Nurses' Experiences of using Electronic Health Records in a Public Health Care Facility: Middle East, Qatar

Aamina Ali Mather

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Supervisor: Mrs. D. Hector

Co-supervisor: Professor E.L. Stellenberg

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DECLARATION

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ABSTRACT

Background: Implementing an Electronic Health Record (EHR) system comes with expected and unexpected challenges. Some constituents welcome the change and embrace the new technology, while others are resistant to the transition to a new system. The overall goal of this study was to explore and describe the experiences of nurses working with the EHR system using a sample of nurses from a chosen public-sector health care facility in Qatar. The significance of the study lies in the nurses' acceptance of the EHR system. The research question which has guided this study is: "What were the experiences of nurses using electronic health records in a public health care facility in Qatar?"

Research methodology: A qualitative exploratory descriptive research study was done to explore nurses' experiences when using the EHR system. Permission was granted from the Health Research Ethics Committee (HREC) of Stellenbosch University (HREC Reference number: S18/04/087) and the health care facility in which the research study was done. All participants in the study signed individual informed consent forms and consent for the recording of the interviews. Audiotaped individual interviews were conducted with eleven nurses from a health care facility in Doha, Qatar. One pilot interview was conducted prior to data collection and was not included in the study. Participants included in the study had at least one year of experience with the EHR system and had worked at the facility for at least one year prior to the EHR implementation. Data were collected over a month from participants who worked in the inpatient unit, day care unit, outpatient unit and theatre. Data analysis were guided by using Graneheim and Lundman's four steps of qualitative content analysis. Trustworthiness was ensured by following the four principles of credibility, transferability, dependability, and confirmability.

Findings: The themes that emerged were training and education, technical challenges, completion of documentation, and end user. The participants expressed an overall satisfaction with the EHR system. Many participants confirmed that the EHR training prior to implementation was insufficient, which made it difficult to adapt to the EHR system. The age factor and insufficient computer skills were identified by participants as barriers that influenced EHR documentation.

Recommendations: Training should be conducted that includes the end user's needs. The competency level and learning styles of end users must be identified in order to overcome training barriers.

Conclusion: The study revealed that the use and adaptation to the EHR system at the facility was received with mixed feelings. Thus, the full potential of the EHR system can best be achieved, if it is well received and accepted.

Key words: Nurses experiences - Electronic health records - EHR documentation

OPSOMMING

Agtergrond: Die implementering van 'n elektroniese gesondheidsrekordstelsel (*Electronic Health Record* (EHR)) kom met verwagte en onverwagte uitdagings. Sommige gebruikers verwelkom die verandering en aanvaar die nuwe tegnologie, terwyl ander weerstand bied teen die oorgang na 'n nuwe stelsel. Die algehele doel van hierdie studie is om die ervarings van verpleegkundiges wat met die EHR-stelsel werk te ondersoek en te beskryf deur gebruik te maak van 'n steekproef van verpleegkundiges van 'n gekose openbare gesondheidsorgfasiliteit in Qatar. Die beduidenheid van die studie lê in die verpleegsters se aanvaarding van die EHR-stelsel. Die navorsingsvraag wat hierdie studie gelei het, is: "Wat was die ervarings van verpleegkundiges wat gebruik maak van elektroniese gesondheidsrekords in 'n openbare gesondheidsorgfasiliteit in Qatar?"

Navorsingsmetodologie: 'n Kwalitatiewe verkennende beskrywende navorsingsstudie is gedoen om verpleegkundiges se ervarings te verken tydens die gebruik van die EHR-stelsel. Toestemming is verleen van die Gesondheidsnavorsingsetiekkomitee (*Health Research Ethics Committee*)(HREC) van die Universiteit Stellenbosch (HREC Verwysingsnommer: S18/04/087) en die gesondheidsorgfasiliteit waarin die navorsingsstudie gedoen is. Alle deelnemers aan die studie het individuele ingeligte toestemmingsvorms onderteken en toestemming vir die opname van die onderhoude gegee. Audio-opnames is geneem van individuele onderhoude met elf verpleegsters van 'n gesondheidsorg fasiliteit in Doha, Qatar. Een loodsstudie is uitgevoer voor die hoofstudie data-insameling en is nie by die studie ingesluit nie. Deelnemers aan die studie het ten minste een jaar ondervinding gehad met die EHR-stelsel en het minstens een jaar voor die implementering van die EHR by die fasiliteit gewerk. Data is, oor een maand, in vier binnepasient-eenhede ingesamel. Data-analise was gelei deur Graneheim en Lundman se vier stappe van data-analise. Betroubaarheid is verseker deur die vier beginsels van geloofwaardigheid, oordraagbaarheid, betroubaarheid en bevestigbaarheid te volg.

Bevindinge: Die temas wat na vore gekom het was opleiding en onderwys, tegniese uitdagings, voltooiing van dokumentasie en eindgebruiker. Die deelnemers het 'n algehele tevredenheid met die EHR-stelsel uitgespreek: "Ons is bly vir die dokumentasie" (Deelnemer 4, reël 181). Baie deelnemers het verklaar dat die EHR-

opleiding voor implementering onvoldoende was, wat dit moeilik gemaak het om aan te pas by die EHR-stelsel: "Ek het gedink hoe kan ons baasraak met hierdie minimale opleiding" (Deelnemer 7, lyn 3). Die ouderdom-faktor en onvoldoende rekenaarvaardighede is deur die deelnemers geïdentifiseer as hindernisse wat die EHR dokumentasie beïnvloed: "Een wat 'n uitstekende rekenaarvaardigheid het, dis makliker vir hulle om dit vinnig te voltooi, die dokumentasie" (Deelnemer 4, reël 14).

Aanbevelings: Opleiding moet uitgevoer word wat die eindgebruiker se behoeftes insluit. Die vaardigheidsvlak en leerstyle van eindgebruikers moet geïdentifiseer word om opleidingshindernisse te oorkom.

Afsluiting: Die studie het getoon dat die gebruik en aanpassing tot die EHR-stelsel by die fasiliteit met gemengde gevoelens ontvang is. Die volle potensiaal van die EHR-stelsel kan die beste bereik word as dit goed ontvang en aanvaar word.

Sleutelwoorde: Verpleegkundige ervarings - Elektroniese gesondheid rekords - EHR dokumentasie

ACKNOWLEDGEMENT

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ABBREVIATIONS

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COW   Computer on Wheels

HICT   Health Information and Communication Technology

EHR   Electronic Health Record

POC   Point-of-Care

CHAPTER 1
FOUNDATION OF THE STUDY

1.1   INTRODUCTION

In the modern Middle East, electronic health record (EHR) keeping has become a standard computerised procedure in most health care sectors, including in Qatar. Computerised systems are increasingly replacing traditional information systems that were characterised by paper-based records. In Qatar, a fully automated health care information system with a single EHR platform was launched at the health care facility in 2014 to bring about change in the practice of health care records management (Olayiwola, 2013:1).

In consideration of a typical working day for nurses, with the many urgent demands made on them, some nurses in the facility found the change to an EHR system challenging (Schaeffer, 2013:1). It was observed that the acceptance of the EHR system varied among nurses working at the health care facility. Some nurses were able to grasp the change quickly, while others found the change to be too fast-paced and as a result were resistant to the change. In addition, the difficulty of using an EHR system while still adjusting to the new technology that it represented caused barriers to acceptance. For example, incomplete nursing documentation was identified as a barrier when an EHR system was implemented at the facility. The fast-paced execution of the EHR system and the lack of computer literacy impacted the level of nursing documentation, thereby increasing the nurses' resistance to the use of the EHR system.

Evidence reveals that any implementation of or a change in new technology sets challenges as it requires training and adoption by all staff to become fully implemented (Hasanain, Vallmuur & Clark, 2015:24). EHR systems have a significant influence on nursing documentation; and although nurses are the largest group of end users, their input in the design and function is rarely sought (Stevenson, Nilsson & Petersson, 2010: 65). Frontline staff often depend on aspects such as whether the changes will benefit the patient, improve working relationships, or improve work processes (Forrest, 2013:1). Computer literacy levels and attitudes towards using computers can also contribute to the level of staff's willingness to change (Topkaya & Kaya, 2014:141). Varying skill levels affect nurses' attitudes to EHR implementation in different ways.

Some prefer to embrace new ideas while others prefer familiar ways of working. In many areas of life, change is actively encouraged as nurses seek to grow and develop knowledge, skills, and relationships (Forrest, 2013:1).

However, even though the EHR implementation at the health care facility had generated substantial interest and expectations, the advantages of a computerised system have not convinced nurses and medical practitioners entirely. As technology evolves, health care workers continue to face many challenges in implementing and maintaining electronic health record systems. These challenges range from technical to security to strategy to human interaction (Siwicki, 2017:1). This study therefore focused on the experience of nurses using EHRs in a health facility.

1.2   RATIONALE

EHR systems have been embraced in the Middle East to augment continuity of care by increasing access to health information, improving quality of care, providing care management, and increasing staff satisfaction while lowering the cost of care (Mostert, Pottas & Korpela, 2011:328).

Computer literacy and attitude play a vital role in the implementation of EHRs. In 2011, a cross-sectional study was conducted in Turkey to address nurses' computer skills and their acceptance of using computers in the health care environment. The 688 participants identified that nurses, in general, had positive attitudes towards computers, and their computer literacy was good (Topkaya & Kaya, 2014:146).

Probably the single most significant effect on computer literacy and attitude towards EHR workflow is nurses' acceptance to change. Accepting a change does not necessarily mean agreeing with it (Miliard, 2014:1). In 2017 Aldosari, Mansour, Aldosari and Alanazi (2017:85) conducted a study in Dammam, Saudi Arabia, to explore nurses' acceptance level of electronic medical records. A total of 230 questionnaires were distributed and 153 questionnaires were completed. The descriptive analysis of the nurses perceived usefulness factor of electronic health record acceptance where 57.0% agreed that the electronic health record system made their job easier. More than half of the participants (64.9%) indicated that the electronic health records are reliable while17.9% were neutral about it. The finding of the study

confirmed that nurses perceived electronic health records to be useful and efficient (Aldosari, Mansour, Aldosari & Alanazi, 2017:85).

Despite the potential benefits of electronic health records, staff behaviour and acceptance can impose barriers (Ajami & Chadegani, 2013:213). An unsystematic-review study was done in Iran in 2013. Barriers identified were linked to cost constraints, technical limitations, standardisation limits, attitudinal constraints and organisational constraints. Studies indicated the most common factor to impact electronic health record implementation was staff resistance to change (Ajami & Chadegani, 2013:213). One of the challenges mentioned in a study conducted by Seidlitz, Blatz, Jennings and LaRocca (2013:1) included nurses' resistance to change because of a lack of knowledge and a fear of the unknown.

Change does not need to be received in a negative way. With the right attitude, it can be a chance to achieve greatness (Hader, 2013:6). Implementation of an EHR system can be difficult for nurses, as they are required to change their mind-sets and adapt to change in order to provide and maintain patient care (Strudwick, Tanimizu, Saraswathy, Yousef & Nickerson, 2015:1). In 2015, a scoping review methodology was utilised to conduct a literature review in five online database searches. One article review was a study done in Turkey; participants reported that EHR training and documentation practices for nurses made the transition easier. Furthermore, software upgrades would help improve their insight of the EHR system (Strudwick et al., 2015:3).

1.3   PROBLEM STATEMENT

The researcher who is currently working at the Health Information Department where the study was conducted, observed that some nurses welcomed the change to the EHR system while other nurses were reluctant to the change. The researcher observed that some nurses appeared to be confident about using and embracing EHRs but pointed out that the change was fast-paced, and they were not ready for it. Furthermore, the nurses' inadequate computer skills and lack of familiarity with the computerised system appeared to trigger barriers in their work processes. In light of the varied observation, the researcher deemed it necessary to explore and describe the nurses' EHR experiences in order to facilitate optimal use of the system.

1.4   RESEARCH QUESTION

What were the experiences of nurses using electronic health records in a public health care facility in Qatar?

1.5   RESEARCH AIM

The aim of the research was to explore the experiences of nurses using electronic health records at a public health care facility in Qatar.

1.6   RESEARCH OBJECTIVE

The objective of this research study was to explore nurses' experiences of using the electronic health record system.

1.7   RESEARCH METHODOLOGY

The research methodology is discussed briefly under the sub-headings below and discussed in detail in Chapter Three.

1.7.1 Research design

The researcher applies an exploratory descriptive design in line with the qualitative nature of the research problem.

1.7.2   Study setting

The research was completed at a health care facility in Doha, Qatar, which falls in the public health sector. The health care facility is the primary provider (tertiary and secondary health care) in the region and comprises of thirteen hospitals in addition to Qatar's ambulance service. This study focuses on the electronic documentation completed by the nursing staff at the chosen health care facility.

1.7.3 Population and sampling

The population includes general registered nurses working in the inpatient, outpatient, and day care units of the facility where the research was conducted. This study used

purposive sampling (non-probability sampling) and concluded with eleven (11) nurses when data saturation was reached.

1.7.3.1 *Sampling Criteria*

In this study, the participants were all general registered nurses. Participants had to meet the criteria of working at the chosen facility, be classified as a full-time employee, and must have worked with the EHR system for at least one year.

1.7.4 Data collection tool

A semi-structured interview guide (Annexure 4) was used and was based on the research objective.

1.7.5 Pilot interview

One pilot interview was conducted at the facility where the research study took place.

1.7.6 Trustworthiness

To ensure the thoroughness of the study, the researcher applied the four principles described by Lincoln & Guba (1985:289), namely credibility, transferability, dependability, and confirmability.

1.7.7 Data collection

Data collection transpired through individual interviews, using a semi-structured interview guide (Annexure 4). The venue and time for the interview was allotted according to the participant's preference and did not disrupt the participants' work routine.

1.7.8 Data analysis

The researcher applied Graneheim and Lundman's qualitative content analysis as an approach to analyse the data (Graneheim & Lundman, 2004:105).

1.8 ETHICAL CONSIDERATIONS

Researchers are, as a standard, required to ensure adherence to ethical principles so as not to disrupt organisations, cause harm, or infringe the rights of participants of the research project (Babbie, 2011:480). Approval for the study was obtained from the Human Research Ethics Committee (HREC) of Stellenbosch University (Annexure 1)

prior to conducting the research (HREC Reference number: S18/04/087). The researcher received permission to conduct the research from the health care facility (Annexure 2), its head nurses, and its participants. Interviews were conducted in Ramadan and therefore no refreshments were offered to Muslim participants. For non-Muslim participants, refreshments were placed on a separate table in the discussion room. As non-Muslim participants entered the discussion room, they helped themselves to the refreshments.

Before each participant signed the informed consent (Annexure 3), participants were informed on the objective of the study and what their involvement entailed. The role of both the researcher and the participants were explained to each participant (Polit & Beck, 2014:85). This research study was a minimal risk study as it only involved obtaining the participating nurses' activity data. No physical risks were identified. Participants were informed of their rights to end an interview session that made them feel uncomforatble in any way. A counsellor at the facility was available in the case if a participant became emotionally distressed during the interview. However, no such cases were identified during the interview sessions. Participants were asked five questions at the start of the interview that were related to collating demographic information. Participants who were not comfortable in answering demographic information – for example, the age of the participant – were given the choice to not answer the question.

In processing the data, the importance of confidentiality was explained and discussed with the transcriber and the language editor (Annexures 5 and 7). A confidentiality agreement was signed by the transcriber and the language editor (Annexures 5 and 7).

The entire study, including data collection and signed consent forms (Annexure 3), are available to HREC and the research supervisors of Stellenbosch University. To ensure security, only the researcher has access to the signed informed consents (Annexure 3), transcripts, tape recordings, and field notes – all of which are stored in a locked drawer in a secure area. All informed consents, field data, and recordings will be kept for a period of five years before being destroyed.

1.8.1 Right to confidentiality and anonymity

All participants were recognised as autonomous individuals. In order to protect participants, confidentiality was maintained throughout the study by allocating participant codes instead of personal identification. The form containing the actual names of the participants is kept in a locked drawer in a secure place and only accessible to the researcher.

1.8.2 Right to protection from discomfort and harm

Participants were informed that they can withdraw from the study at any point and their decisions will be respected without any consequences, harm, or prejudice (Polit & Beck, 2014:83). Participant's privacy and confidentiality was maintained by allocating numbers to the participants and the data collected does not reflect any personal details of the participant. The interview process was completed by all participants that volunteered to participate. There were no participants that refused to sign the informed consent (Annexure 3) or refused to participate.

1.9 DEFINITIONS

1.9.1 Electronic Health Records

An electronic health record is an electronic version of a patient's clinical data and description relevant to that patient's care (Hasanain et al., 2015:24). An electronic health record provides real-time access to a patient's medical information and is readily available for authorised users.

1.9.2 Experiences

Experience is defined as both the time in practice and self-reflection that allows preconceived notions and expectations to be confirmed, refined, or disconfirmed in real circumstances. Merely encountering patient conditions and situations is not considered as experience; rather, experience involves nurses reflecting on encountered circumstances to refine their moment-to-moment decision-making at an unconscious, intuitive level (Koshy, Limb, Buket, Whitehurst & Daniyal, 2017:20).

1.9.3 Registered General Nurse

A Registered General Nurse is an individual who holds a current, legal license issued under a national authority or board that authorises him or her to practice nursing and use the title of a registered general nurse (Qatar Council for Health Practitioners, 2013:4).

1.10 CHAPTER OUTLINE

1.10.1   Chapter 1: Foundation of the study

This chapter comprises a discussion of the synopsis of the study, which comprises the introduction, background, and rationale for the research study. A brief description of the research methodology is also included in this chapter.

1.10.2   Chapter 2: Literature review

The literature review summarises and discusses nurses' experiences with the EHR system.

1.10.3   Chapter 3: Research methodology

Chapter 3 includes an in-depth description of the research methodology used to explore the participating nurses' experiences with the EHR system.

1.10.4   Chapter 4: Findings

This chapter comprises a discussion of the findings of the study, which include biographical data, themes, and sub-themes.

1.10.5   Chapter 5: Discussion, conclusions and recommendations

The findings are discussed in this chapter in relation to the study objectives. The researcher concludes the study and makes recommendations on the basis of the acquired scientific evidence.

1.11   SUMMARY

In this chapter, an introduction and rationale provide an explanation on the background and the significance of undertaking the research study. This chapter includes the research question and research objective. A brief overview of the research methodology demonstrates how the study findings were reached. A comprehensive

explanation of the ethical considerations relevant to this study has also been included. The literature review, which follows in chapter two, describes the participants' experiences using the EHR system related to the literature.

1.12   CONCLUSION

The increased awareness of the EHR system and its associated benefits have increased the adoption rate of EHRs by health care providers around the globe, including in Qatar. Studies have identified the potential benefits of technology in supporting patient care and clinical documentation. However, in order to avail these benefits and ease the transition between health care systems, challenges related to implementation, adoption, and satisfaction in accessing the EHR system need to be addressed.

CHAPTER 2
LITERATURE REVIEW

2.1   INTRODUCTION

The literature review provides the researcher with current and scientific knowledge about a phenomenon (Creswell, 2014:25). The literature review for this chapter was conducted after the data collection and analysis of the study so that the information in the literature would not influence the researcher's openness (Creswell, 2014:25). Current theoretical and scientific knowledge literature about the problem enables the researcher to synthesise what is known and unknown (Burns & Grove, 2011:189). In this chapter, an in-depth literature review is discussed to inform the scope and depth of investigations conducted in this study, and to provide context to this research study.

2.2   ELECTING AND REVIEWING THE LITERATURE

The literature was reviewed to identify research evidence that would add value to the study (Brink, van der Walt & van Rensburg, 2012:54). Scientific studies were searched electronically from PubMed and Google Scholar. Research articles in hard copies were accessed at the Qatar National Library. Other sources of literature included international and local policies and books. A total of 61 articles were reviewed, all of which were published in the last ten years. Some of the key words used to search for related literature included: EHR, effect of EHR on nurses, EHR training, effect of change, EHR documentation, implementation of EHR, and change management.

The literature review for this study has been organised and explained under headings and sub-headings to ensure a logical flow of ideas. Literature was reviewed to gather further information on factors identified during the individual interviews. During the interview sessions, participants spoke about the effect of EHR on the quality of information. Therefore, this topic is further discussed in this chapter after reviewing the relevant literature. Lastly, literature of technical challenges was reviewed to get a better understanding on some of the drawbacks that were discussed by the participants.

2.3 FACTORS INFLUENCING THE USE OF ELECTRONIC HEALTH RECORDS

The EHR system has become standard for documenting nursing care in order to improve the quality, safety, and efficiency of health care delivery systems. Black Booth Market Research Company surveyed 15000 registered nurses that have been utilising EHR systems for the past four years. Black Book asked nurses to rank convenience and usefulness of EHR systems. The majority (96%) of respondents said they would not have any desire to return to utilising paper records, contrasted with Black Booth's 2015 review, in which 26% of respondents said they needed to come back to paper-based procedures (Spitzer, 2018:1).

In this chapter, various published works have been identified to highlight factors influencing the use of EHRs in health care. The below factors that are discussed in this chapter are related to the identified factors in the current study. As Singh and Muthusamy (2013:1531) explain in their study done in India, there is no doubt that the use of an EHR system increases the efficiency of health care. However, there are many factors like embracing change, training and development, age, and emotional intelligence that contribute to the way nurses use EHRs in an effective and efficient way.

2.3.1 Embracing Change

The nursing sector is constantly under pressure to keep up with continuous change in the industry. Change can be sudden or gradual and nurses must be able to adapt to change as they navigate their careers. Change is inevitable and must be embraced with a positive attitude (Carlson, 2015:1). Aldosari et al. (2017:85) conducted a study in Saudi Arabia to explore nurses' acceptance level of EHRs. More than half of the participants (57.0%) agreed that the EHR system made their jobs easier and 64.9% indicated that EHRs are reliable, while 17.9% of nurses were neutral about it. Their study confirmed that, overall, nurses perceived EHRs to be useful and efficient (Aldosari et al., 2017:85).

In today's fast-paced world, rapid change occurs in every aspect of our lives, from evolving technology to evidence-based research that directs health care. Some constituents fight to maintain the status quo, while others show willingness to embrace the change (Hader, 2013:1). In the context of introducing EHRs, those resistant to change will most likely find fault in the EHR system. A descriptive qualitative approach

was taken at a health care facility located in southeastern United States. One of the themes that emerged from the study done by Hader (2013:1) was "constant change." Many of the nurses felt constant technology with based change caused frustration and stress. Overall, nurses were discontented with the EHR system and preferred paper-based documentation (Spiva, Hart & McVay, 2011:6).

According to Garon and Stacy (2009:30), change in health care organisations can be rapid, complex, and chaotic. Often, change is required because of new regulations, advances in technology, and developments in health care. A descriptive, qualitative design using content analysis were carried out in 2009 at a community hospital in California, USA. The aim of Garon and Stacy's (2009:30) study was to describe the nurses' perspectives of change in the care delivery model and the skill mix in an intermediate care unit. The finding of their study reinforced the value of involving staff members in change and the importance of giving voice to their perceptions (Garon & Stacy, 2009:30).

2.3.1.1 *Positive attitude towards electronic health record systems*

According to Kipturgo, Bitok, Karani and Muiva (2014:17), nurses were observed maintaining a positive attitude towards EHR. Nurses from one public hospital and one private hospital were purposively sampled. As many as 93.2% of the nurses in the private hospital were comfortable and competent in using the computer; however, the public hospital scored 48.1% in this category. In the public hospital, 61.4% of the nurses used computers daily and 23.7% of those at the private hospital. In response to individual attitude statements, most participants strongly disagreed with the suggestions that EHR could increase nursing workload.

Nanle, Dare, Nanbur, Rufai, Salisu, Umar and Ahmad (2016:78) conducted a descriptive research study at a teaching hospital in Nigeria. Out of 528 nurses in the hospital, 228 nurses (43.2% of the target population) were selected. Nanle et al. (2016:78) study concluded that the nurses had a positive attitude towards the EHR system. Most of the respondents (82%) perceived that EHRs are better than paper-based records.

Staff that hold a negative attitude towards computers and is left unaddressed can have a ripple effect and negatively influence the entire EHR adoption process (Adams, 2017:1). Three surveys were administered at several hospitals in the United States to

compare changes in nurses' perceptions on patient care processes and workflow before and after EHR implementation. The findings of the study done by Ward, Vartak, Schwichtenberg and Wakefield (2011:502), confirmed that responses were more positive in the pre-training phase, compared to responses collected post-training and post-EHR implementation. The nurses had high expectations after training compared to before training for an overwhelming number of survey items. Participants were less confident after training than before training and, moreover, participants were progressively less positive in the 6-month post-implementation survey (Ward et al., 2011:502). In order to embrace the change with a positive attitude, it is important for organisations to provide specific training for end users. It is also important for organisations to take into consideration the computer skills of their staff when providing the necessary training (Adams, 2017:1).

2.3.2 Training and development

One of the major issues in EHR implementation is how best to prepare end users to use EHR in a safe and effective way (Dastagir, Chin, McNamara, Poteraj, Battaglini, & Alstot, 2012:140). It is extremely important that nurses are equipped with the necessary skills and knowledge to be able to use the EHR system effectively. Therefore, it is vital for nurses to receive the right type of training. There are several methods available to help equip staff to use the EHR system to its full potential. The only deliberation is determining the best training methods and techniques that are appropriate for the given situation (Silver, 2015:1).

2.3.2.1 Technological proficiency

Nurses' opinions and attitudes towards computers is one of the most important factors in the ease of EHR implementation. Kahouei, Mohammadi, Majdabadi, Solhi, Parsania, Roghani and Firozeh (2014:33) indicated that nurses who had computer experience understood the benefits of the EHR system more than others and more readily understood the reasons for using the EHR system. A longitudinal panel study was conducted at a nursing school in Jordan to explore nurses' attitudes towards technology. A total of 140 nursing students were followed over their four years of undergraduate study. During the four years of data collection, students showed positive attitudes towards technology, with the highest attitude scores determined in their final year (Mean = 6.19, Standard Deviation = 0.72) (Tubaishata, Aljezawib,

Rawajfaha, Habiballah & Zaheya, 2016:101). As the students spent more time on their nursing education, they were found to have a more positive attitude. Thus, as the students' education in technology increased, their attitudes were more positive (Tubaishata et al., 2016:101).

Raddaha (2017:4) identified that majority (97%) of nurses working at a government university hospital in Muscat considered the EHR system to be integrated in their daily work routine and had a positive attitude towards the electronic system. Most of the participants did not have prior experience with EHR systems but over half (52.1%) were confident in using the system. Many participants (92.3%) owned a personal computer and more than half (54%) indicated daily use of computers outside the hospital.

In 2017, data were collected from 197 nurses working in Nova Scotia, Canada. The purpose of the study was to investigate nurses' adoption of EHRs. The results indicated that improving the computer knowledge of staff is important for EHR acceptance. Nurses with less computer anxiety tend to develop a more positive attitude to accepting EHR systems (Ifinedo, 2017:317).

2.3.2.2   Nurse involvement in planning and implementation phases

Nurses are specialists in the field of nursing, and they understand the dynamics of nursing care. Therefore, it is important for nurses to be involved in the initial phases of technological implementation. In the same way, it is also important for technology engineers to understand how the software should be designed in order to facilitate a smooth transition to using the new technology and increasing nurses' approval of the system (Weckman & Janzen, 2009:1). Abbott, Fuji and Galt (2015:942) confirmed in their study that nurses had minimal involvement in the discussions regarding the selection of the EHR system. Abbott, Fuji and Galt (2015:942) further confirmed that many nurses felt as if their opinions did not matter and that they were simply expected to adapt to the change.

A poll from Black Book asked approximately 14,000 nurses about their experiences with EHR systems. The results indicated that 90% of nurses believed their organisations did not consider nurses when selecting an EHR system and 85% reported that they struggled with the technology on a daily basis (McCarthy, 2014:1). Nurses can provide unique, valuable perspectives during EHR implementation. One

of the main frustrations of nurses' unwillingness to adapt to change is their constant struggle of getting their voices heard (Wayne, 2016:4). One of the largest international surveys of nursing informatics was conducted in 2016. A cross-sectional survey was done which included participants from 45 countries. A total of 469 participated, of which 89% were nurses. Almost one-third of the respondents (28.6%) indicated that the EHR system did not meet their clinical needs. Some of the nurses felt that the EHR system was not designed for nursing needs but was instead designed to meet the hospitals' financial requirements. Overall, participants felt that the EHR systems were not capable of supporting important features of nursing practice (Topaz et al., 2016:2023).

2.3.2.3 *Inadequate training*

Dastagir et al. (2012:140) conducted a study to evaluate clinician self-perception on efficiency, satisfaction with the EHR, and job satisfaction. The findings of the study showed that due to inadequate training, clinicians turned to other clinicians for help in using the EHR system. However, an intensive three-day off-site training program significantly improved clinician efficiency with the EHR system.

Secginli, Erdogan and Monsen (2013:15) recommended an increase in the number of EHR training sessions in order to improve the attitudes of health professionals towards EHRs. Secginli, Erdogan and Monsen's (2013:15) study was conducted at a primary health care setting in Turkey. A survey was developed based on an extensive literature review and consisted of 33 statements rated on a five-point Likert scale. A total of 325 participants completed questionnaires of which 97% of respondents were satisfied with the EHR system.

Furthermore, it has been observed that nurses who are provided with adequate training on new technology become more integrated with technology and consequently are more willing to adjust to technological change. It is important for nurses to practice using new technology before using it when fully implemented at the bedside, because seeing staff struggle with technology can negatively impact patient satisfaction (Robeznieks, 2014:2).

Gesulga et al. (2017:547) conducted a study in Indonesia in which a total of 175 articles were reviewed to identify barriers when implementing an EHR system. Gesulga et al. (2017:547) identified 57 barriers that were further categorised into six

resources: people, hardware, software, network, data, and procedure resources. Under "people", the review results recognised user resistance, the lack of education and training, and the lack of awareness of EHR as the primary barriers to the implementation of EHR systems. Insufficient training was commonly tagged in the literature as a hurdle during the implementation of EHR systems.

Similarly, Nguyen, Bellucci and Nguyen (2014:782) conducted a systematic review that identified staff training and ongoing technical support as services needed in supporting EHR adoption. Review of the literature showed good quality training improves clinicians' ability in using EHR systems for their successful adoption and use. Inadequate and poor-quality training was linked to poor utilisation of EHR systems, lack of productivity, failure to reach the full potential use of EHRs, and hindering progress.

Brookstone (2012:1) collected thousands of clinician satisfaction ratings about 150 different EHR products. Lack of adequate training was a consistent theme reported by many clinicians as having a negative influence on their ability to effectively use their EHR systems. Training is an important part of EHR implementation, but little emphasis is placed on post-implementation training. Bredfeldt, Awad, Joseph and Snyder (2013:1) created two mixed methods designs to improve providers' effectiveness with the EHR in Kaiser Permanente of the Mid-Atlantic States, USA. Training content included a blended learning format in which short lectures and demonstrations were delivered. A hands-on exercise to allow trainees to acquire new skills while also building tools such as a preference list was also offered to the participants. These activities took place in the live EHR environment. Additional materials, including a quick reference guide and keyboard shortcut template cards were provided to support post-class learning. In a study conducted by Bredfeldt, Awad, Joseph and Snyder (2013:1), that participants felt the training classes should be offered more frequently and that the hands-on exercises were extremely useful. Overall, Bredfeldt et al. (2013:1) study confirmed that participants valued advanced training on EHR tools and workflows to the extent that they were willing to participate on weekends.

2.3.2.4 *Specific training approaches*

A multiple case study was carried out to examine the perceptions of clinical and administrative representatives using EHR systems. Participants from six health care

organisations took part in a study conducted by McAlearney, Robbins, Kowalczyk, Chisolm and Song (2012:294), amounting to a total of 43 interviews. It was observed that training programs that incorporated active learning led to better learning outcomes and meaningful use of EHR systems. All six sites used a variety of different training approaches, including classroom-based didactic training, e-learning modules, hands-on learning methods such as scenario opportunities to practice with mock patients, and intensive one-on-one support in the ambulatory care setting. One specific learning method that was used to train clinicians in several of the sites was scenario-based training. With scenario-based training, the clinicians were presented with a patient scenario and then given the opportunity to interact with the record as if it was a real patient. The findings of the study confirmed that paying attention to the training process is of paramount importance for successful EHR system usage (McAlearney et al., 2012:294).

It is not uncommon for EHR implementation to be met with some resistance. After all, transitioning can be overwhelming in any situation. Transitioning into an EHR system can be a positive experience and, with the proper training, nurses can learn to use the EHR system effectively (Silver, 2015:1). However, even with the correct training, there are often factors that contribute to the nurses' ability to grasp the right technology skills. For example, it was noted that older nurses required more in-depth training and took longer to grasp new technology compared to the younger nurses (Topaz et al., 2016:2023).

2.3.3   The age factor

The average age of nurses in the United States was 46.8 years and approximately 40% of the nursing workforce was over 50 years of age (Spiva et al., 2011:1). There appears to be a more obvious hesitance among the older nurses to accept transitions. Even if research shows that health care practices need to change, the older generation of nurses often resist change (Carlson, 2015:1). Topaz et al. (2016:2023) in a cross-sectional survey confirmed that 7.4% of the participants believed that the generation gap between younger and older nurses requires different levels of training; otherwise, insufficient training prevents reaching full potential use of EHR system capabilities.

Hospitals which assume that everyone is proficient in using modern technology, because it is the internet age, will surely find nurses who are dissatisfied with EHRs

as a whole (Siwicki, 2017:1). In Middle Eastern countries such as the United Arab Emirates and Qatar, nurses can apply for work permits up until the age of 65 years (Pimentel, 2017:1). Holtz and Krein (2011:247) identified, in a mixed method study, that the ages of individuals influence their perceptions of the EHR system. The results of this study confirmed that there is no statistically significant difference in social influence by age ($p = 0.74$). However, nurses with less than 15 years of experience indicated that the EHR system was easier to use than those who had been in the nursing profession for 15 years or more.

While it is true that age plays an important role in training and development, it is just as important for nurse leaders to be involved and focused on motivating performances and outcomes (Sullivan, 2016:1). The reality is that no single player on the health care team can ensure a successful transition and efficient use. It takes good management to achieve meaningful and effective change (Sullivan, 2016:1).

2.3.4   Communication

According to Kodama and Fukahori (2017:209), head nurses are the primary leaders who are responsible to persuade changes in the clinical environment. Understanding the needs of the staff through transparent communication is an important component of a head nurses' responsibility.

Any change requires good communication skills in order to keep information flowing. Managers need to listen to thoughts and feelings and colleagues need to share their anxieties and concerns so that negative behaviour can be prevented (Carlson, 2015:1). A quantitative and descriptive survey study was carried out in 2012 at a public hospital in South Africa. Carlson (2015:1) study revealed that less than half of the participants (32.3%) were satisfied with the extent to which the communication in their hospitals motivated them to meet their goals. The analysis of the findings confirmed that nurses were unhappy with the communication channels at the hospital (Wagner, Bezuidenhout & Roos, 2014:974).

It is important to have the support of administrative, medical, and nursing staff when implementing an EHR system and it is vital to ensure that the information generated through the EHR manual or electronic must be well-timed, accurate, and available when needed (Watson, 2006:16).

2.4   THE QUALITY OF INFORMATION

According to Krenn and Schlossman (2017:1), there are many advantages in using EHR systems. They identified quality of information as being one of the many advantages that include fast access to patient information, better time efficiency, and decrease in legibility errors.

2.4.1   Faster access to patient records and information

The EHR system allows for faster access to patient records and information. The data stored in the EHR system can also be presented to the clinician in a more organised fashion and grouped in a logical arrangement. Many systems include search engine functions, further improving the speed and accuracy of locating documentation. Medication management is streamlined in an EHR system, which allows providers to maintain a comprehensive and accurate list of patient medications. The management of patients with a specific diagnosis such as diabetes or stroke can be a time-consuming task without an EHR platform. EHRs allow for data collection and analysis at the point of care (POC) to assist with effective patient management (Krenn & Schlossman, 2017:41).

Several tools are available in EHR systems, such as assessments for drug interactions, risk score calculators, and body mass index calculators. These applications can be accessed quickly and more likely advise clinicians and their patients in a rapid an effective way (Manca, 2015:846). As indicated by Dr Pearl (2018:1), clinicians have a love-hate relationship association with EHR systems. One unmistakable factor clinician love about the electronic system is the quick, dependable and secure access to understanding medical histories, prescription records and historical test results.

Nguyen et al. (2014:782) reviewed 98 articles in a systematic literature review. The aim of the literature review was to describe information, system, and service quality levels that influence clinical users when using EHR systems. Nguyen et al. (2014:782) study provided a review of EHR implementations around the world and reported findings, including benefits and issues associated with implementation. A combination of positive and negative effects were found. Information quality was reported as important in 23 studies. Improved information quality was perceived by clinicians as a result of EHR implementation. Clinicians found the electronic system to provide timely

and improved access to up-to-date patient information. Many of the clinicians observed documentation to be complete and easily accessible. The electronic systems also solved legibility issues of doctor's handwritten notes.

EHR have alleviated many of the inconveniences encountered previously by nurses. Before the implementation of EHRs, nurses spent large amounts of time collating chart documents, searching through documents, locating lost notes, and interpreting handwritten notes. Furthermore, nurses who have been using EHR systems have forgotten the countless hours spent trying to complete these activities (Krenn & Schlossman, 2017:41).

A systematic review and meta-analysis of published studies were conducted in 2015 to assess the effect of EHR systems on health care quality. Of the 23 398 citations identified, 47 articles were included in the analysis. Nine studies investigated the relationship between the use of an EHR system and the time spent by health care professionals on documentation. The meta-analysis showed strong evidence that EHR use by health care professionals reduced documentation time (Campanella, Lovato, Marone, Fallacara, Mancuso, Ricciardi, & Specchia 2016:60).

The findings of the study conducted by Campanella et al. (2016:60) further confirmed that EHR systems improved the timeliness of clinical documentation completion, which resulted in greater compliance with timeliness guidelines compared to the prior paper-based documentation system. EHRs enabled removal of tedious paper documentation processes and provided real-time data, which supported compliance with documentation timeliness guidelines.

2.4.2   Decrease in legibility errors

According to Leduc, Lorenzetti, Straus, Sykes and Quan (2011:732), legibility and accessibility are clear advantages of using an EHR system. A case-control study that involved 53 clinicians in the UK revealed that EHR decreased legibility errors. Furthermore, two surveys that were reviewed in this study perceived that a decrease in legibility errors improved the quality of care of patients. The second survey that was reviewed confirmed that EHR systems improved the legibility and access to records. Record legibility and completeness was another finding in a qualitative study that was carried out in the USA. Overall, in the identified articles that were reviewed, legibility was recognised as an advantage when using EHR systems (Leduc et al., 2011:732).

Carrington, Effken and Facmi (2011:360) study evaluated the usefulness of EHR systems, which have been associated with reduced documentation time by nurses, improved legibility, more frequent documentation, and fewer documentation errors than in paper-based systems. Legibility was one of the categories that emerged from the study done by Carrington et al. (2011:360) and found to be one of the strengths of EHR systems.

2.5   TECHNICAL CHALLENGES

Although there are significant advantages to using EHRs, there are still challenges that undermine the realisation of the EHR potential (Rathert, Porter, Mittler & Palmer, 2016:5). Heath (2016:1) conducted a study to assess nurses' thoughts on EHR technology and how it fits in their clinical workflows. Overwhelmingly, nurses held negative views on EHR systems. The findings of the study confirmed that 84% of the participants felt the EHR system disrupted their daily workflows, while 85% of the participants were concerned about system defects.

Furthermore when EHRs were out of use, either due to planned upgrades or because of unexpected malfunctions, it disrupted the usual hospital workflow. EHRs are intended to streamline patient information delivery and caregivers' access to it. Electronic devices are replacing paper-based charting and nurses are comfortable inputting charting information using a computerised point-of-care solution. The electronic workflow should help to improve documentation processes and hopefully improve patient care. However a number of factors may negatively affect nurses' work process; for example, the type of system that is used and the ease of using the equipment for EHR recording (Ergotron, 2014:1).

2.5.1   EHR system downtime and slow time

EHR downtime results in issues with laboratory processes, clinician documentation, and medication administration errors. Researchers found that downtime could hinder patient identification and information availability, which may result in serious patient safety risks. Technical malfunctions often prevent the staff from providing efficient and quality patient care, especially during downtime. One of the downsides of system failure is the repetitive documentation, which prevents the nursing team from spending sufficient time in patient care (Larsen, Fong, Wernz & Ratwani, 2018:187).

From a database of 80 381 event reports, 76 reports were selected and analysed to identify clinical processes that were affected by downtime in EHR systems. Larsen et al. (2018:187) study also examined whether downtime processes were put in place and followed. Almost half of the reports (48.7%) were associated with lab orders and results, followed by medication ordering and administration (14.5%). Most issues during downtime involved patient identification and communication of clinical information. Furthermore, 46% of the reports indicated that downtime procedures either were not followed or were not put in place (Larsen et al., 2018:187).

In 2014, a study was carried out in Texas to assess organisational practices when handling EHR downtime (EHRs were unavailable for use). An 84% response rate was calculated in receiving responses from 50 of the 59 institutions. Nearly all respondents had experienced downtime in their EHR systems in the last three years, with 95% reporting at least one unplanned downtime (of any length) and 70% reporting at least one unplanned downtime longer than eight hours. Findings of Sittig, Gonzalez & Singh's (2014:797) study confirmed that unexpected downtimes related to EHRs were common and most institutions had only partially implemented downtime plans.

According to Khalifa and Alswailem (2015:198), hospital information systems are comprehensive, integrated, specialised and designed to manage clinical aspects in health care facilities. The importance of EHR systems arise from the role it has in recording and maintaining all types of patient data and information. Despite evidence of benefits, health care facilities' utilisation of information systems and EHRs is still low. Khalifa and Alswailem (2015:198) created a questionnaire to collect objective quantitative data from different types of EHR users. Findings of the study conducted by Khalifa and Alswailem (2015:198) revealed user dissatisfaction with downtime procedures and highlighted that there was much disruption in POC and real-time charting workflows (Khalifa & Alswailem, 2015:198).

Probably the single most significant effect on EHR workflows was the shift to POC and real-time charting. Experts in nursing documentation have always recommended that charting take place as near in time to the actual event or episode of care as practical (Stokowski, 2013:1).

2.5.2 Computer on wheels (COW) and Point of care (POC) documentation

According to Jen, Cho, Rudkin, Wong, Almassi and Barton (2016:527), computer on wheels enables clinicians' mobility and flexibility while charting patient information. Jen et al. (2016:527) maintained that regardless of the patient's location, the mobile computers allow the clinician to be closer to the patient for accurate and immediate documentation in the EHR. However, Kohle-Ersher, Chatterjee, Osmanbeyoglu, Hochheiser and Bartos (2012:126) concluded differently in their qualitative study conducted in a hospital in southwestern Pennsylvania. The aim of this study was to evaluate the barriers that nurses encountered when completing electronic point of care documentation (i.e. via COW). Kohle-Ersher et al. (2012:126) study identified several barriers to point of care charting: (1) The locations of the computers were an issue as they were often in the way of patient equipment, such as intravenous poles and bedside commodes; (2) Privacy concerns were identified and raised as resulting in the possibility of incidental disclosure of potentially sensitive information when the nurse is standing at a wall-mounted computer in the room, others in the room may hear parts of the discussion; and (3) Patients' response to point of care charting in patient rooms caused distraction to the patient due to the sounds of tapping keys, alert noises, and the light emitted from computer screens. However, the potential benefits of point of care documentation were also identified, which included accuracy and real-time data access (Kohle-Ersher et al., 2012:126).

Nurses spend most of their time with patients and, therefore, nurse-patient communication is vital to ensuring quality nursing care (Collins, 2015:1). A qualitative, phenomenological design was completed in 2014 to describe the experiences of patients communicating with their nurses and physicians while using EHRs in the examination room. Rose, Richter and Kapustin (2014:674) study was completed in Baltimore, Maryland, where 21 patients were interviewed. Patients that were selected were those who had visited and experienced the clinic before and after the EHR implementation. Communication was one of the four themes that arose from the interviews. This study confirmed that patients preferred eye contact with the physicians and nurses as they felt that eye contact was an indication that providers cared about them. The patients felt that eye contact was maintained while typing on the EHR. There was better contact with the nurse than the physician, and that nurses maintained eye contact and listened carefully to the patient (Rose, Richter & Kapustin, 2014:674).

Ehrmeyer (2011:342) believes that POC documentation enables clinicians to have access to the most recent clinical information at the patient's bedside. In addition, EHRs accessed on COW allows clinicians to immediately access a patient's record, ensuring that clinicians do not have to resort to manually searching for medical records. However, the shortage of computers makes it difficult for staff to access patients' medical records at any given time. The usage of EHR were observed in four acute care wards in a large hospital district in Finland. The style of observation varied from the researcher participating in events to simply acting as an audience to the events from the side. At the time of Laitinen, Kaunonen and Åstedt-Kurki's (2014:235) study, the EHR system had been in use for almost two years in every ward that had been observed. The hospital used both fixed desktops and COWs to document. The findings of this study confirmed that there were insufficient numbers of COWs (Laitinen, Kaunonen & Åstedt-Kurki, 2014:235). Challenges that disrupted nurses' workflows—such as lack of equipment, multiple logging-in to the system, or slow system performance—caused them to spend more time documenting instead of providing hands-on care to patients (Miller, 2016:1).

2.5.3   System challenges

Abbott et al. (2015:943) identified the EHR system used in the observed clinics only allows one person to enter information into a patient's chart at a time. Therefore, nurses are forced to handwrite notes when the EHR system is unavailable and workarounds must be created in order to ensure documentation is completed. Another finding that emerged from this study is that the EHR increased nursing workloads and responsibilities. Workflows that are supposed to be completed by the physicians are only available on the nursing workflow process and, as a result, nurses are required to complete physician documentation. For example, drug interaction is completed by the nurse instead of the physician. Subsequently, incorrect workflows result in discrepancies in data extraction.

2.5.4   Data extraction

Reiner (2015:381) believes that data extraction is limited by several factors, including incorrect information, manual workflows, excessive workloads, and the lack of standardisation. Reiner further indicates that these limitations result in data often being overlooked and consequently affecting quality measures.

According to Kanger, Mukherjee, Xin, Diana and Khurshid (2014:1102), quality programs operate under the assumption that clinical quality measures can be reliably extracted from EHR systems. Kanger et al. (2014:1102) used a five-step process to match measures, reduced data errors, and increased trust in EHR clinical outcome reports when using EHR systems. They found that many facilities depended on chart audits to report quality measures as opposed to electronically generated reports directly from their EHRs due to the distrust in the data. As a result, an electronic data reporting project was implemented across all facilities. The project reduced EHR reporting errors over a nine-month period. Furthermore, increased accuracy of clinical reports provided clinicians with better information to guide their decision-making around quality improvement planning.

Liaw, Taggart, Yu and du Lusignan (2013:820) used three data tools to examine two EHR systems. The findings of the study confirmed that the data extracted via the three tools were not transparent. Furthermore, the data extracted were not updated systematically or validated independently. As a result, there were often mismatches. The lack of data transparency, technical standards, and safety suggested that the EHR was unable to ensure that data were accurate and supported by clinical governance.

2.6   SUMMARY

The literature reviewed in this chapter reveals that although there are benefits to EHR systems, such as the increase in speed of documentation and decrease in error rates, there are still important user challenges that undermine the realisation of the EHR system's potential to facilitate better care. In this chapter, factors influencing the use of EHR has been discussed, followed by the effect on quality of information. This chapter concludes with literature on technical challenges.

2.7   CONCLUSION

It is difficult to imagine a contemporary organisation that does not rely on computers and customised software to ensure that employees can work more productively and effectively. Although there are several advantages that the EHR system provides, there are yet significant disadvantages that need mitigation. Solutions that may decrease some of these disadvantages include appropriate implementation

processes, greater involvement of end users, adequate training and management, information technology support, suitable downtime processes, adequate number of terminals for data entry, and appropriate governance measures to ensure data and report accuracy.

CHAPTER 3
RESEARCH METHODOLOGY

3.1   INTRODUCTION

The purpose of this chapter is to describe in detail the research methodology that was applied to explore the experiences of nurses when using the EHR system.

3.2   RESEARCH AIM

The aim of the research was to explore the experiences of nurses using electronic health records at a public health care facility in Qatar.

3.3   RESEARCH OBJECTIVE

The objective of this research study was to explore nurses' experiences of using the electronic health record system.

3.4   RESEARCH METHODOLOGY

3.4.1   Research design

A research design is defined as a framework where the researcher uses theories during data analysis to further expand the understanding of the data (Burns & Grove, 2011:76). According to Burns, Gray and Groves (2011:76), a qualitative methodology is used by researchers who wish to explore the meaning or describe in debt understanding of human experiences. An exploratory descriptive research design was carried out to gain a deeper understanding of the experiences of nurses using the EHR system (Creswell, 2014:17). A descriptive research design is inductive in nature and it gives the researcher the chance to describe events and situations (Babbie, 2011:27). The researcher accessed information in an area that had previously never been explored at the facility under study, and therefore was able to yield new insights into the topic (Babbie, 2011:27).

3.4.2 Study setting

The study was conducted at a health care facility. The participants of the research all work in the selected facility; therefore, the study was conducted in a natural setting. A natural setting is the field or site where participants have experienced the issue or problem (Creswell, 2014:185). The setting was not manipulated or changed in any way. The facility has a total capacity of 451 beds, and it provides inpatient, outpatient, and day care, which enabled the researcher to get information from nurses working in different departments.

3.4.3 Population and sampling

Burns and Grove (2011:290) explain a population as the total set of persons with whom the research question is concerned. The population selected for this study was the nursing staff working at the facility as described in paragraph 3.4. The target population comprised the individuals who met the sampling criteria in this study (Burns & Grove, 2011:290). The population included N=235 critical care nurses employed at the health care facility.

A sample is the selected group of participants that represent the population (Burns & Grove, 2011:290). The researcher contacted the executive director of nursing at the research facility and provided a brief description of the study. The researcher then asked to be included in the next managerial meeting, in which the nurses were given an outline of the study.

The researcher opted to use purposive sampling, which aimed to include nurses working in the hospital setting who had experience with both paper-based and electronic health record systems. The sampling method allowed for the inclusion of nurses working in each area of the facility, namely the inpatient, outpatient, and day care units. It was important for the study to encompass all three sections, as each ward entailed documentation that differed in one or more fields, and the wider scope would provide variability.

The researcher contacted the executive director of nursing at the research facility after obtaining the relevant permission from the hospital and the university. The researcher provided a brief description of the study and requested that it be included at the next departmental meeting where the nurses were given a brief outline of the study. Nurses

interested in learning or possibly participating in the study, contacted the researcher by phone or e- mail.

A poster was created to visually communicate information about the research. A poster was placed in each ward to inform and invite all eligible nurses to a meeting, where details of the study were presented. Once the researcher had all eligible participant names, a total sample of 11 participants were purposefully selected and finalised based on the study criteria. Data saturation was achieved with the 11th participant. Therefore, the final sample size of n=11 was reached with the expectation of reaching data saturation.

Saturation of data is reached when data no longer reveals new information (Creswell, 2014:189). After the researcher had performed nine interviews with the participants, data saturation was achieved, but the researcher continued to perform two more interviews to be certain that data saturation had occurred. These two interviews provided no additional new data.

3.4.3.1 *Sampling criteria*

The target population included all the nurses working full time at the facility, and who had experienced both paper-based and electronic health record systems. Thus, participants must have worked at the facility before implementation, November 2015, and at least one year with the new system during which the staff had experienced the transition to the EHR system and had built experience with the new electronic system at the facility. The reason for this criterion was to enable an in-depth analysis of the research problem under investigation by securing participants that had comprehensive experiences with the record systems.

3.4.4 Data collection tool

The data collection used to build raw data for the study was in the form of interviews. A semi-structured interview guide (Annexure 4) was used during the interviews to give the researcher control over the line of questioning (Creswell, 2014:191). The interview guide consisted of one interview question, thus focusing on the experiences and allowing the participants to volunteer the themes. Participants were asked five demographic questions prior to the interview (Annexure 4). These questions were the age of the participant, years of employment at the health care facility, number of years the participant had been using the EHR, level of computer skills, and how often

participants used computers outside the workplace. The central interview question on the interview guide was: "Tell me about your experiences when using the EHR?" Probing words were used to get more information from the participants. Examples of probing words or phrases that were used include: "experiences with the computer," "easy to use," "system enhances," "training," "nursing informatics," and "positive change."

3.4.5   Pilot Interview

The researcher conducted one pilot interview. The pilot interview assisted the researcher to identify the acceptability, wording, content, clarity, and length of the interview guide (Marshall & Rossman, 2011:95; Babbie, 2011:255). One participant who met the inclusion criteria was selected for the pilot interview. The pilot interview was conducted in the same venue as the main study. No changes were made to the interview guide (Annexure 4) as all the questions and probing statements were clear. The data collected were not valuable and, therefore, the pilot interview was not included in the main study.

3.4.6   Trustworthiness

Trustworthiness was ensured by following the four principles of trustworthiness described by Lincoln and Guba (1985:289), which are credibility, transferability, dependability, and confirmability.

3.4.6.1 Credibility

According to Lincoln and Guba (1985:289), credibility involves establishing the truth value in a qualitative study. For this study, the researcher works in the Health Information Management/Medical Records Department and her work processes does not involve contact with the nursing staff, and therefore it was easy for the researcher to temporarily set aside any assumptions or views on the study in order to ensure the credibility of the research findings.

Interviews continued until data saturation was reached so that participant perceptions and experiences could be fully understood. Participant experiences were used to reflect the data collected. Relevant non-verbal communication, the tone of voice, date, time, and place were written as field notes during the interviews so as not to forget important observations. Interview transcripts were reviewed numerous times by the researcher as part of the collective effort to realise the credibility of the results. Three

transcripts were given to participants to confirm accuracy and ensure credibility. The supervisor and co-supervisor examined the transcriptions against the developed themes to assess whether the researchers' interpretations accurately captured the realities of the participants (Polit & Beck, 2014:4).

3.4.6.2 Transferability

Lincoln and Guba (1985:289) explained transferability as the ability to apply the findings to other participants or contexts. For a reader to decide on the transferability of the study, thick and detailed descriptions of data collection and data analysis are provided under data collection and data analysis. Furthermore, the researcher incorporated the data analysis steps from Graneheim and Lundman's qualitative content analysis as an approach to analyse the data to enhance transferability of the study.

Study limitations have been acknowledged and included in paragraph 5.3. In order to improve transferability, a purposive sample was applied. Purposive sampling maximised the range of specific information by purposefully selecting participants in terms of their knowledge of the phenomenon under investigation and their specific location. Interviews were continued until data saturation was reached so that there was no repetition of themes, therefore making the sample adequate and the data rich and thick (Lincoln & Guba, 1985:289).

3.4.6.3 Dependability

Dependability refers to the provision of evidence such that, if it was to be repeated with the same participants in the same context, the findings would be similar (Lincoln & Guba, 1985:289). In order to ascertain that dependability was maintained, the researcher ensured that all steps of the study were documented. A step-by-step data analysis were applied using Graneheim and Lundman's four steps of qualitative content analysis (Lincoln & Guba, 1985:289). To further ensure dependability, the researcher used a digital tape recorder to ensure that all the information provided by the participants was recorded after the participants voluntarily sign that they consented to participate in the study and for their respective interviews to be recorded. The recorded interviews were transcribed verbatim after all the interviews were completed.

3.4.6.4 Confirmability

Lincoln and Guba (1985:289) suggested that confirmability is the accuracy of the data in terms of relevance, meaning, and whether the data represents the information provided by the participants. The recorded data reflects the participants' voices and not the bias or perceptions of the researcher (Creswell, 2014:27). The researcher explored the phenomena by avoiding any biases through making use of verbatim participant quotations. After transcribing the participant interviews, the data was verified by the participants through member-checking to ensure that the data was transcribed accurately (Matua & Van Der Wal, 2015: 23).

3.4.7 Data collection

Data collection is the process of obtaining the subjects and collecting the data for the study (Creswell, 2014:361). Collection of data commenced after the researcher received permission from the facility (Annexure 2) and the Human Research Ethics Committee (HREC Reference number: S18/04/087) of Stellenbosch University (Annexure 1). Data collection started on 4 June 2018 and ended on 13 June 2018.

The researcher aimed to complete one interview per day. In some cases, two interviews were conducted in one day as some participants worked night shifts. Participants were given the choice to be interviewed during working hours or after work. All eleven participants chose to be interviewed during working hours with the permission of their head nurses. Likewise, the researcher also secured permission from the manager of her department to hold the interviews during working hours.

As standard procedure, the researcher sent a reminder email the day before each interview to ensure that the participants would not miss their appointments. The administration conference room was used as the venue for the interviews, which is located in the administration area of the facility, a few meters away from the clinical area. Based on the availability and preference of the participants, all interviews took place in the same venue. Only the researcher and the assigned participant were present at any given interview session. A sign was placed on the door informing people that an interview was in progress to ensure that there were no disturbances while the interviews were being conducted.

The main languages in the geographical area are Arabic and English. The hospital policy requires all staff to document in English only; therefore, all participants were

interviewed in English. The roles of the researcher and the participants were explained to each participant at the beginning of the interview, before the participant was requested to sign an informed consent form (Annexure 3). Each informed consent form was thoroughly discussed and also co-signed by the researcher. All participants in the study signed individual informed consent forms and consent for the recording of the interviews. Prior to starting the interview, the participants were also given an overview about the study and the researcher's objective. Participants were given a chance to ask questions before and after signing the informed consent (Annexure 3). The researcher informed each participant that participation was voluntary.

The participant was asked to answer five pre-interview questions related to his or her demographics and experiences (Annexure 4). Due to the sensitivity of the questions, the participants were told that answering the pre-interview questions was not compulsory.

Data were collected through individual interviews, using a semi-structured interview guide (Annexure 4). The interview guide was based on the objectives of the study and validated by the researcher's supervisor and co-supervisor (De Vos, Delport, Fouche & Strydom 2011:349). The researcher sat next to the participant to avoid talking across the desk. Each interview was audio-taped with the consent of the participants (Annexure 3). The researcher used two tape recorders and both tape recorders were Sony digital voice recorders with a built-in microphone, speaker, and flash drive.The interview guide comprised of one open-ended question that was based on the objective of the study and was used as the data collection tool. The interviews were conducted by the researcher, who has basic interview skills and has completed an Interview Skills Workshop.

During the interview, the researcher tried to create an informal atmosphere by using techniques such as nodding the head and making sounds indicating interest. An informal atmosphere also encouraged the participants to talk freely about their experiences. The researcher wrote field notes during each interview to enable her to remember any details that took place during the interviews that would be relevant to the research question. The researcher tried to note who, what, where, when, and why of the actions that were observed from the participants. Each interview lasted 20 to 30 minutes. No reimbursement was provided to the participants since the participants

were not inconvenienced in any way. No participant needed to be referred for counselling during the interviews.

In order to ensure privacy and anonymity, participants were given a number. All recordings were transcribed by a qualified and independent transcriptionist (Annexure 5). A list of the participant names and the assigned numbers were kept separate from the data collection files and only the researcher has access to this file which is stored in a locked drawer in a secure place. Both supervisors were given electronic copies of participant information and transcripts. The electronic documents are password protected with access granted only to the researcher and supervisors.

3.4.8   Data analysis

The researcher used Graneheim and Lundman's qualitative content analysis as an approach to analyse the data. Qualitative content analysis is based on data from narratives and observations. It requires understanding and co-operation between the researcher and the participants. The data received from participants has some degree of interpretation and often has multiple meanings. In order to ensure trustworthiness, the researcher only used data from the participants during data analysis and did not impute meaning that was not there (Graneheim & Lundman, 2004:105).

The data in qualitative research is usually in the form of written words, videotapes, audiotapes, and photographs, and therefore involves content analysis (Creswell, 2014:197). The researcher utilised the transcribed text of the interviews in the analysis process. The purpose of the content analysis is to organise and produce meaning from the data collected and to draw realistic conclusions from it (Graneheim & Lundman, 2004:105). Graneheim and Lundman (2004:105) explain content analysis in four steps: condensation, code, category, and theme.

3.4.8.1 Step one: Condensation

Condensation is a process of shortening the text while still preserving the core meaning (Graneheim & Lundman, 2004:105). Before starting the analysis, the interview recordings were transcribed by an independent transcriber. While the recordings were being transcribed by the transcriptionist, the researcher listened to the recordings a number of times so that the content and experience could be captured. Each participant's transcription was assigned a number to maintain anonymity. Once the transcripts were ready, the researcher read the data to draw a

general understanding of what the participants were talking about, essentially identifying the main points and ideas. At this point, condensation took place where the researcher started to shorten the text while still maintaining the core meaning (Graneheim & Lundman, 2004:105). This step allowed the researcher to become immersed in the data (Creswell, 2014:197). Once the main points were identified, the researcher started dividing the text into smaller parts while continuing to ensure that the core meaning was retained.

3.4.8.2 Step two: Code

A code can be thought of as a label; that is, a name that describes what a particular condensed meaning unit is about. A code is usually one or two words in length (Graneheim & Lundman, 2004:105). The next step was to label condensed meaning units by formulating codes and then grouping these codes into categories. The researcher used keywords to code the data. Using the list of codes, the researcher again read the transcripts and labelled parts of the transcripts with the appropriate code. While adding codes to the transcripts, the researcher checked the context for new topics.

3.4.8.3 Step three: Category

A category is formed by grouping together the allocated codes that are related to each other in terms of their context. In other words, codes are organised into a category when they are describing different aspects or similarities and differences of a common concept, or if they logically belong together (Graneheim & Lundman, 2004:105). Topics related to each other were grouped into categories and sub-themes. The researcher tried to use descriptive wording when categorising the text. Data that fell between two catogories were sorted into sub-catogories and then reviewed for further combination of categories. Reoccurring patterns or codes were clustered together to form categories and themes (Graneheim & Lundman, 2004:105).

3.4.8.4 Step four: Theme

A theme answers questions such as why, how, in what way, or by what means (Graneheim & Lundman, 2004:105). In this step, the categories were further grouped into themes. A theme is a process of further abstraction of data and can be seen as conveying an underlying meaning of the latent content (Graneheim & Lundman, 2004:105). The researcher identified themes by comparing codes and appraising

these to identify which codes appear to deal with the same issue and logically can be clustered together. The researcher used verbs, adverbs, and adjectives to make sure descriptive themes were identified (Graneheim & Lundman, 2004:105), which were also developed using the researcher's fieldnotes. The researcher analysed the emerging themes and sub-themes and compared these with the data collected to ensure that all the data were captured. The main study themes and sub-themes have been presented and confirmed by the voices of the participants as headings and subheadings in Chapter 5.

3.5   SUMMARY

In Chapter 3, the research methodology was discussed as applied in the study, which comprised the research design, population and sampling, trustworthiness, data collection, and data analysis. The following chapter presents the research findings.

3.6   CONCLUSION

In order to achieve the aim and objective of this study, the researcher used an exploratory descriptive research design. This approach has allowed the researcher to explore and describe the experiences of nurses using EHRs in the chosen public-sector health care facility.

CHAPTER 4

FINDINGS

4.1   INTRODUCTION

This chapter reflects a discussion of the experiences of nurses when using the electronic health record is presented in this chapter. Following one pilot interview that was not included in the study, eleven participants were individually interviewed; a screen shot of one interview is attached in Annexure six. The biographical data of the participants are presented in Section A and the themes induced from the data analysis are highlighted in Section B. The biographical data are presented in a narrative format and the themes and sub-themes are condensed in Table 1 and discussed further in detail.

4.2   SECTION A: BIOGRAPHICAL DATA

All participants have at least one year or more of both paper-based documentation and EHR experience. Participants have been working at the facility between four and thirty-eight years. From the eleven participants, five participants work in inpatient units, three participants work in outpatient units, two participants work in the day care unit, and one works in the theatre. The participants include four head nurses and seven nurses. Ages of the participants range from 31 to 63 years old. Only one nurse claimed to have an average level of computer skills, eight nurses claimed to have a good level of computer skills, while three interviewees said they were excellent at using the computer. All the participants use computers outside their work; eight participants use their computers often and three participants claim to use the computer rarely.

4.3   SECTION B: THEMES EMERGING FROM THE INTERVIEWS

In order to understand the findings of the study, themes were induced from the participant's experiences. Four main themes emerged from the interviews. Themes are the major findings in a qualitative study and are used as headings in this chapter (Creswell 2014:200). The themes and sub-themes are depicted in Table 1.

Table 1: Summary of themes

#	Themes	Sub-themes
1.	**Training and education**	Insufficient training Nursing informatics support
2.	**Technical challenges**	Downtime and slow time Data extraction
3.	**Completion of documentation**	Error rate Legibility Automatic alerts Identify end users Confidentiality Easy and fast documentation Automatic data generation Computer on wheels: Point-of-care (POC) documentation
4.	**End user computing**	Age factor Computer skills Access to patient information Incomplete physician documentation

4.3.1 Training and education

Participants expressed their concerns of not having sufficient training before the EHR system was implemented, which resulted in more time and effort spent to perform their tasks or to fulfil their responsibilities when using EHRs. Their lack of familiarity with the new system resulted in longer time being spent to complete their tasks.

4.3.1.1　Insufficient training

The participants expressed several responses in the study in which nurses felt there was no ongoing training post-EHR implementation that could have equipped them with the necessary skill sets needed to familiarise them with the EHR system. According to participant 2, to acquaint the nurses adequately with the setup before launching the program, the nurses underwent training which had been provided by the vendor, Cerner Corporation. Since the company is the designer, producer, and distributor of the EHR system, it presumably had the required expertise to train the end users, namely the nurses, on how the system works. However, this was not the case. According to some participants, the training provided prior to implementation was not in-line with the live EHR system. Participant 2 expressed her sentiments.

> *Participant 2 (Line 7): Actually, first of all, we went, all of us, we went for the training for the Cerner before we got launched for Cerner, but when we started, most of the things which is about the Cerner, we didn't get in this training.*

When the nursing staff started attending the organised training sessions, both the inexperienced trainees and the skilled nurses faced moments of anxiety, since many members of staff did not have practical computer skills. In addition, the lack of basic knowledge on how the program functions presented another impediment in their professional preparation for the EHR system. They were unsure in how to overcome the gaps in their knowledge. Moreover, they did not know where and how to start, what instructions to follow first, and whom to ask. Participant 4 confirms that during the initial stages of the training, the nursing staff faced many challenges.

> *Participant 4 (Line 80): It is for initial, for one month we found it very difficult because we don't know where to go and we didn't have enough help.*

Participants expressed concern that they lacked the basic knowledge of the system and the training sessions did not help them much in the beginning, as they had difficulty understanding actions that were more complex. Consequently, with more time lost on explaining the basics, which limited their capacity to acquaint with more advanced options, their progress was slow. However, as Participant 5 confirms, after they had successfully overcome the first obstacle, it was easier to advance and use the program:

> ***Participant 5 (Line 8):*** *At the beginning, we were having hard time to adapt it because it's a new thing, it's a new system but as time goes by, it makes the work more easier.*

Participants 1 confirmed that the Nursing Informatics team are commissioned to assist and support the nurses, enabling them to continue completing their organised tasks with minimal disruption. The participant further stated that sharing experiences allowed every nurse to learn more easily, they took the opportunity to partake in the trials, which enhanced the group's learning outcomes. Participant 1 affirms that the collaborative learning environment improved their comprehension and presented a major boost in the team's ability to advance:

> ***Participant 1 (Line 18):*** *And we suffer in the beginning but with us, with the support of the nursing informatics and our trial and our experience, I will tell my friend, "You have to do like this and this," so we overcome this problem.*

Participant 10 pointed out that as the nursing team gained the much-needed support in their endeavours, and took advantage of the opportunity to collaborate, in time the group overcame the underlying challenges. All the interviewees affirm that the nurses significantly improved their mood over time and found new inspiration to learn and advance their knowledge of the program. Moreover, by sharing their individual experiences in using the EHR system, they inspired each other and improved. Eventually, as Participant 10 states, they were satisfied with their progress.

> ***Participant 10 (Line 11):*** *When it start it was miserable for the first let's say for the first three months we had too many issues. But later on it really started adapting nicely and started functioning well. We are very fine with it now.*

4.3.1.2   Nursing informatics support

Many of the participants verbalised that their greatest support structure was the nursing informatics, which has always been supportive and provided them with insightful information that is required in their daily routine. In principle, the nurses have interacted with the nursing informatics team as far as they can remember. The nursing informatics continuously provides the nursing staff an opportunity to channel their questions and receive timely and appropriate feedback that enhances their work efficiency. The nursing informatics support system shares its practical knowledge, ensuring a smooth and robust working environment, which the medical staff has found

beneficial in their daily routine. Participant 2 emphasises the advantages that such an informatics team brings.

> *Participant 2 (Line 74): Nursing informatics, they were with us from the start, up to the present. Anything we have questions or any, you know, any problems you get in between, we call our, you know, the one assigned for our unit. So, she comes and she helps us.*

Participant 3 confirmed that the informatics team offers a 24-hour service, which ensures continuous support to the medical staff. To solve several problems and challenges they face in their lines of duty, the rigorous nature of nursing responsibilities demands unremitting support. The interviewee also said, the nursing medical staff is grateful to the nursing informatics team, which works in three shifts and immediately responds to any call for help that nurses have, especially during the initial implementation stage of the EHR system.

> *Participant 3 (Line 119): This one I would like to say it is excellent because the nursing informatics team, they were available 24 hours when the Cerner go live, they were working in three shifts so whenever there was an issue, we have their numbers so just to give a call, they came immediately to solve the issues and what our problems we faced, they solved it immediately.*

Participants 4 and 10 shared the same sentiment. In particular, the 24-hour support of the nursing informatics team proved fundamental and efficient in helping the staff solve their uncertainties. According to Participants 4 and 10, the communication between the nursing informatics team and the nurses has been straightforward and practical. Whenever the medical nursing staff has encountered an obstacle, the informatics team assists in resolving the issue quickly and resourcefully.

> *Participant 4 (Line 100): So the informatics really good, to convey the message, what are we lacking, we will inform to them, they are rectifying.*

> *Participant 10 (Line 179): Well they are doing a very good job. I mean there is no doubt on that thing. Whatever we will tell they will be really following up that thing and they will really sort it out and especially after this implementation of ticket issuing.*

4.3.2   Technical challenges

4.3.2.1   *Downtime and slow time*

Some participants narrated that when working with electronic systems, the primary focus should be on the patient. The lack of familiarity with various programs and systems kept the staff detached from their patients. Participant 5 expressed some frustration when speaking about documentation during downtime and slow time. Nursing staff are required to extensively document any change noticed in a patient's condition, which reduces the time that can be dedicated to direct patient care. However, the situation becomes more complex during EHR downtime, which adds to the time needed to document patient information.

> ***Participant 5 (Line 99):*** *The main thing is only when they will ask, the repetition of documentation that only consumes the time, time in documenting rather than spending time with the patient.*

Conversely, one participant stated that various technical issues do not prevent the staff from providing efficient and quality patient care, even during downtime. Again, the only issue that complicates the situation is the repetitive documentation.

> ***Participant 1 (Line 330):*** *Of course, you know sometimes the system is slow, this is a technical issue … But we are managing during down time, we know what to do.*

Participants expressed despondency associated with reverting back to paper-based documentation during downtime and slow time. Some said that paperwork does not offer a solution to the emerging technological issues. Health care institutions that have adopted the EHR system should enhance their functionality by hiring technicians who can rapidly correct system failure. Nevertheless, as Participant 2 confirmed, the staff quickly adapted to occasional problems.

> ***Participant 2 (Line 144):*** *How we can do, also everybody complaining so we go back again to manual, what is this, what is this? But as we do, you know, like several down times, experiencing this, like, it became, you know, everyone knows what to do.*

4.3.2.2   *Data extraction*

As part of her duties as head nurse, Participant 8 noted that she found one of the biggest issues is generating statistical information from the EHR system.

Consequently, nurses encounter difficulties when requesting reports and the only solution is to extract the required data manually.

> ***Participant 8 (Line 48):*** *And so a lot is incomplete for the data for like cancellation of the cases for theatre. All the reasons they cannot document or when we extract the data it's not coming. There is an issue.*

While the participants acknowledged the benefits of the EHR, they underscored the essence of manual data entry. It has proven to be a significant challenge whenever statistical information is needed.

> ***Participant 8 (Line 55):*** *We are making manually actually the statistics. We are still calculating or counting from the system and we leaving, allowing it from the system. Either we don't know or the system, I don't know exactly what is that, the issue.*

4.3.3 Completion of documentation

4.3.3.1 Error rate

Majority of the participants agreed that unlike manual paperwork, computers preserve a high degree of accuracy, which limits the possibility of errors to almost zero. Participant 4 explained that, in comparison, manual documentation is not as accurate, which significantly reduces its dependability. On the other hand, computer software allows easier retrieval of information, location, and amendment of data. Consequently, the possibility of error rate represents another reason why employers should prioritise computer competency training and enhance the organisation's productivity.

> ***Participant 4 (Line 40):*** *… and another thing is the error will be less … of course, if you sit at the computer, you come for the documentation, it will pop up that what are the thing you have done …*

Participant 7 emphasised that the EHR system minimises errors and allows instant access to all the information needed to help a patient. Participant 6 further explained that health care is one of the fields that depend on the employees' level of accuracy and on the tools or programs with which they work. Often, the slightest error in documentation or medication can cause major harm. Therefore, to enhance service delivery processes, medication administrations, and prescriptions, the medical staff have to obtain relevant computer knowledge.

> *Participant 6 (Line 4): Well, when we started this electronic health records, it helped us really to minimise errors, especially for the medication administrations and prescription order … it will be in the system where you can see, you can view …*

4.3.3.2   Legibility

Majority of the participants stated that computer use greatly enhances legibility across the work spectra. Some participants expressed relief not having to experience mounting challenges while working with paper-based records with illegible handwriting. Additionally, participants stated that electronically stored information can be shared via the internet and through network-connected computers, enhancing the speed with which nursing professionals can obtain, interpret, and share data. Therefore, the EHR system stores data, eliminating the need for the patient's previous paper medical records and ensuring their accuracy and legibility. Additionally, the system reduces the risk of data replication and lost paperwork. As the data is stored in a single, easily searchable file, information extraction is much easier, allowing medical professionals to track long-term changes in a patient.

> *Participant 3 (Line 51): Like, each person have his own hand writing and problems and sometimes the other person's penmanship, we cannot read and if the doctor is writing anything, with a speed, like this we cannot read sometimes but when it comes to the electronic, it is all clear so we can easily get… We can know what was written.*

4.3.3.3   Automatic alerts

According to participant 6, one of the particularly useful features of the computer software is the possibility to set automated alerts and remind nurses of an upcoming activity. An example given by Participant 6 referred to alerts which can notify medical professionals when a patient receives the prescription for painkillers, which is useful in detecting addiction problems. Alternatively, as Participant 6 noted, such notifications can periodically alert nurses to administer medications. Consequently, computer programs have considerably eased certain repetitive tasks, ensuring timely and quality health care services and outcomes.

> *Participant 6 (Line 17): Even for assessment, it really alerted us, like for reassessment of pain. Like, if you administer medication for pain, you have to reassess, if you have to reassess on a timely basis it will also work. So, it's really helpful.*

Few participants acknowledged that the EHR system, just like every other software, comes with its advantages and disadvantages. Participant 10 particularly liked the feature where the EHR system reminds nursing teams in each shift, every eight hours, to conduct a full assessment of a patient, for example the humpty dumpty (fall risk assessment). If the medical staff is late in entering the details into the program, the system will react and inform the team that the assessment is not completed:

> *Participant 10 (Line 151): … it will show to you automatically what assessment to be done or humpty dumpty assessment to be done. It is showing you in red. So okay you will do it one time and then again you need to do it in the next time.*

4.3.3.4   Identify end users

Participants stated that although nurses are the front-line care providers in dealing with patients, they are also the end users when using the EHR system. The latter allows medical professionals to easily trace the origin and destination of any document and take full responsibility for their actions. At the same time, while health care providers found EHR challenging at the beginning, they soon realised it eases data entry work, thereby enhancing the outcomes. As Participant 1 stated, the software marks every change, which nurses find beneficial:

> *Participant 1 (Line 235): And each entry will be documented with the staff, even if I update anything in the same chart, it will be entered with staff so it's easily also to trace who did this documentation. So it's more benefit for me when I'm checking, I know who gives this medication …*

4.3.3.5   Confidentiality

One participant believed that the EHR system is designed to respect the health care industry's responsibility to protect patients' right to privacy as well as to their health information. Consequently, the system allows prevention of data-sharing with other health care providers outside the facility. Therefore, Participant 1 emphasised that the confidentiality of patient data is high:

> *Participant 1 (Line 65): The good thing is with the Cerner it is saving the time for the documentation and it's more confidential.*

4.3.3.6   Easy and fast documentation

Participant 10 in the current study stated that the more time staff spend with a patient, the more they learn about patients' health-related issues and needs. Documentation

only serves to update the patients' medical records, adding very little to the recovery process of a patient. Therefore, contact hours with patients are crucial in facilitating their speedy recovery. One of the benefits of the EHR system is that it increases the time medical staff spend in practical patient care and decreases the time of evidencing patient data.

> *Participant 10 (Line 58): As eight hours working with patient it gives us a space to sit with the patient and to be more interactive with the patient rather than caring for the documentation a lot.*

Another participant stated that the EHR system allows uniformity in data handling, which simplifies the medical staff's responsibilities, and allows for better clarity and organisation of the collected information.

> *Participant 11 (Line 6): For me I feel that you seen the computer as a documentation. It is much easier and more organised for me because I can ... I mean it's been so uniform confirm to paper.*

According to some participants, familiarity with informatics and processing is an important aspect of quality service delivery. As the interview with Participant 5 confirmed, it took time before nursing teams adjusted to the EHR system. At the beginning of the adjustment process, employees had the perception that they spent more time at the computer familiarising with the new software than they were committed to patient care. However, employees' job satisfaction has increased now that everyone knows how to use the program.

> *Participant 5 (Line 54): The beginning, more of the nurses or the clinicians complain about spending more time in the computer than the patient because I think they need to sit down and familiarise the things that is needed and now they are adjusted. We rarely hear complaints about that they are not familiar with these things so most of them; they are telling me this is more easier.*

Furthermore, Participant 5 noted that the program has reduced the workload for nurses who were often required to document the same information more than once. Now, with the implementation of the EHR system—which prevents redundancy— nurses can spend their time in a more efficient way, retrieving readily available data.

> *Participant 5 (Line 59): For the nurses who is doing documentation. They prevent redundancy of documentation. They need to tick it's already there, accessible, whatever they need, they will just choose.*

As Participant 3 stated, while the demanding paperwork requires patients to wait between 20 and 30 minutes for admission, EHRs have significantly reduced the waiting time and simplified the process.

> *Participant 3 (Line 16): For the paperwork, we will take … Supposed to be 20 to 30 minutes for one admission. Electronic is very easy, it will finish within 15 minutes for the admission process.*

4.3.3.7 Automatic data generation

Some of the participants spoke about the EHR automatic data generation feature. The EHR system allows health care organisations to automate processes and generate full electronic charts, incorporating paper and electronic documentation directly into the patient's records.

> *Participant 1 (Line 220): Saving times because any entry, I will enter for the patient, that will be filled in all the same and if for example, when I will enter the vital signs, it will be filled in all the vital signs, boards, even in other charts.*

4.3.3.8 Computer on wheels: POC documentation

Most participants were happy with the computers on wheels, which allowed POC documentation. POC permits a nurse who is in direct contact with the patient to document medical information while providing care. When inconsistencies occur, the program alerts medical professionals that the entered data could be a potential administration error. Consequently, EHRs improve workflow, as access to the patient's latest information prevents errors at the patient's bedside. Furthermore, clinicians can immediately note the administered medications and reduce preventable errors. Additionally, as Participant 2 testified, clinicians can approach their patients faster and quickly respond if needed.

> *Participant 2 (Line 85): … more time with the patients and this computer on wheels, yes, they are, you know… It's helpful because they can do, beside the patients, anything that they want to do so it's easy and more, not like before, all of them, they will be in the station for now, it will be, you know, they are more near the patient … They're nearer to the patient so if ever patient needs something, they are near. It's faster, you know. They can go and see what the patient needs faster.*

4.3.4   End user computing

Some of the participants spoke about the implementation of numerous technical improvements and how change is inevitable in the fast-paced health care environment. The findings suggest that older nurses struggled more to keep pace with the new developments. Participant 6 confirmed her awareness that one needs to adjust to every modification in the working environment.

> *Participant 6 (220): Because I witness from zero, I came here 29 years ago as assistant, I witness from nothing till so. I may be old but still I am trying to cope and you know, like to adjust myself, level in the generation, you know, the millennial.*

Participant 9 affirmed that the younger nurses did not find it difficult to cope with the transition due to their increased ability to adapt to new circumstances and to do so more quickly than older nurses. Unlike older nurses, younger nurses have the chance to develop their skills in a new mechanically improved and innovative environment, which continuously equips them with new skill sets and inspires them to grasp new concepts and technologies more easily.

> *Participant 9 (Line 136): The younger nurses like, younger nurses what I feel is, they can grasp easily.*

Participant 10 described training for the EHR system as a learning experience and stated that every learning experience requires adaptation, to which people respond in different ways. While most nurses, especially the older staff, may face differing levels of difficulties and may exhibit resistance, persistence enables them to overcome their struggles with the change. Almost three years into the implementation of the EHR system, the majority of the medical staff has adapted and learned to work with the program without any difficulties. Hence, despite the initial resistance, the nursing staff has accommodated to the change in their daily routine. However, as Participant 10 explained, the acceptance of the new system did not happen quickly:

> *Participant 10 (Line 166): Cerner become very good, thankful to God, we are up to three years. It is really nice, really good adaptation. The people even the one who was having the resistance ... But now everyone is really okay they start knowing it.*

Participant 10 further confirmed that the practice of new skills and the implementation of gained knowledge reduced stressful situations and complications that the staff

encountered at the beginning. Now front-line care providers know how the system functions in practice and operate the EHR system with ease and proficiency.

>*Participant 10 (Line 50):* Day-by-day you will know the system. So day-by-day everything was getting better until now it is getting along nicely.

4.3.4.1   Age factor

Some of the participants indicated age as a principal factor that affects the nurses' attitude towards the acceptance of the EHR system. Participants recognised that generally, as opposed to their younger counterparts, older nurses are reluctant to embrace new technologies. Consequently, the management often assumes that older and more experienced nurses, without much practical computer knowledge, would not like the system. According to participant 5 and 8, age represents a major challenge in every segment of society, including the health care sector, health organisations ought to invest in an ongoing learning process to ensure continuous quality services and requisites that dictate the modern-day nursing environment. Both Participant further concluded that the younger generation finds the EHR system less challenging than they, as older nurses, have.

>*Participant 5 (Line 20):* …some of our staff, especially the old ones, the old generation, they are having hard time for this adjustment because in their curriculum from their college days, the computer is not yet been established so the new generation has faster to learn this electronic health record system.

>*Participant 8 (Line 17):* So because all the young children, people, they learn computer, they have already background of the computer so it was easy for them to adapt the change.

Some participants felt the need to keep abreast with new trends and scientific and technological advancements and stated that health organisations may enhance the competitiveness and productivity of their staff by ensuring continuous education. Participant 4 confirmed that the adaptation to new computer programs is much easier for the younger generation, which has grown up in technologically advanced environments, and she cannot imagine a time when computers and smartphones were not a part of people's daily lives—which are now common in domestic spheres, academic realms, and innumerable professions.

> *Participant 4 (Line 88): The one who is coming now new, their technology's is high now, they are now really good in computer so for them too easy to pick up.*

Some participants stated that while many employees have difficulties in accessing or obtaining technical skills and tools, the increasingly technologically inclined environment makes the coming generation better equipped to handle the challenges of the moment. Participant 10, who is a young nurse, confirmed the older nurses' reluctance to adopt and adapt to information technologies.

> *Participant 10 (Line 17): The first thing is that we had some resistance from the staff to use the computer … Because basically they are ... I would not say they are old ages but I will say they are used to old ways.*

4.3.4.2   Computer skills

Many participants felt that older or more experienced nursing staff have the responsibility to gain a solid foundation in nursing informatics and acquaint the new generation of practitioners with the existing systems. Participant 4 stated that computer literacy eases the documentation workload, and reduced stress is linked to increased job capacity in a given timeframe.

> **Participant 4 (Line 14):** *And document wise, it is one who is having excellent computer skill; it's easier for them to finish it fast, the documentation. One who doesn't have experience, it is hard for them. For me, from my experience, I'm really good in computers so I finish documentation really fast.*

Participants admitted that nearly every aspect of learning includes basic computer literacy; nurses have to seek appropriate training to store, organise, and transmit information. Participant 7 stated that nurses without prior training or lack of computer proficiency cannot access health care-related information quickly. Thus, they are less productive since nearly everything demands software input, tabulation, storage, and retrieval. Therefore, computers have replaced the traditional pen-and-paper modes and integrated a higher degree of accuracy in noting and storing information.

> **Participant 7 (Line 1):** *From my opinion and view when Cerner started, really it was feeling very distressed because most of the staff were not literate in the computer. So everyone was having a huge fuss on how we going to cope with the system.*

4.3.4.3 Access to patient information

Participant 10 stated that the EHR system offers nurses reminders to complete their workload effectively, decreasing the chances of errors and ensuring a timely and efficient response to patients' needs. Consequently, EHRs increase the quality of services the medical staff can offer in a facility. As a study participant confirmed, the program has eased access to patient information.

> *Participant 10 (Line 74): ...like when you open the system it shows you have to do this and this. So it will be in your mind, back in your mind that okay there is something that I need to complete. So that is why I feel the continuity of care of documentation in Cerner it is really seems very clear and on time record.*

Another participant added that the new system offers ease of data entry, its storage, and protection, which has transformed nursing care. For instance, access and transfer of often-illegible paper documentation consume much time and energy. However, as another informant stressed, innovative systems are effective in aiding medical professionals in entering, monitoring, and accessing data with just a tap of the button.

> *Participant 3 (Line 63): The thing for me most of all, patients are from emergency so before when there was the paper documentation, we were still waiting for the patient to come and that time only we came to know what is the patient problem but now with the electronic documentation, when the patient is still in the emergency and they are calling for the admission, we can just access the health care number and we can check what is the patient problem so we can co-ordinate the care accordingly.*

Participant 3 further noted that the ease of data access is extremely important as it not only increases service delivery but also shortens the patients' waiting time in the facility. Electronic data allows instant access to information regardless of who entered it in a patient's medical records.

> *Participant 3 (Line 48): And other thing, for the Cerner documentation, it is all electronic, so if another person has written the notes regarding the patient care and anybody, like, the other health care person can easily access it and they can read it.*

Furthermore, the participant confirmed that technological advancement has enhanced decision-making processes and patients' hospital admission and discharge, as well as decreased the waiting time for these procedures.

> *Participant 3 (Line 48): If the patient is for discharge and for the patient care, we can give their needs quickly. No need to wait long time for the discharge process and the papers. And also, for the patient also it is better. They are getting clear documents so it is good for them also, for the future reference and everything.*

Many of the participants were happy with the file-saving option that the system provides, which enables instant data sharing and access. This option eliminates the dismissal of patients who do not own or have forgotten to bring a hard copy of their medical files. Additionally, as the interviewee stated, unlike physical files that are prone to damage and loss, the innovative EHR system guarantees safe data keeping, and enhances data and retrieval reliability.

> *Participant 7 (Line 80): So, the patients were sent back because the file is not here or we cannot treat the patient because that exacts reason or the previous reports we cannot direct the patient … This report is now with us always. So, when a patient needs it for appointment or anything, we can access the file.*

Participant 5 stated that the medical staff can simply access patients' medical records and view, correct, retrieve, and verify data, it enables nurses to track information and raise timely alarms in case they require correction, which also greatly improves patient care. Participant 5 explained, when medical professionals want to assess data, they can browse through doctors' and nurses' notes.

> *Participant 5 (Line 76): It is faster and accessible for everyone because they can immediately browse it in the computer, whatever they need. They want to see the progress notes of the doctor, it is there. The case manager notes, they can see it is already in the system. Infection control or disease… infection control, nurse notes, are already there.*

4.3.4.4   Incomplete physician documentation

From the concerns that the participants presented, the researcher noticed relying on the accuracy of machines alone might sometimes prove challenging. However, nurses often encounter mistakes that are products of human errors. Subsequently, they need to check and recheck information that medical practitioners have entered into the EHR system, as it influences the accuracy of their tasks.

> *Participant 10 (Line 24): Then there are some mistakes that happens by other people, other health practitioners. Which leads effects on our as nurses, so affects our work*

as nurses. Sometimes you will find a doctor will write the wrong order, anything and then we need to follow them again to fix the orders.

Another big issue the participants discussed in this study is inadequate or incomplete documentation, which is especially important during handover. For example, during the interview, Participant 1 expressed her concerns related to missing or incomplete physician documentation. While the EHR system has many options that enable timely and accurate patient follow-up, the lack of consistency in nurses' and doctors' recordings and insufficient communication among the medical staff create issues. Participant 1 wished she can always understand the status of the patient, which is impossible in cases in which nurses and doctors poorly detail patient documentation.

> *Participant 1 (Line: 90): I will read what he wrote, for example I was not with him in this shift, but I can read what is the plan, how was the wound, what they did. But if it's not written, the communications will be dropped.*

4.4   SUMMARY

In this chapter the findings of the study were presented and discussed. Training and education; technical challenges; completion of documentation and end user computing, were themes that emerged from the study. Overall the themes and subthemes outlined the experiences of nurses when using EHRs.

4.5   CONCLUSION

All participants were happy about the use of EHRs, although some nurses highlighted concerns related to training, technical issues, and the time taken to adapt to the EHR system. Overall, all of the participants relayed positive feedback on the use of the EHR system. Therefore, the research question for this study has been answered and the goal and objective have been successfully explored and described.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

5.1   INTRODUCTION

This chapter comprises the discussion of the findings, the conclusion, and recommendations derived from the study.

5.2   DISCUSSION

The aim of the study was to explore how nurses experience using an EHR system at a health care facility. The researcher explained and discussed the findings of the objective.

The study had only one objective, which was to explore how nurses experience using the EHR system.

The research question for this study was answered and the goal and objective were successfully explored and described.

Themes related to the participants' general experiences are discussed below.

5.2.1   Training and education

5.2.1.1   *Insufficient training*

One of the most common themes relayed by the participants in the current study was that the nurses were not given enough time to familiarise themselves with the EHR system. The initial formal training was depicted unfavourably by many of the participants and identified as a barrier to their learning. Singh and Muthuswamy (2013:1531) in the study conducted in Tamil Nadu, India, reported that lack of training among employees has an impact on the adoption of the EHR system. Furthermore, a study conducted by Dastagir et al. (2012:140), found that a rigorous EHR end-user training program can essentially improve clinical productivity and acceptance with EHR.

The American EHR Partner survey data, from more than 2,300 clinicians confirmed that many clinicians maybe receiving an inadequate amount of initial training on how to use the EHR system (Underwood, Brookstone & Barr, 2011:1). In addition,

participants in the current study also mentioned that they learn best and have better retention when they learn from an instructor in a live setting, giving them hands-on experience. Furthermore, some participants felt that the training sessions were quick and consequently they retained minimal information. The findings of a study done by Zadvinskis, Smith and Yen (2018:38), identified rushed and overwhelming classes that were provided too far in advance of implementation as a major concern.

The dominant understanding of participants in the current study confirmed that the skills learned during the initial training did not help in the practical field. However, the live training was more useful and guided them in the correct direction in using the EHR system more efficiently. A similar finding was reported in Ajami and Tadi (2013:129) study, where initial training was depicted positively by some, however, insufficient training was identified as a barrier, either on the grounds that there was insufficient training or in light of the fact that classroom training was not suitable to needs and learning styles of the clinicians.

In the present study, participants felt that training sessions should be offered more frequently, and hands-on exercises were identified as the most useful portion of the training. Bredfeldt et al. (2013:1) in a study conducted in the United States confirmed that while advanced training was valued by clinicians, training after implementation and hands-on exercises were equally valuable.

5.2.1.2 *Nursing informatics*

In the present study, participants praised the nursing informatics support team who have been central to providing constant and reliable assistance to the nursing staff, helping them fulfill their objectives. However, to ensure that the nurses retained the information after the training, participants in the current study suggested the nursing informatics team should devise follow-up mechanisms and support sessions. This approach would not only reduce the workload of the nursing informatics team but also allow nurses a better retention of the gained knowledge and skills. According to a survey titled "Impact of the Informatics Nurse" (2015:1), the role of nursing informatics is extending and having remarkable impacts on work process and productivity (Caspi, 2015:1). Moreover, 85% of the respondents believe informatics nurses bring value to the EHR implementation phase and 75% say informatics nurses are starting to play a

critical role in ensuring user acceptance and adoption of EHRs (Impact of the Informatics Nurse Survey, 2015:1).

5.2.2   Adapting to change

5.2.2.1   Computer competencies

Based on the participants' narratives in the current study, the researcher noticed that many of the nurses welcomed the change to EHRs. The participants who shared their concerns related the change to factors that make it difficult to use the EHR system and therefore took more time to accept the change than the nurses who were better qualified to use the EHR system. This finding is similar to a study conducted by Ajami and Chadegani (2013:213) that stated, people prefer both personal and professional predictability and stability, and resistance to change is a common phenomenon. In addition, the lack of familiarity with the newly implemented EHR system prevented the nursing staff from carrying out their duties successfully.

Furthermore, those who started to use computers late in their daily routine usually have to spend more time and determination on continuing education. Current university nurses will most likely have technological experience, but experienced nurses already in the field will need to adapt to technology (White, 2014:1).

After having adopted the necessary computer skills to use the EHR system efficiently, the participants in the current study experienced increased satisfaction in the work environment. One of the reasons is that the EHR system allows health care organisations to automate processes and generate full electronic charts. Additionally, medical professionals can easily trace the origin and destination of any document and take full responsibility for their own actions.

5.2.2.2   Age factor

Due to the age gap and the reduced ability to manage complex apparatus and learn complicated computer programs, older medical staff resist changes in the daily routine. Thus, resistance to change is a normal human behaviour, which nurses should overcome to adapt to the newly transformed environment (Uthaman, Chua & Ang, 2015:50). A study conducted in a health care system in the South East of the United States identified constant change as a negative factor that influenced the bedside practice of older nurses, which caused frustration and stress when new technological skills were implemented (Spiva et al., 2011:6). Participants in the current study thought

that older nurses were resistant to change because they were attached to the old practices and didn't think they needed to change. Spina et al. (2011:6) further narrates that nurses are generally more critical of change and often concerned with issues related to patient quality of care and workload, and therefore find it more challenging to adapt to change.

In the present study, participants believed new scientific and technical discoveries, equipment and improved patient care screening techniques prevent older, more experienced nurses from adapting to changes. With increasing scientific and technical data, the older generation finds it difficult to adapt to new technologies, especially since they did not have the opportunity to acquire information technology knowledge during school (Spiva et al., 2011:6).

According to the participants in the present study, it is hard for nurses to let go of old practices before accepting the newly introduced change. In addition, competent nurses are inclined to have confidence in their practice due to their experiences.

5.2.2.3   *Embracing technology*

In many parts of the world, nurses try to provide patients and families with care to help them cure, keep them safe and return them to normal functioning. The struggle to achieve these simple goals is nowhere more obvious than in hospitals. Embracing new technology and having the computer skills to do so is a challenge that contributes to the struggle (Cipriano, 2013:1). The present study supports that nurses who had the right level of computer skills were able to complete documentation a lot quicker than nurses who had minimal or no computer skills.

In 2014, a cross-sectional research study was published on "Does it get easier to use an EHR?" After two years of using the EHR system, 70% of clinicians were able to perform most EHR tasks and report fewer concerns about the EHR system, confirming that clinicians can adapt to EHR systems for meaningful use over time (Ryan, Shih, Winther, & Wang, 2014:1341). Similarly, all participants in the current study stated that the EHR system improved the day-to-day tasks of the nurses and the ability to use EHR system efficiently and effectively with time and experience. McCabe and Timmins (2016:104) who wrote an article on the adoption of health care technology, stated that it is difficult to change the behavior of health professionals in order to freely adopt

technology to sustain self-management, therefore it should start at the undergraduate level and continue throughout the career path.

5.2.3   Completion of documentation

5.2.3.1   Time efficiency

Based on participant narratives, the researcher noted that participants repeatedly claimed to improve their time efficiency by completing documentation using the EHR system. One of the common reasons mentioned by some participants is that nurses often document on standardised forms and care plans that are already integrated into the EHR system. Similarly, Noah and Thomas (2017:1) found that standardised electronic documentation reduced the amount of time spent on documentation. Abu-Abu-Hanna and de Keizer also confirmed in their study findings that standardised EHR documentation decreased time spent on documentation by 8.5%.

In the current study, it was clear that the participants were happy with the process of accessing patient information. In addition, nurses in outpatient departments don't always have enough time to complete the documentation before the next patient arrives, unlike in the hospital environment. Automatic data generation allows nurses to collect and enter sufficient data into the EHR system to plan safe and appropriate care for patients (Miller, 2016:3).

Point-of-care documentation involves nurses bringing the computer into the patient's room and documenting the interventions and assessments of the patient. Patient information that is captured immediately can make a job easier and can promote better patient care. EHR documentation is available to all clinicians who need it for clinical management and quality assurance (Love, 2017:1). In the current study, all the participants were happy with the EHR systems ability to provide point-of-care documentation.

An EHR system is set up to ensure that nursing notes are complete and accurate. Nurses are alerted to any missing, incomplete, or possibly inaccurate documentation. The participants in this study stated that EHRs helped them to avoid documentation errors, more specifically medication errors. Participants also indicated that reminders or alerts helped to prevent possible harm to the patient. This finding is similar to a study by Carroll, Edwards and Rodin (2012:1) in which hospitals reported that EHR

system alerts have saved lives by preventing drug interactions, allergy conflicts and human errors in the ordering. The authors further narrated that hospitals report the EHR aides in faster and more accurate communication between clinicians.

5.2.3.2 *Eliminating legibility issues*

The dominant understanding of participants in the current study relayed positive views about the EHR system eliminating legibility issues. Participants had a feeling of relief when sharing their experiences because, according to the participants, the EHR enables nurses to clearly identify medication prescription and physician orders. Illegible entries in medical records and, for that matter, in medication prescriptions are responsible globally for countless deaths and cost health care providers billions of dollars per year in lawsuits (Briffa, 2011:1). Carroll, Edwards and Rodin (2012:1) further concluded in the results of their study that quality improvement staff confirmed EHR reduces errors related to handwritten orders (i.e. poor legibility) and helps patients read discharge instructions.

Moreover, participants indicated that the EHR system stores data, eliminating the need for a patient's previous paper-based medical records, and ensuring their accuracy and legibility. According to Briffa (2011:1), the EHR system reduces the risk of data replication, prevents data sharing outside the facility with other health care providers, and enables better organization of the information collected and uniform data handling, which, in turn, simplifies the responsibilities of medical staff.

5.2.3.3 *Incomplete documentation*

In the current study, incomplete physician documentation and clinical orders were reported as a negative factor when using the EHR system. The EHR allows physicians to enter orders associated to care and medications. The value of the correct order completion helps to facilitate informed decision-making and accurate nursing care (Alvandi, 2015:1). Participants stated that with paper-based medical records, physicians completed documentation and orders in the ward where the patient's records were kept, and therefore it was easy for nurses to monitor incomplete physician documentation and orders. However, with the EHR system, physicians' complete documentation and orders in their office or in another ward away from the patient's treating or admitting area. This therefore makes it difficult for the nurses to identify incomplete documentation and orders. In addition, nurses are unable to

complete patient care when documentation and orders are incomplete. In a study conducted by Hong, Kaur, Farrokhyar and Thoma (2015:48), of the 270 information fields reviewed, the most common field of incompleteness was history of presenting illness followed by surgical history. The authors also concluded that in many fields of information, despite the claimed benefits of EHR systems, inaccuracies and incompleteness have been found.

5.2.4   Continuity of care

5.2.4.1   Access to patient information

The understanding of participants in this study was that electronic documentation facilitates the exchange of clinical information among health care providers by providing up-to-date clinical information. In the present study, most of the participants said the EHR system makes records readily available at point-of-care and the comprehensive picture helps the nurses to do their job efficiently and effectively. Improved communication was identified as an additional finding in the study conducted by Carroll, Edwards and Rodin (2012:1). Linking inpatient and outpatient documentation and accurate communication between hospital providers helped clinicians' access longitudinal information during admission and discharge planning. In the current study, nurses also indicated that they are able to view emergency department documents before the patient is transferred to the ward, allowing nurses to prepare and adjust care appropriately, even if the patient is unconscious.

Some participants stated that the EHR system securely transmits patient data among clinicians and therefore helps to coordinate patient care. The EHR system enable clinicians treating the patient to continuously update patient clinical data in the EHR system. The 2016 American Hospital Association (AHA) Annual Survey Information Technology Supplement has found that the vast majority of hospitals and health systems provide their patients the ability to access their EHR. In a drastic increase, 93% of health facilities enable their patients to view information from their EHR online, up from 27% in 2012. The findings of the survey further concluded that many hospitals and health care systems go beyond simple access to enable patients to interact with their EHR (Rosenberg, 2018:1).

5.2.5   Technical issues

5.2.5.1   Downtime and slow time

When computer systems go down, or when an EHR system is not working or slow, it disrupts hospital's operations, admissions to finance, supply chain, patient care, and more (Minghella, 2013:1). All the participants that spoke about downtime and slow time in the current study, confirmed that the facility had put a remarkable amount of thought and care into its contingency plan. A study by Larsen et al (2018:187) confirmed that one of the causes of disruption during EHR downtime is when downtime procedures are not in place. In the current study, participants indicated that they were trained in downtime and understood the downtime and slow time processes completely. Participants also expressed their satisfaction and confidence in the response plan during the system failures. Based on the findings of a study done by Cano, Bejarano, Vidal, Luna and Benítez (2017:689), 58% of the participants indicated that they had not received training on the actions to be taken during downtime and 80% replied that they wished to receive adequate training. The authors further concluded that the knowledge of end users in connection with the EHR contingency plan is an important subject to explore, which could lead to successful downtime processes.

5.2.5.2   Clinical data and reports

The findings of the current study confirmed that participants become frustrated when trying to generate reports and, as a result, revert to creating manual reports. In 2011, a study was conducted to verify whether an EHR system could create a high-quality clinical database that saves time and costs. The study demonstrated that the implementation of EHR systems made it possible to generate data automatically and the database helped to maintain high quality data (Salati, Pompili, Refai, Xiumè, Sabbatini & Brunelli, 2014:1017). In addition, participants in the current study expressed concern that there may be a gap in knowledge about the production of reports from the EHR system. According to the findings of a study done by Butler, Wei, Yuan, Kang, Si and Weng, 40% of the manual data could not be found in the EHR dataset and therefore the EHR data were not useful for the eligibility screening of clinical research.

5.3   LIMITATIONS OF THE STUDY

One key limitation identified is that the study does not represent the experiences of nurses working in the Emergency Department, because the study facility does not have an Emergency Department. Subsequesntly the findings cannot be generalised to all departments. The study was conducted in the public health care facilities in Qatar and private health care facilities were excluded. Furthermore, the study included only one health care facility.

5.4   CONCLUSIONS

The shift in health care organisations transitioning to an EHR system from paper-based documentation systems has become the norm over the past fifteen years. This EHR transition has not only brought about numerous changes to individual organisation's documentation systems, but it is also responsible for a significant amount of change in the workplace for hospital staff (Adams, 2017:1). Minimal EHR-related challenges exist at the facility where the current study was carried out. All the participants shared more positive experiences in relation to the EHR system than negative experiences.

Select participants stated that some of the older nurses had difficulty adapting to and understanding the EHR system. Participants that spoke about adaptation challenges suggested that the older nurses took longer to adapt to the change. They may be able to complete their daily tasks; however, their performance lacked when compared to younger nurses. Some participants believed that age was not the only factor that contributed to poor adaptation. Other factors—for example, insufficient training, technology challenges, and management support—also contributed to poor acceptance of the EHR system.

The impact of the EHR system on efficient documentation was predominantly positive. All participants shared one or more positive experiences with EHR-based documentation. The most obvious experience when speaking to participants was the ability of the EHR system to produce quick, easy documentation and eliminate legibility problems. Overall, participants shared more positive experiences than negative experiences on the use of the EHR system.

5.5 RECOMMENDATIONS

With reference to the study findings, the researcher identified three recommendations to strengthen staff acceptance of the EHR system.

5.5.1 Recommendation 1: Training and development

Well-timed and carefully planned training can play a critical role in successful EHR implementations (Dastagir et al., 2012:140). The researcher recommends measures to ensure ongoing training to help providers to maintain a high level of competency and efficiency of tasks. Well-developed and well-delivered training could improve end user skills when using the EHR system. To address nursing concerns through nursing education programs will ensure adequate staffing and resources. In order to provide future nurses with the knowledge and skills necessary to use the EHR system effectively, nursing education and nursing informatics programs should include technical training and not just clinical training (Chaghari, Saffari, Ebadi & Ameryoun, 2017:26). The facility must be prepared to provide not only on-the-job training for technology skills, but also must have the infrastructure to educate new nurses (Dastagir et al., 2012:140).

5.5.1.1 *Continuous professional development*

Nurses have a responsibility to continually update their professional knowledge and skills. Continuous professional development (CPD) is an additional form of ensuring that staff continue to be competent in the EHR system and manage their own professional development on an ongoing basis. CPD will allow nurses to keep pace with the current EHR-based standards of other nurses and maintain and enhance EHR knowledge and skills. This form of development can help ensure that nurses' knowledge of EHR system stay relevant and up to date, so that nurses can make a meaningful contribution to work processes (Beaumont & Stainton, 2016:1).

5.5.1.2 *Inservice training*

According to Topaz, Aditi, Ruth and Kathryn (2013:375), the widespread use of health information technology means that health care providers need to be educated on the use of technological innovation. Furthermore, education plays an important role in achieving organisational goals through a combination of workshops and in-service training (Chaghari et al., 2017:26). Implementing a customised EHR-targeted training course or workshop for employees may be effective in improving the staff's abilities to

demonstrate skills at a competent level. Chaghari et al(2017:26) stated that empowering education is a new way of providing nurses with in- service training because it is practical and can therefore help improve the EHR- based skills of nurses. Moreover, appropriate education in health information technology is critical to quality documentation (Topaz et al., 2013:375).

5.5.1.3   Recognition of work

Creating a learning culture offers benefits for both the facility and the nurses. Nurses should be encouraged to learn new skills and in turn receive recognition. Getting recognition will motivate the nurses to want to learn more. In offering learning opportunities, head nurses' play a key role in improving the nurses' acceptance and skills when using the EHR system. Nurses should also be encouraged to give feedback on the EHR system, which will assist head nurses to identify concerns. Head nurses should have clear expectations of their nursing staff and support their on-going development in order to facilitate the effective use of the EHR system (Cipriano, 2011:1).

5.5.2   Recommendation 2: Resistance to change

There is a need for nurse educators and head nurses to include changes to the nursing processes to maintain and improve the quality of health care services and hospital standards. According to Salam & Alghamdi (2016:80) nurse educators are constantly trying to introduce changes to nursing processes for the sake of development and improvement. In 2016, an editorial was written to emphasise the role of nurse educators in introducing change. The published literature that was reviewed confirmed that nurse educators are required to be innovative and knowledgeable to implement an effective change management strategy (Salam & Alghamdi, 2016:80).

Salam & Alghamdi (2016:80) added that nurse educators should be flexible, creative and knowledgeable to be able to implement an effective change management strategy. They should be mindful when change disrupts an existing pattern of behaviour and when nurses battle to adapt to change and perceive change as a threat. Head nurses should prevent over-enthusiastic behaviour and comments on the future that will be better than the past in the context of mocking the old systems of operations (Salam & Alghamdi, 2016:80).

In addition, Head nurses have a responsibility as first-line leaders to bring about change in the clinical environment, it is important that nursing administrators encourage and support head nurses to make successful changes. (Kodama & Fukahori, 2017:209).

5.6   FUTURE RESEARCH

There is need for further research to help not only nurses but all clinicians to understand the effective use of an EHR system. The following areas can be explored:

- Explore the role and impact of staff's technical skills on a smooth EHR transition.

- Explore experiences of other clinicians (physicians and/or allied health professionals) of using the EHR system.

- Explore the knowledge of head nurses and nurse informatics regarding the reporting and data capabilities that an EHR system has to offer.

5.7   DISSEMINATION

The thesis will be published electronically through the University of Stellenbosch via SUN Scholar. An electronic copy of the study findings will be provided for the facility where the research was conducted. The researcher aims to present the study on various platforms, such as departmental meetings and executive meetings. In addition, the study will be presented at relevant academic conferences. This report will provide recommendations for improvement and hospitals can then determine the feasibility of the recommendations.

5.8   SUMMARY

In this chapter, the findings of the study are discussed in relation to the study objective. Since the study had only one objective, the themes identified in this study were discussed in this chapter.

5.9   CONCLUSION

In this chapter, the findings demonstrate that more participants are satisfied with using the EHR system. Majority of the challenges that were faced were predominantly in the initial stages of implementation. These can be better mitigated for further systemic changes in the future. Identifying these issues can also help in implementing other changes in the operations of the hospital. The remaining challenges when using the EHR system is currently minimal. Participants feel positive about the use of the EHR system and progress each and every day to ensure effective and efficient use of the EHR system.

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ANNEXURES

ANNEXURE 1: ETHICAL APPROVAL FROM STELLENBOSCH UNIVERSITY

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

Health Research Ethics Committee (HREC)

Approval Notice

New Application

29/05/2018

Project ID : 7097

HREC Reference #: S18/04/087

Title: Nurses' Experiences of the Use of Electronic Health Records in a Public Health Facility: Middle East, Qatar

Dear Ms Aamina Mather,

The **Response to Modifications** received on 24/05/2018 16:42 was reviewed by members of **Health Research Ethics Committee 2 (HREC2)** via **expedited** review procedures on 29/05/2018 and was approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: **This project has approval for 12 months from the date of this letter.**

Please remember to use your **Project ID [7097]** on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be submitted to the HREC before the year has expired. Please see *Forms and Instructions* on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Departement of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: https://www.westerncape.gov.za/general-publication/health-research-approval-process. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: Forms and Instructions on our HREC website https://applyethics.sun.ac.za/ProjectView/Index/7097

If you have any questions or need further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Francis Masiye ,

HREC Coordinator,

Health Research Ethics Committee 2 (HREC2).

National Health Research Ethics Council (NHREC) Registration Number:

REC-130408-012 (HREC1)·REC-230208-010 (HREC2)

Federal Wide Assurance Number: 00001372
Office of Human Research Protections (OHRP) Institutional Review Board (IRB) Number:
IRB0005240 (HREC1)·IRB0005239 (HREC2)

The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the *World Medical Association (2013). Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects;* the South African Department of Health (2006). *Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition);* as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).

The Health Research Ethics Committee reviews research involving human subjects conducted or supported by the Department of Health and Human Services, or other federal departments or agencies that apply the Federal Policy for the Protection of Human Subjects to such research (United States Code of Federal Regulations Title 45 Part 46); and/or clinical investigations regulated by the Food and Drug Administration (FDA) of the Department of Health and Human Services.

ANNEXURE 2: PERMISSION OBTAINED FROM THE HEALTH CARE FACILITY

APPROVAL LETTER
MEDICAL RESEARCH CENTER
DOHA-QATAR

Ms. Aamina Ali Mather   Date: 10th May 2018
Assistant Director
Medical Records

Protocol No.	MRC-01-18-045
Study Title	Nurses Experiences of the Use of Electronic Health Records in a Public Health Facility: Middle East, Qatar
The above titled research study has been approved to be conducted in summarized as below:	
Hospitals/ Facilities Approved:	
Team Member List:	Ms. Aamina Ali Mather
Review Type:	'Exempt' under SCH guidelines "*Category* (2) Research involving the use of: Survey and/or interview procedures in adults only **UNLESS**: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; **AND**(ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability **OR** be damaging to the subjects' financial standing, employability, or reputation."
Decision:	Approved

This research study should be conducted in full accordance with all the applicable sections of the rules and regulations of research at   and you should notify the Medical Research Center immediately of any proposed protocol changes that may affect the 'exempt' status of your research proposal. It is the Principal Investigator's responsibility to obtain review and continued approval of the proposal if there is any modification to the approved protocol.

The investigator/ Research team must ensure the study progress is updated in the MRC online system 'ABHATH'.Please always ensure that you are only using the stamped approved versions of the documents for your research. These documents are always accessible through Abhath.

We wish you all success and await the results in due course.

Institutional Officer for Research

Date:10 May 2018

ANNEXURE 3: DECLARATION OF CONSENT BY PARTICIPANT AND INVESTIGATOR

INFORMATION LEAFLET

What is this research study all about?

• The research study will be conducted by principal investigator, Aamina Mather from Health Information Management Department who is studying at the University of Stellenbosch in South Africa.

• The aim of the study is to gather information about the experience of nurses on the use of electronic health records.

• Approximately 15 nurses will participate in this study.

• All participants will be interviewed by the principal investigator.

• Interviews will take place in the administration board room on the 1st floor at a time that is convenient for you.

• Refreshments will be provided during the interview.

Why have you been invited to participate?

You have been invited to participate in this study to share your knowledge and experiences when using the electronic health record.

What will your responsibilities be?

You will be required to attend an interview that will last approximately 30 - 45 minutes.

Will you benefit from taking part in this research?

No personal benefits have been identified; however this research will form the basis of future research on electronic health records.

Are there in risks involved in your taking part in this research?

No physical risks have been identified but if you feel uncomfortable in any way during the interview session, you have the right to decline to answer any question or to end the interview.

If you do not agree to take part, what alternatives do you have?

It is your free will in deciding whether to participate in a research study or not. Participation is voluntary and there will be no discrimination should you decide not to participate.

Who will have access to your interview information?

• The interview will be recorded on an audio-tape. Only the principal investigator and study supervisor will have access to the recording.

• All information collected during the interview will be treated as confidential and protected.

• If information is used in a publication or thesis, your identity will remain anonymous.

• Only the principal investigator and study supervisor will have access to the study information.

What will happen in the unlikely event of some form injury occurring as a direct result of your taking part in this research study?

If at any point of the interview you are feeling overwhelmed or emotionally unable to continue to the interview, you have the right to stop the interview process and proceed at a time that is best suited to you. You also have the right to withdraw from the study without any prejudice, judgement or consequences.

Will you be paid to take part in this study and are there any costs involved?

No you will not be paid to take part in the study. There will be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

• You can contact the Health Research Ethics Committee at +974 21 938 9207 if you have any concerns or complaints.

• You will receive a copy of this information and consent form for your own records.

Declaration by Participant

By signing below, I _____ agree to take part in a

research study entitled: Experiences of Nurses about the use of Electronic Health Records

I declare that:

- I have read the information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at _____ **on** _____ **2018**

_____   _____
Signature of Participant   **Signature of Witness**

Declaration by Investigator:

I, Aamina Mather declare that:

- I explained the information in this document to   _____
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above I did/did not use an interpreter.

Signed at _____ **on** _____ **2018**

_____   _____
Signature of Investigator   **Signature of Witness**

ANNEXURE 4: INTERVIEW GUIDE

Interview Guide

Section A

Demographic Information (Pre-interview questions)

1. Age

2. Employment years at HMC

3. How long have you used EHR (Cerner)?

4. How would you rate your computer skills?   ☐Average   ☐Good   ☐Excellent

5. How often do you use a computer outside of work?   ☐Never   ☐Rarely   ☐Often

Section B

1. Tell me about your experiences when using the electronic health record?
(Probing words: experience with the computer, easy to use, system enhances, positive change, negative change, information technology team, nursing informatics, downtime, age, impact on documentation, impact on quality of care)

ANNEXURE 5: CONFIDENTIALITY AGREEMENT WITH DATA TRANSCRIBER

Transcriber Confidentiality Agreement

Nurses' Experiences of the Use of Electronic Health Records in a Public Health Facility: Middle East, Qatar

I, _Top Transcriptions_ , agree to transcribe data for this study.

I agree that I will:

1. Keep all research information shared with me confidential by not discussing or sharing the information in any form or format (e.g., disks, tapes, transcripts) with anyone other than **Aamina Mather**, the researcher/s on this study;

2. Keep all research information in any form or format (e.g., disks, tapes, transcripts) secure while it is in my possession. This includes:

   - using closed headphones when transcribing audio-taped interviews;
   - keeping all transcript documents and digitized interviews in computer password-protected files;
   - closing any transcription programs and documents when temporarily away from the computer;
   - keeping any printed transcripts in a secure location such as a locked file cabinet; and
   - permanently deleting any e-mail communication containing the data;

3. Give all research information in any form or format (e.g., disks, tapes, transcripts) to the primary investigator when I have completed the research tasks;

4. Erase or destroy all research information in any form or format that is not returnable to the primary investigator (e.g., information stored on my computer hard drive) upon completion of the research tasks.

_____   25/06/2018
Signature of transcriber   Date

_____   25/06/2018
Signature of principal investigator   Date

ANNEXURE 6: EXTRACT OF THE TRANSCRIBED INTERVIEW

INTERVIEWER: So, good morning Sister. Thank you for taking time to come and do this interview with me. As I discussed with you, it's about experiences of the electronic medical record and you know, we use Cerner here at the hospital. So from your experience since November 2005, would you like to share some of your current experiences or past experiences regarding the electronic medical record?

INTERVIEWEE: Actually, first of all, we went, all of us, we went for the training for the Cerner before we got launched for Cerner, but when we started, most of the things which is about the Cerner, we didn't get in this training.

INTERVIEWER: Okay, so what you're saying is the training wasn't sufficient enough?

INTERVIEWEE: Yes, it wasn't sufficient. We learn a lot by our trial and experience with the system but when we start really the training, we went I think for two days or three days for training for the Cerner before we started but when we already launched it and go live, it's totally…

INTERVIEWER: Different?

INTERVIEWEE: Different. And we suffer in the beginning but with us, with the support of the nursing informatics and our trial and our experience, I will tell my friend, "You have to do like this and this," so we overcome this problem. But really, I think that, the training, because still, we are having new staff are coming so training is on-going process. It should be really appropriate so at least the staff will… When they will be in face with the system, they will know a lot because even now there is staff who is going for orientation, most of the things we are teaching ourselves.

INTERVIEWER: Okay. So what you're saying, Sister is when CERNER went live, the training wasn't enough and as a result, you and a lot of your staff and the nurses are battled a lot, trying to understand the system and a lot of…

INTERVIEWEE: We explore the system with ourselves. And of course with the help of the Cerner people and the informatics but really, you know, we've… It was like daily basis problem we are facing. The things I learn today because I face it, like that.

ANNEXURE 7: DECLARATIONS BY LANGUAGE AND TECHNICAL EDITORS

Language and Technical Editors Confidentiality Agreement

Nurses' Experiences of the Use of Electronic Health Records in a Public Health Facility: Middle East, Qatar

I, _____Sabika Shaban_____ , agree to edit data for this study.

I agree that I will:

1. Keep all research information shared with me confidential by not discussing or sharing the information in any form or format (e.g., disks, tapes, transcripts) with anyone other than **Aamina Mather**, the principal researcher on this study;

2. Keep all research information in any form or format (e.g., disks, tapes, transcripts) secure while it is in my possession. This includes:

    - using closed headphones when transcribing audio-taped interviews;
    - keeping all transcript documents and digitized interviews in computer password-protected files;
    - closing any transcription programs and documents when temporarily away from the computer;
    - keeping any printed transcripts in a secure location such as a locked file cabinet; and
    - permanently deleting any e-mail communication containing the data;

3. Give all research information in any form or to the primary investigator when I have completed the research tasks;

4. Erase or destroy all research information in any form or format that is not returnable to the primary investigator (e.g., information stored on my computer hard drive) upon completion of the research tasks.

_____
Signature of editor

28 October 2018
_____
Date

_____
Signature of principal investigator

28/10/2018
_____
Date

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