UNIVERSITY *of the*
WESTERN CAPE

Faculty of Community and

Health Sciences

School of Nursing

KNOWLEDGE, PERCEIVED SKILLS AND ATTITUDE OF NURSES REGARDING THE USE OF ELECTRONIC HEALTH RECORDS IN SELECTED PRIMARY HEALTH CARE FACILITIES IN THE WESTERN CAPE

A mini-thesis submitted in partial fulfilment of the requirements for the Degree of Master in Nursing (Education) in the School of Nursing, Faculty of Community and Health Sciences, University of the Western Cape

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ABSTRACT

Background: The implementation, adoption and the use of EHR globally has been proven a challenge, despite the numerous advantages that have been noted with the use of an electronic health recording system to improve health care services. Among some of the challenges that have been reported is lack of knowledge and staff attitudes towards this new technology. It has also been noted that the success or failure of an EHR system is dependent on nurses' or individual user acceptance, as they are pivotal in the healthcare team; therefore, their attitude towards an EHR system is crucial.

Aim: The aim of the study was to investigate the knowledge, perceived skills and attitudes of nurses towards the use of EHR at selected PHC facilities in the Western Cape.

Method: This study employed a quantitative research approach using a descriptive survey design to investigate the knowledge, perceived skills and attitude of nurses regarding the use of electronic health records at selected PHC facilities of the Northern-Tygerberg substructure. A self-administered questionnaire was used to gather information from N = 112 nurses, yielding a response rate of 63% (n =71). Data was analyzed using the Statistical Package Social Services (SPSS) version 25.0.

Findings: The findings of this study showed that majority 66 (93%) of the nurses had knowledge with regard to the use of computers and EHR in PHC while 59 (83%) of the respondents perceived that they had more EHR skills, and 68 (95.8%) had a positive attitude regarding the use of EHR in PHC. The findings from this study also showed that areas of experience such as paediatric care (P=0.001) and neonatal experience (P=0.019) had a significant relationship with the knowledge of

the respondents regarding the use of EHR in PHC facilities. Similarly, a significant relationship was observed between the nurses perceived skills and the level of educational qualification (P=0.028). Sociodemographic characteristics such as age, level of qualification, years of working experience and the nurses attitudes regarding the use of EHR in PHC had no significant association.

Conclusion: Nurses in PHC have the knowledge, perceived skills and a positive attitude regarding the use of electronic health records in primary health care. This serves as positive indication that the adoption and implementation of electronic health records in primary health care should be a success as the lack of knowledge, perceived skills and attitude of nurses globally have been some of the reasons for the low adoption rates.

Recommendations: The findings of the study suggest that although the nurses had knowledge, perceived skills and a positive attitude, practical training courses on computer use and applications should be implemented to ensure successful implementation and use of an EHR system in PHC facilities.

"It recommends a continuous professional development programs for health professionals on EHR systems in PHC". Necessary measures should be put in place to increase the nurses utilization of EHR such as increasing accessibility of computers in all PHC facilities.

KEYWORDS

Knowledge

Perceived skills

Attitudes

Electronic health records

Primary health care

Nurses

ABBREVIATIONS

EHR: Electronic Health Records

PHC: Primary Health Care

DOH: Department of Health

RSA: Republic of South Africa

DHA: Department of Home Affairs

WHO: World Health Organization

HIT: Health Information Technology

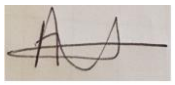
NHI: National Health Insurance

DECLARATION

I declare that the study, knowledge, perceived skills attitudes of nurses regarding the use of Electronic Health Records in selected Primary Health Care facilities in the Western Cape is my original work, that it has not been submitted for any degree or examination at any other University, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full name: Laura Ngweh Tengeh

Date: 20/11/2019

Signed: 

DEDICATION

To God Almighty for being my shepherd, and for giving me strength throughout this journey.

To my parents (Awa Solomon and Awa Alice) for the sacrifices they made to provide me with basic education, the foundation which has enabled me to grow to this height.

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Chapter One

Orientation to the study

1.1 Introduction

This chapter gives a detailed analysis of the background to and rationale for the study. This involves identifying the problem statements, the aim of the research study and its objectives. It also states the appropriate operational definitions of the key terms and concludes by giving an overview of the mini-thesis.

1.2 Background to the study

According to O'Mahony, Wright, Yogeswaran and Govere (2014) and Murua, Carrasco, Agirre, Susperregi and Gómez (2018), the use of electronic health records (EHR) helps prevent the loss of data, reduces room for error, fosters the work of the nurses. It also reduces the length of patient waiting time in the hospital, allows remote access to patient data, and ensures confidentiality. Furthermore it increases follow up on patients, facilitates the drug supply process, enhances healthcare quality at reduced cost, requires less storage space, and allows data to be stored indefinitely. Noah and Thomas (2017) assert that the use of technology (EHR) can support more work being done efficiently, promote safer care delivery, streamline work processes, and provide point-of-care decision support.

Similarly, Thomas (2016) state that the use of EHR systems can significantly improve connectivity within the healthcare system, continues education of healthcare workers, promotes the delivery and supply of disaster management to remote areas, as well as leading to transparency in the governance of the various institutions involved.

However, implementation, adoption and the use of EHR globally has been proven to be a challenge (O'Mahony et al., 2014; Murua et al., 2018), despite the numerous advantages mentioned above from using an electronic health recording system to improve health care. Among some of the challenges that have been reported are lack of knowledge on the benefits of the use of EHR systems, lack of computer skills, staff attitudes towards this new technology, lack of infrastructure, and poor implementation strategies.

According to Holden and Karsh (2010), the success or failure rate of an EHR system is dependent on nurse or individual user acceptance, as they are pivotal in the healthcare team; therefore, their attitude towards an EHR system is crucial. In South Africa the healthcare system comprises a public health sector, which is under-resourced and overstretched, and serves 80% of the population, and a private sector which serves only 20% yet accounts for 60% of the health expenditure (Thomas, 2016). With such disparities, the quality of care at public healthcare facilities is expected to be poor (Thomas, 2016). According to the Department of Communication (Republic of South Africa (RSA), (2014) the use of an EHR system could reduce such disparities in resources and also has the potential to improve quality of care, by enabling people in remote areas to have access to services and expertise which would otherwise be unavailable to them (World Health Organization (WHO), 2008).

The South African Department of Health (DoH) is committed to improve services in the national health system, and also to implement the National Health Insurance plan (DoH, 2012, p. 8) which includes moving primary healthcare (PHC) facilities from the current, predominantly paper-based system to electronic submission of data and setting up an EHR system (DoH, 2012, p. 15). However, this is dependent on whether the institutions and healthcare workers have the

infrastructure and are ready to implement, adopt and use such mechanisms to improve health care (Thomas, 2016).

The Department of Communication (RSA, 2014), states that the country is not yet leveraging the potential benefits associated with EHR systems. This is partly attributed to the lack of skills, the high costs involved, lack of adoption by users, and insufficiently developed infrastructure (Thomas, 2016; Sao, Gupta & Gantz, 2013; Ramtohul, 2015). Looking at South Africa, there is limited literature regarding the knowledge, perceived skills and attitudes of nurses towards the use of EHR, specifically in the PHC sector. However, the few related studies that have been carried out in South African hospitals tend to concede with a positive attitude towards the use of EHR (Nkosi, Asah, & Pillay, 2011; Ruxwana, Herselman, & Conradie, 2010).

1.3 Problem statement

The introduction of EHR in healthcare does not necessarily mean it will be utilized as intended – users may reject, misuse, sabotage or work around it (Holden & Karsh, 2010). Although there are many identified problems with the use of EHR globally, lack of skills and knowledge of the use of computers has been prominent in developing countries, which automatically has a huge impact on the attitude of the users of the EHR systems (Furst et al., 2013). Lack of prior exposure to EHR negatively affects the knowledge, skills, and attitude of nurses as a result; nurses tend to shy away from the use of EHR systems (Furst et al., 2013). This has an effect on productivity and workflow, with productivity measured by the number of patients seen per hour by the healthcare staff (Masselink & Erikson, 2016). Moreover, as a result of the extensive documentation and complexity of the EHR software, it consumes the time of the staff. This view was further supported by Frogner, Wu, Ku, Pittman and Masselink (2017), who mentioned that the implementation of

EHR was positively associated with physicians, but negatively affects nurses productivity in community health centers. This was, however, linked to staff experience or skills in the use of EHR systems (Frogner et al., 2017). As a result of the excessive mouse clicking required to complete EHR documentation, healthcare workers had mixed views or perceptions regarding the use of EHR systems (Frogner et al., 2017). That said, the alterations in the workflow were seen to have some positive effects, as the prompting questions acted as a reminder to the healthcare providers when carrying out assessments of patients (Masselink & Erikson, 2016).

According to Thomas (2016), no study has been found which investigates the knowledge, perceived skills and attitudes of nurses towards the use of EHR at PHC. This study therefore attempts to address this gap by investigating the knowledge, perceived skills and attitudes of nurses regarding the use of EHR in PHC facilities in the Western Cape.

1.4 Aim of the study

This study investigated nurses attitudes, knowledge and perceived skills with regard to the use of EHR at selected PHC facilities in the Western Cape.

1.5 Objectives of the study

The objectives of the study were:

(a) To determine the knowledge of nurses with regard to the use of EHR at selected PHC facilities;

(b) To determine the perceived skills of nurses with regard to the use of EHR at selected PHC facilities; and

(c) To describe the attitude of nurses towards the use of EHR at selected PHC facilities

1.6 Significance of the study

The findings of this study will provide information that highlights gaps with regard to the perceived skills, knowledge, and attitudes of nurses regarding the use of EHR. Understanding the current knowledge, perceived skills and attitude of nurses towards the use of EHR at PHC level could assist the DoH with the development of better strategies that could be beneficial to the implementation and adoption of EHR systems by nurses at PHC facilities.

The findings from this study could be utilized by all relevant stakeholders and the DoH in adequately supporting the PHC nurses in the use of EHR.

1.7 Definition of key terms

Knowledge: Acquaintance with principles, facts or truth as from a study or investigation; general erudition; familiarity or conversance, as with a particular subject or branch of learning; "Acquaintance or familiarity gained by sight, experience or report" (Adams, 2015, p.17). For the purpose of this study, the term knowledge refers to nurses familiarity or acquaintance with EHR systems at PHC level.

Perceived skill: The ability, coming from an individual's aptitude, knowledge, practice, etc., to perform certain tasks well; "Competent excellence in performance; expertness; dexterity" (Adams, 2015, P. 17). For the purpose of this study, the term perceived skill refers to the nurses perceived ability to use the EHR system at PHC level.

Attitude: "Position, manner, feeling, disposition, etc., with regard to a thing or person; tendency or orientation, especially of the mind" (Adams, 2015, p.15). For the purpose of this project, the

term attitude refers to whether the nurses have an interest in the use of an EHR system at PHC level.

Electronic health record: "This is an electronic record containing health-related information of an individual or individuals which complies with a nationally recognized interoperability standards that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization" (Halley, Sensmeier, & Brokel, 2009, p. 306). For the purpose of this study, an electronic health record refers to a computerized system for recording, checking and maintaining patient health information by nurses at PHC level.

1.8 Overview of the mini-thesis

Chapter one sets the scene by providing the background information and rationale for the study which involves identifying the problem statements, the aim of the research study and its objectives. It also states the appropriate operational definitions of the key terms

Chapter two focuses on a review of literature that investigates the knowledge, perceived skills and attitudes of PHC nurses on the role and benefits of the use of EHR systems to the government, PHC sector and the nurses, some of the challenges that have been encountered in the adoption and implementation of EHR worldwide, and lastly what the policies of the South African Government are in terms of EHR.

Chapter three provides an account of the study's methodology, with a detailed description of the research setting, design, population, sampling technique, data instruments, ethics procedures, pilot study, data collection techniques, and data analysis.

Chapter four present the findings of the study which investigated knowledge, perceived skills and attitude of nurses regarding the use of EHR systems, as well as the association between the objectives and demographic data of the respondents

Chapter five discusses the results presented in chapter four, in relation to the study objectives, which were to find out the knowledge, perceived skills and attitude of nurses towards the use of EHR in PHC facilities. It also looked at the relationship between the sociodemographic characteristics (age, years of experience, qualifications, areas of experience) and the knowledge, perceived skills, and attitude of the respondents regarding the use of EHR in PHC facilities.

Chapter six presents a summary of the key findings, and the implications and recommendations of the study.

Chapter Two

Literature review

2.1 Introduction

The use of EHR in health care has been widely researched globally. Several studies have identified that the success or failure of the adoption, implementation and use of EHR systems in health care was solely dependent on the amount of knowledge which the staff had with regard to the benefits of this technology, the perceived skills of the staff in the use of computers to perform the task of electronic recording of patient information, and the attitudes of the staff towards the rewards of using the EHR system.

This chapter focuses on a review of literature that investigates the knowledge of PHC nurses on the role and benefits of the use of EHR systems to the government, PHC sector and the nurses. It will also focus on some of the perceived skills and attitudes of nurses regarding the use of EHR, especially at PHC level, some of the challenges that have been encountered in the adoption and implementation of EHR worldwide, and lastly what the policies of the South African Government are in terms of EHR.

South Africa is currently in the early phases of the adoption and implementation of an EHR system at PHC level. According to Thomas (2016), there is a gap in the literature regarding an understanding of the knowledge, perceived skills and attitude of PHC nurses towards the use of EHR systems.

2.2 Search strategy

This chapter explores relevant literature that focuses on the perceived skills, knowledge and attitude of nurses with regard to the use of EHR at PHC level. Publications, books, journal articles, policy statements, and the work of research organizations (e.g. the WHO) were searched and accessed electronically using the following search engines and databases: Google Scholar, EBSCOHost, PUBMED, CINAHL and Science Direct. Keywords/phrases used included electronic health records, knowledge, perceived skills, attitudes, nurses, and PHC.

2.3 Knowledge of PHC nurses regarding the use of EHR systems

According to Alwan, Awoke and Tilahun (2015) utilization of computers is a basic skill and involves use of the computer and Internet; managing and storing files; and retrieving, analyzing, and presenting the data on hand. Findings from their study (Alwan et al., 2015), indicated that computer knowledge and utilization were generally low among healthcare workers, and even lower for public health professionals who work in PHC centres. This was, however, attributed to there being less access to computers and poor information communication technology infrastructure at the PHC centres.

Furthermore, Biruk, Yilma, Andualem and Tilahun (2014) clearly ascertained that the lack of basic computer knowledge and software on the part of healthcare professionals appears to be one of the major causes of failure when it comes to the implementation of EHR; it was established that the overall computer knowledge and utilization of an EHR system by health professionals were regarded as low. Therefore, before incurring the costs of implementation, it is necessary to understand the current knowledge and utilization habits of health professionals regarding EHR and computers in health care (Alwan et al., 2015).

Similarly, Sukums, Mensah, Mpembeni, Kaltschmidt, Haefeli and Blank (2014) reported low levels of computer knowledge among rural health workers in Africa. They stated that it is important to provide adequate training and support to ensure successful uptake of EHR systems in rural PHC facilities across sub-Saharan Africa, as it has been identified that they are lagging behind in terms of technology use in health care.

2.3.1. The role of technology (EHR) systems in health care

According to Thomas (2016), generally the role of EHR in health care is to improve access and connectivity between healthcare facilities while expanding healthcare coverage, thereby leading to increased financial efficiency in health care. Mostert-Phipps, Pottas, Korpela and Korpela (2013) further mention that the use of EHR has the ability to transform the healthcare industry, while Campanella, Lovato, Marone, Fallacara, Mancuso, Ricciadi and Specchia (2016) state that when EHR systems are appropriately executed, they should be able to expand the quality of health care, increase time efficiency and guideline adherence, and limit medication errors.

Furthermore, Campanella et al. (2016) ascertained that there has recently been a ruse in nurses knowledge regarding the role of EHR in health care, as nurses indicated that EHR will assist in solving some of the healthcare challenges they encounter on a daily basis as healthcare professionals. Mostert-Phipps et al., (2013) state that the use of EHR should be able to simplify and ease the process of assessing, diagnosing and treating patients, provide easy access to evidence-based practice, academic writings, electronic books and various search engines for information, and also provide assistance to home carers through access to information which enables them to care for patients at home in a safe and professional manner.

2.3.2. Benefits of EHR systems to health care

According to Ahmah (2017), nurses reported that the use of EHR has been beneficial, as it has led to a reduction in mistakes in transcriptions and also reduced the incidence of missing information in patients' documentation. This view is supported by Shabnum, Afzal, Hussain and Gilani (2017), who conducted a cross-sectional survey study among nurses in Pakistan, and confirmed that the use of EHR was helpful to them as it promoted quality documentation without adding to their workload (Yontz, Zinn & Schumacher, 2015)

2.3.2.1. Benefit of EHR systems for the government

Following a recent survey by the WHO, about 114 countries (both developed and developing) around the world has adopted the use of EHR systems (Ohuabunwa, Sun, Jubanyik, & Wallis, 2016). In the case of African countries, the rise in infectious diseases, HIV infection, and the high incidence of multidrug-resistant tuberculosis (TB) have been the major reasons for the adoption of EHR systems. Patients with such conditions are in need of follow-up treatments, which requires a proper and efficient documentation system to keep track of patients and their treatments (Millard, Bru and Berger, 2012; Ohuabunwa et al., 2016).

According to Thomas (2016), the government stands to benefit a great deal from the data generated at PHC level, as this assists them to make informed decisions regarding healthcare services, both at facility level as well as at national level. It also allows healthcare workers to collaborate on decisions regarding health care, thereby avoiding the possibility of medication errors or adverse drug interactions.

In terms of organizational outcomes, the use of EHR was stated to be beneficial to the government in several domains (Menachemi & Collum, 2011). Firstly, Menachemi and Collum (2011) mentioned that it will lead to an increase in revenue, due to the fact that the charging or billing process of patients will be captured effectively; reminders about routine health visits will be consistently sent out hence an increase in the amount of visits to the facility; while there will be a reduction in unnecessary printing of results and replacement of misplaced files will be avoided, subsequently reducing the amount of paper ordered by the government.

Another important benefit is the fact that the use of an EHR system will improve the government's meeting legal and regulatory obligations towards safeguarding patients' information, as access to such confidential information can only be by a credible health provider (Tokosi, 2016).

Lastly, the availability of an EHR system creates data which are readily available for the purpose of research. The outcomes of such research studies are usually beneficial to the government, with regard to the development of management strategies for the facilities (Menachemi & Collum, 2011; Thomas, 2016).

2.3.2.2. Benefits of EHR for PHC

According to Nguyen, Bellucci and Nguyen (2014) and Ngunyu (2018), the introduction of EHR at PHC level provides an opportunity for integrated and coordinated health care, and improves the quality of healthcare services provided to patients. This improvement is reflected in a reduction in healthcare costs for providers, who are able to use the collective EHR of their patients to improve management strategies and create healthcare policies.

In addition, use of EHR at PHC level creates a huge database, which enables global investigations intended to improve the healthcare system, patient care and management of resources (Thomas,

2016). Data within the EHR include vital signs, diagnostic billing codes, clinical imaging, procedure codes, physician notes, and laboratory test results. Collection of these data over repeat patient visits can provide important information on disease progression, development and response to intervention strategies or treatment protocols. Hence the implementation of EHR has the potential to provide population-scale real-world clinical data which are accessible for biomedical research (Pendergrass & Crawford, 2018).

The importance of EHR systems to PHC facilities can be categorized as indicated below.

- **Record accuracy**

EHR have accurate, legible, complete documentation for reliable prescribing, billing and coding (Ngunyu, 2018). It is emphasized that EHR foster improved accuracy and timeliness of data, and easy accessibility to up-to-date critical patient data, which make it easy for nurse practitioners at the clinics to make informed decisions during patient care (Deokar & Sarnikar, 2016). Elimination of handwritten documents eradicates problems related to illegibility of charts and prescriptions (McGeorge, Hegde, Guarrera, Zhou, Lin, Crane, & Busantz, 2014), thereby reducing medical errors and improving patient safety and satisfaction, and reducing costs for the hospital (Deokar & Sarnikar, 2016).

- **Enhanced privacy and security/care coordination**

Converting paper-based patient health records to electronic format enhances privacy (Jamoom, Patel, Furukawa, & King, 2014). EHR offer easy and secure access for authorized clinical staff with appropriate login privileges (Hawley, Jackson, Hepworth, & Wilkinson, 2014). The fact that information can only be transferred by a duly authorized health provider enhances care coordination during the transition of care between healthcare facilities, thus promoting patient

safety and reducing potential for errors (Deokar & Sarnikar, 2016). Care coordination among specialty care providers, primary care providers, and hospitals remains a critical component of safe, efficient, and patient-centred care (Kim, Lucatorto, Hawthorne, Hersh, Myers, Elwy & Graham, 2015).

- **Increased practice efficiencies**

Use of EHR reduces average time for patient care because of increased efficiency (Epling, Mader, and Morley, 2014). EHR use leads to fast access to patient health history, faster treatments, and optimization of resources, which promote cost-savings and efficient patient care (Pinho, Beirão, Patrício, and Fisk, 2014). EHR facilitates efficient and convenient delivery of care by eliminating delays in exchange of paper records (Thurston, 2014).

- **Cost savings**

Nursing costs constitute the single largest component of human capital in the healthcare industry (Welton and Harper, 2016). The use of EHR is an overall solution towards reducing healthcare costs (Shah, Murtaza, and Opara, 2014). Decision-makers use EHR data to adjust nursing care hours per patient visit (Welton and Harper, 2015). EHR use leads to cost-saving benefits for healthcare institutions such as PHC facilities by reducing costs associated with maintaining paper medical records (Jamoom et al., 2014). EHR use results in fast access to patient health history, faster treatments, and optimization of time for cost savings (Pinho et al., 2014). EHR data for laboratory and radiology testing results help in reducing unnecessary tests, thereby saving costs for healthcare providers and patients (Thurston, 2014).

2.3.2.3. Benefit of EHR to PHC nurses

Mather (2019) states that EHR systems have been associated with reduced time spent on documentation by nurses, improved legibility, and fewer errors in documentation and medication, as well as easy accessibility.

Documentation time and legibility: Campanella et al., (2016) assert the use of EHR by nurses has led to a decrease in documentation time, but increases the quality of documentation without increasing nurses workload (Shabnum et al., 2017). Mather (2019) mentioned that the legibility of patient health information for the nurses was an advantage of using the EHR system. This view is supported by Gephart, Carrington and Finley (2015), where nurses perceived the use of EHR systems as improving access to records, and legibility, as well as providing nurses with access to evidence-based guidelines to plan and inform patient care decisions.

Documentation and medication errors: the use of EHR assists in the documentation of easy-to-read records, which decreases the problems of illegible prescriptions and doses, and the issue of missing folders (Ozair, Jamshed, Sharma, and Aggarwal, 2015; Deokar and Sarnikar, 2016; and Ahmah 2017). Furthermore, certain adverse drug reactions can be prevented when the EHR are clearly documented and connected to pharmacies, as this helps prevent the prescription from being incorrectly filled, hence averting potential adverse effects. This in turn saves the nurses from having to deal with such an event (Ozair et al., 2015).

Easy accessibility: Hawley et al., (2014) and Ozair et al., (2015), further state that the use of EHR makes it easy for information to be readily available to the nurses, anywhere and at any given time. Such information can be stored indefinitely and require less storage space. This has led to a decrease in the number of lost records, allows for a complete set of backup records at low cost,

assists with research activities, is cost effective, and speeds up data transfer. Hence, EHR have been shown to facilitate quality assurance, improve patient compliance, and reduce medical errors.

2.4. Perceived skills of PHC nurses in the use of EHR systems

According to Tubaishat (2017), if nurses do not perceive the use of EHR in health care as useful or easy, it will be challenging to engage them in using or learning new functionalities of the system. Based on the technology acceptance model theory of perceived usefulness and perceived ease of use, it was established that the more that nurses perceived the system as useful, the more they perceived it as easy to use.

Alwan et al., (2015) stated that the existing skill level of health professionals is one of the common obstacles to the success of implementing EHR systems in health care. Based on the results of their survey, Alwan et al., (2015) established that the overall utilization habits of healthcare professionals with regard to EHR, especially those who work in PHC centres, were found to be low. Hence, providing trainings and continuous follow ups are strategic measures to increase the likelihood of the success of EHR systems being implemented in those settings. Similarly, Mills, Francis, McLeod and Al-Motlaq (2014) hypothesized that if continuous training was provided to nurses and midwives regarding their knowledge and perceived skills, especially for those with limited or no previous experience with the use of EHR, this would increase the nurses use of these tools in their work environment.

Mugomeri, Chatanga, Maibvise and Masitha (2016) mentioned that although healthcare systems worldwide, including in South Africa, have been geared towards the use of EHR with the intention of improving healthcare delivery, this will not be feasible if the healthcare professionals do not have basic computer skills or perceived skills for using EHR systems. This study assessed the

computer literacy of nurses in Lesotho, and it established that the majority of nurses have inadequate computer skills, which indirectly affects their perceived skills in the use of EHR. These poor skills were linked to factors such as many years having passed since the nurses obtained their latest qualification, and lack of exposure to computers. These factors should therefore be considered during planning of training for these nurses.

According to Farokhzadian, Khajouei and Ahmadian (2015), the use of EHR in health care makes available medical information to be used for best practice based on evidence. However, nurses are expected to be able to search for, retrieve and select information to support their clinical decisions. This in effect requires the nurses to have some basic computer skills in the use of EHR in health care. Farokhzadian et al., (2015) found that the information seeking and retrieval skills of these nurses were poor, indirectly indicating that their computer and EHR use skills were poor. Hence training from the school of nursing was suggested, as well as identification of mentors to assist in improving these required skills.

2.5. Attitude of PHC nurses towards the use of EHR

The use of EHR has increased in the clinical atmosphere. According to a survey by Harris, Haskell, Cooper, Crouse and Gardner (2018), nurses in general had positive attitudes regarding the use of EHR in the clinical domain, although they also stated that the use of EHR in health care could lead to burnout. This therefore indicates a gap that needs to be investigated, to assess whether there are associations between EHR use and burnout among all healthcare professionals.

The use of electronic health recording systems has greatly transformed healthcare practice the world over (Kipturgo, Kivuti-Bitok, Karani and Muiva, 2014). Several factors, with the attitude of the healthcare professionals being the cornerstone, greatly affect the implementation and

successful use of these systems. Kipturgo et al., (2014) surveyed nurses attitude towards computerization in health care, and found that they have a positive attitude towards the use of computers, and hence a positive attitude towards the use of the EHR system in health care. However, these authors mentioned factors such as age, highest professional qualification, years of experience, use of computers, and experience with EHR as impacting the attitudes of nurses towards computerization.

Furthermore, Abu Raddaha, Obeidat, Awaisi, and Hayudini (2017) commented that the attitude of nurses towards the EHR system may affect its level of usage, while a positive attitude begins when the system is perceived by nurses as meeting their needs and facilitating nursing activities in practice, or when nurses prefer the EHR system over the paper-based health record system. In their investigation into the interrelationships between opinions, perceptions, and attitudes towards the EHR system among practicing nurses in Oman, it was established that nurses have a high positive attitude towards the use of EHR, which was influenced by their computer knowledge. The nurses highly rated EHR systems as outweighing the paper-based system, and states that it was time saving, easy to use, and did not disrupt their work flow. It was also noted that those with higher professional qualifications could have negative attitudes, which was an indication that they were resistant to the new technology.

Similarly, Sukums et al., (2014) mentioned that positive attitudes are important regarding the use of an EHR system in health care, and that the willingness of healthcare workers to use such a system is greatly influenced by their perceptions of its value, clinical benefits, and ease of use, and the computer knowledge and skills among the healthcare workers. Consistent with Abu Raddaha et al.,'s (2017) findings, an overwhelming majority of health workers (95.3%) had positive attitudes towards computer applications in healthcare, and they expected that computers could

potentially improve patient care and simplify their work. It is important to promote and support these attitudes after the introduction of an EHR system in health care.

2.6. Challenges of nurses in the implementation of EHR at PHC level

Across the nine provinces of South Africa, several EHR systems have been adopted (Ohuabunwa et al., 2016). These systems have a common goal, which is to enable proper communication across the different levels of health care (primary, secondary and tertiary) so as to fully benefit from the use of the EHR system. Despite the advantages of using EHR systems for the delivery of health care to the inhabitants of South Africa, its adoption and implementation has so far been blighted by some shortcomings (Ohuabunwa et al., 2016). Some of these challenges are categorized below.

2.6.1: Inadequate computer skills

One of the key factor in nurses inability to take advantage of the use of EHR systems, according to Furst et al., (2013) and Nkosi et al., (2011), was inadequate computer skills and Alqahtani, Crowder and Wills (2017), the lack of computer skills, lack of perceived usefulness and lack of perceived ease of use, among other factors, seem to have been the reasons behind the slow implementation of EHR systems in Saudi Arabia. This correlates with the findings of Mohammed, Andargie, Meseret and Girma (2013), which established the overall understanding and use of computers by healthcare professionals to be very low.

Senafekesh, Tesfahun, Mulusew and Binyam (2014) had a similar outcome, where level of computer skills greatly affected the implementation of EHR. A recommendation from the healthcare staff in their study was that more training had to be done for the implementation of EHR to be successful.

2.6.2. Attitudes towards computerization and use of EHR in health care

Ghoochani, Kahouei, Hemmat, Majdabadi and Valinejadi (2017) indicated that the attitude of nurses or the individual user acceptance towards an EHR system is crucial in determining the success or failure rates of its adoption and implementation. This was also noted as a challenge with regard to the implementation and use of EHR systems in health care where (Mijin, Jang, Choi and Khongorzul, 2017), health professionals' perceived usefulness of EHR systems directly affects their attitude towards the use of EHR systems in the hospitals.

2.6.3. Infrastructure of healthcare facilities and EHR systems

The poor nature or geographical location of healthcare facilities have been among the reasons for the poor connectivity and communication infrastructure of the healthcare systems, especially PHC facilities (Thomas, 2016).This accounts for why South Africa is not yet leveraging the potential benefits associated with the use of EHR systems in health care. Mutula (2015) further states that the lack of or insufficiently developed infrastructure in KwaZulu-Natal province is an issue, although nurses are expected to deliver effective and quality care to their patients, based on the assumption that the use of EHR should improve the services rendered (Mutula, 2015).

2.6.4. Lack of knowledge regarding the benefits and use of EHR systems

According to Miller, Stimely, Matheny, Pope, McAtee and Miller (2014), nurses are at the epicentre of every healthcare facility, and hence their knowledge regarding the use of EHR systems in health care is crucial. It is therefore also crucial for nurses to have some degree of knowledge with regard to the use and benefits of EHR, so as to enhance patient safety and decrease healthcare costs (Miller et al., 2014). The awareness and use of computers by healthcare workers prior to and after the implementation of EHR systems in healthcare institutions is very important, as this has

been noted in other studies to be the origin of the fiasco in meaningful use of these systems (Alwan et al., 2015). A study by Paunic and Stojkovic (2014) showed that nurses had poor knowledge and relatively very few skills in the use of EHR systems, and stated that they can barely use the programs or did not use them at all.

In South Africa the acceptance and implementation of EHR remains challenging (Mostert-Phipps et al., 2013). The adoption and use of the EHR system so far have been slow, despite its numerous advantages (Mostert-Phipps et al., 2013). Among the factors that arose was the fact that healthcare professionals did not have adequate knowledge on the advantages of using an EHR system in health care.

2.7. EHR policies in South Africa (eHealth strategy)

Electronic health (e-health) policy refers to a set of directives, statements, laws, and judicial interpretations that direct and manage the life cycle of EHR systems (Thomas, 2016). The developing world seeks ways to overcome extreme healthcare worker shortages and improve rural health care, at the same time improving or perhaps implementing district-level electronic health information systems.

The legislative and regulatory cornerstone for health in South Africa is the Constitution. The 1996 Constitution states in section 27 of the Bill of Rights that "access to healthcare is a basic human right" (Katuu, 2015; RSA, 1996, Sec 27). In line with this section of the constitution, the South African DoH has created a policy document outlining its e-health strategy, with the focus on improving patient information systems. Hence, in conjunction with the Council for Scientific and Industrial Research, Department of Science and Technology, and Department of Home Affairs, the Unique Patient Identifier has been introduced, which is a patient information system that allows

a patient to be followed from one facility to another. This unique code is linked to a patient's identification number at the Department of Home Affairs, and is a lifetime number. Over 6.3 million patients have been registered onto this system (Tokosi, 2016; DoH, 2012). The Electronic and Communication Transaction Act of 2002 has a significant impact on the health sector, as its implication is that all departments are encouraged to implement electronic systems that are characterised by security, integrity, and authenticity (Tokosi, 2016; Presidential National *Commission (*PNC), 2006, p. 22-23). By law, every information officer has a fiduciary duty to set up control measures to prevent unauthorized access to patient records, and to the storage and retrieval facility, or system, where records are kept (Tokosi, 2016; RSA, 2003, p. 11).

Another strategy put in place by the DoH is the reorganization of the healthcare sector, aimed at achieving the following: improved health (level and equity), responsiveness, financial risk protection, and improved efficiency. The health system was organized into three areas of healthcare service delivery: PHC services, hospital and specialized services, and emergency medical services (Tokosi, 2016).

PHC Services are highly regarded as they provide services such as health promotion, disease prevention, curative (acute and chronic clinical) services, and rehabilitation and palliative services. This has also led to the ideal clinic initiative, which is designed to improve PHC. So far, 786 facilities have been renovated (Thomas, 2016).

However, benefits from EHR at PHC level are yet to be proved (Jawhari, Keenan, Zakus, Ludwick, Isaac, Saleh, and Hayward, 2016). With the implementation of EHR in the PHC sector still in its early phases in South Africa, coupled with the gap in literature (Thomas, 2016), it is important to look into some of the factors that might hinder its implementation and adoption. It was therefore

necessary to investigate the knowledge, perceived skills and attitudes of nurses towards the use of EHR at PHC facilities in the Western Cape.

2.8. Chapter summary

This chapter covers a systematic search of literature that focused mainly on the knowledge, perceived skills and attitude regarding the use of EHR systems in PHC. In line with the study objectives, literature indicates that computer knowledge and utilization were generally low among healthcare workers and even lower for public health professionals who work in PHC centres. This was, however, attributed to there being less access to computers and poor information communication technology. The overall utilization habits or perceived skills of healthcare professionals with regard to EHR, especially those who work in PHC centres, were also found to be low. However it was established that nurses have a high positive attitude towards the use of EHR as they were informed about the benefits of the use of EHR in health care.

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Chapter Three

Research methodology

3.1. Introduction

This chapter provides an account of the study's methodology, with a detailed description of the research setting, design, population, sampling technique, data instruments, pilot study, data collection techniques, and data analysis.

3.2. Research approach

A quantitative research approach was employed to conduct the study. Quantitative research enables the researcher to draw conclusions based on the numerical data that emanate from the study, which are quantified and analyzed using mathematical methods (Houser, 2016). Quantitative research is an objective approach to collecting data or reporting certain behavior (Terry, Brown, Bestard Denomme, Thind and Stewart, 2012). Based on previous studies (Alwan et al., 2015; Tubaishat, 2017; Yontz et al., 2015) surveys have so far been the most common means of measuring knowledge, perceived skills and attitudes, as these allow the respondents ample time to reflect on the subject, while providing anonymity, and ensuring that the surveyor cannot influence responses, which are measured in tools such as the Likert scale.

3.3. Research design

Research design can be defined as a comprehensive plan for addressing a research question, as well as specifications for increasing the study's integrity (Polit & Beck, 2013). This study

employed a descriptive survey design, where the researcher used a self-administered questionnaire to gather information from the respondents at selected PHC facilities of the Northern-Tygerberg substructure. This study design was appropriate, because it has the advantages of being able to reach a larger group of people in limited time, and providing respondents with some sense of anonymity, with the format of collecting the data being independent of the researcher (Babbie, 2015).

3.4. Objectives of the study

The objectives of the study were as follows:

- To determine the knowledge of nurses in the use of EHR at selected PHC facilities;
- To determine the perceived skills of nurses in the use of EHR at selected PHC facilities; and
- To describe the attitude of nurses towards the use of EHR at selected PHC facilities.

3.5. Research setting

The research was carried out at selected PHC facilities located in the Northern-Tygerberg substructure, Western Cape. There are 10 PHC facilities that fall under the Northern-Tygerberg administrative region. These PHC facilities have a similar structure and consist of an emergency/trauma room, antenatal room, psychiatric room, HIV rooms, TB rooms, pediatric room, adult consulting room, and a family-planning room. Health services rendered range from health education and promotion, to preventative care, curative care, rehabilitation and emergency care. Extended services include antenatal care for mother and baby, immunization, family planning, and

counselling and treatment for HIV/sexually transmitted diseases. These facilities also provide follow-up treatments for patients with chronic conditions, physical disabilities, and the mentally unstable, as well as referrals to a secondary or tertiary hospital. These sites were chosen because they provided the researcher with a reasonable number of nurses in order to carry out a survey study. These sites were also chosen due to their geographical convenience, as they are located close to taxi stops, train stations and bus stops, which were accessible to the researcher and for these nurses to get to work.

3.6. Population

A population can be defined as a group of subjects, generally people about whom we want to draw conclusions (Houser, 2016). The total population of respondents for this study was nurses of different categories (Advanced Registered nurses, Registered nurses with Degrees and Diplomas, Enrolled staff nurses, and Auxiliary nurses). The researcher included only nurses who were willing to participate in the study. The total target population for this study was N= 112.

3.7. Sample and sampling technique

A sample is a subset of the population being studied, while sampling involves the process of selecting groups of events, people, behaviors or other elements to conduct a study (Burns & Grove, 2010. Considering the small number of study population (N=112), an all-inclusive sampling technique was used to include all members of the targeted population in the study sample.

3.8. Research instrument

Grove, Burns and Gray (2010, defined instrument as an application of specific rules with the aim of developing a measuring device or tool. The information gathering instrument for the study was a self-administered questionnaire made up of closed-ended questions. The study made use of two separate questionnaires that were adapted from pre-existing questionnaires Jiang, Chen and Chen,2004; and Moody, Slocumb, Berg and Jackson,2004; Yontz et al.,2015). Permission to use the questionnaire was requested from both authors, they have been acknowledged and both articles cited in the reference list.

The final questionnaire comprised four sections. Section A consisted of closed-ended questions relating to demographic information (age, gender, race, marital status, and years of experience, highest professional qualification, and areas of experience).

Section B of the questionnaire related to questions regarding knowledge and perceived skills with regard to the use of EHR in health care, as identified by Jiang, Chen and Chen (2004) using the Delphi method. The adapted questionnaire comprised of 15 questions relating to nurses knowledge of the use of EHR by actually checking their computer knowledge and the use of a health information system to do electronic health recording in PHC facilities. The Likert scale ranged from 1 to 3. Nurses could agree to a question, mark it as being uncertain or disagree.

Section C was designed to investigate the perceived skills of nurses in the use of EHR in PHC facilities. A total of 18 questions were selected from the identified questions by Jiang et al., (2014), to investigate the perceived skill of nurses with regard to computer use and the use of electronic health recording as part of health information systems. The Likert scale ranged from 1 to 3. The

respondents could agree to a question, mark it as being uncertain or disagree. The Cronbach's alpha for this questionnaire was 0.956 based on 18 items.

Section D of the questionnaire deals with nurses attitudes towards the use of EHR. This was adapted from an existing questionnaire used in a survey by Moody, Slocumb, Berg and Jackson (2004), which investigated nurses perceptions, attitudes, and preferences on electronic health documentation, and by Yontz et al., (2015), who investigated perioperative nurses attitudes towards the use of EHR. Of the 13 questions that were adapted to suit the South African context, 6 questions related to computers and their characteristics, and 7 questions asked about the organizational benefits of the use of EHR in health care.

The survey instrument was tested for reliability and validity through a pre-test study at one of the PHC faccilities, and the necessary grammatical changes were made based on comments from nurses. A three-point Likert scale was used for computer variables, and the organizational benefits of the use of EHR, and Cronbach's alpha for this instrument was 0.757, based on 7 items that related to the organizational benefits of the use of EHR in health care.

The final questionnaire comprised four sections. Section A consisted of 8 closed-ended questions relating to demographic information, section B comprised 15 questions referring to knowledge, section C contained 18 questions regarding perceived skills, and section D entailed 13 questions concerning attitude towards EHR. The overall Cronbach's alpha for the complete questionnaire (knowledge, skills and attitude) was 0.920.

3.9. Validity

Validity refers to the degree to which an instrument measures what it is supposed to be measuring (Grove et al., 2012). Validity has the following types: content, face, criterion-related and construct

validity (Grove et al., 2012). This study dealt with face validity, where experts in the field and the research supervisor reviewed the instrument for appropriateness and content validity (Table 3. 1), to ensure that the major objectives of the study were being measured by the instrument. The content validity of the instrument was ensured through the use of expert review.

Table 3. 1: Content validity

Objectives	**Questions**
(a) To determine the knowledge of nurses in the use of EHR in the PHC system	Section B Questions (1-15)
(b) To determine the perceived skills of nurses in the use of EHR	Section C Questions (1-18)
(c) To describe the attitude of nurses towards the application of EHR	Section D Questions (1-13)

3.10. Reliability

Reliability is defined as consistency of the test scores, and is important because the researcher needs to be sure that the data collected are a true indication of the ability of the people tested (Houser, 2016). Therefore, an instrument used by the researcher should give the same results when measuring the same phenomena in a similar context (Houser, 2016). Hence a pre testing of the instrument was conducted to ensure the reliability of the study. The internal consistency of the instrument was tested using the Cronbach's alpha coefficient for the sections where Likert scale questions were used. Internal consistency was computed in the actual study to determine whether the instrument was reliable with the population of the study. A Cronbach's alpha of 0.70 and above is acceptable to ensure internal consistency. The overall Cronbach's alpha for the complete questionnaire (knowledge, skills and attitude) was 0.920.

3.11. Pre-test study

A pretest was conducted using a similar study population that met the requirements to answer the questionnaire. A total of ten nurses were randomly chosen at a selected PHC to conduct pre-testing of the tool. The aim of a pre-test is to examine how feasible the study is and to identify possible inconsistencies or ambiguity in the instruments (Babbie, 2015). The purpose of the study was explained to the respondents to obtain voluntary consent to participate in the study, before being given the questionnaire to complete. This information collected was analyzed using the Statistical Package for Social Science (SPSS) software version 25 program. This allowed the researcher to polish the questionnaire for final use, and create a database and code book for entry of data.

Based on recommendations from the nurses, some grammatical changes were made on the questionnaire, as they indicated that some questions were not clear. The outcome of the pre-test phase gave the researcher an estimate of about 15-20 minutes for completion of the survey instrument. This also assisted the researcher to assess the cost involved in the data collection process, and to be prepared for any unpredicted events that might occur.

During the pre-test phase all questionnaires that were completed were considered null and void, as minor grammatical changes were made to the tool based on the nurses recommendations, and hence they were not included in the actual study.

3.12. Data collection procedure

Data collection is a systematic and precise method of gathering information pertinent to the research purpose, or questions, specific objectives and hypothesis of a study (Grove et al., 2012). Before data collection was commenced, an ethics approval letter was obtained from the ethics committee of the University of the Western Cape, as well as approval from the City of Cape Town

to carry out the study. Permission to enter these PHC facilities was obtained from substructure area managers/coordinators and facility/unit managers.

The data collection was carried out from the nine PHCs that were approved, that fall under the Northern-Tygerberg substructure. The target population comprised all nurses working at these PHC facilities who were willing to take part in the study. The total number of respondents that completed the questionnaire was n=71, giving a response rate of 63%. Data were collected from September to October 2018.

At each of the facilities the researcher made contact with the nurses during their clinical meetings, tea and lunch breaks, or at any other suitable time that was identified by the facility manager or the nurses. English language as the official language of communication in healthcare institutions was used to collect data. The purpose of the research was explained to the respondents before they signed the consent form. It took approximately 15-20 minutes to complete each questionnaire.

Those who could not complete the questionnaires on the spot were allowed to take them home and complete them at a time of their own convenience. An agreed time and date to return completed questionnaires was discussed and agreed with these respondents. The researcher's cell number and email address were given to the nurses in case they needed some clarification on the questions.

Subsequent follow ups were done on numerous occasions to increase the response rate, especially among those nurses who were not able to complete the questionnaires after the initial time and date that was agreed upon. During such follow ups respondents were asked a suitable means of communication, such as their email address or work phone numbers, just to send reminders, and also to find out if the researcher could come and collect the questionnaires. To keep track of participants in the study, the researcher developed a list of all of the respondents who had signed

the consent forms and collected the questionnaires to complete. Each questionnaire was assigned a code to ensure anonymity of the respondents. To minimize contamination, it was explained to the respondents that there are no good or bad answers, and that there would be no prejudice.

3.13. Data analysis

Data are regarded as the pieces of information received from the data collection process, while analysis is the systematic organization and synthesis of research (Polit & Beck, 2013). The completed questionnaires were immediately checked for completeness with the respondents present, and any unanswered questions were corrected. However, a questionnaire was considered and analyzed based on the number of respondents that provided their answers to a particular question. There were no irregularities in the answers given, and as a result no completed questionnaire was discarded. A code book was developed at the end of the pre-test study to code the different variables on the research tool. Completed questionnaires were coded and organized for analysis using the SPSS software version 25 program for analysis.

Descriptive statistics assisted the researcher to convert and reduce a large amount of data into easy to read information, hence making it possible for readers of the research report to make sense of it (Polit & Beck, 2013). The data were entered into SPSS version 25 and were cleaned and rechecked for accuracy in data entry.

Analysis was done using descriptive statistics to describe the findings (Polit & Beck, 2013). Frequencies and percentages were used to describe categorical data. The frequency of a particular response, such as age in years, gender, marital status, years of working experience, level of qualification, and specialty areas, were calculated using frequencies and percentages.

Numerical values were given to the Likert scale (Disagree = 1, Uncertain = 2, Agree = 3) next to each variable on the questionnaire to be investigated, in order to facilitate the calculation of each statistical value needed in the study.

Fifteen items were assessed to describe the knowledge of nurses on the use of computers and EHR in health care. After grouping the 15 items into three groups (Disagree, Uncertain and Agree), a total score was calculated for the 15 items; 0 was considered as minimum and 15 as maximum of the total score. Then the percentage of the total score was also calculated, to determine whether respondents were more or less knowledgeable on the use of computers and EHR systems.

Eighteen (18) items were used to investigate the perceived skills of nurses in the use of computers and EHR in health care. After grouping the 18 items into three groups (Disagree, Uncertain and Agree), a total score was calculated for the 18 items; 0 was considered as minimum and 18 as maximum of the total score. Then the percentage of the total score was also calculated to determine whether respondents were more skilled or less skilled in the use of computers and EHR systems.

Thirteen items (13) were used to describe nurses attitude regarding the use of computers and benefits of EHR systems in health care. These were also grouped into Disagree, Uncertain and Agree. After grouping the 13 items into the three groups, a total score was also calculated, where 0 was considered as minimum and 13 as maximum. Then the percentage of the total score was calculated to determine whether respondents had positive or negative attitudes to the use of computers as well as EHR systems in health care. The findings have been presented in tables.

Bivariate analysis was also used in this study to check the relationship between two variables, using a cross-tabulation test to determine the association between sociodemographic

characteristics (age, gender, years of work experience, level of qualification, and nurses' knowledge, perceived skills or attitudes towards the use of EHR in health care).

3.14. Ethical considerations

Permission to carry out the study was obtained in writing from the Biomedical Ethics Committee of the University of the Western Cape. To gain access to the study population, permission was obtained from the City of Cape Town DoH, and both permission letters were emailed to the substructure and facility managers. Ethical principles as outlined below were followed in this study.

Beneficence: Respondents were made aware of the fact that any information they provided on the questionnaire will be kept strictly confidential and extracts will not be used to punish them. Questionnaires were identified through the use of codes to avoid the disclosure of private information.

Respect for person: Letters were handed out to all respondents stating the purpose of the study, the importance of confidentiality and animosity which was ensured through the use of codes and not names to safe guard respondents' information. Each and every respondent were asked to sign consent to form. It was also emphasized that participation in the study was voluntary and respondents could withdraw from the study at any point in time

Informed consent: During the actual data collection phase, respondents were handed the information sheet which is a brief summary of the study aims and objectives. The nature, purpose and significance of the study were explained to the respondents, as well as what would be expected of them. The respondents were requested to give their written consent as proof of voluntary

participation, and were notified that they had the right to withdraw from the study without any penalties.

Right to anonymity: The questionnaires had code numbers and respondents did not have to provide their names. During data analysis, respondents' information was coded to avoid disclosure of sensitive information that could have caused the respondent any harm. The raw and soft data collected for the purpose of the study shall be stored for a period of 5 years, after which it will be destroyed (the hard copy will be shredded and the soft copy will be deleted from the computer).

Confidentiality: The researcher had a responsibility to make sure that information provided by the respondents was safeguarded with an exception of the study supervisor. This was to reassure respondents that whatever information they shared would be safe goaded.

Justice: The researcher included every nurse that was working at the approved primary health care facilities. Every respondent was treated fairly and privacy was ensured as each respondent was approached individually and questionnaires distributed accordingly. The respondents could complete the questionnaire immediately or at a later date. Respondents gave a date and time when the completed questionnaire could be collected.

3.15. Chapter summary

This chapter gives a detail description of the research methodology, its design, the setting, target population, sample size and sampling techniques, survey instruments, data collection process, and data analysis procedure used in this study. Chapter Four follows, with details from the data analysis process.

Chapter Four

Results of the study

4.1. Introduction

The purpose of this chapter is to present the findings of the study which investigated knowledge, perceived skills and attitude of nurses regarding the use of EHR systems, as well as the association between the objectives and demographic data of the respondents. Data were collected from the approved facilities by means of a self-administered questionnaire; the data were then coded, captured on an Excel spreadsheet and transferred to the SPSS program. Data were analyzed with the help of a statistician using SPSS version 25.0.

The results of the study are presented in three sections, based on the objectives of the study:

- To determine the knowledge of nurses in the use of EHR at selected PHC facilities;
- To determine the perceived skills of nurses in the use of EHR at selected PHC facilities; and
- To describe the attitude of nurses towards the use of EHR at selected PHC facilities.

4.2. Response rate

The study population comprised all nurses working at PHC facilities in the Western Cape. The sample size for this study was (N=112) nurses that were working at the approved PHC facilities. The questionnaires were distributed to the total sample of the study population, and a total of 71 nurses completed the self-administered questionnaire, giving a response rate of 63%. Tables have been used to present the results as per demographics; nurses knowledge, perceived skills and

attitudes regarding the use of EHR at the PHC level; as well as the inferential statistics to determine the association between the various variables and demographic information with regard to the use of EHR.

4.3. Presentation of findings

The findings from this study are presented in sections:

- Section I presents the sociodemographic information.
- Section II presents nurses knowledge on the use of EHR at PHC facilities, and established if there were associations between sociodemographic characteristics and nurses knowledge of using EHR.
- Section III presents the perceived skills of nurses regarding the use of EHR at PHC facilities, and the association between sociodemographic characteristics and perceived skills regarding the use of EHR systems in PHC facilities.
- Section IV describes the findings of the attitude of nurses regarding the use of EHR at PHC facilities, and the associations between sociodemographic characteristics and nurses attitudes regarding the use of EHR systems in PHC facilities.

4.3.1. Section I: Sociodemographic information

In this section, the frequencies and percentages of the sociodemographic variables are presented. This section consisted of 8 questions related to demographic information on the respondents (age, gender, marital status, race, highest professional qualification, years of experience, and areas of experience).

The age group of the respondents ranged from 20 years to 50 years and above. Based on the results, the majority of the study population 28 (39.4%) was in the 40-50-years age range, followed by the age range of 30-40 years 26 (36.6%). Those aged 50 years and above were in the minority 9 (12.7%) of the population, while the fewest respondents 8 (11.3%) were between the ages of 20-30 years.

As indicated in Table 4.1, a large proportion of the respondents were female 66 (93.0%), and only 5 (7%) were males. The majority of the respondents 52 (73.2%) reported being married, and 19 (26.8%) were unmarried. The respondents' races were predominantly given as 'colored', accounting for 47 (66.2%), followed by black with 20 (28.2%) respondents. The white population was in the minority, with only 4 (5.6%). The results in Table 4.1 also show that the majority of the respondents 28 (39.4%) had more than 15 years' experience in nursing, followed by those who had 5-10 years' experience 23 (32.4%). Respondents with 1-5 years' experience were in the minority at 14 (19.7%), with the fewest being those within the 10-15 years bracket 6 (8.4%). The findings indicate that the majority of the nurses 26 (36.6%) had a degree in nursing. With the focus of the DoH on PHC re-engineering, there is an interest in nurses with advanced nursing qualifications. Those with an advanced nursing qualification numbered 23 (32.4%) of the study population, while there were more nurses 12 (16.9%) with other qualifications (such as enrolled nurses or auxiliary nurses), than those with diplomas in nursing science, who were in the minority 10 (14.1%). Table 4.1 provides a summary of the demographic characteristics.

Table 4.1: Sociodemographic information

Summary		N	Percentage
Age group (years)	40 – 50	28	39.4
	30 – 40	26	36.6
	50+	9	12.7
	20 – 30	8	11.3
Gender	Female	66	93.0
	Male	5	7.0
Marital status	Married	52	73.2
	Unmarried	19	26.8
Race	Colored	47	28.2
	Black	20	5.6
	White	4	66.2
Years of experience	15+	28	39.4
	5-10	23	32.4
	1-5	14	19.7
	10-15	6	8.4
Highest professional qualification	Advanced nursing professional qualification	23	32.4
	Bachelor of Science in Nursing (4 years' training).	26	36.6
	Enrolled/Auxilliary nursing	12	16.9
	Diploma in Nursing Science (3 years' training)	10	14.1

According to the DoH, PHC facilities should be the first point of contact for any patient, before referral to a secondary or tertiary institution based on the severity of the illness. The PHC facilities should also provide follow up to patients once they have been discharged from hospital, and assist to rehabilitate them into the community. It is therefore very important for the nurses to have experience in the different departments or rooms at the PHC facilities. Based on the figures reflected on Table 4.2 below, a greater proportion of the nurses had experience in most of the areas or consulting rooms in PHC centres. The majority of the respondents had experience in pediatric care 62 (87.3%) followed by a constant proportion 59 (83.1%) who had experience in handling family-planning issues, adult care or consultations 59 (83.1%), HIV treatment and management protocols 59 (83.1%), and lastly, those who had experience working with TB management and follow-up procedures 59 (83.1%). A total of 58 (81.7%) reported having worked in the trauma or emergency rooms, while 52 (73.2%) had antenatal care experience. Some of the nurses 40 (56.3%) had labor room experience; while a slightly lesser number 36 (50.7%) had experience in neonatal care, and psychiatry experience 35 (49.3%). Table 4.2 reflects the numbers and percentages of the study population regarding areas of experience.

Table 4.2: Sociodemographic information: Areas of experience in PHC

Areas of experience	Yes	No
	N (%)	**N (%)**
Pediatric rooms	62 (87.3)	9 (12.7)
Adult consulting rooms	59 (83.1)	12 (16.9)
HIV rooms	59 (83.1)	12 (16.9)
Family-planning rooms	59 (83.1)	12 (16.9)
TB rooms	58 (81.7)	13 (18.3)
Emergency/trauma rooms	54 (76.1)	17 (23.9)
Antenatal rooms	52 (73. 2)	19 (26.8)
Labour/delivery rooms	40 (56.3)	31 (43.7)
Neonatal rooms	36 (50.7)	35 (49.3)
Psychiatric rooms	35 (49.3)	36 (50.7)

4.3.2. Section II: Nurses knowledge regarding the use of EHR in PHC facilities

In order to achieve objective one of the study, which was to determine the knowledge of nurses on the use of EHR at selected PHC facilities, questions relating to the nurses' knowledge regarding the use of EHR in PHC services were asked. Respondents answered whether they agreed, uncertain, or disagreed for each question.

The majority 68 (95.8%) of nurses agreed that the use of EHR systems was necessary in PHC, followed by 67 (94.4%) who knew about the importance of confidentiality when processing computerized data and medical records. Nearly all of the respondents 66 (93.0%) agreed that they

knew how to log in and out of a computer. As indicated in Table 4.3, 64 (90.1%) respondents agreed with the statement that the computer cannot replace the role of nurses as it is only a tool to provide better nursing care; only 5 (7.0%) were uncertain about this. Similarly, 62 (87.3%) of the nurses agreed that it is a useful tool in promoting healthcare running efficiency, although 8 (11.3%) were uncertain.

The vast majority of the respondents 61 (85.9%) also agreed that the computer could be used to carry out nursing functions such as staffing, scheduling and quality control, but 8 (11.3%) had reservations, as they indicated some degree of uncertainty. This response was also similar regarding whether the nurses were aware of the fact that if effort is not being put into learning how to use the computers it will not be a useful tool in nursing: 60 (84.5%) agreed, with an insignificant number of respondents 2 (2.8%) disagreeing and 9 (12.7%) being unsure. Sixty (84.5%) respondents agreed that they knew what a computer program was, while 9 (12.7%) were uncertain.

There was a drop in the number of respondents 56 (78.9%) who knew how to manage and store files on a computer, with 14 (19.7%) being uncertain. This drop in response number was also seen with regard to being able to identify the location of computer devices, with 54 (76.1%) agreeing and 14 (19.7%) being uncertain. Although 47 (66.2%) knew about the use of simulation software for continuing education and training, the number that were uncertain 21 (29.6%) cannot be ignored; the continuous education and training of every staff member is important for their professional growth, and if they are unaware of such programs as a means of improving their knowledge, this is a concern that should be addressed.

Although more than half of the respondents 46 (64.8%) agreed that they knew where to find resources to resolve common computer problems, a considerable number 22 (31%) were uncertain, and 3 (4.2%) disagreed. Similarly, 46 (64.8%) of nurses were also aware of the availability of

video disks that could help them with issues of patients' health education; however, it was also a point of worry that 22 (31%) were uncertain about this, and 3 (4.2%) disagreed that they were aware of this availability. Only 45 (63.4%) of nurses knew about the applications of computer networks and telecommunication in nursing, with 22 (31.0%) being uncertain and 4 (5.6%) disagreeing that they knew about this.

There was one question where the responses showed a different trend when compared to the above. In this instance, the majority of the respondents 37 (52.1%) disagreed, with 28 (39.4%) being uncertain and only 6 (8.5%) agreeing that they know what an EHR system is in general. Table 4.3 shows a summary of these results, showing the responses according to the Likert scale

Table 4.3: Nurses knowledge regarding the use of EHR in PHC facilities

	Agree (A) N (%)	Uncertain (N) (%)	Disagree (D) N (%)
Know that EHR in primary health care is necessary	68 (95.8)	0 (0.0)	3 (4.2)
Know the importance of confidentiality	67 (94.4)	3 (4.2)	1 (1.4)
Know the basic usage of a computer (login/logout) a computer.	66 (93.0)	3 (4.2)	2 (2.8)
Know that the computer is only a tool to provide better nursing care. It cannot replace the role of nurses'.	64 (90.1)	5 (7.0)	2 (2.8)
Know EHR are useful tools in promoting hospital-running efficiency.	62 (87.3)	8 (11.3)	1 (1.4)
Know that the computer can be used as a tool for staffing, scheduling, quality control.	61 (85.9)	8 (11.3)	2 (2.8)
Know that the computer will not be a powerful nursing tool until users put efforts into learning how to use it.	60 (84.5)	9(12.7)	2 (2.8)
Know what a computer program is	60 (84.5)	9 (12.7)	2 (2.8)
know how to manage and store files	56 (78.9)	14 (19.7)	1 (1.4)
Know about the design of the computer screen, location of computer devices	54 (76.1)	14 (19.7)	3 (4.2)
Know there is simulation software for continuing education and training.	47 (66.2)	21 (29.6)	3 (4.2)
Know where to find resources to resolve computer problems	46 (64.8)	22 (31.0)	3 (4.2)
Know there are video discs for nurses' continuing education, patients' health education, etc.	46 (64.8)	22 (31.0)	3 (4.2)
Know about applications of computer networks and telecommunications in nursing.	45 (63.4)	22 (31.0)	4 (5.6)
Know what EHR is in general.	6 (8.5)	28 (39.4)	37 (52.1)

4.3.2.1. Level of knowledge regarding the use of EHR in PHC facilities

As stated in the methodology section, 15 items were assessed to investigate the knowledge of nurses regarding the use of EHR in PHC. These were grouped into 'Agree', with a score of 1; Uncertain (2), and Disagree (3); after this grouping, a total score was calculated for the 15 items, with 0 considered as minimum and 15 as maximum. The percentage of the total score was also calculated to determine whether respondents were more or less knowledgeable regarding the use of EHR. This study used Olivier's knowledge measurement method, where a cut-off of 80% was used to measure the level of knowledge of the respondents (Olivier, 2010). Therefore, respondents were considered to have more knowledge if the percentage of the total score was equal to or above 80%, and to have less knowledge if it was less than 80%. As shown in Table 4.4 below, respondents that agreed to the knowledge questions, with a score above 80%, were considered to have more knowledge, while those that were uncertain and disagreed were considered to have less knowledge regarding the use of EHR in PHC facilities. The majority of the respondents 66 (93%) were found to have more knowledge, while 5 (7%) were found to have less knowledge regarding the use of EHR in PHC facilities.

Table 4.4: Level of knowledge regarding the use of EHR in PHC facilities

	Frequency **N**	**Percentage** **%**
Less knowledge	5	7.0
More knowledge	66	93.0
Total	71	100.0

4.3.2.2. Demographic characteristics and knowledge of nurses regarding the use of EHR in PHC facilities

In order to analyze the link between demographic characteristics and the knowledge of nurses, cross-tabulation was done using the Chi-square test, where probability value (significant at $P<0.05$) was used to determine if there was any significant association between the demographic characteristics and knowledge of EHR.

As shown in Table 6, the majority of the respondents between the ranges of 40 and 50 years (25, 89.3%), and in the 30-40-year range 24 (92.3%) had more knowledge, while 3 (10.7%) and 2 (7.7%) in these age ranges respectively had less knowledge with regard to the use of EHR in PHC centres. While only 9 respondents were aged 50 years and above and 8 were between the ages of 20-30 years – all of these respondents (100%) had knowledge with regard to the use of EHR in PHC centres. In the 50 years and above age group, this could have been due to the fact that the few respondents that were in leadership positions were of more advanced age and had a computer at their disposal, and hence would seize every opportunity to empower themselves whenever they had an opportunity for training on the use of computers and EHR. Those within the 20-30 years bracket are presumed to be knowledgeable on the use of computers and to understand EHR systems. However, the P value of 0.597 indicated that there was no significant association between the age groups in relation to the respondents' knowledge regarding the use of EHR systems.

As noted in Table 4.5, the respondents with a Bachelor of Science degree in nursing (4 years' training) were more knowledgeable 24 (92.3%), while 2 (7.7%) had less knowledge. This result was followed by those with advanced nursing qualifications, where all 23 (100.0%) had more knowledge. Nurse managers or assistant managers (second or third in command) and those working in the TB/HIV and child immunization programs were among this category of

respondents, who are exposed to computer use on a daily basis; hence the need to be knowledgeable on computer use and EHR becomes paramount. Respondents with a Diploma in Nursing Science (3 years' training) 9 (90.0%) and enrolled/auxiliary nurses 10 (83.3%) were the least in numbers, but were also more knowledgeable with regard to the use of EHR in health care. In these groups of respondents, 2 (16.7%) and 1 (10.0%) respectively had less knowledge. However, no significant association was noted between the highest levels of qualification and knowledge regarding the use of EHR, as the P value was 0.309%.

Respondents with experience of 15 years and above were in the majority 26 (92.9%) and appeared to be more knowledgeable with regard to the use of EHR in PHC, followed by those with 5-10 years of experience 21 (91.3%). Under each of these categories, 2 (7.1%) and 2 (8.7%) respondents, respectively, had less knowledge with regard to the use of EHR. There was, however, no significant relationship with regard to their knowledge on the use of EHR and their years of experience (P = 0.571). This was similar for respondents with 1–5 years of working experience where all 14 (100%) had more knowledge regarding the use of EHR. This is to be expected, that the younger the respondents, the more computer literate they are, and hence more knowledgeable on the use of EHR. Those with 10-15 years of experience 5 (83.3% with more knowledge) were the least in number, with 1 (16.7%) having less knowledge.

Table 4.5: Demographic characteristics and knowledge regarding the use of EHR

Variables		Those in the group with more or less knowledge				P value
		Less knowledge n (%)		More knowledge n (%)		
Age group (years)	40-50	3	10.7	25	89.3	0.597
	30-40	2	7.7	24	92.3	
	50+	0	0.0	9	100.0	
	20-30	0	0.0	8	100.0	
Highest professional qualification	Bachelor of Science	2	7.7	24	92.3	0.309
	Advanced nursing	0	0.0	23	100.0	
	Enrolled/Auxiliary nurse	2	16.7	10	83.3	
	Diploma in Nursing)	1	10.0	9	90.0	
Years of experience	15+	2	7.1	26	92.9	0.571
	5 – 10	2	8.7	21	91.3	
	1 – 5	0	0.0	14	100.0	
	10 – 15	1	16.7	5	83.3	

Chi-square test.*Significant at P<0.05.

With regard to the areas of experience (Table 4.6), the majority of respondents 60 (96.8%) had worked in the pediatric rooms, and also indicated that they had more knowledge with regard to the use of EHR in health care, with 2 (3.2%) of those with experience in the pediatric rooms having less knowledge. Some of the respondents did not have pediatric experience 6 (66.7%), but they still had more knowledge compared to the 3 (33.3%) who had neither pediatric experience nor knowledge regarding the use of EHR in PHC facilities. The P value of 0.001 indicates that there is a significant relationship between experience in pediatric care and knowledge on the use of EHR in PHC facilities. Respondents that have been exposed to pediatric care have more knowledge with

regard to the use of EHR in health, and this is probably due to the fact that pediatric care is one of the areas where there is electronic recording of health information, to track growth, immunization, and the outbreak of infectious diseases. Hence nurses working in such areas are exposed to computers on a daily basis.

Table 4.6: Areas of experience and extent of knowledge on use of EHR		Knowledge group of the total score			P value
			Less knowledge	More knowledge	
Pediatric rooms	Yes	n	2	60	0.001
		%	3.2	96.8	
	No	n	3	6	
		%	33.3	66.7	
TB rooms	Yes	n	3	55	0.193
		%	5.2	94.8	
	No	n	2	11	
		%	15.4	84.6	
HIV rooms	Yes	n	4	55	0.848
		%	6.8	93.2	
	No	n	1	11	
		%	8.3	91.7	
Adult consulting rooms	Yes	n	5	54	0.296
		%	8.5	91.5	
	No	n	0	12	
		%	0.0	100.0	
Family-planning rooms	Yes	n	5	54	0.296
		%	8.5	91.5	
	No	n	0	12	
		%	0.0	100.0	
Emergency/trauma rooms	Yes	n	4	50	0.830
		%	7.4	92.6	
	No	n	1	16	
		%	5.9	94.1	
Antenatal rooms	Yes	n	3	49	0.488
		%	5.8	94.2	
	No	n	2	17	
		%	10.5	89.5	
Labor/delivery rooms	Yes	n	2	38	0.445
		%	5.0	95.0	
	No	n	3	28	
		%	9.7	90.3	
Neonatal rooms	Yes	n	0	36	0.019
		%	0.0	100.0	
	No	n	5	30	
		%	14.3	85.7	
Psychiatric rooms	Yes	n	1	34	0.174
		%	2.9	97.1	
	No	n	4	32	
		%	11.1	88.9	

Another area where most of the respondents had experience or had worked was the TB rooms. These respondents were also exposed to the use of computers, which is a positive factor as it indicates the use of EHR for tracking of patients' adherence to medications, cases of drug resistance or missed treatment, and proper capturing of statistics for the DoH. Table 4.6 indicates that 55 (94.8%) of the respondents who had experience in the TB rooms had more knowledge, while 3 (5.2%) had the experience but had less knowledge on the use of EHR in PHC. Some of the respondents 11 (84.6%) did not have experience in this area, but had more knowledge, compared to 2 (15.4%) who had neither the experience nor the knowledge with regard to the use of EHR in PHC. No significant association was noted, as indicated by the P value of 0.193.

The majority of the respondents 55 (93.2%) had experience in the management of HIV or had worked in the HIV consulting rooms in PHC facilities, as well as having more knowledge on the use of EHR, while 4 (6.8%) had the experience but had less knowledge. Some of the respondents had no experience in this area 11 (91.7%) but had more knowledge, as opposed to the 1 (8.3%) who had neither the experience nor the knowledge regarding use of EHR. However, no significant association was noted (P = 0.848).

Similar results were noted where more than half of the respondents 54 (91.5%) had experience in the adult consulting rooms as well as having more knowledge regarding the use of EHR; 5 (8.5%) had experience in this area, but less knowledge regarding the use of EHR in PHC. Respondents who did not have experience in adult consulting rooms 12 (100%) still had more knowledge regarding the use of EHR. This is an indication that areas of experience such as working in the adult consulting rooms did not affect the respondents' level of knowledge regarding the use of EHR in PHC, and hence an insignificant P value of 0.296.

Furthermore, 54 (91.5%) respondents had experience in the family-planning rooms and also had more knowledge with regard to EHR in health care, with a few 5 (8.5%) having the experience but less knowledge. The reverse occurred where respondents did not have the experience but still had more knowledge with regard to EHR in PHC 12 (100%). There is no significant association between family planning room and knowledge of nurses (P = 0.296) was recorded.

Respondents with experience in emergency or trauma rooms 50 (92.6%) had more knowledge, while 4 (7.4%) had less knowledge. Those with no experience in this area had more knowledge with regard to the use of EHR 16 (94.1%), with only 1 (5.9%) having less knowledge. No significant association was noted (P = 0.830).

Most of the respondents 49 (94.2%) had experience in the antenatal rooms and also indicating being more knowledgeable with regard to the use of EHR, while 3 (5.8%) of those who did have experience in this area had less knowledge regarding the use of EHR in PHC. Less than half of the respondents 17 (89.5%) had no experience in the antenatal rooms but had more knowledge with regard to the use of EHR, while only 2 (10.5%) had neither experience in the antenatal rooms nor knowledge regarding the use of EHR in PHC. The P value of 0.488 indicates an insignificant relationship between the respondents' experience in antenatal rooms and their knowledge regarding the use of EHR in PHC facilities.

A significant number 38 (95.0%) had experience in the labor/delivery rooms, as well as more knowledge with regard to the use of EHR, while 2 (5.0%) had experience in the labor rooms but were less knowledgeable on the use of EHR in health care. While 28 (90.3%) did not have labor room experience, they had more knowledge on EHR, while 3 (9.7%) had no experience and less knowledge regarding the use of EHR in PHC. No significant association was noted (P = 0.445).

More than half 36 (100%) of the respondents who had experience in the neonatal rooms all indicated having more knowledge with regard to the use of EHR, while 30 (85.7%) did not have neonatal room experience but had more knowledge on EHR. Only 5 (14.3%) had no experience and less knowledge on the use of EHR in PHC. The results were significant (P value = 0.019), indicating that there is an association exists between respondents' experience in the neonatal rooms and their level of knowledge regarding the use of EHR in health care.

Lastly, less than half of the respondents 34 (97.1%) had experience in the psychiatry rooms, but had more knowledge regarding EHR; only 1 (2.9%) had experience in psychiatry rooms with less knowledge on the use of EHR. Similarly, 32 (88.9%) had no experience in psychiatry rooms but had knowledge on EHR, while 4 (11.1%) had neither the experience in psychiatry rooms nor the knowledge on the use of EHR in PHC. These results were insignificant, with a P value of 0.174.

4.3.3. Section III: Perceived skills regarding the use of EHR in PHC

Section III of the questionnaire comprised questions that were intended to respond to the second objective of the study, which was to determine the perceived skills of nurses regarding the use of EHR at selected PHC facilities. As mentioned above in Table 4.3, most 68 (94.4%) of the respondents agreed that the use of an EHR system is necessary in PHC.

With regard to perceived skills in the use of EHR in PHC, most respondents 65 (91.5%) agreed, 3 (4.2%) were uncertain, and 3 (4.2%) disagreed that they could send and receive emails. Fifty-eight (81.7%) agreed, 12 (16.9%) were uncertain, and 1 (1.4%) disagreed that they are able to use the World Wide Web to search for information, while 55 (77.5%) agreed, 13 (18.3%) were uncertain, and 3 (4.2%) disagreed that they are able to use word processing software to generate nursing documents. Similarly, 55 (77.5%) of the respondents could use the computers as a self-learning tool, with 15 (21.1%) being uncertain about this, and only 1 (1.4%) disagreeing.

Furthermore, 53 (74.6%) respondents agreed that they are able to use a library retrieval system such as Medline, as opposed to 13 (18.3%) who were uncertain and 5 (7.0%) who disagreed. More than half of the respondents 52 (73.2%) are able to use computerized self-learning equipment, while 17 (23.9%) were uncertain and 2 (2.8%) disagreed. Similarly, 50 (70.4%) could use PowerPoint software to prepare lectures or patient education and 19(26.8) were uncertain, while 2 (2.8%) disagreed.

Subsequently, with regard to the use of EHR in nursing information systems, more than half of the respondents 46 (64.8%) agreed that they could use the EHR systems, while 23 (32.4%) were uncertain and 2 (2.8%) disagreed. In addition, most of the respondents agreed that they are able to use EHR to do nursing work (nursing records) 46 (64.8%), while a small portion were uncertain 23 (32.4%) or disagreed 2 (2.8%). Forty-five (63.0%) of the respondents could use EHR to store/retrieve and transfer data such as patient information or drug information, while 24 (33.8%) were uncertain and 2 (2.8%) disagreed. Most of the respondents 44 (62.0%) agreed that they are able to maintain nursing information systems, while 25 (35.2%) were uncertain and 2 (2.8%) disagreed.

In terms of the use of EHR, more than half of the respondents 44 (62%) could design a flowchart for a nursing information system, while 22 (31%) were uncertain and 5 (7.0%) disagreed. Most respondents are able to use database software to construct nursing databases 38 (53.5%), while 28 (39.4%) were not sure and 5 (7.0%) disagreed. In addition, 37(52.1%) respondents could convert files for different application software, while 29 (40.8%) were uncertain and 5 (7.0%) disagreed.

Less than half of the respondents stated that they are able to use statistical software for nursing research 34 (47.9%), while 32 (45.1%) were uncertain and 5 (7.0 %.) disagreed. A similar response

was noted where only 32 (45.1%) agreed that they were able to create multimedia files for web pages, and 33 (46.5%) were uncertain while 6 (8.5%) disagreed.

The positive response dropped further when it came to whether they could actually resolve common computer errors, with only 22 (31.0%) of the respondents agreeing, the majority 30 (42.3%) being uncertain, and 19 (26.8%) disagreeing. Similarly, only 22 (31.0%) respondents rated that they could assemble the basic components of a computer, while 29 (40.8%) were uncertain and 20 (28.2%) disagreed. Table 4.7 gives a detailed analysis of the responses of the respondents with regard to their perceived skills in the use of an EHR system in PHC.

Table 4.7: perceived skills regarding the use of EHR in PHC

	Agree(A) N (%)	Uncertain (UN) N (%)	Disagree(D) N (%)
Be able to send/receive mails	65 (91.5%)	3 (4.2%)	3 (4.2%)
Be able to use the world wide web (www).	58 (81.7%)	12 (16.9%)	1 (1.4%)
Be able to use word processing software	55 (77.5%)	13 (18.3%)	3 (4.2%)
Be able to use computers as self-learning tools	55 (77.5%)	15 (21.1%)	1 (1.4%)
Be able to use a library information retrieval system	53 (74.6%)	13 (18.3%)	5 (7.0%)
Be able to use computerized equipment	52 (73.2%)	17 (23.9%)	2 (2.8%)
Be able to use presentation editing software (MS)	50 (70.4%)	19 (26.8)	2 (2.8%)
Be able to use EHR in nursing information systems	46 (64.8%)	23 (32.4%)	2 (2.8%)
Be able to use EHR to do nursing work	46 (64.8%)	23 (32.4%)	2 (2.8%)
Be able to use EHR to store/retrieve.	45 (63.0%)	24 (33.8%)	2 (2.8%)
Be able to maintain nursing information systems.	44 (62.0%)	25 (35.2%)	2 (2.8%)
Be able to design a flowchart	44 (62%)	22 (31%)	5 (7.0%)
Be able to use database software	38 (53.5%)	28 (39.4%)	5 (7.0%)
Be able to convert files for different application	37 (52.1%)	29 (40.8%)	5 (7.0%)
Be able to use statistical software	34 (47.9%)	32 (45.1%)	5 (7.0%)
Be able to create multimedia files for web pages	32 (45.1%)	33 (46.5%)	6 (8.5%)
Be able to resolve common computer error.	22 (31.0%)	30 (42.3%)	19 (26.8%)
Be able to assemble basic components of computer	22 (31.0%)	29 (40.8%)	20 (28.2%)

4.3.3.1. Level of perceived skills regarding the use of EHR in PHC

As stated in the methodology section, 18 items were used to assess the perceived skills of nurses regarding the use of EHR in PHC. Respondents could either 'Agree', which had a score of 1, be 'Uncertain', with a score of 2, or 'Disagree', with a score of 3. After grouping the 18 items into these three categories (agree, uncertain and disagree), a total score was calculated for each, with 0 considered as minimum and 18 as maximum. The percentage of the total score was also calculated, to determine whether respondents had less or more perceived skills regarding the use of EHR. This study used Olivier's skills measurement method, where a cut-off of 80% was used to measure the level of skills of the respondents (Olivier, 2010). Respondents were therefore rated as having more perceived skills when the percentage of the total score was equal to or above 80%, and to have less perceived skills when the percentage of the total score was less than 80%. As shown in Table 4.8, the majority of the respondents 59 (83.1%) had more perceived skills, while 12 (16.9%) had less perceived skills regarding the use of EHR in PHC.

Table 4.8: Level of perceived skills regarding the use of EHR in PHC facilities

	Frequency **N**	**Percent** **%**
Less perceived skill	**12**	**16.9%**
More perceived skill	**59**	**83.1%**
Total	**71**	**100.0%**

4.3.3.2. Demographic characteristics and perceived skills regarding the use of EHR in PHC

In terms of perceived skills regarding the use of EHR and the age of the respondents, 22 (84%) of those aged 30-40 years had more perceived skills, followed by 20 (71%) respondents in the 40-50 years age group. All respondents in the 50 years and above group 9 (100%) and those in the 20-30 years age group 8 (100%) all scored 100% for more skills. It can be seen that those in the 30-40 and 40-50 years age groups largely had more perceived skills regarding the use of EHR in PHC. However, while there were fewer respondents in the 50 years and above bracket and the 20-30 years age group, there was a 100% response, showing that they all have more perceived skills than those in the previous brackets. This again could be justified by the fact that those in the 50 years and up age group are mostly in leadership positions, and are expected to use computers and the EHR systems, and hence try to equip themselves with the necessary skills through constant training. Those in the 20-30 years age group are members of the younger generation, and are presumed to have more perceived skills with regard to computers and EHR systems. However, there was no association between the perceived skills of the respondents and age, as the P value was 0.102 (Table 4.9).

With regard to the respondents' highest professional qualification attained, 24 (92%) with a Bachelor of Science in Nursing degree, and 21 (91%) with an advanced nursing degree or diploma rated as having more perceived skills, followed by those with Diplomas in Nursing Science 7 (70%), and lastly enrolled/auxiliary nurses 7 (58%). It was noted that the qualification of the respondents does have an effect on their perceived skills regarding the use of EHR in PHC (P = 0.028).

Table 4.9: Demographic characteristics and perceived skills in use of EHR

		Perceived skills group, N (%) of the total score				
		Less skills N (%)		More skills N (%)		P value
Age group (years)	30 – 40	4	15.4	22	84.0	0.102
	40 – 50	8	28.6	20	71.0	
	50+	0	0.0	9	100.0	
	20 – 30	0	00.0	8	100.0	
Highest professional qualification	Bachelor of Science in Nursing	2	7.7	24	92.0	0.028
	Advanced nursing	2	8.7	21	91.0	
	Diploma in Nursing Science	3	30	7	70.0	
	Enrolled/Auxiliary nurses	5	41.7	7	58.0	
Years of experience	15+	5	17.9	23	82.0	0.221
	5 – 10	5	21.7	18	78.0	
	1 – 5	0	0.0	14	100.0	
	10 – 15	2	33.3	4	66.0	

Chi-square test.*Significant at P<0.05

With regard to years of experience, those with 15 years and above 23 (82%), and those with 5-10 years of experience 18 (78%) were in the majority numerically of those with more perceived skills. Fewer numbers of respondents with more skills had worked 1-5 years 14 (100%), or 10-15 years 4 (66%). Hence, the groups with 15+ and 5-10 years of working experience seem to have more

perceived skills with regard to the use of EHR in PHC facilities; however, those with 1-5 years of working experience had a 100% response, indicating that all of them had more perceived skills than the other groups. Again, those with 1-5 years of experience fall within the younger age groups, and are presumed to have more perceived skills with regard to the use of computers, which is a prerequisite for the use of EHR. However, no significant relationship was noted (P = 0.221). There is therefore no association between the respondents' perceived skills regarding the use of EHR and the extent of their years of experience of working as a nurse.

With regard to the respondents' areas of experience (Table 4.10), most of those with more perceived skills in the use of EHR in health care 55 (88.7%) had worked in the pediatric rooms, while 7 (11.3%) had experience in the pediatric rooms but had less perceived skills. Some of the respondents did not have pediatric experience but still had more perceived skills 4 (44.4%), compared to 5 (55.6%) who had neither pediatric experience nor perceived skills regarding the use of EHR in PHC. The P value of 0.001 indicates that there is a significant relationship between experience in pediatric care and the respondents' perceived skills in the use of EHR in PHC. Respondents that have been exposed to pediatric care have more perceived skills with regard to the use of EHR in health care. This probably is due to the fact that pediatric care is one of those areas where electronic recording of health information takes place to track growth rate and immunization. Hence, nurses' workings in such areas are exposed to computers on a daily basis.

Table 4.10: Areas of experience and perceived skills in use of EHR

Areas of experience			Skills group, N (%) of the total score		P value
			Less skill	More skill	
Paediatric rooms	Yes	n	7	55	0.001
		%	11.3	88.7	
	No	n	5	4	
		%	55.6	44.4	
TB rooms	Yes	n	8	50	0.140
		%	13.8	86.2	
	No	n	4	9	
		%	30.8	69.2	
HIV rooms	Yes	n	9	50	0.412
		%	15.3	84.7	
	No	n	3	9	
		%	25.0	75.0	
Adult consulting rooms	Yes	n	11	48	0.385
		%	18.6	81.4	
	No	n	1	11	
		%	8.3	91.7	
Family-planning rooms	Yes	n	11	48	0.385
		%	18.6	81.4	
	No	n	1	11	
		%	8.3	91.7	
Antenatal rooms	Yes	n	8	44	0.573
		%	15.4	84.6	
	No	n	4	15	
		%	21.1	78.9	
Emergency/trauma rooms	Yes	n	11	43	0.165
		%	20.4	79.6	
	No	n	1	16	
		%	5.9	94.1	
Labour/delivery rooms	Yes	n	5	35	0.261
		%	12.5	87.5	
	No	n	7	24	
		%	22.6	77.4	
Neonatal rooms	Yes	n	3	33	0.051
		%	8.3	91.7	
	No	n	9	26	
		%	25.7	74.3	
Psychiatric rooms	Yes	n	4	31	0.225
		%	11.4	88.6	
	No	n	8	28	
		%	22.2	77.8	

Another area in which most of the respondents had experience or had worked was the TB rooms. Like those working in the pediatric rooms, these respondents were also exposed to the use of computers, which is a positive factor as it indicates the use of EHR for tracking of patients' adherence to medications, cases of drug resistance, or missed treatment, and proper capturing of statistics for the DoH. Table 4.10 shows that 50 (86.2%) of the respondents who had experience in the TB rooms had more perceived skills, while 8 (13.8%) had the experience but had less perceived skills in the use of EHR in PHC. Some of the respondents 9 (69.2%) had no experience in the TB rooms yet had more perceived skills, while 4 (30.8%) had no experience in this area as well as less perceived skills with regard to the use of EHR in PHC. However, no significant association was noted, as indicated by the P value of 0.140.

The majority of the respondents 50 (84.7%) had experience in the management of HIV or had worked in the HIV consulting rooms in PHC facilities as well as having more perceived skills, while 9 (15.3%) had the experience but had less perceived skills with regard to the use of EHR. Some respondents had no experience in this area but had more perceived skills 9 (75%), while 3 (25%) had neither the experience nor the perceived skills in the use of EHR. However, no significant association was noted (P = 0.412).

Similar results were noted where more than half of the respondents 48 (81.4%) had experience in the adult consulting rooms as well as more perceived skills regarding the use of EHR; 11 (18.6%) had the experience but less perceived skills in the use of EHR in PHC. Respondents who did not have experience in adult consulting rooms 11 (91.7%) still had more perceived skills regarding the use of EHR, with only 1 (8.3%) having less perceived skills. This is an indication that this area of experience did not affect the respondents' level of perceived skills regarding the use of EHR in PHC facilities, with an insignificant P value (0.385).

Furthermore, 48 (81.4%) respondents had experience in the family-planning room and also had more perceived skills with regard to EHR in health care, with a few 11 (18.6%) having the experience but less perceived skills. A further 11 (91.7%) did not have the experience, but still had more perceived skills with regard to EHR in PHC; only 1 (8.3%) had no experience and less perceived skills. An insignificant association (P = 0.385) was recorded.

The majority of the respondents 44 (84.6%) had experience in the antenatal rooms, as well as indicating that they had more perceived skills with regard to the use of EHR; while 8 (15.4%) had experience in this area, they had less perceived skills regarding the use of EHR in PHC. Fifteen respondents (78.9%) had no experience in the antenatal rooms but had more perceived skills with regard to the use of EHR, while only 4 (21.1%) had no experience in the antenatal rooms and indicated having less perceived skills regarding use of EHR in PHC. The P value of 0.573 indicates an insignificant relationship between the respondents' experience in antenatal rooms and their perceived skills regarding the use of EHR in PHC facilities.

Most respondents with experience in emergency or trauma rooms 43 (79.6%) had more perceived skills, while 11 (20.4%) had less perceived skills. Sixteen respondents (94.1%) had no experience in this area, but had more perceived skills with regard to the use of EHR. Only 1 respondent (5.9%) had no experience in this area and less perceived skills 1 (5.9%). No significant association was noted (P = 0.165).

A small proportion 35 (87.5%) had experience in the labor/delivery rooms as well as more perceived skills with regard to the use of EHR, while 5 (12.5%) had such experience but less perceived skills in the use of EHR in health care. A significant number 24 (77.4%) did not have labor room experience, but had more perceived skills in EHR, while 7 (22.6%) had no experience

and less perceived skills regarding the use of EHR in PHC. No significant association was noted (P = 0.261).

Less than half 33 (91.7%) of the respondents had experience in the neonatal rooms and indicated having more perceived skills with regard to the use of EHR, while 3 (8.3%) had the experience but had less perceived skills. A significant number of respondents 26 (74.3%) had no experience in the neonatal rooms but had more perceived skills, while 9 (25.7%) has less perceived skills as well as no experience in this area. The results were insignificant (P = 0.051).

Lastly, less than half 31 (88.6%) of the respondents had experience in the psychiatry rooms, with more perceived skills regarding EHR, while 4 (11.4%) had experience in psychiatry rooms but less perceived skills. Another 28 (77.8%) with no experience in psychiatry rooms had more perceived skills regarding the use of EHR, while 8 (22.2%) had neither the experience nor the perceived skills in the use of EHR in PHC facilities. These results were also insignificant, with a P value of 0.225.

4.3.4. Section IV: Nurses attitude regarding the use of EHR in PHC

Section IV of the questionnaire was made up of questions that investigated what the nurses attitudes were regarding the use of the EHR system in PHC.

As Table 4.11 shows, the majority of respondents 63 (88.7%) were in support of the idea that the use of computers in PHC is necessary. Sixty-two (87.3%) respondents agreed that the EHR system could improve documentation, while 7 (9.9%) were uncertain and 2 (2.8%) disagreed. Most of the respondents 61 (85.9%) agreed that the use of an EHR system could lead to or has led to neatness at the workplace, while 7 (9.9%) were uncertain about this, and 3 (4.2%) disagreed. This was followed by 55 (77.5%) who agreed that an EHR system would be more of a help than a hindrance

to care, while 12 (16.9%) were unsure about this, and 4 (5.6%) disagreed. Similarly, more than half of the respondents 55 (77.5%) also agreed that the use of an EHR system in time could lead to improved patient care, with 13 (18.3%) being uncertain and only 3 (4.2%) disagreeing.

Furthermore, a total of 50 (70.4%) respondents agreed that an EHR system could lead to or has led to a decreased workload of nursing staff and other personnel; 13 (18.3%) were not sure about this, and 8 (11.3%) disagreed. Although more than half of the respondents 48 (67.6%) agreed that an EHR system would lead to or has led to a decrease in healthcare costs, 19 (26.8%) were uncertain about this, and 4 (5.6%) disagreed. Regarding the use of EHR and maintaining patient privacy, a slight majority of the respondents 36 (50.7%) agreed that EHR could be more of a threat to privacy than paper records, while 15 (21.1%) were unsure about this, and 20 (28.2%) disagreed with the statement.

While continuing to look at the questions that related to the respondents' attitudes towards computer use and EHR 46 (64.8%) agreed that they were able to use EHR systems to store/retrieve and transfer data such as patient or drug information, while 23 (32.4%) were uncertain and 2 (2.8%) disagreed. A small proportion of the respondents 21, (29.6%) indicated that they have access to a computer when they need to document patient care or were unsure about this 8 (11.3%), while more than half of the respondents 42 (59.2%) disagreed that they had access to computers. A similar number 21 (29.6%) agreed that there are frequent problems with the computers, while the majority were uncertain 29 (40.8%) about this, or disagreed 21 (29.6%). A low response rate was noted where only a small fraction of the respondents indicated that all computers at the PHC centres have the same functionality 16 (22.5%), while a greater proportion were uncertain 26 (36.6%) or disagreed with this statement 29 (40.8%).

A very small proportion of the respondents 13 (18.3%) agreed that computer documentation of patient care will put some staff out of a job, while 28 (39.4%) were uncertain about this and 30 (42.3%) thought otherwise and disagreed with this statement. Similarly, a small number 12 (16.9%) agreed that listening to people who are using computer jargon intimidates others and 24 (33.8%) were uncertain, while half of the respondents 35 (49.3%) disagreed that the use of computer jargon by colleagues intimidates others. Table 4.11 indicates the responses of the nurses and their attitudes regarding the use of EHR system in PHC.

Table 4.11: Nurses attitude regarding the use of an EHR system in PHC

	Agree N (%)	Uncertain N (%)	Disagree N (%)
The use of computers in PHC is necessary	63 (88.7)	5 (7.0)	3 (4.2)
Do you agree EHR system could/has improved documentation?	62 (87.3)	7 (9.9)	2 (2.8)
Use of EHR system could lead to or has led to neatness at the workplace	61 (85.9)	7 (9.9)	3 (4.2)
EHR system would be more a help than a hindrance to care	55 (77.5)	12 (16.9)	4 (5.6)
The use of EHR system in time could lead/has led to improved patient care	55 (77.5)	13 (18.3)	3 (4.2)
EHR system could lead or has led to decreased workload of nursing staff	50 (70.4)	13 (18.3)	8 (11.3)
EHR system could lead to or has led to a decrease in healthcare costs	48 (67.6)	19 (26.8)	4 (5.6)
The use of EHR would be more of a threat to privacy than paper records	36 (50.7)	15 (21.1)	20 (28.2)
Able to use EHRs to store/retrieve and transfer data	46 (64.8)	23 (32.4)	2 (2.8)
Have access to a computer when I am in need to document patient care	21 (29.6)	8 (11.3)	42 (59.2)
Have frequent problems with the computers	21 (29.6)	29 (40.8)	21 (29.6)
All computers at this PHC have the same functionality	16 (22.5)	26 (36.6)	29 (40.8)
Computer documentation of patient care will put some staff out of a job	13 (18.3)	28 (39.4)	30 (42.3)
Listening to people using computer jargon intimidates others	12 (16.9)	24 (33.8)	35 (49.3)

4.3.4.1. Level of attitudes regarding the use of EHR in PHC

As stated in the methodology section, 14 items were used to assess the attitudes of nurses regarding the use of EHR in PHC facilities, where respondents either agreed (with a score of 1), indicated that they were uncertain (score of 2), or disagreed (score of 3. After grouping the 14 items into the three categories (agree, uncertain and disagree), a total score was calculated, with 0 considered as minimum and 14 as maximum total score. The percentage of the total score was also calculated, to determine whether respondents had a positive or negative attitude regarding the use of EHR. This study made use of 80% as the cut-off point to establish which percentage of the respondents had a positive or negative attitude. Respondents were rated as having a positive attitude when the total score was equal to or above 80%, or as having a negative attitude when the total score was less than 80%. Table 4.12 shows that the majority of the respondents 68 (95.8%) had a positive attitude, while 3 (4.2%) had a negative attitude regarding the use of EHR in PHC facilities.

Table 4.12: Respondents having positive and negative attitudes to EHR

	Frequency N	**Percentage %**
Negative attitude	3	4.2
Positive attitude	68	95.8
Total	71	100.0

4.3.4.2. Demographic characteristics and attitudes regarding the use of EHR in PHC

The Chi-square test was used to establish whether there is an association with demographic information, and the attitudes of respondents regarding the use of EHR at PHC centres.

With regard to the age of the respondents (Table 4.13), those aged 30-40 years were in the majority (26) and 100% of them had a positive attitude regarding the use of EHR in health care. In this case one presumes that they have worked for a couple of years, and have come across the use of EHR and understand the advantages of using EHR systems in PHC. This was followed by the 40-50-year age group in terms of numbers (28), but the percentage of those with a positive attitude had dropped to 89.3%. This indicates that the older the respondents are, the more mixed feelings they have about the use of computers and EHR in PHC settings, as this will mean that they have to go for training to acquire the necessary knowledge and skills. While those aged 50 years and above were in the minority (9), they all had a positive attitude (100%). These could be respondents in leadership positions, who have computers at their disposal and understand the advantages of using an EHR system in health care. Those aged 20-30 years were least in number (8), but again all (100%) had a completely positive attitude, as they understand the advantages of using an EHR system in health care and are also probably skilled in computer use. However, a P value of 0.186 showed that there was no significant association between the attitude and age of the respondents.

In terms of highest professional qualification obtained by the respondents, those with a Bachelor of Science in Nursing were in the majority (26), and all had a positive attitude regarding the use of EHR in health care. This 100% positive response could be due to the fact that most of these respondents were in the younger age groups, and hence have knowledge of the importance of EHR in health care, coupled with the necessary skills. In terms of numbers, those who had an advanced nursing qualification were second (23), and their positive response rate was also good (91.3%). This class of respondents involved academics with different post-

basic qualifications, and some were in leadership positions or worked in the specialty areas where they are exposed to the use of EHR; hence they also have knowledge of the benefits of using EHR as well the necessary skills. Those with enrolled/auxiliary nurses qualifications were in the minority (12), and also mostly showed a positive attitude (91.7%). They might not have computers at their convenience, but they do understand their benefits in health care. Lastly, those with a Diploma in Nursing Science were the least in numbers (10), but all (100%) were positive on the benefits of using EHR in health care. However, once again the P value was insignificant (0.358), indicating that no association existed between highest professional qualification attained by the respondents and their attitude regarding the use of EHR in PHC facilities.

Lastly, regarding years of working experience, those with 15 years and above were in the majority in terms of number (28), and most (92.9%) had a positive attitude regarding the use of EHR in PHC. This was followed by those with 5-10 years of experience (23), of whom 95.7% had a positive attitude. This group of respondents was closely followed by those with 1-5 years of experience (14), who all had a positive attitude, and lastly by those with 10-15 years of experience (6), again, all of whom had a positive attitude to the use of EHR. The 100% response rate of these groups could be linked to the fact that these are the younger respondents, who understand the benefits of EHR. However, the results did not show any association between years of working experience and the respondents' attitude regarding the use of EHR in PHC (P = 0.689). Table 4.13 shows the attitudes to EHR in relation to these demographic variables.

Table 4.13: Demographic characteristics and attitude regarding the use of EHR in PHC

		Attitudes, N (%) of the total score				P value
		Negative N (%)		Positive N (%)		
Age group (years)	30 – 40	0	0.0	26	100.0	0.186
	40 – 50	3	10.7	25	89.3	
	50+	0	0.0	9	100.0	
	20 – 30	0	0.0	8	100.0	
Highest professional qualification	Bachelor of Science in Nursing	0	0.0	26	100.0	0.358
	Advanced nursing qualification	2	8.7	21	91.3	
	Enrolled/Auxiliary nurse	1	8.3	11	91.7	
	Diploma in Nursing Science	0	0.0	10	100.0	
Years of working experience	15+	2	7.1	26	92.9	0.689
	5 - 10	1	4.3	22	95.7	
	1 - 5	0	0.0	14	100.0	
	10 - 15	0	0.0	6	100.0	

Chi-square test.*Significant at P<0.05

With regard to the areas of experience, most of the respondents (62) had worked in the paediatric rooms and most of these 59 (95.2%) also indicated that they had a positive attitude to the use of EHR in health care; 3 (4.8%) had experience in the paediatric rooms, but had a negative attitude to the use of EHR in health care. Nine of the respondents did not have

paediatric experience, but all of these had a positive attitude regarding the use of EHR in PHC. The P value of 0.500 indicates that there is no association between areas experience and the respondents' attitudes towards the use of EHR in PHC (Table 4.14).

Similarly, more than half of the respondents had experience in the adult consulting rooms, 57 (96.6%) and also had a positive attitude regarding the use of EHR; 2 (3.4%) had the experience but had a negative attitude to the use of EHR in PHC. Twelve respondents did not have experience in adult consulting rooms, but most of these 11, (91.7%) had a positive attitude regarding the use of EHR, with only 1 (8.3%) having a negative attitude. The P value of 0.438 indicates that experience in adult consulting rooms did not affect the respondents' attitudes regarding the use of EHR in PHC.

The majority of the respondents 57 (96.6%) had experience in the management of HIV or had worked in the HIV consulting rooms in PHC facilities, and also had a positive attitude, while 2 (3.4%) had the experience but had a negative attitude with regard to the use of EHR. Eleven (91.7%) respondents had no experience in this area but had a positive attitude, as opposed to 1 (8.3%) who did not have the experience and also had a negative attitude regarding the use of EHR. No significant association was noted (P = 0.438).

Furthermore, 57 (96.6%) respondents had experience in the family-planning room and also had a positive attitude with regard to the use of EHR in health care, with a few 2, (3.4%) having such experience but a negative attitude. Similarly, 11 (91.7%) had no experience in family-planning rooms, but still had a positive attitude with regard to EHR in PHC, while only 1 (8.3%) had no experience and a negative attitude. An insignificant association (P = 0.385) was recorded.

Another area in which most of the respondents had experience or had worked was the TB rooms. Here respondents were exposed to the use of computers (as was the case in the paediatric rooms), which is a positive factor as it indicates the use of EHR for tracking of

patients' adherence to medications, cases of drug resistance or missed treatment, and proper capturing of statistics for the DoH. Table 4.14 shows that 55 (94.8%) of the respondents who had experience in the TB rooms had a positive attitude, while only 3 (5.2%) had the experience but had a negative attitude to the use of EHR in PHC. The few respondents (13) who had no experience in the TB rooms all had a positive attitude with regard to the use of EHR in PHC. However, no significant association was noted (P = 0.402).

Of respondents with experience in emergency or trauma rooms, 52 (96.3%) had a positive attitude with regard to the use of EHR in health care, while 2 (3.7%) had a negative attitude. Of those with no experience in this area, 16 (94.1%) also had a positive attitude with regard to the use of EHR, while 1 (5.9%) had a negative attitude. No significant association was noted (P = 0.697).

Most of the respondents had experience in the antenatal rooms and also indicated that they have a positive attitude with regard to the use of EHR 50 (96.2%), while 2 (3.8%) with experience in this area had a negative attitude regarding the use of EHR in PHC facilities. While 18 respondents (94.7%) had no experience in the antenatal rooms, they had a positive attitude with regard to the use of EHR; 1 (5.3%) had no experience in the antenatal rooms, as well as a negative attitude regarding the use of EHR in PHC. The P value of 0.793 indicates an insignificant relationship between the respondents' experience in antenatal rooms and their attitudes regarding the use of EHR in PHC facilities.

Of the respondents, 38 (95.0%) had experience in the labour/delivery rooms as well as a positive attitude with regard to the use of EHR, while 2 (5%) had such experience but a negative attitude to the use of EHR in health care. A significant number 30 (96.8%) did not have labour room experience but had a positive attitude to EHR, while 1 (3.2%) had no experience and a negative attitude regarding the use of EHR in PHC. No significant association was noted (P = 0.712).

More than half (36) of the respondents had experience in the neonatal rooms, and all of these had a positive attitude with regard to the use of EHR. A significant number of respondents 32 (91.4%) had no experience in the neonatal rooms but a positive attitude, while 3 (8.6%) had a negative attitude as well as no experience. These results were not significant (P = 0.073).

Lastly, less than half (35) had experience in the psychiatry rooms, and all of these respondents had a positive attitude regarding EHR. Although 33 (91.7%) had no experience in the psychiatry rooms, they had a positive attitude regarding the use of EHR, while 3 (8.3%) had a negative attitude and no experience in this area. The results were also insignificant, with a P =0.081.

Table 4.14: Area of experience and attitude regarding the use of EHR

Areas of experience			Negative attitude	Positive attitude	P value
Paediatric rooms	Yes	n	3	59	0.500
		%	4.8	95.2	
	No	n	0	9	
		%	0.0	100.0	
Adult consulting rooms	Yes	n	2	57	0.438
		%	3.4	96.6	
	No	n	1	11	
		%	8.3	91.7	
HIV rooms	Yes	n	2	57	0.438
		%	3.4	96.6	
	No	n	1	11	
		%	8.3	91.7	
Family-planning rooms	Yes	n	2	57	0.438
		%	3.4	96.6	
	No	n	1	11	
		%	8.3	91.7	
TB rooms	Yes	n	3	55	0.402
		%	5.2	94.8	
	No	n	0	13	
		%	0.0	100.0	
Emergency/trauma rooms	Yes	n	2	52	0.697
		%	3.7	96.3	
	No	n	1	16	
		%	5.9	94.1	
Antenatal rooms	Yes	n	2	50	0.793
		%	3.8	96.2	
	No	n	1	18	
		%	5.3	94.7	
Labour/delivery rooms	Yes	n	2	38	0.712
		%	5.0	95.0	
	No	n	1	30	
		%	3.2	96.8	
Neonatal rooms	Yes	n	0	36	0.073
		%	0.0	100.0	
	No	n	3	32	
		%	8.6	91.4	
Psychiatric rooms	Yes	n	0	35	0.081
		%	0.0	100.0	
	No	n	3	33	
		%	8.3	91.7	

4.4. Summary of chapter

This chapter describes the findings of the study, based on the research objectives. The majority of respondents 66 (93%) were found to have more knowledge regarding the use of EHR in PHC (Table 4.3), although there was no significant relationship between demographic characteristics (age, years of experience, qualifications) and such knowledge (see Table 4.5). However, Table 4.6 indicates that there is a positive, significant relationship between paediatric care experience and knowledge on the use of EHR in PHC (P = 0.001). Similarly, the results were significant (P = 0.019) for neonatal experience, indicating an association between respondents' experience in the neonatal rooms and level of knowledge regarding the use of EHR in health care.

As noted in Table 4.8, the majority of the respondents 59 (83.1%) had more perceived skills regarding the use of EHR in PHC. Of note is the fact that the highest professional qualification had a significant association (0.028) with perceived skills in the use of EHR in PHC. With regard to areas of experience too, the P value of 0.001 indicated a positive, significant relationship with experience in paediatric care and the respondents' perceived skills in the use of EHR in PHC.

As presented in Table 11, most of the respondents 68 (95.8%) had a positive attitude regarding the use of EHR in PHC facilities.

Chapter Five will focus on discussing the above results in comparison to the findings of other recent literature regarding the use of EHR in health care.

CHAPTER FIVE

Discussion of findings

5.1. Introduction

This chapter discusses the results presented in Chapter Four, in relation to the study objectives, which were to find out the knowledge, perceived skills and attitude of nurses towards the use of EHR in PHC facilities. In section I of this chapter the sociodemographic information will be discussed, section II provides discussion of the findings regarding nurses knowledge on the use of EHR in PHC, while section III looks at the level of perceived skills and, lastly, section IV considers nurses attitudes towards the use of EHR in PHC. In the course of discussing the three main objectives under the various sections, the outcome of the analysis in Chapter Four, which looked at the relationship between the sociodemographic characteristics (age, years of experience, qualifications, areas of experience) and the knowledge, perceived skills, and attitude of the respondents regarding the use of EHR in PHC facilities, will be elaborated upon.

5.2. Section I: Sociodemographic information

As shown in Table 4.1 in Chapter Four, the majority of respondents were 40-50 years of age, followed by those aged 30-40 years. The current findings show that there is a need to recruit sufficient numbers of young nurses to the nursing population working in PHC facilities. Those aged 50 years and above were in the minority of the population, with the fewest respondents between the ages of 20 and 30 years.

Table 4.1 also showed that the majority of the respondents had more than 15 years' experience in the nursing profession, closely followed by those with 5-10 years' experience. This should be of advantage regarding knowledge, perceived skills and attitudes regarding the use of EHR in PHC, since these nurses would have the necessary experience to work in PHC as well as a sufficient time span of experience during which they could have upgraded their qualifications.

However, this also shows a lack of management in terms of the recruitment of health workers, especially in the nursing profession, due to the fact that years of work experience goes together with greater age, and hence many approaching retirement. This is evident in the age structure of the respondents in this study, where most were 40-50 years of age, followed by those between the ages of 30 and 40 years. Sukums et al., (2014) found that years of experience were inversely correlated with computer knowledge, as respondents with 5 or less years of experience more often reported having basic computer knowledge. This fits in with today's younger generations, who have enormous exposure to computers and modern technology. In our study the fewest respondents fell within the 10-15 years of experience brackets in terms of years of experience as opposed to the study by Sukum, et al., (2014), where a greater number of respondents (67.4%) had 11 or more years of professional experience and were computer illiterate. Years of experience go hand in hand with age; hence, the introduction of EHR will not be an issue, as these nurses have worked in different areas of health care, some of which are already using the EHR, and therefore they have knowledge and skills on the use of EHR and its necessity in PHC.

At the PHC facilities under investigation, most of the nurses had a 4-year degree (Bachelor of Science in Nursing) to qualify in general nursing, midwifery and psychiatric nursing. Nurses in this category have been exposed to research studies, which imply that they have at least basic knowledge or some perceived skills in the use computers; hence, with the introduction of EHR, they might not be negative towards its adoption or have to attend many training workshops. The results of this study are in line with those of a study that investigated the moderating effects of demographic and individual characteristics on nurses acceptance of information systems such as EHR, where most respondents 91(46.2%) had a bachelor's degree in nursing (Infinedo, 2016). Also, in the study by Kahouei, Zadeh and Roghani (2015), most respondents' (294, 93%) were nurses with a bachelor's degree, who indicated that they were able to use the EHR at their facility.

Those with advanced nursing qualifications were the second highest category in the study population, indicating more experienced nurses working at the PHC centres, who are expected to have more knowledge, perceived skills and a positive attitude regarding the use of EHR in PHC. Enrolled/auxiliary nurses numbered more than those with Diplomas in Nursing Science, who were in the minority. This contrasted with the study by Infinedo, (2016), where 77 (39.1%) were nurses with diplomas.

It is very important for nurses to have experience in the different departments or rooms at the PHC facilities. Table 4.2 in Chapter Four it indicates that a greater proportion of the nurses had experience in most of the areas or consulting rooms in the PHC centres. In terms of area of experience, most of the respondents had experience in paediatric care, which is one of the areas where a computer is available for electronic recording of health information, to enable tracking of growth, immunization, and the outbreak of infectious diseases. Hence nurses working in this area are exposed to computers and electronic recording on a daily basis, and their knowledge, perceived skills and attitude towards the use of EHR should be better than those who have not been exposed to paediatric care.

A constant proportion of the respondents (closer to 60%) had experience in handling family-planning-related issues, adult care or consultations, HIV treatment and management protocols, and TB management and follow-ups procedure. These areas of care are similar to paediatric care, in that nurses are exposed to computers for checking patient results, or for tracking adherence to medications, and cases of drug resistance or missed treatment, and proper capturing of statistics on how many patients are seen a day by each nurse on behalf of the DoH. According to O'Malley, Draper, Gourevitch, Cross and Scholle (2015), EHR were found to enable delegation of tasks and facilitate communication in primary care teams using task management software and instant messaging, and were able to create evidence-based templates

for symptom-specific data. Exposure to these areas of care is a positive factor, as it indicates the use of computers and EHR by these nurses.

More than three-quarters of the respondents reported having worked in the trauma or emergency rooms, while slightly more than half had antenatal care experience, which was similar to the number that had labour room experience.

A slightly lower number of nurses had experience in neonatal care; however, nurses working in this area work hand in hand with those in paediatric care, and therefore have access to computers for statistical purposes. Lastly, the lowest number of nurses worked with psychiatric departments, and was not exposed to computers on a regular basis.

5.3. Section II: Nurses knowledge regarding the use of EHR in PHC facilities

Overall, 66 (93%) of the nurses in this study had more knowledge with regard to the use of computers and EHR in PHC. To support the above finding that majority of the study population was considered to have more knowledge, most of the respondents indicated that the use of EHR is necessary in PHC, knew how to log in and out of a computer. The respondents in their majority also indicated that confidentiality with regards to the use of EHR was very important.

This result was contrary to Alwan, Awoke & Tilahun (2015) who investigated using a survey on the knowledge and utilization of computers among health professionals. The findings of this study show that computer knowledge (3.4%) and utilization (18.4%) was low for public health professionals who work in the primary health care centres. Similar contrary results were recorded in the survey studies according to Biruk, Yilma, Andualem & Tilahun (2014) Sukums and Mensah, Mpembeni, Kaltschmidt, Haefeli & Blank (2014).

With regards to knowledge regarding the benefit of using an EHR in health care, nearly all of the respondents agreed the use of computer cannot replace the role of nurses as it is only a tool

to provide better nursing and promoting health care running efficiency Majority of the respondents also agreed that the computer could be used to carry out nursing functions such as staffing, scheduling and quality control although this will not be possible if effort is not being put into learning how to use the computers.

A contributing factor as to why most of the respondents had knowledge on the use of computers and the benefits of using EHR in health care could be the fact that most of the respondents had indicated that they had experiences in paediatric care, and TB/HIV consulting rooms, where there is regular use of computers and EHR for patient health information.

In O'Mahony et al.,(2014) qualitative study, the respondents shared a similar view, as the nurses knew about EHR and clearly expressed the potential benefits of an EHR, such as fewer errors, more complete records, easier reporting, faster work, preventing loss of data, access to information and knowledge, ensuring confidentiality, reducing health care costs, and promoting continuity of care. They perceived that an EHR system would resolve the challenges identified in the use of paper-based record systems, some of which included duplication of data, misfiling, excessive time for recording, lack of a chronological patient record, and reduced time for patient care.

5.3.1. Association between age group, years of working experiences and nurses knowledge regarding the use of EHR in PHC

With reference to Table 4.5 in Chapter Four, the age of the respondents was analyzed indicating that most were in the older age group (40-50 years), followed by those aged 30-40 years, and those aged 50 years and above,; this is as opposed to the smaller number of respondents in the younger age group of 20-30 years, who are presumed to be more computer literate than the older respondents. However, the P value (P=0.597) indicated that there was no significant

association between age group and the respondents' knowledge regarding the use of EHR systems in PHC. This result was similar to Alwan, Awoke & Tilahun (2015), who stated "respondents who were younger (age 25-35) were approximately 3 times more likely to use computers than respondents aged 36 years and older".

Most of the respondents had more than 5 years' experience and also knowledge with regards to the use of EHR in health care. Those with in the 5-10years bracket were 26 respondents and their knowledge score was (91.3%) while those within the 10-15 years were 21 in number with a knowledge score of 83.3% and lastly those with 15years and above 5 respondents with 92.9% knowledge with regard to the use of EHR. Those with less than 5 years of experience were 14 in total but had a100% with regards to knowledge on the use of EHR in PHC. Hence this indicates that age is neither directly nor inversely correlated to computer literacy as those with below or above five years of experience had knowledge with regards to the use of EHR computers in health care. This was could be seen with the P value of 0.571 indicating that there was no significant association between years of experience and the respondents' knowledge regarding the use of EHR systems in PHC.

This result is different from that of Sukums et al., (2014), where respondents with 11 or more years of professional experience (67.4%) were computer illiterate, and respondents with 5 years or less, that is, younger people, more often reported basic computer knowledge in EHR. According to Sukums et al., (2014), computer literacy and years of experience were inversely correlated with the nurses knowledge on the use of computers for electronic recording of maternal and child health ($p<0.01$)

With regard to the association of educational level and knowledge of EHR, the P value was 0.309%., which indicates no significant association, was noted between the highest levels of qualification and knowledge regarding the use of EHR. Those with a Bachelor of Science in nursing were 24 with a 92.3% knowledge score, followed by those with advanced nursing

qualifications 23 respondents and a100.0% knowledge score. Nurse managers or assistant managers (2nd or 3rd in command) and those working in the TB/HIV and child immunization programs were among this category of respondents who are exposed to computer use on a daily basis; hence the need to be knowledgeable on computer use and EHR becomes paramount. Respondents having diploma in nursing science were 9 in total with a score of 90.0% while enrolled/auxiliary nurses were 10 with 83.3% knowledge score.

This was different to the findings of Sukums et al., (2014), where a significant association was noted between level of education and the use of computers and EHR among the respondents as indicated with a P value of 0.01.

With regard to their areas of experience, most respondents reported having experience in paediatric and neonatal care areas, have more knowledge with regard to the use of EHR in health care. The Chi-square test findings show that there is a significant relationship between working areas and knowledge on the use of EHR in PHC. This is probably due to the fact that nurses working with paediatric and neonatal care clinics are exposed to the use of computers and electronic recording of health information. A similar study by Kim, Rivera, Persing, Bundy, Psoter, Ghazarian, Miller and Solomon (2017) identified that the adoption of EHR improves the efficiency and quality of childhood immunization through EHR-based clinical alert systems, leading to increased paediatric immunization rates.

5.4. Section III: Perceived skills of nurses regarding the use of EHR in PHC

With regard to perceived skills, 83% of the respondents reported having more EHR skills. Based on the findings of this study most of the respondents had experience in different areas such as neonatal care, paediatric care, and TB/HIV management, where they are or have been exposed to the use of computers and EHR systems. Mugomeri et al., (2016) had a completely different result, as the majority 177 (61%) of nurses in Lesotho were found to have inadequate computer skills. This was attributed to the many years having passed since the nurses obtained their latest qualification, and lack of exposure to computers; hence such factors should be considered during the planning of training curricula for nurses (Mugomeri et al., 2016).

Although the results of this study indicate that majority (83%) of the respondents had skills with regards to the use of EHR in health care, ongoing training cannot be ignored as it will be necessary for sustainability of the use of EHR in health care as technology constantly evolves. Similarly, Kahouei et al., (2015), also anticipated that use of EHR should not be a problem at the PHC facilities, although ongoing training was pivotal for the successful implementation and sustainability of an EHR system although most of the respondents in the study had some prerequisite skills or some degree of experience in information literacy and the use of computers in health care (Kahouei et al., 2015).

According to Sadoughi, Azadi and Azadi (2017), who investigated information seeking and retrieval skills of nurses, computer skills are essential for the storage and retrieval of patient health information and also to treat the patient based on best evidence-based practice. However, the results of their study seem to indicate that nurses have inadequate skills when it comes to searching the internet for evidence-based practice, or to search online databases for information and its retrieval (Sadoughi et al., 2017), which was in line with the findings of this study.

Contrary to the results of this current study which indicated that nurses have skills with regards to EHR use in health care, Mugomeri et al., (2016), did an assessment of computer literacy of nurses in Lesotho and the results indicated the respondents had inadequate skills as they stated factors such as finding hyperlinks on Web pages, use of advanced search parameters, and downloading new software, proved to be challenging to the highest proportions of nurses.

With regard to the demographic information (highest professional qualification) and perceived skills, the results indicated a positive relationship (P=0.028). This is an indication that strategies need to be put in place for training of nurses working at the PHC facilities, to enhance their skills on computers in general before implementation of an EHR system at the facilities or providing them with computers.

5.4.1. Association between age group, years of experience and nurses perceived skills regarding the use of EHR in PHC

In this study most of the respondents (83%) had more perceived skills regarding the use of an EHR system in health care. However, sociodemographic characteristics such as age (P = 0.102), and years of working experience (P = 0.221) had no significant relationship between respondents perceived skills and their age or years of working experience regarding the use of EHR in PHC respectively. This finding is in contrast with those of Mugomeri et al., (2016), where age (P = .001) and years of work experience (P < .001) were significantly associated with inadequate computer skills.

However, highest professional qualification attained was seen to be significantly associated with more perceived skills of the respondents (P = 0.028). This could be explained by the fact that most respondents were nurses with degrees, or with advanced diplomas, these same categories of nurses were also in management positions or working in specialty areas such as TB/HIV, and they have access to computers for the electronic recording of patient information

or capturing of statistics for the DoH. Mugomeri et al., (2016) found that inadequate computer skills of nurses (61%) in Lesotho were significantly associated with their lack of exposure to computers. Hence it was emphasized that this factor should be considered during the planning of a training curriculum for nurses (Mugomeri et al., 2016).

With regard to the areas of experience, more than three-quarters of the respondents had worked in the paediatric rooms, and also indicated that they had more perceived skills in the use of EHR in health care (P = 0.001). The results indicate that having experience in this area of care was a contributing factor as to why these respondents had high perceived skills in the use of EHR in PHC. This is probably due to the fact that respondents with paediatric care are exposed to the use of computers and electronic recording of health information where, according to Kim et al., (2017), the adoption of EHR improves the efficiency and quality of childhood immunization through EHR-based clinical alert systems, leading to increased paediatric immunization rates. Hence nurses working in such areas are exposed to computers on a daily basis.

5.5. Section IV: Attitudes regarding the use of EHR in PHC

Most respondents 68 (95.8%) had a positive attitude regarding the use of EHR in PHC. This was similar to the results of a study investigating attitudes of nursing staff to computerization, which were found to be positive regarding the use of computers and EHR in health care, with those who were users of computers having a more positive attitude (mean 74.56) than those who were non-users (mean 69.86) (Kipturgo et al., 2014). According to Sukums et al., (2014), primary health workers had little computer knowledge, yet they had positive attitudes and expressed willingness to adopt the technology. Likewise, in this study, were the majority of

the health care workers (95.3%) had a positive attitude towards EHR in healthcare, and stated that EHR could potentially improve patient care and simplify their work.

However, there were certain questions that the respondents disagreed on although this did not have much impact on the attitude of the respondents regarding the use of EHR in PHC, as only 3 (4.3%) had a negative attitude. Most respondents 42, (59.2%) had indicated that they do not have access to a computer when they need one to document patient care. This is inconsistent with the results of a study that investigated the readiness of healthcare providers for EHR in PHC centres in Lebanon, where most 50, (87.7%) of the healthcare providers included in the study indicated that they have access to computers at their respective PHC centers Saleh et al., (2016). However, the finding was important, as this indicated that lack of access to computers by nurses acts as a major barrier to the adoption of EHR in their workplace (Saleh et al., 2016). This therefore poses a challenge that needs to be addressed for the effective implementation and use of EHR in PHC facilities.

In this study the positive attitudes were clear, as the majority of the respondents were in support of the idea that the use of computers at PHC facilities is necessary, although a very small number of respondents agreed that electronic documentation of patient care will put some staff out of jobs. In the study by Kipturgo et al., (2014), different groups of respondents had varying responses: the non-users disagreed had a significantly higher attitude score compared to the users ($p = 0.0274$), while the users of EHR in health care agreed that the use of EHR in health care could put some staff out of their jobs. Most of the respondents agreed that an EHR system would improve documentation. This was similar to the finding of Kipturgo et al., (2014) that a larger proportion of respondents (43.5%/47.7%) indicated that electronic documentation saves recording steps and allows nursing staff to become more efficient in completing documentation regarding patients' health. Based on the results of this study, more than 70% of the respondents agreed that an EHR system could be more of a help than a hindrance to care.

More than half of the respondents agreed that the timeous use of an EHR system could lead to improved patient care. This was similar to the results of the study by Kipturgo et al., (2014), where both non-users (49.7%) and users (40.9%) of EHR in health care agreed that computerization of nursing data offers nurses a remarkable opportunity to improve patient care. This was supported by the view that increased EHR use will allow nurses more time to give patient care (45.3% and 37.8%, respectively).

Furthermore, the majority of respondents also agreed that an EHR system could lead to a decreased workload for nursing staff and other personnel. This contrasts with the findings of Kahouei et al, (2015), who evaluated the compatibility of an electronic patient record system with nurses management needs. 10.6% totally agreed with the effect of EPR on the head nurses and supervisors' duties such as planning and organization. The results showed that only 10.6% of the respondents totally agreed the use of an electronic information system did help nursing personnel to plan and organize nursing staff activities; this was due to the incomplete registering of patient information, which meant that the nurses had to get more information in order to accomplish their task. Therefore, to ensure proper implementation it is important for nursing personnel to participate in the strategy process (Kahouei et al., 2015).

In this study, about 48 (67.6%) of the respondents agreed that an EHR system could lead to a decrease in healthcare costs. However, in the study by Kahouei et al., (2015), less than half of the respondents (43.5%) agreed that the use of an EHR led to reduced costs. Different results were also noted by Kipturgo et al., (2014), where both respondent groups(KNH 34.4% ,33.8% and AKUH 34.1%, 2.3%) strongly disagreed or disagreed that the costs of health care are likely to increase because of EHR use at a facility, and also disagreed that the use of EHR increases costs of health care by increasing nurses workload.

With regard to the use of EHR and maintaining patient privacy, a slight majority of respondents agreed that EHR would not be more of a threat to privacy than paper records. In the study by

Kipturgo et al., (2014), while the non-users (KNH 33.3%, 29.3%) disagreed, the group of users (AKUH 32.4%, 27%) strongly agreed or agreed that confidentiality will be sacrificed by making patient records electronic.

5.5.1. Association between age group, years of working experience and nurses attitudes regarding use of EHR systems in PHC

In this study the majority of the respondents (95.8%) had a positive attitude regarding the use of an EHR system in health care. However, sociodemographic characteristics such as age and years of working experience were not seen as contributing factors in why the respondents had a positive attitude regarding the use of her. The Chi-square test has shown that there is no significant association between the attitude and age of the respondents (P = 0.186). On the contrary, Kipturgo et al., (2014) found a significant association (p = 0.039) between age and attitudes towards electronic recording of patient information in health care. It was found that nurses aged 40 years and below responded positive to most of the questions hence a high attitude scores than those aged 40 and above (Kipturgo et al., 2014).

With regard to highest professional qualification and the attitude of the respondents, the P value was again insignificant (P = 0.358), indicating that no association existed between highest professional qualification attained by the respondents and their attitude regarding the use of EHR in PHC. Abu Raddaha et al., (2017) observed a significant negative correlation between having a high positive attitude towards the EHR system and increasing level of academic nursing education (rho = 0.194, p = 0.01). The correlation analysis showed that the higher the academic levels among nurses, the lower the positive attitude towards the EHR system. This finding was puzzling, as one would expect nurses with higher qualifications and knowledge to perceive more clinical benefits regarding the use of an EHR system in health care. In addition, the correlation analysis also indicated that nurses with higher levels of education were older, which possibly implies that nurses with higher levels of education may be more resistant to the

EHR system as they are closer to retirement and not ready to learn new things. Therefore, future qualitative studies are encouraged because they would recognize and provide the opportunity for a deeper appreciation of different human perceptions and opinions (Abu Raddaha et al., 2017).

In terms of working experience and the respondents' attitudes regarding the use of EHR in PHC, the results did not show any association (P = 0.689). According to Infinedo (2016), years of experience and age have no or little bearing on the development of nurses attitudes towards implementing EHR systems in health care.

5.6. Chapter summary

This chapter concludes that an outstanding majority of the respondents have more knowledge regarding the use of EHR in PHC, although no significant relationship was recorded in terms of an association between demographic characteristics (age, years of experience, qualifications). The exception was regarding areas of experience, where paediatric care and neonatal experience were found to have a significant relationship with the knowledge of the respondents regarding the use of EHR in PHC.

Similarly, the majority of the respondents had perceived skills regarding the use of EHR in PHC. To be noted is the fact that highest professional qualification had a significant association with regard to the use of EHR in PHC, as well as areas of experience, with a positive, significant relationship recorded with respondents who had paediatric care experience and perceived skills.

Finally, the majority of the nurses had a positive attitude with regard to the use of EHR in PHC, although no significant association was noted in terms of to the respondents' age, years of experience, highest professional qualification and areas of experience and the positive attitude. Most of the respondents indicated that the use of EHR was necessary in PHC, although most of the respondents do not have a computer at their disposal. Hence in order to increase the

adoption and use of EHR, nurses should be provided with computers for day-to-day use and computer skills training.

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Chapter Six

Conclusion, recommendations and implications

6.1. Introduction

The preceding chapters presented the background to the study, study objectives, and literature reviewed, as well as the methodology and data analysis used to address the objectives of the study. The quantitative data collected were analysed and findings were presented, and these were discussed, framed by the literature that was reviewed.

This chapter presents a summary of the key findings, and the implications and recommendations of the study. The study aimed at investigating the use of EHR in PHC, based on the he following objectives: (1) to describe nurses knowledge on the use of EHR; (2) to describe nurses perceived skills on the use of EHR; and (3) to describe nurses attitudes towards the use of EHR. Demographic characteristics (age, years of experience, qualifications, and areas of experience) were used to determine the association between knowledge, perceived skills and attitudes towards the use of EHR in PHC.

6.2. Key findings

The key findings to this study were analyzed in Chapter Four and discussed in Chapter Five. These findings will be outlined below and the major findings will be stated and reiterated.

6.2.1. Objective 1: Nurses knowledge regarding the use of EHR in PHC

One of the primary aims of this study was to investigate the knowledge of nurses at selected PHC facilities in the Western Cape. The percentage of the total score was calculated. A score of 80% was used as a cut-off point to indicate whether the nurses had more knowledge or less knowledge regarding the use of EHR in health care It was found that the majority 66 (93%) of the nurses had more knowledge with regard to the use of computers and EHR in PHC. In

support of the above view that majority of the study population was considered to have more knowledge, most of the respondents indicated that the use of EHR is necessary in PHC, with more than half indicating that they know what EHR systems are. Another contributing factor was the fact that most of the respondents indicated that they have experiences in paediatric care, and TB/HIV consulting rooms, where the use of computers and EHR of patient health information takes place on a regular basis.

6.2.2. Objective 2: Nurses perceived skills regarding the use of EHR

As discussed in Chapter Five, with regard to perceived skills, score of 80% was used as a cut-off point to indicate whether the nurses had more perceived skills or less perceived skills regarding the use of EHR hence 59 (83%) of the respondents perceived that they had more EHR skills, despite the fact that very few computers are available at the facilities. A contributing factor was the fact that the majority of the nurses have experience in different areas such as neonatal care, paediatric care, and TB/HIV management, where they are or have been exposed to the use of computers and EHR systems.

6.2.3. Objective 3: Nurses attitude regarding the use of EHR in PHC

Regarding the third objective, to describe nurses attitudes regarding the use of EHR in PHC, a score of 80% was used as a cut-off point to indicate whether the nurses had a positive or negative attitude. The majority of the respondents 68 (95.8%) had a positive attitude regarding the use of EHR in PHC. In this study the positive attitude was supported by the fact that respondents agreed that the use of computers is necessary at PHC facilities. The respondents also agreed that in time the use of EHR could lead to improved patient care, a decreased workload for nursing staff, and a decrease in healthcare costs.

6.2.4. Association between age group, years of working experiences and nurses knowledge, perceived skills, and attitudes regarding the use of EHR in PHC

In terms of association between the selected variables (age, years of work experience, educational qualifications, areas of experience) and nurses knowledge, perceived skills and attitudes regarding the use of EHR, all of the variables were significant to the study.

With regard to knowledge and the demographic characteristics of the respondents, the findings show no significant relationship between the knowledge of electronic record-keeping and demographic characteristics of the respondents. This is with the exception of areas of experience, where paediatric care and neonatal experience had a significant relationship with the knowledge of the respondents regarding the use of EHR in PHC facilities.

Similarly, a significant relationship was observed between the nurses perceived skills and the level of educational qualification (P=0.028). This therefore indicated that the more qualified the nurses, the more perceived skills they have regarding the use of EHR.

Although the majority of the respondents (95.3%) had a positive attitude regarding the use of EHR, sociodemographic characteristics such as age, level of qualification, and years of working experience were not seen as contributing factors, as there was no significant association observed between these variables and the nurses attitudes regarding the use of EHR in PHC.

6.3. Limitations of the study

Describing the limitations of the study from the researcher's perspective aims to highlight possible weaknesses that could have had an impact on the study. In this study, the PHC facilities that were selected in the Western Cape only comprised those that fall under the Tygerberg-Northern substructure, which therefore limits the representativeness of the study to the general population of nurses in Cape Town. In addition the sample size was small,

therefore, the findings cannot be generalised to other nursing populations and cannot really influenced nursing policies hence a recommendation for a similar study and a larger sample size.

Another limitation to add to your limitation section is that nurses who felt less interested in EHR or who felt less comfortable with the use of computers might have been the ones who did not participate in the study – thus reporting bias might have occurred.

6.4. Recommendations to improve the knowledge, perceived skills and attitudes of nurses regarding the use of EHR in PHC facilities (Implication for nursing practice)

1. The City of Cape Town management in general should develop continuous professional development programs for health professionals on EHR systems in PHC.

2. Although the majority of the respondents had more perceived skills, a small proportion had less perceived skills, and this can be a concern as skills are critical in the successful use of any EHR system. Therefore, the necessary measures should be put in place to increase the nurses utilization of EHR. Increasing accessibility of computers in all PHC facilities and proving the ongoing computer skill training enhance their skills on computers and the use of an EHR system at the facilities.

3. The findings of the study suggest that although the nurses had knowledge, perceived skills and a positive attitude, practical training courses on computer use and applications should be implemented to ensure successful implementation and use of an EHR system in PHC facilities.

6.5. Implications for nursing policy, research and nursing education

It is recommended that a larger-scale study to be conducted to influence decision making and policy formulation on the use of EHR in health care. Firstly, research needs to be conducted

around nursing informatics competencies in South Africa, and also into investigating a framework for including Nursing Informatics into the new nursing curricula.

Further qualitative research also needs to be conducted to gain a deeper understanding of some of the challenges and barriers that affect nurses knowledge, perceived skills and attitudes towards the use of EHR in PHC facilities.

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APPENDICES

Appendice B: Data collection tool

Section A. Socio- demographic information

1. Indicate your age (thick the correct answer)

	Response
10-20 years	
20-30 years	
31-40 years	
41-50 years	
50+	

2. Indicate your gender (thick the correct answer)

	Response
Female	
Male	

3. Indicate marital status

	Response
Married	
Unmarried	

4. Indicate your race

	Response
Black	
White	
Colored	
Indian	

5. Indicate your highest professional qualification? (Thick the correct answer)

	Response
Advanced nursing professional qualification	
Bachelor of Science in nursing (Four years training).	
Diploma in nursing science (three years Training)	
Diploma in Midwifery (one year training)	
Enrolled/Auxilliary nursing qualification	

6. Indicate how many years of experience you have working as a nurse (thick the correct answer)

	Response
1-5 years	
6-10 years	
11-15 years	
More than 15 years	

7. Indicate where you have experience in the following

	Yes	**No**
Adult consulting rooms		
HIV rooms		
Pediatric rooms		
Emergency/trauma rooms		
Psychiatric rooms		
Antenatal rooms		
TB rooms		
Family planning rooms		
Labor/delivery rooms		
Neonatal rooms		

Section B. Questions related to the knowledge of nurses towards EHR.

With the use of an (X), where appropriate answer the following questions

	Agree (A)	**Uncertain (N)**	**Disagree (D)**
Know that EHR in primary health care is necessary			
Know the importance of confidentiality			
Know the basic usage of a computer (login/logout) a computer.			
Know that the computer is only a tool to provide better nursing care. It cannot replace the role of nurses'.			
Know EHR are useful tools in promoting hospital-running efficiency.			
Know that the computer can be used as a tool for staffing, scheduling, quality control.			
Know that the computer will not be a powerful nursing tool until users put efforts into learning how to use it.			
Know what a computer program is			
know how to manage and store files			
Know about the design of the computer screen, location of computer devices			
Know there is simulation software for continuing education and training.			
Know where to find resources to resolve computer problems			
Know there are video discs for nurses' continuing education, patients' health education, etc.			
Know about applications of computer networks and telecommunications in nursing.			
Know what EHR is in general.			

Section C. Questions related to skills of nurses towards the use of electronic health records. With the use of an (X) where appropriate answer the following questions

	Agree(A)	Uncertain(UN)	Disagree(D)
Be able to send/receive mails			
Be able to use the world wide web (www).			
Be able to use word processing software			
Be able to use computers as self-learning tools			
Be able to use a library information retrieval system			
Be able to use computerized equipment			
Be able to use presentation editing software (MS)			
Be able to use EHR in nursing information systems			
Be able to use EHR to do nursing work			
Be able to use EHR to store/retrieve.			
Be able to maintain nursing information systems.			
Be able to design a flowchart			
Be able to use database software			
Be able to convert files for different application			
Be able to use statistical software			
Be able to create multimedia files for web pages			
Be able to resolve common computer error.			
Be able to assemble basic components of computer			

Section D: Questions related to nurses attitudes towards electronic health records. With the use of an (X) answer the following question.

	Agree (A)	Uncertain (UN)	Disagree (A)
The use of computers in PHC is necessary			
Do you agree EHR system could/has improved documentation?			
Use of EHR system could lead to or has led to neatness at the workplace			
EHR system would be more a help than a hindrance to care			
The use of EHR system in time could lead/has led to improved patient care			
EHR system could lead or has led to decreased workload of nursing staff			
EHR system could lead to or has led to a decrease in healthcare costs			
The use of EHR would be more of a threat to privacy than paper records			
Able to use EHRs to store/retrieve and transfer data			
Have access to a computer when I am in need to document patient care			
Have frequent problems with the computers			
All computers at this PHC have the same functionality			
Computer documentation of patient care will put some staff out of a job			
Listening to people using computer jargon intimidates others			

Apendice C: Ethics clearance certificate from UWC

OFFICE OF THE DIRECTOR: RESEARCH AND INNOVATION DIVISION

Private Bag X17, Bellville 7535 South Africa T: +27 21 959 4111/2948 F: +27 21 959 3170 E: research-ethics@uwc.ac.za www.uwc.ac.za

16 May 2018

Ms LN Awah

School of Nursing

Faculty of Community and Health Science

Ethics Reference Number: BM18/3/4

Project Title: Knowledge, perceived skills and attitude of nurses' regarding the use of electronic health records at selected primary health care facilities in the Western Cape.

Approval Period: 20 April 2018 – 20 April 2019

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report in good time for annual renewal.

The DoH approval must be submitted to BMREC for record keeping purposes.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias

Research Ethics Committee Officer

University of the Western Cape

PROVISIONAL REC NUMBER -130416-050 (FROM UWC)

Appendice D: Consent from the selected city of Cape Town

CIVIC CENTRE IZIKO LOLUNTU BURGERSENTRUM
HERTZOG BOULEVARD CAPE TOWN 8001 P O BOX 2815 CAPE TOWN 8000
www.capetown.gov.za
Making progress possible Together.
CITY HEALTH
Dr Natacha Berkowitz
Epidemiologist: Specialised Health
T: 021 400 6864 F: 021 421 4894
E: Natacha.Berkowitz@capetown.gov.za

2018-06-05

Re: Knowledge, perceived skills and attitude of nurses, regarding the use of electronic health records at selected primary health care facilities in Western Cape 7992

Dear Ms Laura Awah

Your research has been approved to recruit health care workers at the following City Health facilities:

Northern & Western: Bloekombos, Brackenfell, Brighton, Durbanville

Wallacedene Clinics

Contact Person: Dr Andile Zimba (Area 1 Manager)

Tel/Cell: 021 980 1230/084 627 2425

Tygerberg/Klipfontein: Delft South, Dirkie Uys, Elsies River, Parow Clinics

Kasselsvlei CHC

Contact Person: Mr Ruberto Isaaks (Acting Area 3 Manager)

Tel/Cell: 021 444 0893/078 565 7607

Please note the following:

1. All individual patient information obtained must be kept confidential.

2. Access to the clinics and clients must be arranged with the relevant Managers such that normal activities are not disrupted.

3. A copy of the final report must be sent to the City Health Head Office, P O Box 2815 Cape Town 8001, within 6 months of its completion (which is currently scheduled for Dec 2018) and feedback must also be given to the clinics involved.

4. Your project has been given an ID Number (7992): please use this in any future correspondence with us.

5. No monetary incentives to be paid to clients on the City Health premises

6. If this research gives rise to a publication, please submit a draft before publication for City Health comment and include a disclaimer in the publication that "the research findings and recommendations do not represent an official view of the City of Cape Town".

Thank you for your co-operation and please contact me if you require any further information or assistance.

Yours sincerely

DR N BERKOWITZ

Epidemiologist: SPECIALISED HEALTH

Cc. Dr Andile Zimba

Dr R Isaaks

Appendice E: Proof of language editor

L. Gething, M.Phil. (Science & Technology Journalism) (*cum laude*)
WHIZZ@WORDS
PO Box 1155, Milnerton 7435 Cape Town, South Africa; cell 072 212 5417
leverne@eject.co.za
18 November 2019

DECLARATION OF EDITING OF mini-dissertation, 28 850 words, on nurses attitude to, knowledge of and skills in electronic health records in primary health care

By Laura Ngweh Awah

I hereby declare that I carried out language editing of the above mini-thesis on behalf of the Laura Ngweh Awah.I am a professional writer and editor with many years of experience (e.g. 5 years on *SA Medical Journal*, 10 years heading the corporate communication division at the SA Medical Research Council), who specializes in Science and Technology editing - but am adept at editing in many different subject areas. I am a full member of the South African Freelancers' Association as well as of the Professional Editors' Association, and have previously edited many theses and journal papers for UKZN.

Yours sincerely

LEVERNE GETHING

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