study will be used to come up with strategies that will ensure proper use of technology in nursing practice in order to reduce wastage of time and money and to improve on efficiency of the nurses' work.

Participation: Participation in the study will entail answering questions which will be filled by the interviewer in the semi-structured questionnaire. You will not be subjected to any invasive procedure.

Benefits: There is no direct monetary benefit in participating in this study. However, findings of the study will be used to develop strategies on how to improve on the technological skills of the nurses so as to better utilize technology in improving the quality of care given to maintain high standards of nursing care. The results of the study will be useful in facilitating the understanding and application of technology in nursing together with the various challenges on nursing skills associated with technology and the strategies used to cope with the challenges. The findings will be availed to the hospital, other relevant decision makers and stakeholders to aid in putting in place measures that will improve the application of technology in nursing in order to avoid redundancy and improve the efficiency of nursing care.

Risks: There are no economic or physical risks as a result of participation in the study. However, you will take some time off your schedule to respond to questions from the researcher administered questionnaire. Also during the interview, some questions will require you to disclose some personal information that might trigger some negative feelings and possibly anxiety. If this happens, the researcher will refer you to the hospital counselor. The researcher will also try and spend approximately 30 to 40 minutes of your time.

Confidentiality: Confidentiality will be maintained and the information you provide will only be used for the intended purpose of the study. In addition, your name will not be required on any forms or used during publication of the final report thus ensuring your anonymity. All materials used during the study will be under lock and key and only the personnel involved in this study will have access to them. Electronic files will be saved on password and fire-wall protected computers. In case you want to know the results they will be availed to you.

Voluntary participation: Participation in this study is voluntary. Refusal to take part will not attract any penalty. You retain the right to withdraw from the study without any consequences. You are free not to answer any question during the interview.

Compensation: There is no compensation for participating in the study.

Conflict of interest: The researcher and the supervisors confirm that there is no conflict of interest amongst them.

CONSENT FORM

If you consent to participate in the study please read the following and sign below:

I have been informed of the nature of the study being undertaken and potential risks explained to me. I also understand that my participation in the study is voluntary and the decision to participate or not to participate will not affect my employment status at this facility in any way whatsoever. I may also choose to discontinue my involvement in the study at any stage without any explanation or consequences. I have also been reassured that my personal details and the information I will relay will be kept confidential. I confirm that all my concerns about my participation in the study have been adequately addressed by the investigator. I have also been asked questions to ascertain my comprehension of the information provided. I hereby consent to participate in this study

Participants Signature ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯Date ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

I confirm that I have clearly explained to the participant the nature of the study and the contents of this consent form in detail and the participant has decided to participate voluntarily without any coercion or undue pressure.

Researcher's Signature ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯Date ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

For any Clarification, please contact
Sharon Mina Okeyo
Researcher
Mobile Number: 0722418898
Email: mina304061@yahoo.com

Or

Prof Anna Karani,

Professor of nursing & nursing education

School of nursing

University of Nairobi

Mobile Number: 0721850910

Email:annakarani@gmail.com

Or

Dr. Emmah Matheka,

Lecturer

School of Nursing

University of Nairobi

Mobile number: 0710105771

Email: emmahmatheka@yahoo.com

Or

The Chairman,

University of Nairobi- Kenyatta National Hospital Ethics and Research Committee

P.O BOX 19676 Code 00202

Tel :(254-020)-2726300 Ext 44355

Email: uonknh_erc@uonbi.ac.ke

APPENDIX II: QUESTIONNAIRE FOR NURSES

Instructions

- Ensure that you have read, understood and signed the consent form attached before filling in this questionnaire
- Do not write your name in any of the pages of this questionnaire
- Read carefully and respond to each question by ticking the appropriate answer and providing details where required.
- You are allowed to select more than one choice where you think the answers are more than one.
- Ensure that you seek clarification where you do not understand

Socio-demographic Data

1. Age
   a) 20-30yrs   [   ]
   b) 31-40yrs   [   ]
   c) 41-50yrs   [   ]
   d) 51-60yrs   [   ]

2. Gender
   a) Male   [   ]
   b) Female   [   ]

3. What is the level of your qualification or training?
   a) Certificate level   [   ]
   b) Diploma level   [   ]
   c) Degree level   [   ]
   d) Masters level   [   ]

4. What is your level of training in computer skills?
   a) No training   [   ]
   b) Certificate level   [   ]
   c) Diploma level   [   ]

d) Higher diploma level   [   ]

e) Degree level   [   ]

5. How many years have you worked in KNH?

a) 0-10years   [   ]

b) 11-20years   [   ]

c) 21-30years   [   ]

d) 31-40years   [   ]

6. Which is your job group?

a) Nursing officer I

b) Nursing officer II

c) Nursing officer III

d) Senior Nursing officer

e) Enrolled Nurse

f) Senior enrolled nurse

7. Which department are you working in?

a) Department of medicine

b) Department of surgery

Part I: Ways of utilization of technology in nursing

8. Do you have computer application skills?

a) Yes [   ]   b) No   [   ]

B) If yes, at what level would you classify your knowledge of computers?

        1. Basic skills in handling and operating a computer

        2. Skills in use of application software like fun soft, Microsoft office, etc.

        3. Skills in programming and developing application software

        4. Skills in system analysis, user-need identification and maintenance of systems.

9. Which of the above skills do you think are important for nurses to have?

a) 1   [   ]

b) 1, 2   [   ]

c) 1, 2, 3   [   ]

d) 1, 2, 3, 4   [   ]

10. Indicate which of the following technological applications in health are in use at your work place.

    a) Biometrics (use of electronic identification) in health

    b) Electronic health records

    c) Computerized physician/provider order entry (CPOE)

    d) Clinical decision support

    e) Bar-coded electronic medication administration(Bar-code eMAR)

    f) Don't know

11. In using the electronic Health records (i.e., patient health records in fun soft). Do you know how patient health information confidentiality and security is maintained by the nurse?

    a) Yes [   ]   b) No [   ]

12. How would you rate the percentage of use of the electronic health records by the nurses in your ward?

    a) 10%

    b) 30%

    c) 60%

    d) 90%

13. Do you know what electronic medication administration systems (Bar-code eMAR) are?

    a) Yes [   ]   b) No [   ]

    b) If yes have you ever used this application in your work to administer medication?

    a) Yes [   ]   b) No [   ]

14. At what percentage would you classify errors in medication administration in your ward?

    a) 10%

    b) 30%

    c) 60%

    d) 90%

15. Do you think electronic medication administration systems (Bar-code eMAR) can help nurses in reducing medication errors?

a)   Yes [   ]   b) No [   ]   c) Don't know [   ]

16. Indicate which areas you use technology in your nursing practice

   a)   Billing patients

   b)   Admission of patients

   c)   Drug dosage calculations

   d)   Ordering of supplies

   e)   Off/duty rosters

   f)   Computer assisted instructions

   g)   Drug ordering

   h)   Ward reports

   i)   History taking guidelines

   j)   Nursing care plans

   k)   Nursing cardex

   l)   Observations and vital signs

   m) Health education to patients

Part II: Influence of Patient acquired information from the internet on nursing practice

17. How would you rate the level of health knowledge of the patients you attend to about their health conditions?

0	2.5	5	7.5	10
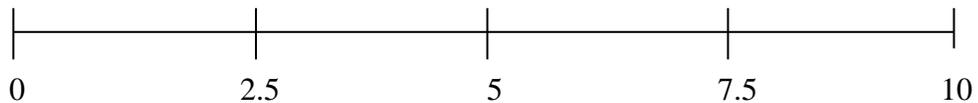
   a) No knowledge -0

   b) A little knowledge-2.5

   c) Adequate knowledge-7.5

   d) A lot of knowledge-10

18. Do you think the level of health knowledge of a patient affects the outcome of their treatment?

   a) Yes [   ]   b) No [   ]   c) Don't Know [   ]

19. What impact does the information acquired by patients from other sources like the internet have on their treatment? Explain

   _____

   _____

20. Do you think patients prefer other sources for health information rather than the health practitioner?

a) Yes [　　]   b) No [　　]

21. Does the information acquired from internet and other sources by patients affect your work as a nurse?

a) Yes [　　]   b) No [　　]

B) If yes, how does it affect your work?

a) Patients do not follow treatment directives

b) Patient education becomes more difficult because they develop a 'Know it all' attitude

c) More health complications as a result of wrong self-diagnosis and treatment

d) Many patients develop depression from the information and they need special care

f) Too many questions from the patients therefore more time spent on one patient

g) Patients are more co-operative in their health care

22. Which skills do you think you need to acquire in order to handle the patients who have a lot of knowledge about their health conditions?

a) Internet navigation skills

b) Skills in Research

c) Communication Skills

d) Patient education skills

Part III: Challenges faced and coping strategies used by nurses in handling technological trends in nursing practice

23. Have the technological developments in nursing practice in your ward challenged your skill at work?

a) Yes [　　]   b) No [　　]

24. How have these new technological developments challenged your nursing skills?

a) I am not using some skills because they are no longer necessary because of computers

b) I have been able to upgrade my skills to incorporate technological changes in nursing

c) I use just a few of the skills I learnt before joining the practice

d) I need to acquire more skills in technology in order to be effective.

e) (List any other) _____

25. Do you think you have adequate technological skills to effectively practice nursing today with the new technological developments in nursing?

a) Yes [   ]   b) No [   ]

26. If no, Which of the following areas do you need to acquire more skills in order to use technology more effectively at work

a) Operating the computer and laptops   [   ]

b) Health software e.g., fun soft   [   ]

c) Electronic Health records   [   ]

d) Digital equipment like glucometers, BP machines etc.   [   ]

27. What challenges do you get when using technology in your work as a nurse

a) Lack of skills on how to navigate on the computer and other technological gadgets

b) Network connection is off most times

c) Few computers therefore no access

d) Lack of the necessary nursing application soft wares in the system

e) Cannot quantify some nursing care given into quantities in the computer system.

f) Not conversant with computer vocabularies and language

g) There is not enough time to operate the computers as one is nursing

28. Do you think computer technology has helped to make your nursing work easier

Yes   [   ]   No   [   ]

B) Which of the following areas of your nursing work has been made easier through the use of computers?

a) Admission of patients

b) Drug dosage calculations

c) Ordering of supplies

d) Off/duty rosters

e) Computer assisted instructions

f) Drug ordering

g) Ward reports

h) History taking guidelines

i) Nursing care plans

j) Nursing cardex

k) Observations and vital signs

l) Health education to patients

m) Billing Patients

29. Do you think skills in computers and technology applications should be included in nursing education curriculum as a requirement for nursing practice?

Yes   [   ]   No   [   ]

30. What strategies you have used to handle challenges brought by technology on your nursing practice?

_____

_____

31. What measures do you think can be taken to enhance integration of technological trends in nursing practice in KNH?

_____

_____

THANK YOU!

APPENDIX III: INTERVIEW SCHEDULE FOR THE KEY INFORMANTS

1. What are the technological changes that have occurred in nursing practice in this hospital?

2. How do nurses in this hospital utilize technology in their work?

3. How has technology affected the work of the nurse and their skill of practice?

4. Do you think nurses have adequate skills to handle the technological changes in nursing? Explain.

5. With the current exposure to technology, how would you describe the level of knowledge of the patients on their medical conditions?

   How does this level of knowledge affect the work of the nurse?

   Are the nurses' skills adequate to handle very knowledgeable patients?

6. What challenges do nurses face in applying their practicing skills in this technologically dynamic work environment?

7. What measures do you think can be undertaken to enhance integration of technology in nursing practice in KNH?

THANK YOU!

APPENDIX VI: LETTER TO UNIVERSITY OF NAIROBI-KENYATTA NATIONAL HOSPITAL (UON-KNH) ETHICS COMMITTEE

Sharon Mina Okeyo,

School of Nursing Sciences,

College of Health Sciences,

University of Nairobi

11th April 2016

The Chairperson,

UoN-KNH Ethics Research Committee,

P.O.Box 20723, 00202,

Nairobi.

Dear Sir/Madam,

Request for permission to conduct research

I am a postgraduate student at the University of Nairobi pursuing Master of Science in Nursing Education. I am preparing to conduct research as part of the requirements for the award of the degree.

I am writing to request for permission to carry out the research at Kenyatta National Hospital between April and May this year. The research will be conducted on nurses and is titled "**Technological dynamics and challenges on nurse practicing skills in Kenyatta National Hospital".** The findings will be utilized in improving patient care through recommendations to improving on efficiency of nursing care by the incorporation of technology in nursing service delivery.

I will appreciate your consideration.

Yours Faithfully,

Signature ——————————————

Sharon Mina Okeyo Mobile Phone Number 0722418898

APPENDIX VII: LETTER TO KENYATTA NATIONAL HOSPITAL MANAGEMENT

Sharon Mina Okeyo,

School of Nursing Sciences,

College of Health Sciences,

University of Nairobi

11th April 2016

The manager,

Research and training department,

P.O.Box 20723, 00202,

Nairobi.

Dear Sir/Madam,

Request for permission to conduct research

I am a postgraduate student at the University of Nairobi pursuing Master of Science in Nursing Education. I am preparing to conduct research as part of the requirements for the award of the degree.

I am writing to request for permission to carry out the research at Kenyatta National Hospital between April and May this year. The research will be conducted on nurses and is titled "**Technological dynamics in nursing and their challenges on nurse practicing skills in Kenyatta National Hospital".** The findings will be utilized in improving patient care through recommendations on ways of improving efficiency of nursing care by the incorporation of technology in nursing service delivery.

I will appreciate your consideration.

Yours Faithfully,

Signature ⸻⸻⸻⸻⸻

Sharon Mina Okeyo Mobile Phone Number 0722418898

UNIVERSITY OF NAIROBI
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Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

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

Ref: KNH-ERC/A/141

25th April, 2016

Sharon Mina Okeyo
H56/76095/2014
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Sharon

REVISED RESEARCH PROPOSAL: TECHNOLOGICAL DYNAMICS IN NURSING AND THEIR CHALLENGES ON NURSE PRACTICING SKILLS IN KENYATTA NATIONAL HOSPITAL   (P43/01/2016)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH-UoN ERC) has reviewed and **approved** your above proposal. The approval period is from 25th April 2016 – 24th April 2017.

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 serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
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 ERC 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 **http://www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M.L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c.   The Principal, College of Health Sciences, UoN
         The Deputy Director, CS, KNH
         The Assistant Director, Health Information, KNH
         The Chair, KNH- UoN ERC
         The Director, School of Nursing Sciences, UoN
         Supervisors: Prof. Anna Karani, Dr Emmah Matheka

Ref: KNH/SAD-SURG/15/Vol.I/71   Date: 13th May, 2016

Sharon Mina Okeyo
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Sharon

RE: PERMISSION TO COLLECT DATA IN SURGERY DEPARTMENT

Following approval of your study by the KNH/UON- ERC and completion of the KNH study registration form, permission is hereby granted for you to collect data from the KNH Surgical Services Division in the following areas: **Level 5 [5A,5B,5C,5D]** to enable you complete your study on *"Technological Dynamics in Nursing and their challenges on Nurse practicing skills in Kenyatta National Hospital"*.

Kindly liaise with the Senior Assistant Chief Nurse, Incharge of General Surgery for facilitation. By a copy of this letter, the Incharge is informed and requested to facilitate.

DR. ONDEDE K.
AG. ASSISTANT DIRECTOR, GENERAL SURGERY

Cc.   SACN, General Surgery [Level 5]

Vision: A world class patient-centered specialized hospital

ISO 9001: 2008 CERTIFIED

KENYATTA NATIONAL HOSPITAL
P. O. Box 20723, 00202 Nairobi

Tel: 2726300/2726450/2726550
Fax: 2725272
Email: knhadmin@knh.or.ke

Ref: KNH/SAD-MED/42B/VOL.I/259   Date:6th May 2016

Sharon Mina Okeyo
School of Nursing Sciences
College of Health Sciences
University of Nairobi

RE:APPROVAL TO CONDUCT A STUDY IN MEDICINE DEPARTMENT

Following approval of your study by the KNH/UoN ERC and completion of the KNH study registration form, permission is hereby granted for you to collect data from the Medicine Department   to enable you complete your study on *"Technological dynamics in nursing and their challenges on nurse practicing skills" in* Medicine Department at Kenyatta National Hospital, Nairobi County, Kenya.

Kindly liaise with the Senior Assistant Medicine Department for facilitation. By a copy of this letter, the Senior Assistant Chief Nurse – Medicine Department is informed and requested to facilitate.

DR. P. ETAU
AG. AD - MEDICINE

Copy to: Senior Assistant Chief Nurse – Medicine Department

Vision: A world class patient-centered specialized care hospital

ISO 9001: 2008 CERTIFIED

110

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
    ...... SHARON MINA OKEYO ....

2. Email address: mina.204061@yahoo.com .... Tel No. 0722418898 ....

3. Contact person (if different from PI)..

4. Email address: .... Tel No. ....

5. Study Title
    ...... TECHNOLOGICAL DYNAMICS IN NURSING AND THEIR CHALLENGES ......
    ...... ON NURSE PRACTICING SKILLS IN KENYATTA NATIONAL ......
    ...... HOSPITAL ......

6. Department where the study will be conducted ... MEDICAL & SURGICAL DEPARTMENT
    (Please attach copy of Abstract)

7. Endorsed by Research Coordinator of the Department where the study will be conducted.

    Name: .... Signature .... Date ....

8. Endorsed by Head of Department where study will be conducted.

    Name: ...... STAH .... Signature .... Date 15.16......

9. KNH UoN Ethics Research Committee approved study number __P43/01/2016__
    (Please attach copy of ERC approval)

10. I SHARON MINA OKEYO _____ commit to submit a report of my study
    findings to the Department where the study will be conducted and to the Department of Research
    and Programs.

    Signature...................... Date ...... 29th APRIL 2016 ......

11. Study Registration number (Dept/Number/Year) __Medicine__ /63/2016
    (To be completed by Research and Programs Department)

12. Research and Program Stamp _____

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of
Research and Programs and investigators **must commit** to share results with the hospital.

Version 2: August, 2014

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
   SHARON MINA OKEYO

2. Email address: mina2a4061@yahoo.com   Tel No. 0722418898

3. Contact person (if different from PI)..

4. Email address: ....   Tel No. ....

5. Study Title
   TECHNOLOGICAL DYNAMICS IN NURSING AND THEIR
   CHALLENGES ON NURSE PRACTICING SKILLS IN KENYATTA
   NATIONAL HOSPITAL

6. Department where the study will be conducted MEDICAL & SURGICAL DEPARTMENTS
   (Please attach copy of Abstract)

7. Endorsed by Research Coordinator of the Department where the study will be conducted.

   Name: .... Signature .... Date ....

8. Endorsed by Head of Department where study will be conducted.
   M. ONDEDE L.
   Name: .... Signature .... Date 9.5.16

9. KNH UoN Ethics Research Committee approved study number ___P43/01/2016___
   (Please attach copy of ERC approval)

10. I ___SHARON MINA OKEYO___ commit to submit a report of my study
    findings to the Department where the study will be conducted and to the Department of Research
    and Programs.

    Signature................................ Date ......29/04/2016......

11. Study Registration number (Dept/Number/Year)_____ Surgery _____ / 2016
    (To be completed by Research and Programs Department)

12. Research and Program Stamp _____

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of
Research and Programs and investigators **must commit** to share results with the hospital.