FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

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Factors Affecting the Adoption and Meaningful Use of Electronic Medical Records in General Practices

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DECLARATION

I, Melissa Masiza (20639175), hereby declare that the dissertation for Magister Technologiae in Information Technology to be awarded is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

Melissa Masiza

ABSTRACT

Patients typically enter the healthcare systems at the primary care level from where they are further referred to specialists or hospitals as necessary. In the private healthcare system, primary care is provided by a general practitioner (GP). A GP will refer a patient to a specialist for treatment when necessary, while the GP remains the main healthcare provider. The provision of care is, thus, fragmented which results in continuity of care becoming a challenge.

Furthermore, the majority of healthcare providers continue to use paper-based systems to capture and store patient medical data. However, capturing and storing patient medical data via electronic methods, such as Electronic Medical Records (EMRs), has been found to improve continuity of care. Despite this benefit, research reveals that smaller practices are slow to adopt electronic methods of record keeping. Hence this explorative research attempts to identify factors that affect the lack of adoption and meaningful use of EMRs in general practices.

Four general practices are surveyed through patient and staff questionnaires, as well as GP interviews. Socio-Technical Systems (STS) theory is used as a theoretical lens to formulate the resulting factors. The findings of the research indicate specific factors that relate to either the social, environmental or technical sub-systems of the socio-technical system, or an overlap between these sub-systems. It is significant to note that within these sub-systems, the social sub-system plays a key role. This is due to various reasons revealed by this research.

Furthermore, multiple perceptions emerged from the GP and patient participants during the analysis of the findings. These perceptions may have an influence on the adoption and potential meaningful use of an EMR in a general practice.

Additionally, the socio-technical factors identified from this research highlight the challenges related to encouraging the adoption and meaningful use of EMRs. These challenges are introduced by the complexities represented by these factors. Nevertheless, addressing the factors will contribute towards improving the rate of adoption and meaningful use of EMRs in small practices.

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To God is the Glory.

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ACRONYMS

ECT	**:** Electronic Communication and Transaction Act
EHR	: Electronic Health Record
EMR	: Electronic Medical Record
GP	: General Practitioner
NMMU	: Nelson Mandela Metropolitan University
PHR	: Personal Health Record
STS	: Socio-Technical Systems

"Exploratory research is really like working in a fog. You don't know where you're going. You're just groping. Then people learn about it afterwards and think how straightforward it was." - Francis Crick

CHAPTER 1

1. INTRODUCTION

1.1. Background

In the past, it was the norm for a patient to consult with a single healthcare provider throughout their lifetime. In modern society, however, this has changed as patients move between healthcare providers. These days, patients enter the healthcare system at the primary care level from where they are further referred to specialists or hospitals as necessary (Mostert-Phipps, Pottas & Korpela, 2010; Medical School, 2003). In the private healthcare system of South Africa, primary care is provided by a general practitioner (GP) (de la Harpe, 2008). This is similar to other parts of the world (Wilf-Miron, Kokia & Gross, 2007; St. Peter, Reed, Kemper & Blumenthal, 1999). According to Smith (n.d.), a GP "is a medical doctor who provides comprehensive general care to patients, rather than focusing on a specific organ system". A GP will refer a patient to a specialist for treatment when necessary, while the GP remains the main healthcare provider. The provision of care is, thus, fragmented which has resulted in continuity of care becoming a challenge (Haggerty *et al.*, 2003).

Saltman, Rico and Boerma, (2006) describe continuity of care as "the degree to which a series of discrete health care events is experienced as coherent and connected, and is consistent with the medical needs and personal context of the patient". In 1975, Geyman, Hansen, Hennen and McWhinney, are seen as the first authors to explore the concept behind continuity of care (Stumberg, 2003). Since then, it is noted that continuity of care is defined differently by different authors. However, interpersonal, informational and longitudinal dimensions are found to be the three most common aspects addressed in these definitions (Stumberg, 2003; Freeman, Shepperd, Robinson & Richard, 2001).

It is important to have a clear understanding of what each of these dimensions involve. Stumberg (2003) and Mostert-Phipps *et al.,* (2010) note that the interpersonal dimension involves the relationship between the patient and the healthcare provider, the interpersonal relationships with family members and the

patient or the GP having relationships with other involved healthcare provider(s). The informational dimension involves keeping proper records of patient information and it involves the communication that occurs between the GP and other healthcare providers.

The longitudinal dimension involves the patient consulting with the same healthcare provider over a prolonged period therefore delivering patient care at a single point of care. It requires keeping a patient record over a period of time. This results in the healthcare providers, providing care to the patient, having a growing knowledge of the patient. It is important to take note that the characteristics discussed above are not "exclusive" to each dimension, as overlapping exists. For instance, whilst there is good communication between a GP and other healthcare providers (informational dimension), a relationship is in existence (interpersonal dimension).

These continuity dimensions can be arranged in a hierarchy, starting with the need for informational continuity at the lower level of the hierarchy, as illustrated in Figure 1.1 (Saultz & Albedaiwi, 2004). Informational continuity is required to have longitudinal continuity, whilst longitudinal continuity is required to have interpersonal continuity. Mostert-Phipps *et al.,* (2010) assert that, currently, the likelihood of a patient receiving care from the same healthcare provider, throughout their lifetime, from "the cradle to the grave", is either none or close to non-existent. This makes it difficult to achieve interpersonal and longitudinal continuity of care. Therefore, it is apparent that informational continuity is important in modern society.

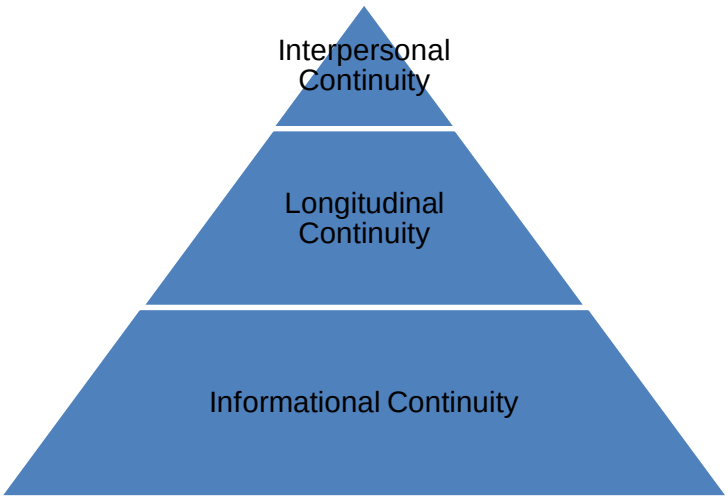


Figure 1.1: Continuity of Care Hierarchy

Informational continuity of care is important, because it is thought to improve the outcomes of care by increasing the knowledge of the caregiver with regards to the relevant facts about the patient (Donaldson, 2000; Mainous III & Gill, 1998; Freeman, Olesen & Hjortdahl, 2003). Proper records of patient information must be kept to achieve this continuity of care.

Currently, most healthcare providers still use a paper-based system to capture and store patient records (Mostert-Phipps *et al*., 2010; Cochrane & Ramokolo, 2007; U. S. Department of Health and Human Services, 2011). However, these paper-based patient records have the potential to negatively impact on continuity of care and the quality of care that patients receive. Illegibility, incompleteness and poor organization linked to notes taken by hand, in the form of medical records, can make it difficult to consider quality of care as a guarantee (Tsai & Bond, 2007). These problems are discussed in more detail in Chapter 2, section 2.2.

These highlighted problems mean that paper-based patient records are not the most viable solution to improving informational continuity of care (Boonstra & Broekhuis, 2010). Improving access to patient medical records kept by various healthcare providers requires using electronic methods to capture and store data instead of paper-based methods (Helleso & Lorensen, 2005; Schers, Van den Hoogen, Grol & Van den Bosch, 2006).

The following are technology-based components that have a role in improving informational continuity of care in the health sector, as illustrated in Figure 1.2 (Mostert-Phipps *et al.*, 2010):

- Electronic Health Records (EHR)
  An EHR allows the collection and storage of summary information gathered from all the different healthcare providers into one central point (Texas Medical Association, 2010; Garets & Davis, 2006; Boonstra & Broekhuis, 2010). The likelihood of a patient, as mentioned, receiving care from the same healthcare provider, throughout their lifetime, from “the cradle to the grave” is none or is close to non-existent. Healthcare providers need to have access to patient data for effective quality of care to be possible (Pirnejad, Bal, Stoop & Berg, 2007). Since an EHR is able to provide an aggregated patient history, it is a national

goal (Ludwick & Doucette, 2009). However, a realistic starting point to achieving this goal is to begin with Electronic Medical Records (EMRs), since EMRs are required to provide an EHR with the data that it needs to function (Garets & Davis, 2006).

- Electronic Medical Records (EMR)

  An EMR is patient information that is kept electronically by a single provider, such as a clinic, hospital, GP or other healthcare provider (Porter Research, 2007). It is possible to upload and download patient information to and from EHRs, other EMRs, and Personal Health Records (PHRs) as needed.

- Personal Health Records (PHR)

  A PHR is an application that allows an individual to manage his/her own health records. A PHR can upload or download patient information from an EMR (Reid, Compton & Grossman, 2005).

- Electronic Prescribing (E-Prescribing)

  E-Prescribing is the automation of medical prescriptions to avoid the errors that occur with handwritten prescriptions (Miller, Gardner, Johnson & Hripcsak, 2005).

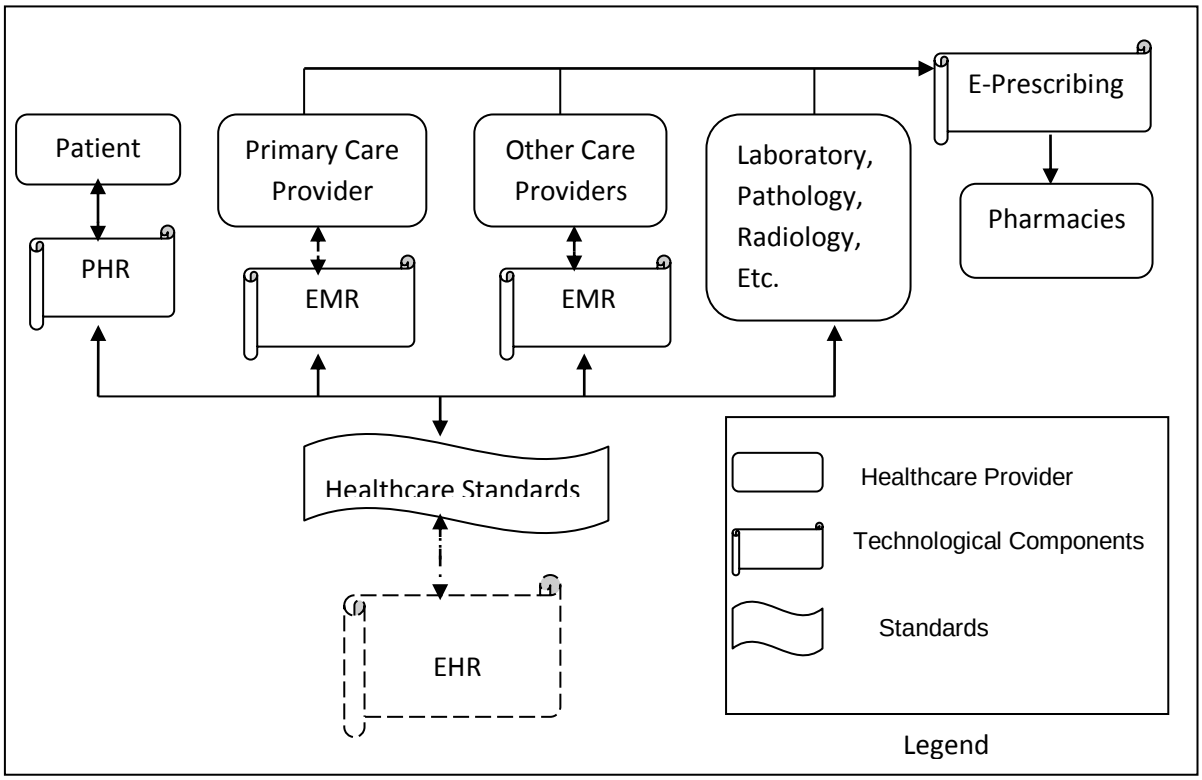


Figure 1.2: A technological model to improve continuity of care (Mostert-Phipps *et al.*, 2010)

An EHR may assist in improving continuity of care; therefore, it is important to aim for its implementation. However, since EMRs are required to provide an EHR with the data that it needs to function, it is important to promote the adoption of EMRs. Hence, this study focuses on EMRs. The benefits associated with the use of EMRs include the following (Miller & Sim, 2004; Jackson, 2004; Goodman, 2009):

- Reduces costs;
- Simplifies recordkeeping;
- Reduces storage needs;
- Helps protect confidentiality;
- Enhances continuity of care;
- Improves efficiency of healthcare providers;
- Reduces medical errors; and
- Allows for easier and less erroneous patient billing.

Despite these benefits, research indicates that healthcare providers are lagging behind in adopting EMRs (Chismar & Thomas, 2004). Internationally, this research established that there are countries who have made a considerable effort in adopting and meaningfully using EMRs, an example is Denmark with a 100% adoption rate (Gray, Bowden, Johansen & Koch, 2011). However, these authors state that there are a number of countries that still need to work on their low levels of adoption, such as the United States of America with an adoption rate of less than 50%. Research indicates that these low-adoption rated countries include developing countries such as South Africa. Previous research has established that healthcare providers in these countries still use paper-based methods and most of the healthcare providers who use IT solutions, only use it for billing purposes (Mostert-Phipps *et al.*, 2010; Cochrane & Ramokolo, 2007; Tierney *et al.*, 2007).

Furthermore, research reveals that smaller practices are slower to adopt EMRs than larger practices (Gans, Kralewski, Hammons & Dowd, 2005; Lee, Cain, Young, Chockley & Burstin, 2005; Russell & Spooner, 2004; Randeree, 2007). Some of these smaller practices are general practices. A general practice is defined as “the first point of contact for the majority of people, individuals, families and communities, seeking health care, and often therefore the first point of referral” (Royal Australian

College of General Practitioners, 2011). Therefore, for the purposes of this research, general practices, as the main healthcare provider are targeted.

Efforts to improve the adoption of EMRs need to recognise that the transition from paper-based to the electronic accumulation of patient data introduces the following effects:

- A change in the way the healthcare provider carries out tasks;
- A change to the way the patient relates with the healthcare provider;
- A change to the way the family of the patient relates with the patient and caregiver; and
- A change to the way the healthcare providers involved relate to one another.

Disregarding these changes and focusing only on the actual technology solution will constitute a mistake. Whetton (2005) terms the tendency to focus mainly on technology and technological issues, rather than viewing the technology as an extension or part of the wider system, as the “techno-centric” approach. The users of technological systems are expected to work around technology rather than the technology being developed around the way the user carries out the processes.

Socio-Technical Systems (STS) theory meets the challenges brought on by complex technical systems present in the human world (Coiera, 2007). The STS approach, unlike a techno-centric one, considers the following three aspects: social, technical and environmental aspects (Liu & Errey, 2006). STS theory considers that every organisation is comprised of people (social sub-system) using tools, techniques and knowledge (technical sub-system) to produce goods and services valued by customers whilst remaining open to the outside influences of the immediate environment (environmental sub-system) (Trist, Higgin, Murray & Pollack, 1963). These sub-systems are depicted in Figure 1.3.

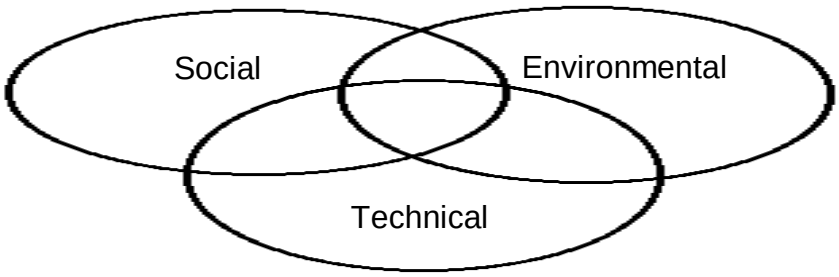


Figure 1.3: Socio-technical Systems

According to Pirnejad *et al.*, (2007), STS theory focuses on the "fit" between an organisation and information technology. Extensive research proves that successful organizations are those that focus on technical, environmental and social factors, not just on the technology (Painter, 2009; Butson, 2010). When considering the use of EMRs in general practices through an STS lens, the contributors as illustrated in Table 1.1 can be identified. The social sub-system consists of the GP and administrative staff contributors; the environmental sub-system consists of the patient and legal aspects contributors; and the technical sub-system consists of an EMR application (including software and hardware) as a contributor.

	Contributors/Participants
Social	• GP • Administrative Staff
Environmental	• Patient • Regulations
Technical	• EMR

Table 1.1: Private general practices through an STS lens

The reasons for including the abovementioned contributors, within the respective sub-systems, are as follows:

- GP and administrative staff (Social sub-system)
  As stated, the STS theory considers the "people" working within an organization to belong within the social sub-system. GPs and administrative staff were identified as the "people" working within a general practice, within the context of data capturing, Hence they were included as contributors is the social sub-system.

- Patient and regulations (Environmental sub-system)
  The STS theory categorises "customers", people who are in the receiving end of a product or service, within the environmental sub-system. In the context of general practices, these "customers" are patients, as they receive healthcare

services from a practice. Therefore, patients belong within the environmental sub-system.

- EMR (Technical sub-system)
  The tools, techniques and knowledge used to provide a service(s) forms part of the technical sub-system, as noted by the STS theory. An EMR is a tool that can be used by a general practice to provide a service. Hence, it is placed in the technical sub-system.

1.2. Problem Statement

In modern society patients are referred from one healthcare provider to the next which results in patient records being fragmented. For healthcare providers to provide adequate care, they need to have access to the medical history of a patient. EHRs can potentially assist in improving informational continuity of care because they provide a summarized medical history of the patient. However, this is only an envisioned goal for the future (Garets & Davis, 2006). The first step in realizing this goal will be the adoption of EMRs, since EMRs are required to provide an EHR with the data that it needs to function. However, according to research, general practices are slow in adopting EMRs. The main problem addressed in this explorative research is, therefore, the lack of adoption and meaningful use of EMRs in general practices. This study uses STS theory as a theoretical lens through which the problem is analysed.

1.3. Research Questions

The primary question that this research answers is: Which factors need to be addressed to encourage the adoption and meaningful use of EMRs in general practices?

The following sub-questions are addressed to answer this main research question:

- What is the impact of the current patient record keeping in general practices on quality of care?
- What role can EMRs play in improving quality of care?
- Which social factors need to be addressed to encourage the adoption and meaningful use of EMRs?

- Which environmental factors need to be addressed to encourage the adoption and meaningful use of EMRs?
- Which technical factors need to be addressed to encourage the adoption and meaningful use of EMRs?

1.4. Research Objectives

The primary objective of this research is to identify the factors that need to be addressed to encourage the adoption and meaningful use of Electronic Medical Records in general practices.

The sub-objectives of the project include the following:

- Investigate the impact of the current patient record keeping in general practices on quality of care;
- Explore the role that can be played by EMRs in improving quality of care;
- Identify the social factors that need to be addressed to encourage the adoption and meaningful use of EMRs;
- Identify the environmental factors that need to be addressed to encourage the adoption and meaningful use of EMRs; and
- Identify the technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs.

1.5. Research Methodology

It is important that a proper research process is followed and that appropriate methods are used to be able to answer the research questions in this study.

1.5.1. Research process

This explorative research was conducted in two phases, which are depicted as two triangles in Figure 1.4. In phase one (1), in the bottom left triangle, a literature review was conducted (step 1); data collection instruments were prepared to aid the collection of data (step 2); and the data was collected using a research survey as a strategy (step 3). Butts (1983), describes a research survey as “a significant way of generating knowledge of what is”. For the purpose of this research, general practices were surveyed to assist in answering the research questions. The survey of the general practices involved various questionnaires, completed by patient,

administrative staff and GP participants, as well as GP interviews. The knowledge generated in phase one (1) of this research is utilised in phase two (2).

In phase two (2), in the top right triangle of Figure 1.4, the literature review together with the primary data collected during phase one (1) are used to formulate socio-technical factors (step 4). Two experts were asked to validate the formulated socio-technical factors, by providing their input prior to the production of the final findings of this research (step 5). Suggested amendments were incorporated in the final version of the factors (step 6).

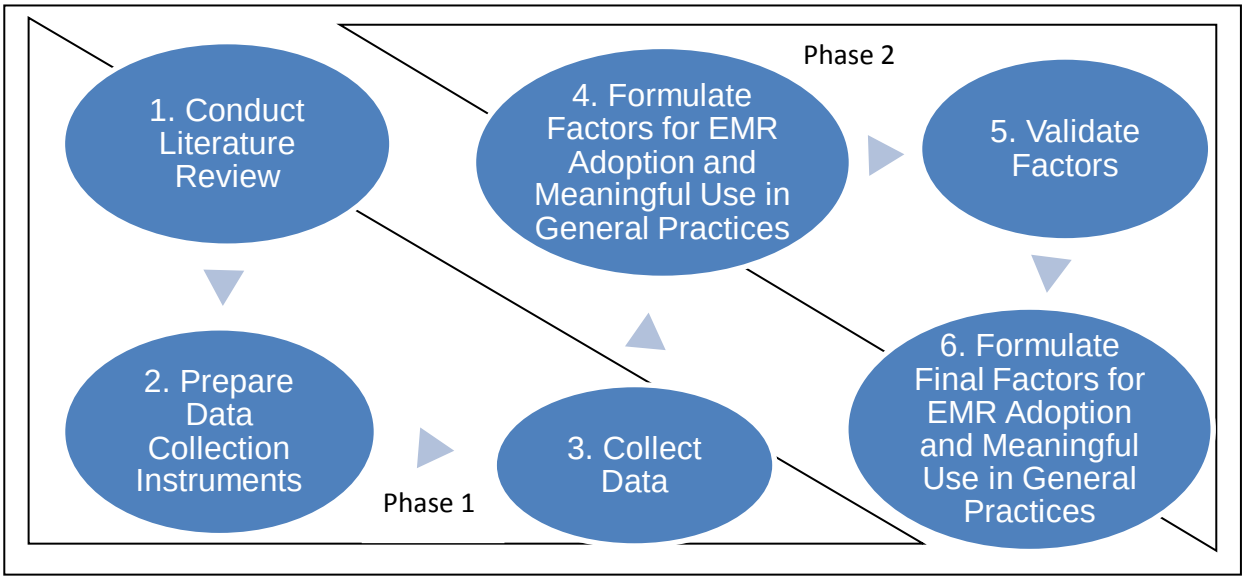


Figure 1.4: Research Process

1.5.2. Research methods

In choosing the practices surveyed in this research, both convenience and purposive sampling were used. Convenience sampling can be defined as a method of selecting study units that are easily accessible to the researcher (Laerd Dissertation, 2010). Purposive sampling is defined as a method that allows for the selection of study units within a domain that comprises of "knowledgeable experts" (Tongco, 2007; Jupp & Oliver, 2006). The use of both these methods is elaborated on in Chapter 4, section 4.1.

The methods used to collect the data to answer the research questions are presented in Table 1.2.

Research Question	Research Objective	Method
What is the impact of the current patient record keeping in general practices on quality of care?	To investigate the impact of the current patient record keeping in general practices on quality of care.	• Literature Review
What role can EMRs play in improving quality of care?	To explore the role that can be played by EMRs in improving quality of care.	• Literature Review
Which social factors need to be addressed to encourage the adoption and meaningful use of EMRs?	Identify the social factors that need to be addressed to encourage the adoption and meaningful use of EMRs.	• Literature Review • GP Questionnaires • Administrative staff Questionnaires • GP interviews
Which environmental factors need to be addressed to encourage the adoption and meaningful use of EMRs?	Identify the environmental factors that need to be addressed to encourage the adoption and meaningful use of EMRs.	• Literature Review • Patient Questionnaires • GP Questionnaires • GP interviews
Which technical factors need to be addressed to encourage the adoption and meaningful use of EMRs?	Identify the technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs.	• Literature Review • Administrative staff Questionnaires • GP Questionnaires • GP interview

Table 1.2: Mapping of Research Questions, Objectives and Methods

It is important for proper data analysis techniques to be utilised for the results of the survey to be credible. The data gathered during the GP interviews, patient and staff questionnaires was analysed using qualitative content analysis. Hsieh and Shannon (2005) define qualitative content analysis as a method that makes use of coding, theme or pattern identification, subjectively, to interpret the context of text data. These authors mention three qualitative content analysis strategies:

- Conventional content analysis

This type of analysis is commonly used when a researcher aims to describe a phenomenon using a study design. This applies when there is a limitation in existing theory or research literature.

- Directed content analysis

This type of analysis is commonly used by a researcher when it is established that a phenomenon may benefit from further description or existing theory or prior research is incomplete in their topic of interest.

- Summative content analysis

This type of analysis quantifies words using an analysis called manifest content analysis and goes beyond by interpreting the content using an analysis called latent content analysis.

The conventional content analysis strategy was appropriate to this research, because this type of analysis deals with incomplete existing theory. This is elaborated on in Chapter 5, section 5.1.

1.6. Ethical Considerations

Ethical considerations are relevant to the following three stages of a research project (Welman & Kruger, 2001):

- When participants are recruited;
- During the intervention or measurement procedure to which they are subjected; and
- In the release of the results.

This research involved engaging with the GP, administrative staff and patients within the context of a general practice, but excluded the viewing of patient information. Ethical approval was received from NMMU before the research proceeded. The ethics approval letter is attached in Appendix 1.

1.7. Delineation

This research was conducted in the Nelson Mandela Bay Metropolitan area, thus, the primary data collected is only from this environment. Past research reveals that the emphasis of the health information system development and implementation strategies has mostly focused on the public sector rather than on the private sector (Matshidze & Hanmer, 2007; Herbst, Littlejohns, Rawlinson, Collinson & Wyatt, 1999; Jack & Mars, 2008; Wharton University of Pennsylvania, n. d.). Hence, this study focuses on the private sector.

1.8. Chapter Outline

- **Chapter 1:**

Introduction

This chapter introduces the research problem area, problem statement, research questions, research objectives and methods.

- **Chapter 2:**

Record Keeping in General Practices

This chapter focuses on investigating the impact of paper-based patient record keeping in general practices on quality of care and exploring the role that can be played by EMRs in improving quality of care.

- **Chapter 3:**

Literature Review – Factors that Affect the Adoption and Meaningful Use of EMRs in General Practices

This chapter investigates the social, environmental and technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. The investigation is based on secondary data collated from conducting a literature review.

- **Chapter 4:**

Survey Empirical Results

This chapter reports on the results that emerged from the gathering of primary data for this research. A survey was conducted to investigate the social, environmental and technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. Therefore the empirical results are in relation to the survey.

- **Chapter 5**

Literature Review and Research Survey - Factors that Affect the Adoption and Meaningful Use of EMRs in General Practices

This chapter presents the factors affecting the adoption and meaningful use of EMRs in general practices that have been collated from the literature review and the survey results.

- **Chapter 6:**

Conclusion

This chapter concludes the research and provides a summary of the research covered in this dissertation. An overview of the benefits and limitations of the research, and future research opportunities are provided.

1.9. Conclusion

In concluding this chapter, CHAPTER 1, presents the chapters as related to the research questions stated in section 1.3. No research questions are answered in chapter 1 and chapter 6, because they are the introduction and conclusion chapters respectively. Chapter 2 investigates the impact of the current patient record keeping in general practices on quality of care and the role that EMRs can play in improving quality of care. Chapters 3, 4 and 5 investigate the social, environmental and technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs.

Primary research question

Which factors need to be addressed to encourage the adoption and meaningful use of EMRs in general practices?

Research chapters

Chapter 1 Introduction

Chapter 2
Record Keeping in General Practices

Chapter 3
Literature Review – Factors that Affect the Adoption and Meaningful Use of EMRs in General Practices

Chapter 4
Survey Empirical Results

Chapter 5
Literature Review and Research Survey - Factors that Affect the Adoption and Meaningful Use of EMRs in General Practices

Chapter 6 Conclusion

Research questions

What is the impact of the current patient record keeping in general practices on quality of care?

Research Question 1

What role can EMRs play in improving quality of care?

Research Question 2

Which social factors need to be addressed to encourage the adoption and meaningful use of EMRs?

Research Question 3

Which environmental factors need to be addressed to encourage the adoption and meaningful use of EMRs?

Research Question 4

Which technical factors need to be addressed to encourage the adoption and meaningful use of EMRs?

Research Question 5

Primary research objective

Identify factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices

Figure 1.5: Research Questions Mapped to Research Chapters

CHAPTER 2

2. RECORD KEEPING IN GENERAL PRACTICES

In a healthcare practice, the quality of care is influenced by the way that things are done (Ariffin, Yunus & Embi, 2008). The way that patient information is captured and stored in a general practice affects the quality of care provided to the patients. As illustrated in the chapter outline in Chapter 1, Figure 1.5, this chapter focuses on investigating paper-based patient record keeping in general practices. This is done by investigating the impact of paper-based patient record keeping in general practices on quality of care and exploring the role that can be played by EMRs in improving quality of care. This chapter probes the disadvantages associated with paper-based patient records, and the advantages and disadvantages of using EMRs. In addition, the viability of EMRs above paper-based systems is explored.

2.1 Paper-based Patient Record Keeping

Patient information is created by a GP based on his/her interpretation of the medical condition of the patient, after examining the patient (de la Harpe, 2008). It is important that this information be legible, accurate and adequate (Stumberg, 2003). Thus, it is crucial that patient information is stored in a viable manner. As noted in Chapter 1, section 1.1, most healthcare providers still use a paper-based system to capture and store patient records. It is important to understand what is meant by paper-based systems and how it is used.

A paper-based system is a means of storing information using paper, forms or folders (Rodriguez, Murillo, Borges, Ortiz & Sands, 2002). Patient folders are usually used to file or store patient forms or papers. They are usually in the nature of "progress notes, nursing documentation forms, laboratory results, diagnostic studies results and physician orders" (Rodriguez *et al.*, 2002).

The following advantages can be linked to the usage of these documents (Tange, 1995; Ayatollahi, Bath & Goodacre (2009) :

- Portability, since healthcare providers can carry them around or move them from one area to the next;
- Stability, as they do not need electricity;
- Flexibility, since they fit into a number of different settings;
- Compatibility, since they fit into the daily routine of healthcare providers; and
- Not obsolete.

2.2 Problems with Paper-based Systems

A number of problems arise with the use of a paper-based system. One of the challenges is the requirement of increasing storage space, which amongst other challenges, results in a difficulty with the management and storage of these records (Abrams, Bowden, Chamberlain & Maccallum, 1968; Boonstra & Broekhuis 2010).

Dick, Steen and Detmer (1997), believe the following are additional problems that arise with the use of paper-based records:

- Inaccurate data, which has a negative impact on the safety of the patient;
- Unnecessary costs for patients when healthcare providers have to duplicate tests because previous test results are not always available at the point of care; and
- Continuity of care is challenging when healthcare providers do not have access to central relevant information.

De la Harpe (2008) conducted research in which general practices were visited. The observations related to patient records were as follows:

- Paper patient folders are misplaced;
- Recordkeeping is a problem due to litigation problems, regardless whether a paper-based system or electronic based system is used;
- Time is wasted when a patient has to complete an identical form again when consulting with another unit in the same centre;
- It is sometimes difficult to read handwritten notes; and
- Data is sometimes incomplete.

Mostert-Phipps *et al.*, (2010) quotes Dr Shaheen Khotu, former chief information officer of the Department of Health in South Africa, who states that the use of a paper-based system can negatively impact the quality of care that patients receive due to a lack of vital information and misinformation. In a study carried out in general

practices, it was established that data captured using a paper-based system had more illegible information when compared to data captured using a computer system or a hybrid system (Hamilton, Round, Sharp & Peters, 2003; Hippisley-Cox *et al.*, 2003).

Paper-based systems have been found to lack confidentiality, since it is easy for anyone, authorised or not, to open and read the contents of a patient health record should the record be misplaced or even neglected (Abrams *et al.*, 1968; Loomis, Ries, Saywell & Thakker, 2002). However, these authors note that non-users of EMRs have been debating that EMRs introduce higher confidentiality risks than paper-based systems.

Nevertheless, based on the aforementioned problems with the use of a paper-based system in general practices, it can be concluded that there are numerous disadvantages. It is clear that the quality of care provided to patients can be affected. Therefore, EMRs will be explored as an alternative to using paper-based systems.

2.3 Electronic Medical Records

An EMR "is a computerized health information system where providers record detailed encounter information such as patient demographics, encounter summaries, medical history, allergies, intolerances, and laboratory test histories" (Ludwick & Doucette, 2009). The functionality of an EMR, within the context of patient care, can be divided into three categories, namely "pre-visit functionality", "visit functionality" and "post-visit functionality" (American Medical Association, n.d.):

- Pre-visit functionality

  This is the functionality that the general practice can use to prepare for a patient visit. This allows the administrative staff to schedule and register a patient into the system; communicate with healthcare provider(s) about the scheduled patient and the healthcare provider can view the medical history of the patient in preparation for the visit.
- Visit functionality

  This is the functionality that the GP uses during the visit. This allows the GP to capture information acquired from the examination of the health condition of the

patient; electronically prescribe the required medication; electronically order diagnostic tests and results from external laboratories; and provide the patient with patient education material.

- Post-visit functionality

  This is the functionality that is used after the GP-patient consultation is complete. This allows the administrative staff to communicate with relevant healthcare provider(s) using electronic messaging; to make patient reminders related to the disease of the patient; to maintain and manage reports; to manage billing and receivables; and to allow patients to request follow-up visits.

It is evident that there is a lot of functionality offered by EMRs. A general practice has to first plan and decide which EMR functionality is likely to improve quality of care, and which functionality will not add much value to the quality of care they can offer to patients (Gill, 2009).

Research reveals that a number of practices who have adopted EMRs do not use its offered functionality meaningfully (Gill, 2009). It is important to realise the advantages and disadvantages linked to these functionalities. These are discussed in the following section.

2.4 Advantages and Disadvantages of Electronic Medical Records

Before a general practice may consider using the full functionality of EMRs to improve quality of care, the following advantages and disadvantages need to be recognised:

2.4.1 Advantages of Electronic Medical Records

EMRs provide a platform on which patient data can be managed using a structured and integrated approach to (Ariffin *et al.*, 2008):

- Improve the number of complete charts;
- Improve the speed for availability of test results; and
- Improve decision making with reasonable access to patient medical information.

Additionally, an EMR can aid in ensuring that the patient information within a general practice can be combined into a single record which eases information discovery. This saves time, which the healthcare provider can invest in the healthcare of the

patient by providing more attention to the patient (Sánchez, Savin & Vasileva, 2005). However, this is seen as debateable, since studies conducted by other researchers note that the use of EMRs requires an increase in time and effort to capture patient information. This in turn decreases the interaction between the healthcare provider and patient (Ayatollahi *et al.*, 2009).

An EMR can be viewed as beneficial because good health may result from its meaningful use (Williams & Boren, 2008). This may be due to the availability of a correct, complete medical history record. Notably, Ariffin *et al.*, (2008) cite the Computerised Patient Record Institute Work which states that EMRs allow for larger volumes of data to be captured, processed and integrated. This results in healthcare providers being provided with meaningful information, which contributes to their knowledge of the patient. This contribution positively improves the quality of care the patient receives.

Furthermore, EMRs can be viewed as a convenient communication tool which assists in facilitating communication between the healthcare providers. This improves the quality of care afforded to patients, because healthcare providers get prompt message alerts about patient conditions that they need to be aware of and can attend to timely. This assists healthcare providers with decision making. EMRs are valuable decision support tools (Gill, 2009; Makela, Flottorp & Grimshaw, 2005).

The occurrences of tragic events, both natural and unnatural, such as hurricanes and fires, have proven the value of some of the benefits offered by EMRs (Goodman, 2009). Since an EMR database is usually not stored physically within general practices, in case of the occurrence of these tragic events patient information is not lost (Hood & Scherger, 2009).

Since the risk of gaps in information caused by the loss of patient folders and files is eliminated by the use of an EMR, the information stored can be seen as more complete. EMRs make it possible to keep track of which healthcare provider accessed information of a particular patient and when (Hamilton *et al.*, 2003). This accountability ensures that medical staff members do only what they are able to account for, ensuring that the quality of care provided to the patient is not compromised.

These advantages appear to add value to the kind of patient care that can be offered in general practices. However, there are disadvantages that need to be taken into consideration before deciding to adopt EMRs.

2.4.2 Disadvantages of Electronic Medical Records

There are disadvantages that are introduced by the adoption of EMRs, during both the transition to and the actual use of EMRs. It is possible that some of these disadvantages are the reason behind the slow adoption of EMRs in general practices.

Chapter 1, section 1.1, states that transitioning from a paper-based system to an EMR introduces a change in the way the healthcare provider and other professionals involved carry out their work. According to Ayatollahi *et al.*, (2009), documentation habits will have to change. Thus training becomes a requirement to try and make the change as seamless as possible (Goodman, 2009).

When adopting an EMR a general practice has to understand that the transition to a new system might result in healthcare providers taking longer to accomplish their tasks using an EMR. However, Goodman (2009), Hood and Scherger (2009) indicate the following for the transition period:

- Slowdown can be expected to last for about 6 months to a year, before things return to normal;
- First 4-6 months is the average time needed for pre-implementation preparation, learning to interact with the system and capturing all the necessary information that had been collected using other means; and
- Following 6 months can be used to gain proficiency.

Data capturing proficiency seems to be easily acquired because current EMR users acknowledge that capturing data into existing EMRs is not difficult (Loomis *et al.*, 2002). It can be expected that staff will display reluctance to adopting an EMR (Goodman, 2009). This has the potential to impact the quality of care they provide to patients.

Furthermore, there are disadvantages that can be experienced even after the successful transition to an EMR. One is the significant initial costs involved. It is

possible for a general practice to go bankrupt should it fail to generate enough profits to both sustain its on-going operations and pay for the EMR implementation over the agreed-upon number of years (Goodman, 2009). Both current users and non-users of EMRs argue that this risk is introduced by the fact that EMRs are expensive (Loomis *et al.*, 2002). This is said to be especially true for small practices and individual physicians (Irland, 2011).

The use of EMRs makes patient information available to a larger audience, both authorised and unauthorised. It is argued that hackers can possibly access and steal patient information which compromises both security and confidentiality. However, this is being resolved by continuous efforts to minimize such risks (Janssen, 2011). For instance, one of the features of EMRs is that they allow healthcare providers to shade the screen whilst they are away from it, to keep the patient data confidential.

2.5 The Viability of EMRs Over Paper-Based Systems

According to Ariffin *et al.*, (2008), EMRs can be viewed as a "remedy for the inherent flaws of the conventional paper system". However, it is important to recognise that the transition from a paper-based system to an EMR system is "complex and difficult" (Williams & Boren, 2008). It is vital to investigate the viability of EMRs over paper-based systems to understand the importance of eliminating the barriers to EMR adoption and its meaningful use.

In a study conducted by the University of California, which surveyed 20 small general practices that had implemented EMRs, it was reported that almost all users witnessed improved quality of patient care (Goodman, 2009). According to Goodman, this improvement was due to the legible, accessible and organisable patient data, and the valuable functionality offered by EMRs such as prescription ordering, prevention and disease management, and decision support.

It is important to remember that paper-based systems have advantages, but since EMRs are suggested as a more viable option, it is important to understand whether they will respond to some of the problems that are perpetuated by the use of paper-based systems. The solutions offered by EMRs to the problems that arise with the use of paper-based systems are presented in Table 2.1.

Problems with paper-based systems	**Solution offered by EMRs**
Information can be incomplete and contain inaccurate data.	Because the patient information is accumulated into one file, it is more complete and accurate.
Unnecessary costs for patients when healthcare providers have to duplicate tests.	Patients save on costs, since tests no longer need to be duplicated as recent test results are available at the point of care when needed.
Difficulty to manage and store records.	Information discovery and retrieval is easier, since healthcare providers do not have to physically sort through a number of folders.
Requires increasing storage space.	Storage needs are reduced, since the patient files are not stored physically in cabinets, but are rather stored in a database.
Does not store accumulated patient information in one record.	Records complete patient information such as consultation notes, clinical history and allergies in one record.
Difficult to have complete charts on paper.	The number of incomplete charts is reduced because healthcare providers have all the information they need to generate the charts.
Patients wait long periods for test results.	Reduces the waiting time for paper-based test results, since healthcare providers can access test results as soon as they have been uploaded.

Problems with paper-based systems	**Solution offered by EMRs**
Patient folders are misplaced.	Patient information is not lost, since healthcare providers are unable to physically remove the folder of a patient to different locations.
Lack of confidentiality.	EMRs are able to use access control, by means of passwords and other security mechanisms, to help protect confidentiality.
The difficulty to read handwritten notes introduces errors.	Allows for easier reading and less erroneous patient information.
Slows down decision making, since healthcare providers do not have a way of receiving prompt alerts.	Improves decision making with immediate access to patient medical information.

Table 2.1: EMR Solutions to Paper-based System Problems

There are additional benefits offered by EMRs as discussed in the next section.

Additional benefits offered by EMRs

The following benefits are additional to the benefits previously discussed. However, these benefits are distinct, because the previous benefits were solutions to paper-based system problems.

- Has multiple functionality for all three contexts: pre-visit, visit and post-visit;
- Patient data can be managed using a structured and integrated approach;
- Beneficial in achieving supportable economic development and growth; and
- Assists in facilitating communication between healthcare providers by providing prompt message alerts.

It is clear that EMRs have add-in value for general practices. However, in spite of the solutions offered by EMRs to solve the paper-based system problems and the additional benefits that EMRs introduce, their adoption remains slow.

2.6 Conclusion

This chapter investigated paper-based patient record keeping. The use of a paper-based system in general practice to capture and store patient medical records influences the quality of care patients receive and as such its related problems were discussed. As an alternative to paper-based systems, EMRs were investigated together with their benefits. The viability of EMRs over paper-based systems was explored. It was evident that EMRs can play an important role in providing patients with improved quality of care. It is, however, important to realise that to maximize the potential role played by EMRs in improving quality of care, GPs need to realise their meaningful use and strengths offered (Gill, 2009). Despite the advantages discussed in this chapter there are barriers to the adoption and meaningful use of EMRs. Therefore Chapter 3 investigates the social, environmental and technical factors that affect the adoption and meaningful use of EMRs.

CHAPTER 3

3. LITERATURE REVIEW - FACTORS THAT AFFECT THE ADOPTION AND MEANINGFUL USE OF EMRs IN GENERAL PRACTICES

This chapter investigates the social, environmental and technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. The investigation is based on secondary data collated from conducting a literature review. Research reveals that the slow adoption of EMRs is a serious problem that has not been addressed properly (Archer & Cocosila, 2009). Loomis *et al.*, (2002) assert that further studies are necessary to examine non-users of EMRs in more detail, to ascertain their true needs and the factors that prevent them from adopting and meaningfully using EMRs.

It is important to recognise that change is introduced by the move from a paper-based system to an EMR system in a general practice. This was made apparent in Chapter 1, section 1.1, and expanded on in Chapter 2, section 2.4.2. Thus an appropriate approach must be used to deal with this change. As noted in Chapter 1, section 1.1, successful organizations are those that do not use a techno-centric approach to deal with changes, but rather use a socio-technical approach. This approach is appropriate as it focuses on social, environmental and technical factors, not just on the technology itself (Painter, 2009; Butson, 2010; Liu & Errey, 2006).

Chapter 1, section 1.1, states that the social sub-system consists of the GP and administrative staff contributors; the environmental sub-system consists of the patient and legal aspect contributors; and the technical sub-system consists of an EMR application as a contributor. The influence of these contributors on the way that EMRs are adopted and used in general practices is discussed in sections 3.1-3.5. In this discussion, STS is used as a theoretical lens through which the problem is analysed and STS is used to relate the identified factors in the relevant sub-systems.

The positioning of each identified factor within its respective sub-system meant that factors which belonged to more than one sub-system were established. For instance,

the concerns a GP has regarding the change he perceives to be introduced by an EMR to the GP-patient relationship, involves two (2) sub-systems, namely the social and environmental sub-systems. Therefore a factor, labelled GP-Patient relationship (GP concern), representing this concern needed to be positioned within both sub-systems. However, merely duplicating the factor across both sub-systems may misrepresent the relationship occurring between the respective sub-systems. This may cause the underestimation of the complexity introduced by this factor. Therefore, in the following discussion, such factors are placed within an overlap of two or all three sub-systems respectively, based on the sub-systems involved. The discussion is followed by Figure 3.6, which summarizes all the identified factors.

3.1. Social Factors that Impact the Adoption and Meaningful Use of EMRs in General Practices

The following factors related to the social sub-system, illustrated in Figure 3.1, may have an impact on the adoption and meaningful use of EMRs:

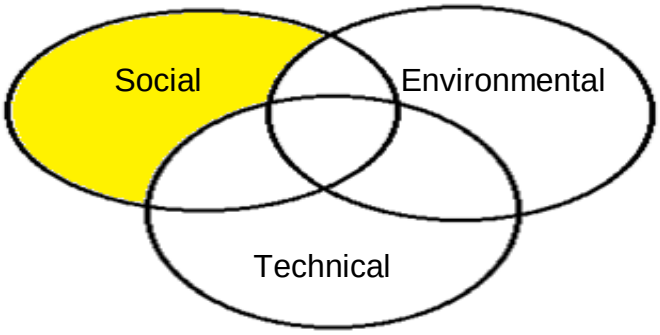


Figure 3.1: Social sub-system

- **Communication:**

A lack of communication, when implementing an EMR, amongst internal staff within the general practice can prove problematic if staff is left to depend on their own assumptions, as far as the purpose of using an EMR in the practice is concerned. Research emphasizes the importance of having all the staff in agreement about the ultimate vision of the practice in using EMRs; otherwise the practice runs the risk of losing sight of its main goal (Crosson, Stroebel, Scott, Stello & Crabtree, 2005).

- **Decision making style:**

Decision makers in general practices tend to run the practice in a dictatorship manner. As a result, staff may have a negative attitude towards change brought about by these individuals (Crosson *et al.*, 2005). If the EMRs were introduced, without proper consultation with all relevant stakeholders, it is highly possible that the staff will have already decided against adopting and meaningfully using them.

- **Management support:**

The lack of support from management, i.e. the decision maker, prior, during and after implementing the system negatively contributes to the adoption and meaningful use of EMRs (Barash, 2005).

3.2. Social-Environmental Factors that Impact the Adoption and Meaningful Use of EMRs in General Practices

This section presents the factors that overlap between the social and environmental sub-systems, as illustrated in Figure 3.2. The following factors, related to the social-environmental sub-systems overlap, may have an impact on the adoption and meaningful use of EMRs:

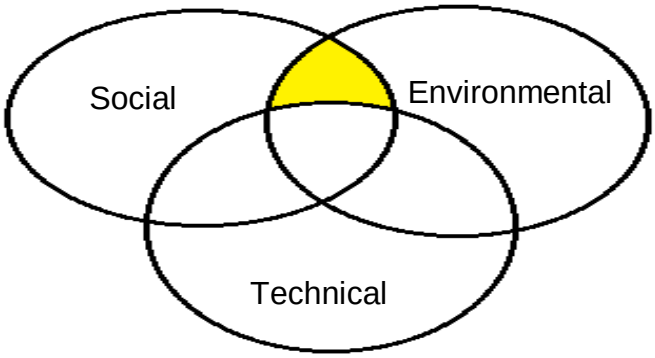


Figure 3.2: Social-Environmental sub-system overlap

- **GP-Patient relationship (GP concern):**

The use of EMRs requires the GP to spend a certain amount of time interacting with the computer screen, resulting in them being of the opinion that EMR use during consultations disturbs their relationship with the patient (Boonstra & Broekhuis, 2010). This is even more evident whilst they are learning the EMR functionality and menu options. However, the information accessed by the GP whilst interacting with

the computer screen, during a consultation, may boost communication between the GP and the patient (Noordman, Verhaak, van Beljouw & van Dulmen, 2010).

- **Patient perceptions:**

Patient perceptions about an electronic storage medium may have an influence on the adoption and meaningful use of EMRs in a practice. One perception established from current literature is:

- GP-Patient relationship (Patient concern)

  Patients seem to share the perception that the use of an EMR in a general practice will negatively affect their relationship with the GP, since the GP will sometimes have to face away from them whilst interacting with the screen (Flynn, Marcus, Kerber & Alessi, 2003). However, researchers have noted that some patients, who have been exposed to the use of an EMR during a consultation, have not expressed boredom or frustration. These patients instead used the time to talk with the GP whilst he/she attends to the EMR (Doebbeling, Chou & Tierney, 2006; McGrath, Arar & Pugh, 2007; Ludwick, Manca & Doucette, 2010).

- **GP perceptions:**

GP perceptions regarding an electronic storage medium may have an influence on the adoption and meaningful use of EMRs in a practice. One perception established from the literature relates to:

- Quality of care

  The impact on the quality of patient care, resulting from the use of EMRs, is perceived by some healthcare providers to be negative, because they expect the response time of the system to be slow and have too many steps to follow (Boonstra & Broekhuis, 2010; Van Der Meijden, Tange, Troost & Hasman, 2003). This perception makes GPs unsure about adopting EMRs, because they do not want to negatively impact the healthcare of their patients. However, studies have found this perception to be inaccurate, as EMRs either positively impact the quality of care or have no impact at all (Wang *et al.*, 2003; Bates, Ebell, Gotlieb, Zapp & Mullins, 2003; Hillestad *et al.*, 2005).

- **Incentives:**

Healthcare providers need to be motivated to make the transition to EMRs. This may be in the form of incentives from an external source, for example, receiving an incentive from the government for publicising performance reports. A lack of incentives may demotivate them, especially if they have not identified any personal gain to be worth the transition (Boonstra & Broekhuis, 2010; Miller & Sim, 2004).

- **Legal requirements:**

If a general practice has resolved to take the digital route when handling patient information, some Acts come into play, for example, the Electronic Communication and Transaction Act, No 25, (ECT) (Government Gazette, 2002). This means that the general practice has to ensure that they understand and implement what is required by such Acts. There still exist many uncertainties about these legal requirements, which do not help the situation (Boonstra & Broekhuis, 2010; Hall, 2009). Certain practices might view having to deal with these legal issues as a burden, because they may not have the resources or understanding to deal effectively with these legal requirements.

3.3. Social-Technical Factors that Impact the Adoption and Meaningful Use of EMRs in General Practices

This section presents the factors that overlap between the social and technical sub-systems, as illustrated in Figure 3.3. The following factors, related to the social-technical sub-systems overlap, may have an impact on the adoption and meaningful use of EMRs:

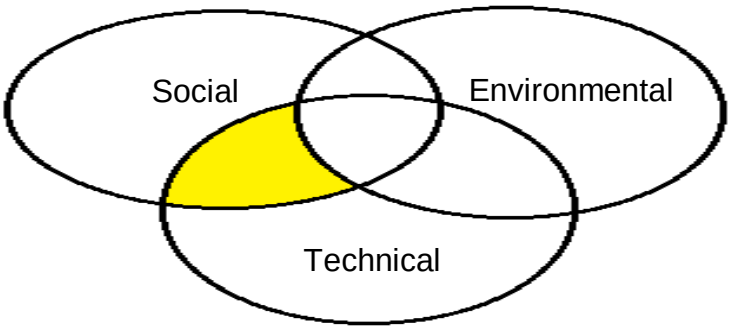


Figure 3.3: Social-Technical sub-system overlap

- **Workflow:**

Healthcare providers are aware that EMR use will affect workflow by changing the way they carry out their work processes. This may possibly be due to a change in a variable, for example, the time it takes to complete a certain task (University of Carlifornia, 2003; Ludwick *et al.*, 2010). Hence; they become reluctant to adopt EMRs, since they may have developed a form of security with their current workflow (Boonstra & Broekhuis, 2010).

- **Computer literacy:**

Prior computer experience and computer literacy influence the willingness of healthcare providers to adapt to a change such as removing the paper-based system and transitioning into using EMRs (Barash, 2005; Anderson, 2007; Ludwick *et al.*, 2010).

- **Control:**

Fear of loss of control was found to be associated with the lack of EMR adoption. General Practices become reluctant to adopt EMRs through the fear of possibly "losing" control over patient information, since they think that other healthcare providers may access the EMR (Boonstra & Broekhuis, 2010).

- **Learning time:**

Initially, there may be a learning curve that will result in more time taken to capture data (Bates *et al.*, 2003; Barash, 2005; Anderson, 2007; Korst, Eusebio-Angeja, Chamorro, Aydin & Gregory, 2003). Until the healthcare providers are fluent with the system, they will take time to familiarize themselves with the system whilst capturing data. This learning curve may introduce a "slow down" period in processes within a general practice. Hence, healthcare providers without prior experience with EMRs may not be willing to go through this period, especially if they are unable to foresee rapid change (University of Carlifornia, 2003; Ludwick *et al.*, 2010; Miller & Sim, 2004).

- **Backup:**

Healthcare providers are reluctant to adopt EMRs, due to their fear that the system might crash during a consultation which will leave them unable to retrieve the necessary patient data (Barash, 2005, Boonstra & Broekhuis, 2010). However, a

trend has arisen amongst actual users to be less concerned about the reliability of EMRs (Russell & Spooner, 2004). This means, according to their experience, that EMRs have proved to be reliable where availability of data is concerned. This may be due to the fact that, currently, EMRs offer back-up power supplies and disaster recovery strategies, should an unforeseen event occur (Didham & Martin, 2004).

- **Finances:**

The reduced profits associated with EMR implementation, though not permanent, has an impact on the decision to adopt EMRs or not (Crosson *et al.*, 2005; Barash, 2005; University of Carlifornia, 2003; Miller & Sim, 2004). Financial strain may be experienced through the need for personnel who are knowledgeable about information technology (extra labour) and equipment costs involved in initially implementing the system (Boonstra & Broekhuis, 2010; Anderson, 2007). Hence, a lack of financial support is found to be one of the major barriers preventing healthcare providers from adopting EMRs (Anderson, 2007).

- **Maintenance support:**

The lack of maintenance support from vendors experienced or witnessed by healthcare providers might make them reluctant to venture into EMRs, because they are wary of technical issues that are not attended to promptly (Boonstra & Broekhuis, 2010; Miller & Sim, 2004).

- **System integration:**

The implementation of an EMR in a general practice requires interconnection with other technologies (Miller & Sim, 2004). The practice may have an existing system that will have to be discarded if it is not compatible with an EMR. This will pose a challenge to general practices (Boonstra & Broekhuis, 2010).

- **Hardware:**

Research has found that not all general practices have the hardware required to implement an EMR. This means that those general practices are not able to adopt EMRs, until they acquire the necessary hardware (Boonstra & Broekhuis, 2010).

3.4. Environmental-Technical Factors that Impact the Adoption and Meaningful Use of EMRs in General Practices

This section presents the factors that overlap between the environmental and technical sub-systems, as illustrated in Figure 3.4. The following factors, related to the environmental-technical sub-systems overlap, may have an impact on the adoption and meaningful use of EMRs:

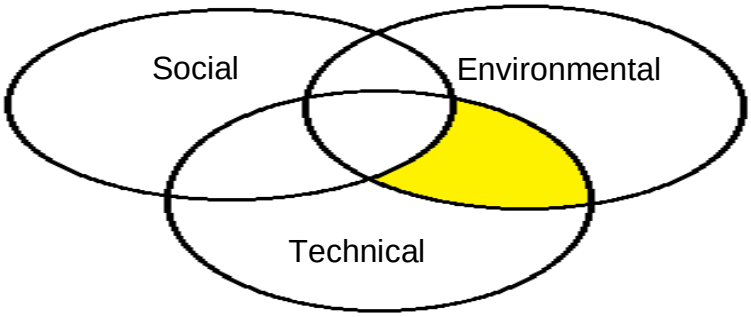


Figure 3.4: Environmental-Technical sub-system overlap

- **Patient perceptions**

Patient perceptions in relation to an electronic storage medium may have an influence on the adoption and meaningful use of EMRs in a practice. One perception established from the literature is:

- Patient confidentiality:

  A lot of patients were said to be concerned about the privacy of their health records. These concerns were from patients who refused to have their records migrated to an electronic record, and patients who had agreed to the migration (Anderson, 2007; Flynn *et al.*, 2003).

3.5. Social-Environmental-Technical Factors that Impact the Adoption and Meaningful Use of EMRs in General Practices

This section presents the factors that overlap between all three sub-systems, namely the social, environmental and technical sub-systems, as illustrated in Figure 3.5. The following factors related to the social, environmental and technical sub-system may have an impact on the adoption and meaningful use of EMRs:

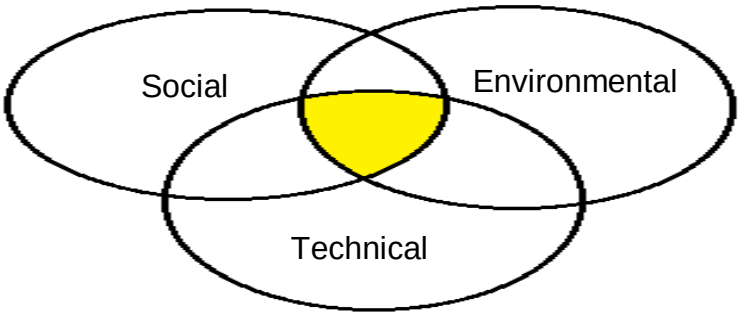


Figure 3.5: Social-Environmental-Technical sub-system overlap

- **Patient confidentiality (GP concern):**

Healthcare providers are concerned that patient confidentiality may be compromised when using EMRs, since a larger number of healthcare providers will have access to the records of patients and security is a challenge when multiple persons can be held accountable (Crosson *et al.*, 2005; Boonstra & Broekhuis, 2010). According to the General Practice Computing Group (n.d.), there are no fool proof mechanisms to ensure patient privacy.

- **Inadequate electronic data exchange**

Sometimes a general practice is not able to access laboratory results from certain laboratories due to their refusal to setup data exchange between the two institutions (Miller & Sim, 2004). Miller and Sim noted that for some of the general practices that are allowed access to such laboratories it means making programmatic changes to their EMR to accommodate the electronic data exchange between the practice and the laboratory.

- **Standards:**

Common standards have not been adopted by all the vendors. This results in some general practices being reluctant to adopt EMRs, because without standards, continuity is questionable if any unforeseen circumstances prevent the vendor from rendering any further services to general practices (Bates *et al.*, 2003; Anderson, 2007).

3.6. Literature Review - Factors that Affect the Adoption and Meaningful Use of EMRs in General Practices

Figure 3.6 presents a summary of the factors identified in section 3.1-3.5. This figure is amended in Chapter 5 to include the factors identified through the research survey.

Literature Review - Factors that affect the adoption and meaningful use of EMRs in general practices

Social

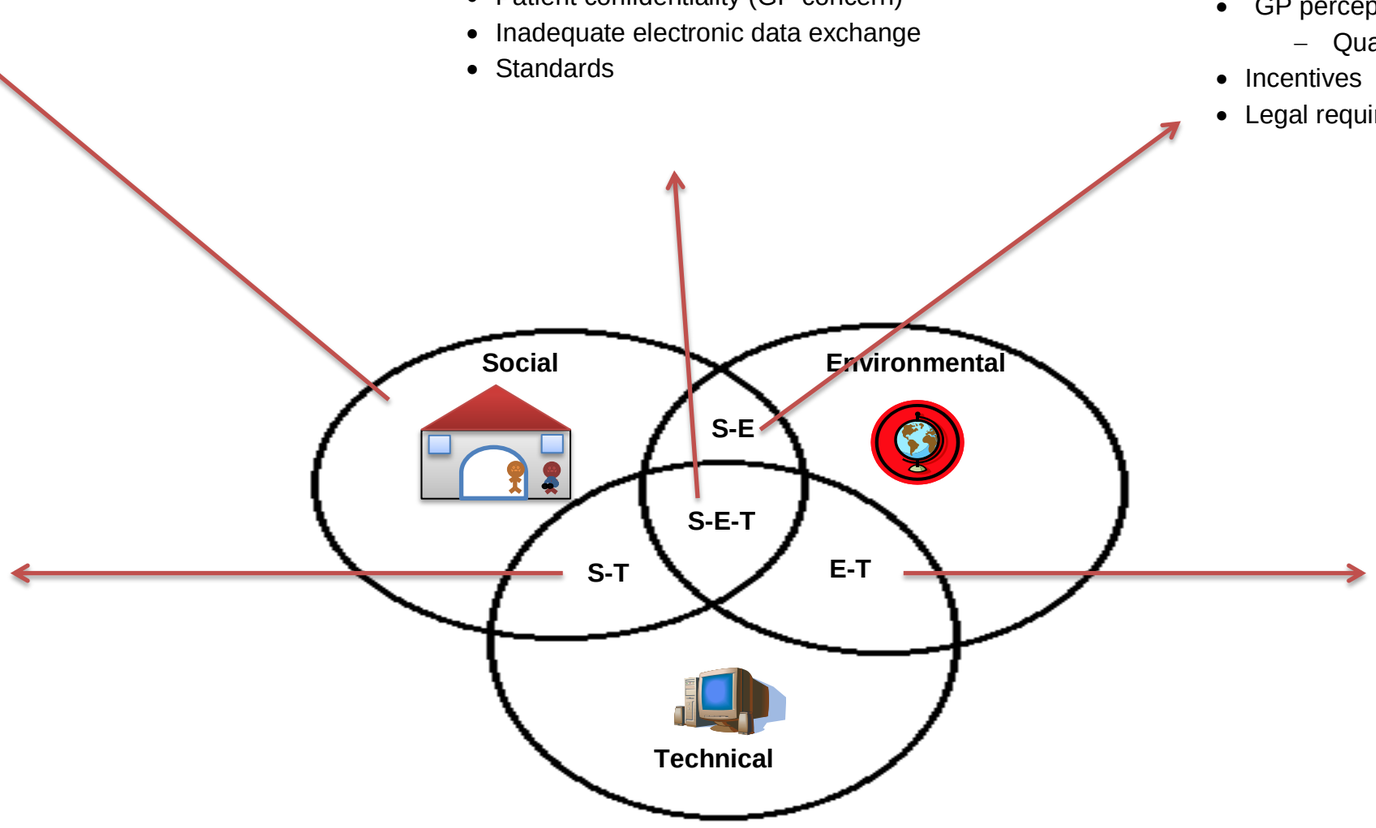
- Communication
- Decision-making style
- Management support

Social-Environmental-Technical

- Patient confidentiality (GP concern)
- Inadequate electronic data exchange
- Standards

Social-Environmental

- GP-Patient Relationship (GP concerns)
- Patient perceptions
  - GP-Patient relationship (Patient concerns)
- GP perceptions
  - Quality of care
- Incentives
- Legal requirements



Social-Technical

- Workflow
- Computer literacy
- Learning time
- Backup
- Finances
- Control
- Maintenance support
- System integration
- Hardware

Environmental-Technical

- Patient perceptions
  - Patient confidentiality

Figure 3.6: Factors that affect the adoption and meaningful use of EMRs in general practices

3.7. Conclusion

The chapter investigated the socio-technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. Secondary data was collated from a literature review, based on research conducted in the context of general practices. The identified factors were grouped according to social; social-environmental; social-technical; environmental-technical; and social-environmental-technical sub-systems. It is interesting to note that none of the identified factors were purely environmental or technical. All four (4) of the five (5) sets of factors, involved the social sub-system. It is therefore established that the social sub-system plays a significant role. Furthermore, it is important to note that besides the factors that belonged purely within the social sub-system, all factors were placed within an overlap of two (2) sub-systems or more. These overlaps had a large allocation of factors, thus proving the complexity of factors that may affect the adoption and meaningful use of EMRs. The next chapter reports on the results of the research survey that was conducted in four general practices.

CHAPTER 4

4. SURVEY EMPIRICAL RESULTS

According to research, small general practices have been slow in adopting EMRs (Gans *et al.*, 2005; Lee *et al.*, 2005; Russell & Spooner, 2004; Randeree, 2007). The main problem addressed in this research is, therefore, the lack of adoption and meaningful use of EMRs in general practices. Thus, the primary question that this research will answer is: Which factors need to be addressed to encourage the adoption and meaningful use of EMRs in general practices? The purpose of this chapter is to report on the results that emerged from the gathering of primary data for this research with the aim of answering the primary research question. It is important to understand how the surveyed small general practices were identified, and the data gathering techniques that were used to collect data from these practices. The data collection process is described together with preparations prior to data collection. Lastly, the results that emerged from the survey are presented.

4.1. Selection of General Practices

In Chapter 1, section 1.2, it was stated that prior research has mostly focused on the public health sector rather than on the private. In the private healthcare sector of South Africa, primary care is provided by a GP (de la Harpe, 2008). As noted in Chapter 1, section 1.1, a GP will refer a patient to a specialist when necessary, whilst remaining the main healthcare provider. Therefore, for the purpose of this research, the main healthcare provider was targeted.

In choosing the practices surveyed in this research, both convenience and purposive sampling were used, as indicated in Chapter 1, section 1.5.1. The use of convenience sampling ensured the identified practices were of both easy access and immediacy to the researcher. The contacted participants were within the vicinity of the Nelson Mandela Bay Metropolitan area. Furthermore, purposive sampling was used to ensure that the contacted general practices met the criteria of the research. When applying purposive sampling there are various strategies that can be used. The strategy used in selecting practices to be studied in this research is criterion

sampling. Criterion sampling explores cases that meet certain set criteria. The practices that were selected had to meet the following criteria:

- The practice had to be a general practice; and
- The general practice had to be a private practice that is not part of a group practice.

This strategy led to 15 small general practices being identified and contacted; however, only five were identified as interested participants. Out of these five, one was excluded for reporting purposes, because the practice provided partial data. This research project yielded small samples. However, these samples satisfied the explorative nature of the research.

4.2. Data Gathering Techniques

In each practice, data was gathered using both questionnaires and interviews. Some of the questions used, apart from those self-formulated by the researcher, were adapted from questions formulated in studies done by Loomis *et al.*, (2002), Ludwick and Doucette (2009) as well as Arvary (2002). This research adapted and included questions that were relevant to the main and sub-research questions. According to Mills *et al.* (2005), a researcher is allowed to formulate questions based on their own "intuition" together with adapting questions in data collection instruments formulated by other researchers. All these data collection instruments are presented in Appendix 2 to Appendix 6. (Note: In these Appendices questions that were adapted from previous studies are indicated with "A" for adapted, whereas the rest of the questions were formulated by the researcher.)

The questionnaire types and purpose of each are further explained in Table 4.1.

- **Questionnaires:**

The questionnaires were used to obtain an overview of most aspects in the whole general practice. This technique was selected as it is suitable for obtaining information that does not need the participant to provide elaborative or lengthy answers.

- **Interviews:**

An interview involves the oral questioning of participants, either as individuals or as a group (Denscombe, 2001). An interview provides a platform for selecting a single participant in each practice and elaborating on certain information that may be useful to the research, because it will provide a deeper understanding of certain aspects. It was chosen as a means of obtaining important information from the GP of each practice, about the general practice, whilst exploring issues that need further probing in more depth, since interviews allow for the formulation of questions that entail a more in depth view and richer qualitative data.

The specific purpose of each of these data collection instruments is as follows in Table 4.1:

Data Collection Instrument	Completed by	To obtain information about
General Survey	A member of staff who is knowledgeable of the details of the practice, the IT infrastructure; and use of IT within the particular practice.	• Number of staff employed in the practice; • Computer use; • Software use; • Paper-based format information; and • Electronic format information.
Patient Questionnaire	All willing patients, whilst in the waiting room of the practice. These were handed out by the receptionist when a patient approached him/her.	• Patient biographical information; and • Patient views about the storage of their information on paper and electronic formats.
General Practitioner Questionnaire	All GPs within the practice	• GP biographical information; • Language use; • Paper-based system use; • Computer literacy; and • Computer use.
Administrative Staff Questionnaire	All administrative staff within the practice.	• Administrative staff biographical information; • Language use; • Paper-based system use; • Computer literacy; and • Computer use.

Data Collection Instrument	Completed by	To obtain information about
GP Interview	All GPs within the practice.	• The flow of a typical consultation; • Where encounter notes are captured; • Likes and dislikes about the current system; and • The perceptions that the GP has about EMRs.

Table 4.1: Data Collection Instruments

The questions posed in the questionnaires and interviews are provided in Appendix 2 – Appendix 6.

4.3. Data Collection Preparation

The researcher had to prepare questionnaires and interview instruments for each of the general practices:

4.3.1. Preparing for data collection: questionnaires and general survey

The researcher had to produce copies of the questionnaires that would be sufficient for all selected general practices to prepare for data to be collected with questionnaires. These were neatly prepared in a separate file that was delivered to each practice, to ensure that the questionnaires would not be misplaced within the paper-based systems still in use in the practices.

4.3.2. Preparing for data collection: interviews

The researcher, to prepare for the interviews, revisited the interview questions to recap what questions were included and how they were phrased. This was to act as a reminder because the questions were formulated in the early stages of the research. The researcher practiced the interview with a colleague to establish a time frame. Video recording was not appropriate due to the need to protect the identity of the interviewee. Hence, a smart pen was chosen as the appropriate recording device

for the interviews, due to its capability to record audio and written notes. The Live Scribe smart pen was the selected recording device.

4.4. Data Collection

The researcher had to first seek out permission from the "gate keeper" at each general practice to engage the practice in research. This included obtaining permission to:

- Enter the premises of the practice;
- Engage with the staff and patients via questionnaires; and
- Interview a suitable member of staff in each practice after consent had been received.

The consent form was adapted from a template provided by the NMMU for research purposes. These actions were necessary to be able to gather data in the different practices. Once permission was granted from the selected practice, the researcher commenced with the survey. Data gathering was undertaken from 2 September 2011 until 23 August 2012.

Each practice received one questionnaire to obtain the general details of the practice; the IT infrastructure; and use of IT within the particular practice. These questionnaires were directed to one or more members of staff in the particular general practice who were knowledgeable about these aspects. Patients had their own questionnaires which they completed, at their own free will, while in the waiting room of the general practice. The questionnaires were constructed to elicit an understanding of how patients feel about having their information stored electronically. GPs and administrative staff were asked to complete questionnaires, because they may assist in providing the researcher with a clear picture of the social, environmental and technical factors within general practices that need to be addressed to encourage the adoption and meaningful use of EMRs.

After preparing for the interviews and choosing the recording method, the researcher conducted interviews with each GP, within each of the participating general practices. The interviews were carried out on their premises. The interviews were conducted during office hours and each interview was approximately 30 minutes in duration. As an incentive, a consultation fee was paid to remunerate the GP,

because his time may have been spent consulting with a patient rather than in an interview. However, one of the GPs declined to be remunerated for the time spent in the interview. The questions posed in the interview are presented in Appendix 6.

Prior to the presentation of the results that emerged from this research, it is important to first gain an understanding of the general practices that were involved. Hence the following section provides a general description of these general practices.

4.5. General Practices

Demographic Profile

The demographic profile of the four participating practices covers the following:

- The GP and administrative staff census;
- The approximate time the GPs spent consulting, per day, with patients;
- The technology used in the practice; and
- The storage medium(s) used for patient clinical and billing information.

According to the GP and administrative staff census, as presented in Table 4.2, all four practices had a single GP. Three of these practices employed 2 administrative staff, as the fourth practice employed a single administrative staff. Thus, the prevalent GP-administrative staff ratio was 1:2 respectively.

	Practice 1	Practice 2	Practice 3	Practice 4
No. of GPs	1	1	1	1
No. of Admins	1	2	2	2
GP-admin ratio	1:1	1:2	1:2	1:2

Table 4.2: GP and Administrative Staff Census

As presented in Table 4.3, the approximate number of patients that the GPs saw per day is between 15 and 30 patients. The target consultation duration was between 10 and 30 minutes per patient. From this, it was deduced that the average time the GPs spent consulting with patients, per day, was between 3.75 hours to 10 hours.

	Practice 1	Practice 2	Practice 3	Practice 4
Approximate number of patients (per day)	15	20	15	30
Target consultation duration	15min	20-30min	20-30min	10-15min
Approximate total time spent consulting per day (hrs.)	**3.75hrs.**	**6.7-10hrs.**	**5-7.5hrs.**	**5-7.5hrs.**

Table 4.3: Approximate total time spent consulting per day

Typical General Practice workflow

From the data acquired during the interviews with the participating GPs, the researcher was able to compile a summary of the typical general practice workflow as illustrated in **Error! Reference source not found.**. The workflow involves three 3) immediate types of actors, namely a patient (wishing to consult with the GP), administrative staff (who perform the administrative tasks required before the patient can consult the GP) and the GP (who consults with the patient). The workflow occasionally includes a task that involves an interaction with a fourth type of actor, a Medical Aid service provider who is external to the practice. According to the Medical Scheme Act, cited in an article on the Pfizer website (n.d.), a Medical Aid scheme is described as the "undertaking of liability" regarding healthcare cost "in return for a premium or contribution" from a Medical Aid member. It is important to note that this workflow only describes the events occurring from the time the patient enters the practice to the time the patient leaves after a consultation.

When the patient enters the practice, the first person he/she interacts with is an administrative staff member. If the patient is a returning patient, the administrative staff member locates the file of the patient. This may be with the aid of a Microsoft Office program called Excel. An Excel spread sheet is used to look up file numbers. If the patient is new, the administrative staff member opens a new patient folder where she records biographical data about the patient, such as name, address, employer, phone number at work, mobile phone number and home number. She verifies the identity of the patient by checking their identity document (ID).

Some patients use the services of a Medical Aid scheme. Hence, if a Medical Aid is involved, for the new patient, the Medical Aid information is captured. Thereafter, the administrative staff member contacts the specified Medical Aid service provider to

verify the membership of the patient and what benefits they are entitled to. Otherwise, for returning patients, the Medical Aid provider is contacted to verify the availability of funds, if the patient has not recently seen the GP.

The patient waits in the queue to see the GP. Once the patient is in the consultation room, the GP examines and diagnoses the patient, whilst taking handwritten notes on the patient file. Depending on the diagnoses and the Medical Aid benefits (if applicable), the GP dispenses medication for the patient; otherwise the GP prescribes medication that the patient obtains from a pharmacy (external from the practice). The Medical Dictionary (2007) defines a pharmacy as "the branch of the health sciences dealing with the preparation, dispensing, and proper utilization of drugs". After receiving the medication or prescription, the patient exits the practice.

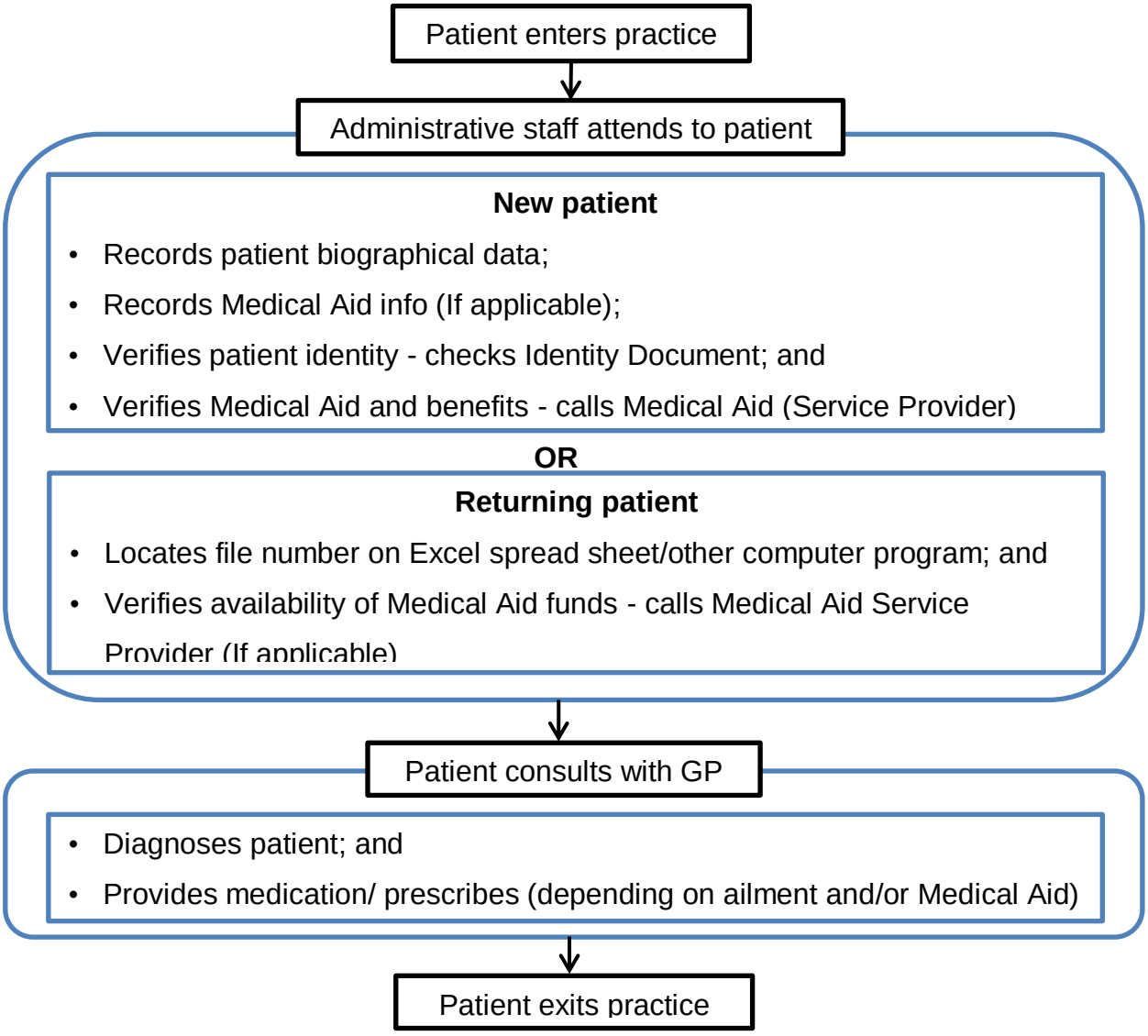


Figure 4.1: Typical consultation flow

The technology that the practices used together with the storage medium(s) used for storing patient clinical and billing information is discussed in sections 4.5.1 to 4.5.4. This discussion is summarized in Table 4.4 and Table 4.5, respectively.

4.5.1 General Practice 1

No desktop computers were used in this general practice, as both the GP and the administrative staff each used a laptop. The researcher established that this practice uses both a paper-based format and an electronic format to store patient clinical information. Only patient billing information is stored in a paper-based format, while the clinical information is stored in an electronic format.

4.5.2. General Practice 2

The administrative staff members use desktop computers and the GP uses laptops. This practice uses a paper-based format to store the patient clinical information. Other information, such as patient billing, Medical Aids, service provider and biographical information is stored in an electronic format.

4.5.3 General Practice 3

The administrative staff members use a desktop computer and the GP uses a laptop. The practice uses a paper-based format to store the patient clinical information. All information, except for patient billing, is stored in a paper-based system. However, the handling of claims - for billing purposes, is outsourced to an external administrative office.

4.5.4 General Practice 4

The two desktop computers are used by the administrative staff members. Additionally, the practice uses a laptop, but its user was not specified in the general survey. However, in an interview with the GP, it was clear that he had a computer. Therefore, the researcher deduced that the GP used the laptop. A paper-based system and an electronic system are used for both clinical and billing patient information.

	Practice 1	Practice 2		Practice 3		Practice 4	
Computers	2 laptops	2 laptops	3 desktops	1 laptop	1 desktop	1 laptop	2 desktops
User	GP and admin	GP	Admin	GP	Admin	GP	Admin
Software	Accounting software	Windows Office & eMD		*Not provided*		MedED	
Internet connectivity	Wireless	T-1 Lines, 3G		Analog/Dialup		DSL, Wireless	

Table 4.4: Technology used

The researcher found it interesting that all four (4) GPs used laptops, yet all the GPs, except for one, provided their administrative staff with desktop computers.

	Practice 1	Practice 2	Practice 3	Practice 4
Patient clinical information	Paper-based format and electronic format	Paper-based format	Paper-based format	Paper-based format and electronic format
Patient billing information	Paper-based format	Electronic format	Electronic format	Paper-based format and electronic format

Table 4.5: Storage mediums used for patient clinical and billing information

All the practices use a paper-based system for the storage of patient clinical information. Some practices use applications such as Excel and Medical Aid applications for storing parts of the patient clinical information. In an interview with the GP from the 2nd practice, it was established that the practice uses general practice software, known as eMD. However, the researcher was able to conclude that the software is not categorised as an EMR, since it is mainly used for account purposes, although it includes a component that allowed for biographical data and parts of the clinical patient information. The researcher based this conclusion on the following (Note: the responses in italics verbatim written comments by the participants):

2. Self-conducted research about the software:

   The researcher gathered information from the website of the software service provider, to gain an understanding of what they are offering.

3. Data provided by the GP in the general practice survey:

   In the general practice survey, the GP described the purpose of the software as *"Medical Accounts"*. The GP stated that clinical information is stored in a paper-based format and did not list it amongst the information stored in an electronic format. This is supported by the following quotes:

   (The following quote was in response to this question: *"Specify information stored in a paper-based format, e.g. patient billing, clinical information, biographical information, etc.")*

   "CLINICAL INFORMATION ON PAPER BIOGRAPHICAL INFORMATION ON ELECTRONIC"

   (The following quote was in response to this question: *"Specify information stored in an electronic format, e.g. patient billing, clinical information, biographical information, etc.")*

   "1. BILLING 2. MEDICAL AIDS 3. SERVICE PROVIDER 4. BIOGRAPHICAL"

   Furthermore, another GP who used the same software indicated that it is *"Accounting software"*.

4. Data that emerged from the entire interview with this GP:
   During the interview, the GP referred to the software as *"some kind of very simple electronic system"* rather than an EMR. When asked about adopting an EMR one of his comments was that they *"are still looking into it"*.

It is thus apparent that none of the participating practices used EMRs for storing patient clinical information. This finding was not unexpected, since literature states that small general practices have been slow in adopting EMRs (Gans *et al.*, 2005; Lee *et al.,* 2005; Russell & Spooner, 2004; Randeree, 2007).

For the researcher to meet the main objective of this research, it is important to have an understanding of the people who work within the given environments whilst having a clear understanding of the environment within each of the participating practices. Hence, the next section discusses the results of the data collected from the administrative staff participants working within the participant practices.

4.6. Administrative Staff Questionnaire

Six of the seven (7) administrative staff questionnaires were completed. The data gathered is presented next (Note: the responses in italics verbatim written comments by the participants).

4.6.1. Demographic profile

The demographic data is summarized in Table 4.6. As illustrated, all the participants are females. Half of the participants (3) are between 25 and 34 years old. The home language distribution of participants was Xhosa (Five) and English (1). Only one of the participants had a Bachelor's Degree as part of her education profile, while the rest of the participants have a Certificate/Diploma (5) as their highest education level. All the participants (6) use English as the language of communication in their daily work to communicate with the members of the community whom they serve; however, in addition to English some participants indicated that they use Xhosa (2) and Zulu (1).

	Practice 1	**Practice 2**	**Practice 3**		**Practice 4**	
Admins	1	1	2		2	
Gender	F	F	F	F	F	F
Age	35-44	25-34	35-44	25-34	25-34	45-54
Home Language	Xhosa	English	Xhosa	Xhosa	Xhosa	Xhosa
Education	Certificate/ Diploma	Certificate/ Diploma	Bachelor's Degree	Certificate/ Diploma	Certificate/ Diploma	Certificate/ Diploma
Communication Language	English	English	English	English	English	English
	Xhosa		Zulu	Xhosa		

Table 4.6: Administrative Staff Demographic Profile

A paper-based system, as stated, was found to be the storage medium used extensively within each of the participating practices. Therefore; the following section discusses the problems that these administrative staff participants have experienced whilst using a paper-based system.

4.6.2. Problems experienced with a paper-based system

The researcher found that out of all 6 participants; only 1 participant stated they have experienced problems whilst using a paper-based system. This statement was supported by the following quote:

(The following quote was in response to this question: *"Have you experienced problems whilst using a paper-based system?")*

"*Loss of information without a computer*"

4.6.3. Computer literacy

The participants provided the ratings in Table 4.7 when asked to rate their computer literacy on a 1 to 5 Likert scale, where 1 rates as "not computer literate" and 5 as "expert or power user". The researcher noted that, based on these self-ratings, the participants considered themselves as quite computer literate, since one (1) rated themselves as a rating of 2.

	Practice 1	**Practice 2**	**Practice 3**		**Practice 4**	
Rating	4	4	3	2	4	3

Table 4.7: Own Computer Literacy Rating (Administrative staff)

The applications the participants use and the rate at which they use them is presented in Figure 4.2. The researcher noted that the most used application was a Word Processor, as 4 out of 6 participants rated the application as "Always" used. The 2nd highest rated application, rated by 3 participants as used "Most times", was the general practice applications.

It was interesting to note that all six (6) participants agreed that using an EMR will decrease the opportunity of medical errors, and yet, as mentioned, only 1 of the 6 indicated that she experienced problems whilst using a paper-based system. This participant is the oldest (45-54) of the participants.

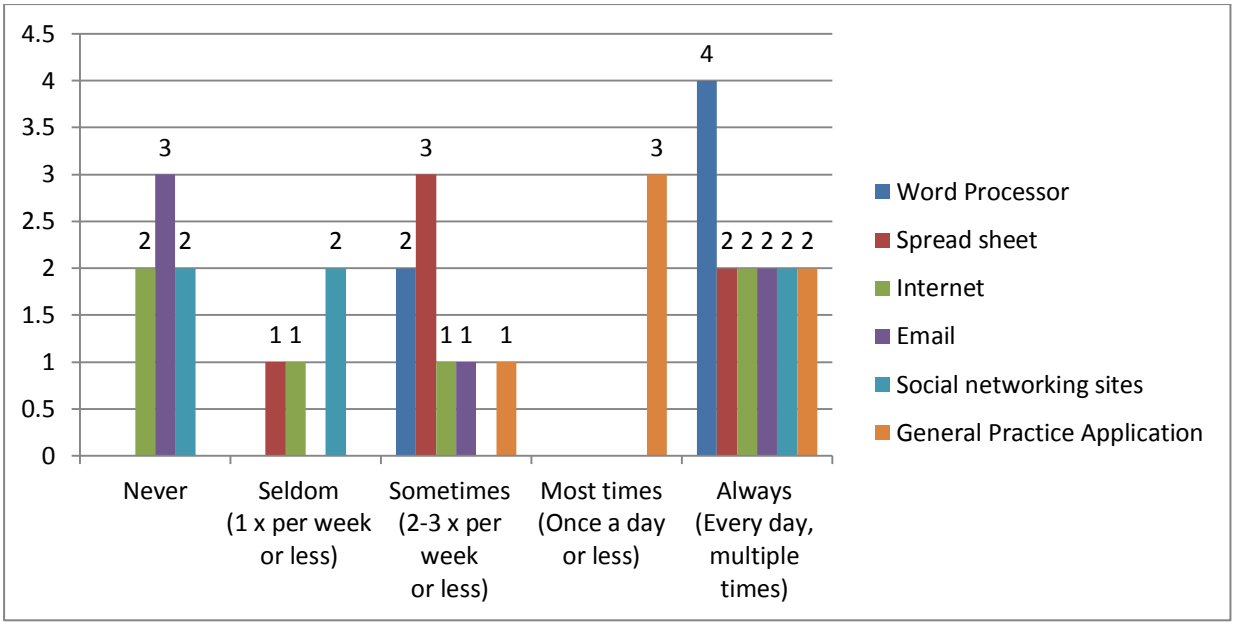


Figure 4.2: Used applications and Rate of usage (Administrative staff)

All participants agreed that the use of EMRs would reduce medical errors. The following quotes, gathered from open-ended questions included in the questionnaires, support this sentiment:

"IT WILL SAVE TIME."

"NO MORE LOOSING FILES | INFORMATION"

"NO LOSS OF FILES"

"Easier to see mistake emmediately"

However, not all participants were of the opinion that the widespread use of EMRs would improve healthcare quality in South Africa, Four (4) agreed, 1 disagreed and the other participant did not respond to this question.

The participants mentioned both the saving of storage space and the speed that would be introduced by the use of EMRs, when asked how the use of EMRs would impact their daily job. However, one of the participants could not see any impact, since she was satisfied with the current paper-based system. The following quotes are in support of these opinions:

"NOT SURE, BECAUSE MY CURRENT SYSTEM [Paper] DOES NOT STRESS ME."

"[EMRs] SAVE TIME & STORAGE"

"[EMRs] LESS STORAGE PLACE, FILES WILL NO LONGER BE KEPT IN FILING CABINET, BUT IN USB"

"[EMRs] Quick and easy, saves time."

"[EMRs] Faster processes"

Furthermore, the participants listed the following positive aspects when asked to mention positive or negative aspects that they associated with the acquisition, implementation and use of EMRs in their practice:

"IT WOULD IMPROVE THE QUALITY OF PATIENT CARE."

"Easier to work, faster easier retrieval of information"

4.7. GP Questionnaire

Each GP within the participating general practices completed a questionnaire which resulted in four (4) GP questionnaires in total. The data gathered is presented next (Note: the responses in italics verbatim written comments by the participants.).

4.7.1. Demographic profile

The summary is presented in Table 4.8. All the GP participants are males. Half of the participants (2) were between 45-54 years old. The prevalent home language amongst the participants was Xhosa (3). The roles of the participants included being the practice owner, decision maker and acting as an administrator.

Out of the 4 participants, 2 used English as the language of communication in their daily work to communicate with members of the community whom they serve; however, additionally, one (1) used Xhosa and one (1) used Afrikaans. The other 2 participants indicated they only used Xhosa. All the GPs indicated they do not use their home language to record clinical data; they use English, except for one. This participant selected both English and Afrikaans as his home language. All the participants have each been in practice for a number of years. All the participants played more than one role in the practice.

	Practice 1	Practice 2	Practice 3	Practice 4
GP	1	1	1	1
Gender	M	M	M	M
Age	35-44	55-64	45-54	45-54
Home Language	Xhosa	English	Xhosa	Xhosa
Education	Degree	*Not provided*	MBChB, BSc (hons), Post Grad Dip. Occupational Medicine, Post Grad Diploma in Disability Management.	Degree
Communication Language	English	English	Xhosa	Xhosa
	Xhosa	Afrikaans		
Years in Practice	19	40	16	18
Additional role	Administrator and practice owner	Practice owner and key decision maker	Sole proprietor	Practice owner and key decision maker

Table 4.8: GP Demographic Profile

It is important, while considering the demographic profile of the GP participants, to have an understanding of the problems that they have experienced whilst using a paper-based system. The problems are discussed in the next section.

4.7.2. Problems experienced with a paper-base system

The researcher established that all 4 GP participants have experienced problems whilst using a paper-based system. The following quotes support this:

"Lost files and notes"

"1. Loss of Records 2. Increasing Number of files"

"LOSS; MIX-UP OF CLINICAL NOTES; POOR METHOD OF REMINDERS"

"mis-filling & misplacement of folders"

This was interesting when the researcher recalled that of six (6) administrative employees; only one has experienced problems whilst using a paper-based system.

4.7.3. Computer literacy

The participants provided the ratings presented in Table 4.9 when asked to rate their computer literacy on a 1 to 5 Likert scale, where 1 rates as "not computer literate" and 5 as "expert or power user". The researcher noted that, based on these ratings, the participants considered themselves as computer literate, since none rated themselves below a rating of 3.

	Practice 1	Practice 2	Practice 3	Practice 4
Rating	4	4	3	3

Table 4.9: Own Computer Literacy Rating (GP)

The applications the participants used and the rate at which they used these applications are presented in Figure 4.3. The highest ranked applications are an Email application and the general practice application. Both applications were rated by all 4 participants as "Always" used. The 2nd highest rated application was a Word Processor, which was rated by 3 out of the 4 participants as "Always" used.

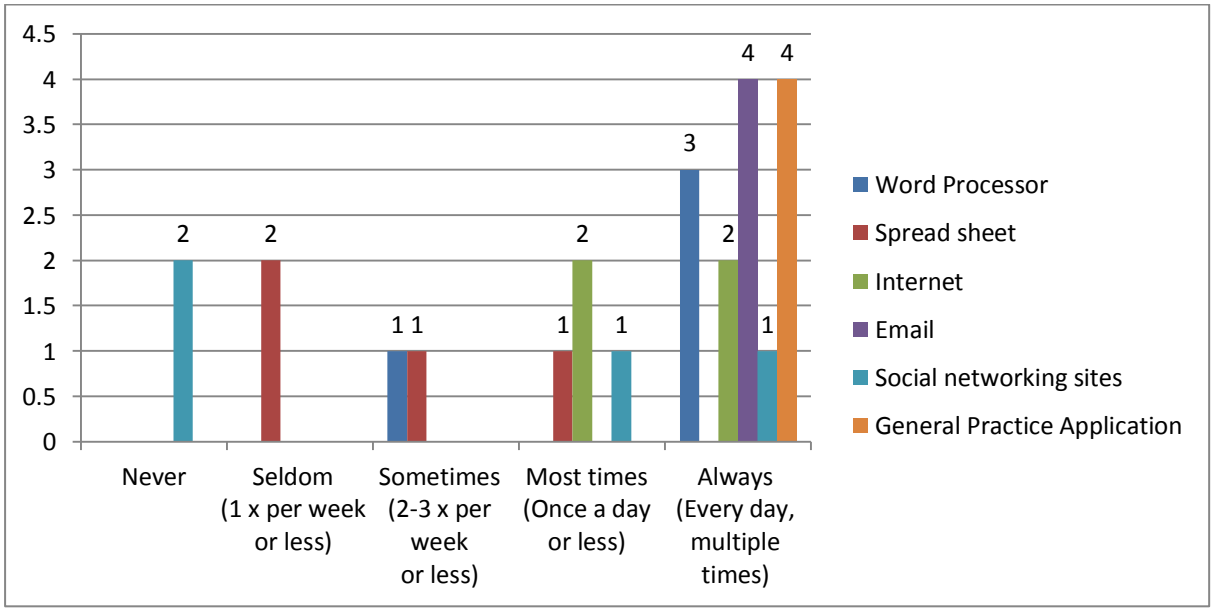


Figure 4.3: Used applications and Rate of usage (GP)

All 4 GP participants stated that there was no computer use, currently, during consultation. In the questionnaire the GPs were provided with possible reasons, as a check box option, for this lack of computer use during consultations. These results are presented in Table 4.10. The GP participants were provided with an option to list other reasons not restrict their responses. The following reasons were provided:

Not using a computer during consultation, because:	Practice			
	1	2	3	4
The cost of adopting a computerized system is too great	✓			
It will take too much time during consultation	✓			✓
There is no standardization	✓	✓		
I do not have time to learn	✓			
It will affect the patient/doctor relationship	✓			✓
Other:				
"Equipment must be suitable for a medical office, Software cost must be reasonable"	✓			
Crime factor/township				✓
"See 9." - ("NONE PRESENTLY, BUT ITS LONG OVERDUE. MOST OF MEDICAL AIDS ENFORCE ELECTRONIC COMMUNICATION")			✓	

Table 4.10: Reasons for not using a computer during consultation

It was established that out of all the four (4) GPs, only 1 indicated concern about computer system costs. This was interesting to the researcher especially when considering that the GP in question, preferred to provide his own comment about cost rather than highlight from the list provided in the questionnaire. The researcher is of the opinion that this implies that the GP does not believe that the cost of adopting a computerized system is too great, in its entirety, but is only concerned about software costs. Only one (1) GP revealed that he did not have time to learn a computer system. The researcher noted that crime was stated as one of the reasons for not using a computer during a consultation.

The GPs showed interest in the functionality indicated in Table 4.11 when asked to indicate the functionality they would be interested in, should they adopt and use EMRs. It was encouraging to note that 3 of the 4 GPs are interested in all the functionality listed in the questionnaire.

Pre-visit functionality:	**Practice**			
	1	**2**	**3**	**4**
Schedule and register a patient	✓	✓	✓	
Communicate with healthcare provider(s) about the scheduled patient	✓	✓	✓	
View the medical history of the patient in preparation for the visit	✓	✓	✓	✓
Visit functionality:	**Practice**			
	1	**2**	**3**	**4**
GP or other medical staff can type in information acquired from the examination of the health condition of the patient; electronically prescribe medication	✓	✓	✓	✓
Electronically order diagnostic tests and results from labs	✓	✓	✓	✓
Provide the patient with patient education material	✓	✓	✓	
Post-visit functionality:	**Practice**			
	1	**2**	**3**	**4**
Communicate with relevant healthcare provider(s) using electronic messaging	✓	✓	✓	✓
Make patient reminders related to the disease of the patient	✓	✓	✓	✓
Maintain and manage reports	✓	✓	✓	
Manage billing and receivables	✓	✓	✓	
Allow patients to request follow-up visits	✓	✓	✓	

Table 4.11: Functionality of interest to the GPs

All 4 GPs were of the opinion that using an EMR would reduce the risk of making medical errors. The following quotes are in support of this opinion:

"Paper record keeping; no duplications; quick - to access or disseminate"

"With Record standardisation the information will be stored in an organised way."

"NOT TO FORGET PATIENTS VISITS; NOT TO FORGET DISCUSSING RESULTS."

"Information will be readily available (e.g. allergy/previous operations and dinemic disease information)"

The participants believed that widespread use of EMRs would improve healthcare quality in South Africa:

"… NB plus proper statistics"

"1. Duplication of services will be reduced 2. Patient management will improve"

"- no lost medical documents - follow-up care"

All the GP participants indicated positive thoughts towards the use of EMRs, because when queried about how the use of EMRs would impact their daily job they noted the following positive aspects:

- Simplicity;
- Improved interaction with other service providers;
- Reduced paper use;
- Reduce consultation time;
- Promote proficiency; and
- Improve patient management.

These are represented by the following positive quotes:

"[S]implify it; more interesting with interaction; with other service providers"

"It will reduce paper trail & improve time with the patient."

"Proficiency"

"- it will make less consultation time - improve patient management"

The GP participants, however, provided the following aspects as presented in Table 4.12, when asked to list or discuss any other positive or negative aspects that they associate with the acquisition, implementation and use of EMRs in their practice.

	Aspect
Positive	*"[S]ecurity"*
	"INFORMATION STORAGE & RETRIEVAL WILL BE IMPROVED"
	"- [A]ccessible patient history - centralised medical file"
Negative	*"[H]acking; security"*
	"LOSS OF DATA DUE TO SOFTWARES HARDWARE FAILURE"
	"Price + Time"
	"Confidentiality"

Table 4.12: Positive and negative aspects associated with the acquisition, implementation and use of EMRs

It was interesting to note that security is seen as both a positive and negative aspect associated with the acquisition and implementation of EMRs.

4.8. GP Interview

An interview was conducted with the GPs from each of the four practices. The individual interviews, as stated, were audio recorded. The researcher had to capture the recorded data on paper and transcribe it, to ease data analysis. According to Patton (2002), it is important to go through the data in the transcripts, to "get a sense of the whole". However, Patton points out that acquiring this "sense" does not start there; rather it starts during the actual transcription process. This is because even at that initial stage, the researcher is able to get a feel of the data that they will later need to analyse. Therefore, the researcher decided on transcribing the interviews without the services of a transcriber.

It is important to ensure that the transcripts capture verbatim the exact recorded comments, though it is up to the researcher to decide what they want to transcribe from the audio recording and whether they want to pay attention to nonverbal observations (McLellan & Macqueen, 2003; Oliver, Serovich & Mason, 2005; Davidson, 2009). The researcher followed suggestions by these authors when transcribing the data. The transcription of all four interviews is in Appendix 7.

The purpose of the interviews was to obtain in-depth qualitative data to assist the researcher in answering the research questions. Hence, the data that emerged from the interviews is used to enrich the answers to the research questions in the next chapter, Chapter 5.

4.9. Patient Questionnaires

A total of 86 of 140 questionnaires were received from the participating general practices, representing a 61% response rate. However, one (1) of the 86 questionnaires appeared to have been completed by a 13 year old minor. This questionnaire was excluded from this research. Therefore, the data used in this research was gathered from 85 questionnaires. The data gathered is presented next (Note: the responses in italics verbatim written comments by the participants.).

The 85 questionnaires were distributed as follows in Table 4.13:

	Practice 1	Practice 2	Practice 3	Practice 4
No. of patient questionnaires	21	28	11	25

Table 4.13: Distribution of patient questionnaires

4.9.1. Demographic profile

The demographic profile of the 85 patient participants reveals that 68.2% are female, 28.2% are male and 3.5% of the participants did not specify their gender. The ages of the participants are distributed as presented in Figure 4.4.

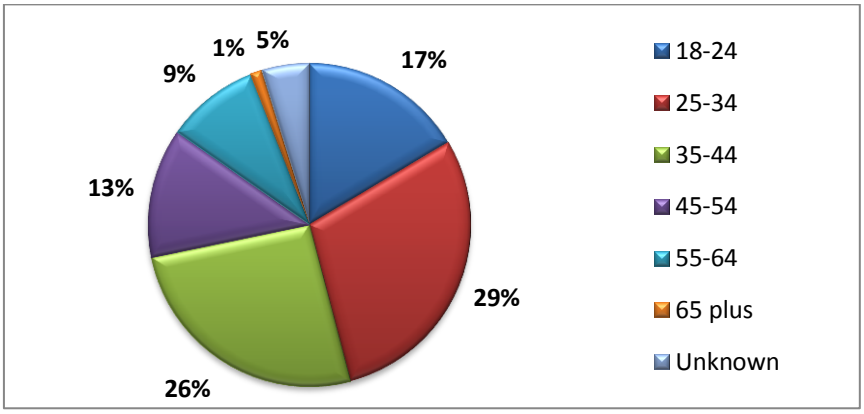


Figure 4.4: Age distribution of participants

The majority of the participants were between 25 and 34 years old. Only 9.4% of the participants were visiting the general practice for the first time, on the day they completed in the questionnaire. Fifty per cent of the participants had been visiting, the practice in question, for more than four years as illustrated in Figure 4.5.

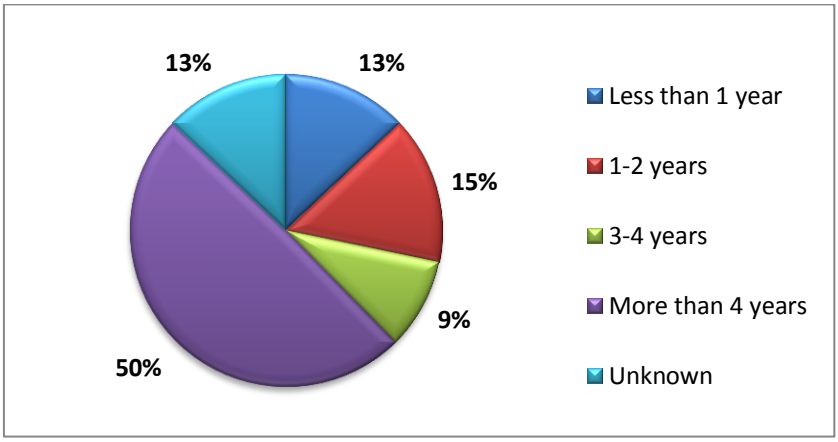


Figure 4.5: Years visiting this practice

The home language distribution of participants was Xhosa (60%), English (24.7%), Afrikaans (9.4%), Zulu (2.3%) and unknown (3.5%) The education profile of participants was Grade 9/Adult Basic Education (4.7%), Grade 12 (28.2%), Certificate/Diploma (35.2%), Bachelor's degree (14.1%), postgraduate degree (8.2) and unknown (9.4%).

4.9.2. Continuity of care

It was revealed that almost half of the participants (47%) see more than one GP. This is illustrated in Figure 4.6.

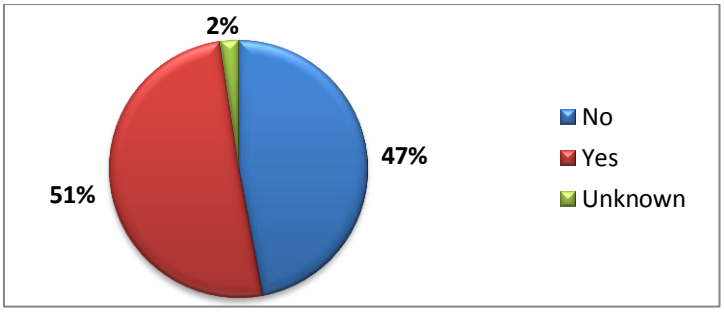


Figure 4.6: Patients visiting one GP

This makes achieving continuity of care difficult, because their medical information is fragmented between the information systems of the GPs they visit. As noted in Chapter 1, section 1.1, continuity of care can be defined as the intersection of three aspects: interpersonal, informational, and longitudinal continuity. Interpersonal and longitudinal continuity are, therefore, challenging to achieve. Thus, there is a need for solid informational continuity, to ensure that the storage medium used has a minimum negative impact on the quality of care the patients receive.

4.9.3. Impact on quality of care

The researcher wished to establish whether the participants viewed the use of a paper-based information storage system as negatively impacting the quality of care provided to them. It was rather thought-provoking to discover that the majority of participants thought that the use of a paper-based system had no negative impact on their potential health care, as 32% strongly disagreed and 46% disagreed when asked. This result is presented in Figure 4.7.

However Tsai & Bond (2007), seem to disagree, because they think that illegibility, incompleteness and poor organization linked to notes taken by hand, in the form of medical records, can make it difficult to guarantee quality of care.

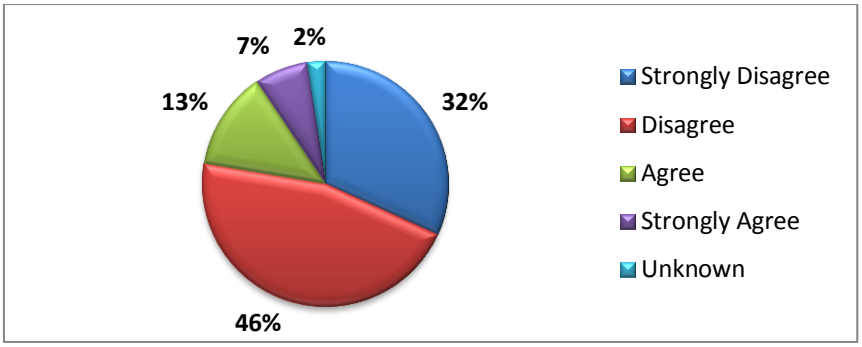


Figure 4.7: Perception of negative impact on the quality of care (Paper-based system)

4.9.4. Patient confidentiality

There was a small difference of opinion between concerns of confidentiality for a paper-based system versus an electronic system. Of the participants, 14% (Strongly Agree) and 26% (Agree) expressed concerns about confidentiality with the use of a paper-based system to store their information, whereas 17% (Strongly Agree) and 27% (Agree) expressed concerns about confidentiality with the use of an electronic format. These results are presented in Figure 4.8 and Figure 4.9.

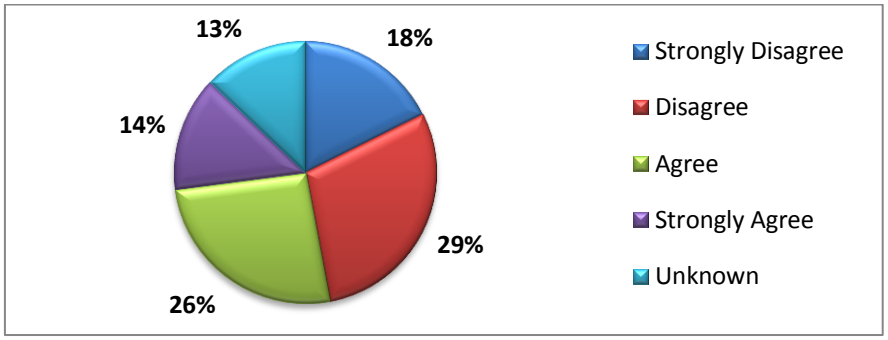


Figure 4.8: Perception of lack of information confidentiality (Paper-based system)

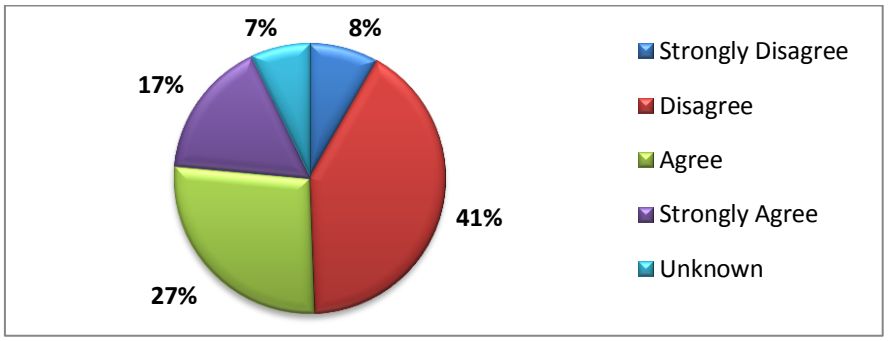


Figure 4.9: Perception of lack of information confidentiality (EMRs)

The system that is extensively used in each of the practices is a paper-based system. Hence, it was interesting to find that patient participants displayed the same level of concern about EMRs and paper-based systems.

4.9.5. Patient storage preferences

Forty per cent (Strongly Agree) and 17% (Agree) of the participants indicated they prefer their GP to use a computerized system to store their consultation details as presented in Figure 4.10.

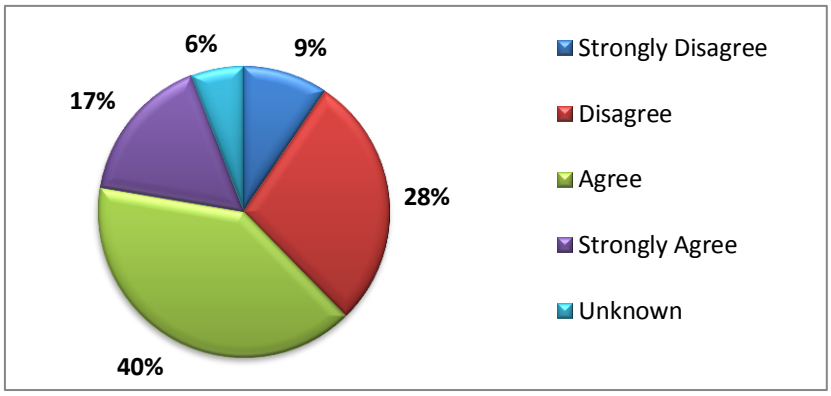


Figure 4.10: Perception that GP should use a computerized system

This corresponds with the 48% of participants who selected EMRs as their preferred storage medium, 8% indicated they preferred any of the two storage mediums while 27% preferred a paper-based storage medium and 17% of the participants did not specify their overall preferred storage medium on the questionnaires as presented in Figure 4.11.

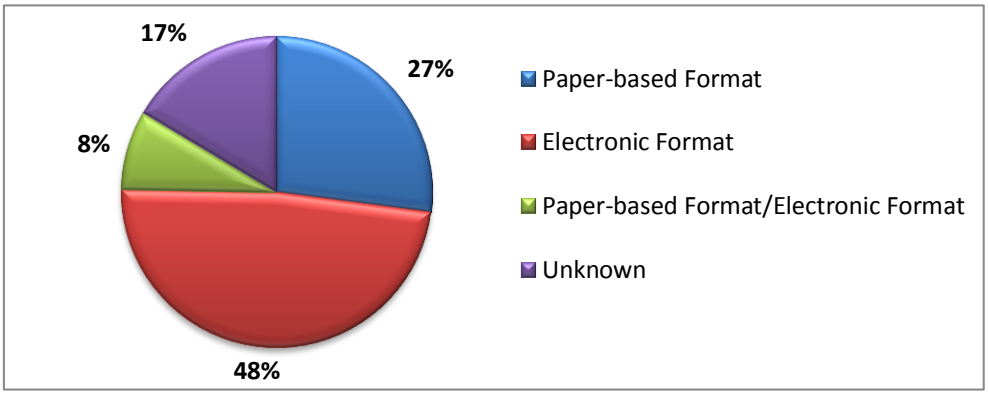


Figure 4.11: Overall storage medium preference

It emerged that of the 85 participants, 27% preferred a paper-based system and 48% preferred EMRs. Prior to any conclusions on whether the patient participants preferred an EMR, it is important to further examine their reasoning. Therefore, this

discussion focuses on trying to understand why the participants held their specific views about the two storage mediums, paper-based and EMRs.

The participants were provided with a comment field below each question in the questionnaire to acquire the qualitative data necessary to understand the reasoning behind the views of the participants. The researcher analysed this data using content analysis. Key phrases were, therefore, generated to understand why a specific storage medium was preferred. The categories that emerged from the key phrases are: clinical, ecological, social, security and technical as presented in Table 4.14.

These categories, with key phrases, are listed in alphabetical order. No order of importance is implied. All the categories have four columns: Paper (+) or EMR (+); and Paper (-) or EMR (-), which respectively represent the positive and negative aspects that the participants associated with the storage medium. Overlapping exists in certain positives and negatives.

Key phrase representing concept identified	Storage medium (Positive/Negative relationship)			
Clinical	**Paper (+)**	**Paper (-)**	**ER (+)**	**ER (-)**
Complete medical history	+		+	
Continuity of care			+	
Correct diagnosis and treatment	+			-
Quality of care	+	-	+	
Ecological	**Paper (+)**	**Paper (-)**	**ER (+)**	**ER (-)**
Costs			+	
Eco-friendliness		-	+	
Wide use			+	
Patient-doctor relationship	+		+	
Patient-other staff relationship	+			
Computer literacy	+			
Familiarity	+			
Human aspect	+			
Satisfaction	+			
Security	**Paper (+)**	**Paper (-)**	**ER (+)**	**ER (-)**
Confidentiality	+	-	+	-
Data capturing errors			+	
Computer distrust				-
Record integrity	+			
Record safety	+	-	+	-
System availability and reliability	+		+	-
System security and privacy		-	+	
Technical	**Paper (+)**	**Paper (-)**	**ER (+)**	**ER (-)**
Accessibility	+		+	
Backup	+		+	
Convenience	+		+	
Ease of use	+		+	
Efficiency	+		+	
Speed			+	
Less paper work			+	
Long-term storage			+	

Key phrase representing concept identified	Storage medium (Positive/Negative relationship)			
Storage space			+	
Timeliness	+	-		-
Structured storage	+		+	
Question replication			+	
Total	**20**	**6**	**23**	**6**

Table 4.14: Likes and dislikes of paper-based system/an EMR (Patient Views)

The key phrases within each category shown in Table 4.14 are further discussed based on the gathered qualitative data:

Clinical category

- Complete medical history:

It was interesting to find participants who considered a paper-based folder as capable of accommodating their complete medical history, even though the physical build-up of such a file would make it difficult to manage.

"[Paper] that way you can record each detail."

- Continuity of care:

The researcher noted that of the participants (85), only 1 (one) mentioned continuity of care as a perceived added benefit, should an EMR be adopted.

"… [EMR] easily accessible if need to consult with other doctors."

- Correct diagnosis and treatment:

It was disconcerting to find that some participants were under the impression that unlike a paper-based system, an EMR would provide the opportunity of incorrect diagnosis and treatment, due to the record of one of the patients getting mixed up with another patient record.

"… [Paper] can assist doctor to correctly diagnose and treat me accordingly."

"It [EMR] can be mixedup with another patient's file and I could get the wrong medication."

- Quality of care:

It was interesting to discover that most patients (32% Strongly Disagreed and 46% Disagreed) were of the view that the current information storage medium used has no negative impact on the quality of care they receive.

"I think that storing my info in this manner [paper] has a positive impact."

Twenty per cent of the participants were in disagreement. However 2%, out of the 20%, gave contradictory justifications for their selection.

Ecological category

- Costs:

Interestingly, none of the participants referred to the costs that would be introduced by the use of an EMR, but rather distinguished cost reduction about the paper that would be used.

"…The use of computerised systems cuts down on paper costs"

- Eco-friendliness:

The researcher found it encouraging discovering participants who were aware of the impact a paper-based system has on the environment. Further research needs to be carried out to determine whether patient awareness in this aspect would positively affect the adoption of EMRs.

"It [paper] doesn't only have a negative impact [on quality of care, but] on the environment as well."

"… [T]he use of computerised systems cuts down on … CO2 emmissions in the long term."

- Wide use:

Some participants were of the view that migration to EMRs is inevitable and they would support their use.

"*Technology now a days is mostly used*"

- Patient-doctor relationship / Patient-other staff relationship:

It is possible that the views of the participants were aligned to their satisfactory relationship with their GP, which prevents them from disconnecting their feeling

towards the current storage medium, from this relationship. However, further research needs to be carried out to verify this statement:

"THIS PRACTITIONER IS THE BEST TO ME"

"…The receptionist welcomes me with a smile and even the doctor…"

- Computer literacy:

Participants expressed a concern about computer literacy; hence they prefer a paper-based system, since no computer literacy is required.

"Because some people dont know how the computer works"

- Familiarity / Human aspect:

According to wiseGEEK (2012); Essed and Goldberg (2002), it is human nature to seek familiarity, therefore, it makes sense to reason that some patients preferred what they were already comfortable with a paper-based system.

"…Just used to files in a paper format…"

"I still believe in old human workforce beside, Computers Are taking over in job industry As it is."

- Satisfaction:

Some participants seemed to be satisfied with the current system. This is reflected by the following:

"I have been consulting my gp for over 10 years and up till now everything was and is ok."

Security category

- Confidentiality:

It was interesting to note that some participants were of the opinion that a paper-based system caters for the confidentiality of their information. Whereas a paper-based system does not have inbuilt security mechanisms, such as access authorization, when compared to EMRs. However, some participants were aware of this:

"[Paper] it kept confidential no one read my folder its [except] my doctor."

"Receptionist or anybody can read your file."

"… [EMR] ATLEAST MY PRIVATE ILLNESS WON'T BE KNOWN TO PUBLIC"

"[EMR] Cause anyone can go through my personal details if they have passport."

- Data capturing errors:

Some participants were under the impression that data captured in an EMR is always correct.

"*[B]ecause information Stored in an electronic Format has to be inputed Correct[l]y*"

- Distrust computers:

Some participants had a problem trusting computers, possibly due to past experience or lack thereof.

"*I DONOT TRUST COMPUTERS*"

- Record integrity:

Some participants were in favour of a paper-based system, because it presented them with an opportunity to sign their record. However, it is thought-provoking to wonder whether their preference would be swayed if they knew that the same is possible with EMRs, due to technology advancement.

"[Paper] you have op[p]ortunity to sign and is not easy to tamper with the information"

- Record safety:

Record safety seems to be a concern, as it was highlighted with regards to both storage mediums. However, some participants showed confidence in both storage mediums about record safety.

"*The information get stored in a lockable cupboard + Always a reasonable care is being taken*"

"[EMR] To prevent loss of record"

"[Paper] Information can go missing, anything can happen to the practice eg. Fire and all documentation & patient records destroyed"

"Your computer could crash and all Informartion will be lost"

- System availability and reliability:

Participants were concerned about the unavailability of their record should load-shedding occur, but some made note of the mobility aspect that is introduced by EMRs.

"k/Hh power cuts these days [paper] it's a much better option. You can still be seen by dr even if there is no electricity"

"INFORMATION SHOULD BE READILY AVAILABLE AT ALL TIMES AND ANYWHERE (USE OF LAPTOPS, TABLETS, ETC)."

- System security and privacy:

Some participants emphasised the advantage of the user control mechanisms introduced by EMRs, such as password use.

"[Paper] NOT STRONG ENOUGH TO HOLD SUCH PRIVATE AND CONFIDENTIAL DOCUMENTS."

"passwords created stored with fire walls enabled no need for concern"

It was interesting to note, as shown in Table 4.14, that the category with the most negative aspects was the EMR security category.

Technical category

- Accessibility:

Participants displayed comfort about accessibility with regard to both storage mediums about accessibility.

"I feel that the storing of my information on a paper based folder makes it possible to access it if I want to"

"[EMR] It is easier to retrieve by the clerk when I visit the Doctor."

- Backup

Participants were aware of the option to back up information. They were of the view that both systems cater for information back up.

"[Paper] It helps as a back-up sytem when computer is down."

"Computer system is safe for backup."

- Storage space

Storage space was indicated as an advantage of using EMRs.

"[I]nformation can be stored electronically also to have the storage space"

- Timeliness

It was disconcerting to learn that only 2 of participants mentioned that the use of a paper-based system results in longer waiting times. This is supported by the following quote:

> *"[Paper] Everytime I come to see the doctor, the receptionist welcomes me with a smile and even the doctor, u don't even wait for long and a special[l]y when u are getting serious they Ask the person (NO 1) to put u in 1st."*

- Structured storage

It was interesting to note that the participants were of the view that a paper-based system stored records in a neat and organized manner:

"[M]y patient folder is kept neat at all times"

"[T]hings are kept neat and information is saved well"

- Question replication

The use of EMRs was related to the elimination of the replication of questions when visiting the practice again:

"So that when, I come again, they mustn't ask me some stuff."

The following few concepts were mentioned, but were not elaborated on. Hence no quotes are provided:

- Convenience

Convenience is one of the concepts that emerged and both storage mediums were associated with this concept.

- Efficiency and ease of use

Efficiency and ease of use were linked to both storage mediums.

- Speed

Interestingly, none of the respondents linked speed to a paper-based system, but the association was made with EMRs.

- Less paper work

Another perception that emerged was that the use of EMRs results in less paper work.

- Long-term storage

One of the positives linked to EMRs was the perception that they cater for long-term storage.

Few (6) negative aspects were identified from the qualitative data, about a paper-based system or an EMR. However, a number of positive aspects were identified about both systems, regardless of the fact that the participants were unfamiliar with EMRs in the participating practices.

4.10. Survey challenges

This section describes the challenges the researcher faced whilst conducting this research, in terms of the acquiring of interested general practices as research participants; getting questionnaires completed; and getting individual GP interview appointments, respectively.

4.10.1. Acquiring interested General Practice participants

The researcher struggled to find general practices to participate in the survey. Some of the practices the researcher approached were either unwilling to participate or had no time to get involved in the research. Speaking telephonically to the GPs of the contacted practices to secure an appointment to explain the research was difficult during office hours. Going to the practices and asking to speak to the practice owner was challenging as GPs were busy consulting with patients. The researcher had to speak to the administrative staff within the practice, and rely on them to pass on the information to the GP, as the administrative staff members were unable to provide consent on behalf of the GP.

4.10.2. Getting completed questionnaires

The researcher, once consent was received from the practice owner, provided the particular practice with a file that consisted of the different questionnaires and a box for the completed questionnaires. The administrative staff agreed to provide the questionnaire to every willing patient and agreed to time when the researcher should make a follow up. However, when follow up occurred, the researcher would find that no questionnaires had been completed. This was a huge challenge, as it delayed the research process and its completion. However, the researcher was careful not to aggravate the participants and interfere with the research by putting pressure on

them. Hence, the researcher politely called to remind them about the questionnaires, every now and then.

4.10.3. Securing individual GP interview appointments

Securing individual GP interview appointments was an unexpected and unsolicited challenge, because waiting to conduct these appointments threatened the timeous completion of this research. The first interview was conducted in September 2011, the rest were conducted between June and August 2012, almost a year later.

4.11. Conclusion

This chapter reported on the results that emerged from the gathering of primary data for this research with the aim of answering the primary research question. The identification of surveyed small general practices and the data gathering techniques were discussed. The researcher described what occurred before and during the data collection. Lastly, the chapter presented the results that emerged from the research survey.

CHAPTER 5

5. LITERATURE REVIEW AND RESEARCH SURVEY - FACTORS THAT AFFECT THE ADOPTION AND MEANINGFUL USE OF EMRs IN GENERAL PRACTICES

In this chapter, the factors affecting the adoption and meaningful use of EMRs in general practices are collated from the literature review and the survey results. The results provided in Chapter 4 are analysed to identify the key findings of the research. The data analysis technique that was selected is revisited, prior to expanding on how the researcher utilised this technique to analyse the data. The findings that emerged from the analysis of the data are reported on, by means of factors.

5.1. Data Analysis Techniques

After data gathering it was necessary to analyse and evaluate the data. This was done to understand what value and information the data holds. As mentioned earlier, the data gathered during interviews and questionnaires was analysed by means of conventional content analysis. Hsieh and Shannon (2005), describe this technique as one that is used when there is a limitation in existing theory or research literature.

5.2. Data Evaluation and Analysis

The researcher, to be able to analyse the data, had to code it using codes that communicate the meaning that the researcher was able to derive from the text. When conventional content analysis is used, any codes and categories used in the coding must have emerged from the data being analysed (Hsieh & Shannon, 2005). Hence, the researcher did not use any predetermined codes during coding. The researcher followed suggestions from Hsieh and Shannon when coding.

The researcher captured the open-ended questionnaire questions and comments, in English, in an Excel spread sheet. A few questionnaires which were completed

in the Afrikaans language were translated by an Afrikaans speaking person to whom the context of the study was explained.

The data in the spread sheet was structured according to the question that was asked and the comments that belonged to it. The coding was structured similarly. The researcher first read the question to be reminded its context, and then read all the comments relating to that question, to obtain an understanding or “feel” of the data. The comments were re-read, but this time individually, with the purpose of deriving what the particular comment was about. The idea, or ideas, that the comment communicated were given a specific code and the code placed in the coding sheet, for that particular question, where it would be assigned a number. A copy of the number was placed next to the comment being reviewed.

It was possible for a comment to have more than one code related to it, because it may be expressing more than one idea. The researcher would proceed to the next comment for that question and code. If the comment expressed an idea fitted to an existing code, a copy of the number assigned to the existing code was accorded it. Otherwise, a new code that would fit the expressed idea was added to the code sheet and assigned a unique number. The researcher repeated this process for the remaining comments. Some codes were changed to something more suitable as the process went on. When the researcher was done with a particular question, the codes were double checked for validity and a description was placed next to each.

The researcher would move to the next question, whereby the process was repeated. However, the researcher ensured consistency when assigning codes to ensure that overlapping ideas between questions were not lost. After all the questionnaire data was coded, the researcher placed the emerged codes into different categories that described their purpose. . During the initial cycle of coding, the allocations of code were discussed with and reviewed by the thesis supervisors. Thereafter, improvements were made, based on the feedback.

5.3. Findings

This section reports on the socio-technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. The investigation was based on primary data collated from conducting the research

survey. It is important to note that the following factors are representative of data collected from participants within a particular environment. Hence, it might not be a true representative of views belonging to a population in a different setting, especially considering that the surveyed participants had no experience with an EMR.

Chapter 1, section 1.2, stated that this study uses the STS theory as a theoretical lens when identifying the aspects that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. The STS theory focuses on three (3) sub-systems, namely social, environmental and technical sub-systems. The social sub-system consists of the GP and administrative staff contributors; the environmental sub-system consists of the patient and legal aspect contributors; and the technical sub-system consists of an EMR application as a contributor. The influence of these contributors on the way that EMRs are adopted and used in general practices is discussed in sections 5.3.1-5.3.5. The discussion is followed by the interpretation of the findings, the validation of the factors and Figure 5.6, which summarizes all the identified factors including those identified through the literature.

The following factors are presented in the following manner:

- The header of the factor and its description are provided;
- If the factor is supported with a quote, the question asked is provided to contextualise the quote. However, it is important to note that sometimes the response, or part of the response, is not relevant to the question that was asked; and.
- Quote (if applicable).

Note: Since interviews were conducted with GPs, the researcher was able to obtain more in-depth qualitative data. Hence, it was possible to support the identified factors with rich quotes from the GPs. However, in terms of the patients, there were no interviews and quotes could not be provided for all factors derived from the patients.

5.3.1. Social factors affecting the adoption and meaningful use of EMRs in general practices

The following are factors that were identified as relating to the social sub-system, illustrated in **Error! Reference source not found.**. These factors may have an mpact on the adoption and meaningful use of EMRs in small general practices:

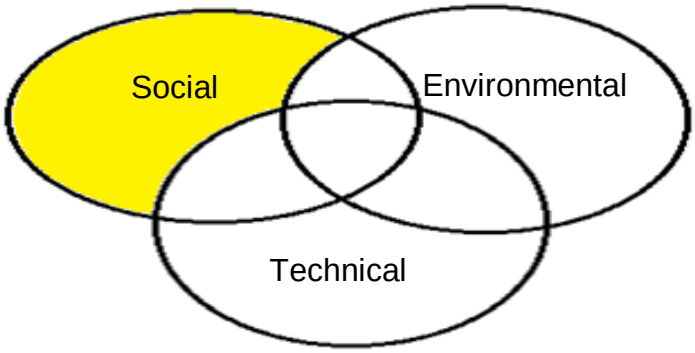


Figure 5.1: Social sub-system

- **Communication:**

The healthcare providers perceived a lack of communication, between themselves and the staff, as a potential challenge to the adoption and meaningful use of EMRs. There was an indication that communication was not constantly suffering, but it was apparent that it is worth noting as a possible factor. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think lack of communication affects the adoption of EMRs.")*

> *"... what I found with the staff is... is... is over a period of time, there is a period of time where you'll really see them pleasing you. But there are also a lot of times where you'll really think "I'm not sure about them now" and that maybe 1 or 2 of them... periods or something like that. It's difficult really to say. But if it were to be now, I would really experience problems now, because communication at this stage is not that good. But if you were to ask me... I would say about 18 months ago, I would have been upbeat, so it's really where the issues are."*

- **Qualified staff:**

The lack of high qualifications from administrative staff members already employed by a general practice was perceived to be problematic when adopting EMRs in a

practice. It was evident that there was a lack of confidence in the potential contribution of under qualified staff towards the desired smooth transition from using a paper-based system to an EMR system. This lack of confidence may affect the adopting and meaningful use of an EMR in the practice. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think lack of management support affects the adoption of EMRs.")*

> *"… I think more than anything lack of [qualified] staff. For example, if I had a woman... with a tertiary qualification, even if its office administrative clerk, many things would be simpler here. Ja, if I had a..., but now you find that you get someone who has Std. 10. Like the one I have in [omitted as the mentioned area could possibly identify the participating practice], I don't even think that she went to school, you know. Maybe Std. 6."*

- **Staff motivation:**

Practice owners feel that their administrative staff members lacks motivation, because they do not get satisfactory monetary compensation from their job. Therefore, the practice owners doubt their willingness and commitment to learn when faced with a new technology. Practice owners are compassionate towards their administrative staff members, but they lack the funds to increase their salaries. This compassion may make practice owners reluctant to require more from their administrative staff members, therefore, affecting the adoption and meaningful use of EMRs. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think negative staff perceptions about using technology affects the adoption of EMRs.")*

> *"… [T]he staff is not motivated. Our staff is not that much paid. They are not paid as much. Look, we do our best. So you find that they don't like learning new things.*"

5.3.2. Social-environmental factors that impact the adoption and meaningful use of EMRs in general practices

This section represents the factors that overlap between the social and environmental sub-systems, as illustrated in Figure 5.2. The following factors, related to the social-environmental sub-systems overlap, may have an impact on the adoption and meaningful use of EMRs:

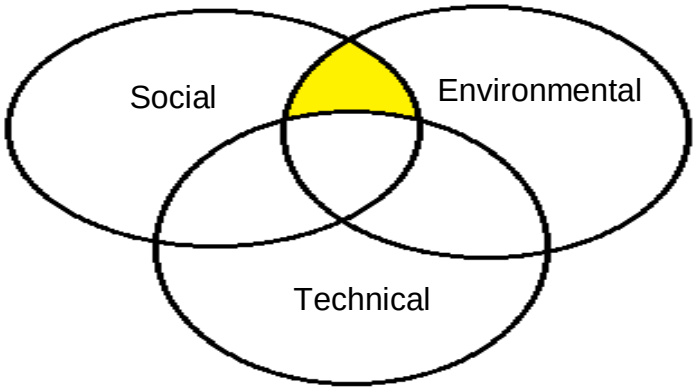


Figure 5.2: Social-Environmental sub-system overlap

- **GP-Patient relationship:**

There exists a perception that the use of an EMR may strain the relationship between a GP and a patient. GPs are of the opinion that their interaction with an electronic system during a consultation may distract them. They believe this distraction may result in the patient doubting their attentiveness. This perception may affect the adoption and potential meaningful use of EMRs. The following verbatim quote supports this:

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: Initial cost.")*

> "*[Y]ou don't want to be distracted when consulting. You don't want to take your eye contact away from the patient... you jotting down or typing down somethings whilst he's telling you his story and all of that. You want to give as if concentrated and listening to him attentively.*"

- **Incentives:**

The lack of incentives may affect the adoption and meaningful use of EMRs. There was an indication that if practice owners were offered monetary or other benefits as motivation, this may affect adoption of EMRs. However, there was no indication

of an awareness of such incentives in terms of EMRs. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think lack of incentives affects the adoption of EMRs.")*

> "*Yes, for example, now Healthbridge is giving us an incentive that if we use their platform for chronic, they'll pay us R200 per patient. They are trying it as a pilot, I think. I think with an incentive, if, I'm talking now about a basic incentive, like they would say if you are on Healthbridge and you are on the same... as in if you put a claim today, you will know tomorrow from the Medical Aid. That kind of seriousness thing. I think we would all go the desired route.*"

- **Government subsidization**

It was evident that the lack of government subsidies when adopting an EMR affects the adoption and potential meaningful use of EMRs. This lack of government subsidy was linked to the absence of government involvement in providing a national direction and promoting the adoption of EMRs. This lack of government involvement may negatively affect the adoption and meaningful use of EMRs in general practices. The following verbatim quote supports this:

(The following quote was in response to this question: *"What do you dislike about your current system?")*

> *"… [W]e need some subsidization of that system and the government probably needs to come in there as well and say for the country as a whole, we're going to use electronic systems, you know…"*

5.3.3. Social-technical factors that impact the adoption and meaningful use of EMRs in general practices

This section represents factors that overlap between the social and technical sub-systems, as illustrated in Figure 5.3. The following factors, related to the social-technical sub-systems overlap, may have an impact on the adoption and meaningful use of EMRs:

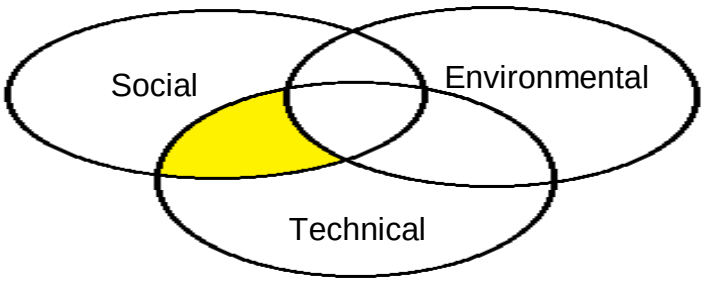


Figure 5.3: Social-Technical sub-system overlap

- **Service provider continuity**

The dependence on an external party is one of the fears that emerged from questioning the GPs about EMRs. GPs are used to having complete control over the patient medical records that they use to offer services to a patient. Therefore, the fear of relying on a third party for the availability of a patient record may have an impact on the adoption and meaningful use of EMRs in general practices. The following verbatim quote supports this:

(The following quote was in response to this question: *"Can you please explain the single biggest concern you have about using EMRs.")*

> "…*[S]ome of these companies, because one would rely on them, if anything goes wrong with them that means one is in trouble. I think that is the biggest concern…*"

- **Ease of use**

It is important for an EMR to be user-oriented, to ensure that healthcare providers find it both easy to use and adapt to an EMR. This is especially true considering that healthcare providers with previous storage medium experience, paper-based or electronic system, will have an instant benchmark to use when comparing an EMR. This may potentially affect the adoption and meaningful use of EMRs. The following verbatim quote supports this:

(The following quote was in response to this question: *"Have you thought of or have you investigated the option of adopting an EMR in your practice?")*

> "*We just waiting for the software developers to come with a program on the iPad that we can use easily. The ease of use will always be the major consideration here, [be] cause it's easy to make notes, but it's not so easy to work on a computer while you're working.*"

- **Fear of the unknown**

Lack of familiarity was cited as one of the factors that affect the adoption and meaningful use of EMRs by GPs. All the participating practices had a computer and/or a laptop, with applications such as Excel and/or billing applications, yet they were all extensive, paper-based system users. Adopting an EMR and meaningfully using it would require that they abandon the paper-based system to store patient clinical data and tread unfamiliar ground. It is this fear of the unknown that introduces a stumbling block for healthcare providers. The GPs were of the opinion that this fear haunted their administrative staff. The following verbatim quotes support this:

(The following quote was in response to this question: *"Have you thought of or have you investigated the option of adopting an EMR in your practice?")*

"*I already made up my mind to… you know… to… to... get one …I must be honest, is... the fear of the unknown.*"

(The following quote was in response to this question: *"Explain whether and how you think negative staff perceptions about using technology affects the adoption of EMRs.")*

> *"No, they have never said anything... the staff, but I think it's more of the fears, because I never saw any enthusiasm. There's that fear that 'Are we gonna be up to it or not?' …"*

- **Management knowledge**

The deficiency of management knowledge about an EMR may affect the adoption and meaningful use of an EMR within the practice. According to the experience of healthcare providers, the lack of knowledge about newly introduced technology within the practice, places the practice owners in an uncomfortable position. This position results in practice owners lacking the ability to provide support or assistance to their practice staff. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think lack of management support affects the adoption of EMRs.")*

> "*Supporting the staff would help, because even now, I'm familiar with the accounting system that we use, because I know some doctors are not.*

They don't know what's going on. The ladies do as they wish. The ladies go... I went for training first. I trained my lady. I know the accounting."

- **Learning time**

One of the factors that may affect the adoption and meaningful use of EMRs is the perception, amongst healthcare providers, that the actual time it takes staff to become proficient in the new system may take too long. This perception makes healthcare providers undecided and reluctant to adopt EMRs. This reluctance may challenge the meaningful use of an EMR, if a practice does adopt this system. The following verbatim quotes support this:

(The following quotes were in response to this question: *"Explain whether and how you think lack of learning time affects the adoption of EMRs.")*

"… *[B]ecause, some of the ladies that we have are not as bright as they are supposed to be. As you can imagine, you know... this is a small scale.*"

"*That's where I have question marks. That's where I have the.... some of my fears.*"

- **EMR Awareness**

In the participating general practices a healthcare provider acted as the general practice owner and the key decision-maker. The fact that the decision makers may be unaware of the existence of EMRs and the benefits they offer may affect the adoption of EMRs. The provision of awareness about EMRs to decision makers is not sufficient. They need to view and interact with EMRs for them to become familiar with them enough to at least adopt and potentially meaningfully use an EMR. The following verbatim quotes support this:

(The following quote was in response to this question: *"Explain whether and how you think lack of communication affects the adoption of EMRs.")*

"… [I]t's not widely publicized"

(The following quote was in response to this question: "Any other factor that has not been covered?")

"… [W]e don't have much of insight into what's available or what is coming through in the market place. And there are a few EMR available that I have seen, you know. I would like to see what they look like and see which is the best one for this practice and this area as well."

- **Negative staff perceptions**

General Practitioners view the practice administrative staff as having negative perceptions about the use of EMRs in the practice. This is fuelled by the suspicion that the administrative staff members perceive the introduction of an EMR to demand more working time from them and less free time. GPs believe that administrative staff members perceive that an EMR will enforce stricter structure in terms of their work. These perceptions may affect the adoption and potential meaningful use of EMRs a general practice. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think negative staff perceptions about using technology affects the adoption of EMRs.")*

> *"… [A]t the way I'm looking at it, as you can imagine, it means more time now working that seating down doing nothing. Because as you can imagine now, it's not gonna be a matter of 'we are giving away a file and then entering the drugs', which they do at their own leisure time.*"

- **Staff knowledge**

The lack of enthusiasm from administrative staff to gain knowledge about technology, to adapt to new technology, makes the GPs doubtful about whether they would show interest and acquire the knowledge required to adopt and meaningfully use EMRs. This lack of interest to gain knowledge may affect the adoption and potential meaningful use of EMRs. The following verbatim quote supports this:

(The following quote was in response to this question: *"Explain whether and how you think lack of time during consultation affects the adoption of EMRs.")*

> "*You see why I have some concern about my staff is, because like now, we don't do much, but the internet is available to them when they want to, but they... they hardly, they hardly make use of it and... and that lack of interest to me it makes me have some question marks... you know. It makes me have some question marks.*"

- **Backup**

General Practitioners showed concern about the unavailability of important data should an unforeseen event occur. It was apparent that GPs need assurance that the information will be available when required and backups are done without them being regarded as extra applications. The absence of this assurance may affect the adoption and potential meaningful use of EMRs in a practice. The following verbatim quotes support this:

(The following quote was in response to this question: *"Why? [After having answered 'Yes' to 'Is information backup a concern for you in the electronic environment?']")*

> "*For example the people who might be having the back up now… these people that I use for accounting, the EMD, I can always say to them "Give me my information" and they can give it to me.*"

(The following quote was in response to this question: *"Explain whether and how you think lack of incentives affects the adoption of EMRs.")*

> "*Availability would be a major issue you know, and one that is not going to add more unnecessary software to your - to your current software environment.*"

- **Finances**

The financial status of a general practice may affect the adoption and meaningful use of EMRs. This is especially true since small general practices tend to lack financial freedom. Practice owners are of the opinion that the adoption of EMRs may place them under financial strain based on perceived EMR financial demands. These owners perceive these demands to include the costs of human resources (hiring and training of staff); initial implementation; and operational costs. There was a desire to integrate an EMR with an existing computer based system to centralize costs. The availability of an option to centralize costs, or lack thereof, may affect the adoption and meaningful use of EMRs. The following verbatim quotes support this:

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: change requirements.")*

"*More staff; training of the staff*"

(The following quote was in response to this question: *"Can you please explain the single biggest concern you have about using EMRs.")*

> "*For me, it's the cost and the human resources involved. It's the cost generally, which is the human resources cost, the capital cost for the thing and the maintenance.*"

(The following quotes were in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: On-going cost.")*

> "*Yes, I suppose we'll have to look at it and say 'what is the long-term cost of keeping an EMR system?' What'll happen is that we'll obviously build it into our accounting system, so it's 1 record for both and pay the software people 1 amount per month to take care of all the data…*"

> "*I am also mindful of the fact that there might not be much of a problem now, but I am not sure in the long-term. Because, unfortunately, these costs also rise... I mean increase.*"

(The following quote was in response to this question: *"Explain whether and how you think lack of hardware affects the adoption of EMRs.")*

"*Software would be [a major financial issue], proper software, ja. Proper electronic medical record software.*"

- **Office suitability**

The GP participants indicated concern about the suitability of EMR hardware within the internal environment of a general practice. Smaller hardware seemed to be the ideal preference, over larger hardware that may prove challenging to their working desk space limitations. There was an indication that GPs sometimes move between rooms when consulting with a patient. Therefore, acquiring larger hardware would restrict a GPs movement and interfere with their job. It is apparent that this suitability concern may affect the potential adoption and meaningful use of an EMR in a practice. The following verbatim quote supports this:

(The following quote was in response to this question: *"Have you thought of or have you investigated the option of adopting an EMR in your practice?")*

> "*We don't want bulky equipment on our desk and laptops and so on ja. Like an iPad would be fine. We are going to look at the iPad system, because it looks like the portable system that you don't have to leave on your desktop, you know. Because the problem with leaving information on your desktop is that other people can access it, but if it's a portable iPad you can close it and put it in your pocket and walk to the next room and carry on with your ...*"

- **Maintenance support**

The GP participants who had previous experience with the use of a computerized billing system were exposed to either satisfactory or unsatisfactory technical support from the system service provider. This experience may influence their perceptions on the availability of technical support when using an electronic system such as an EMR. Failure to acknowledge these perceptions and find means to reassure GPs, may affect the adoption and meaningful use of EMRs. The following verbatim quote supports this:

(The following quote was in response to this question: *"Does availability of maintenance support or lack thereof have an impact on the operation of your current system? How big of a problem would this be if you had to use an EMR?")*

> "*I can now imagine if I was dependent on it from A-Z … because the support is not so good. It's not 24 hrs. And the people sometimes can't help you then and then with the problem. They will always say we'll come back to you, we'll investigate the problem... you know. It would be very big, because it'll mean... it'll now perhaps mean I'll have to see this patient without having all the data in the computer, because I can't get the people on the other side.*"

- **Hardware**

Practice owners perceived that adopting an EMR would require the acquisition and maintenance of hardware. However, it became apparent that sometimes practice owners do not need to acquire hardware, as they are able to use existing hardware that was already in use at the practice. Practice owners need to be made aware of the exact hardware requirements, to prevent them from basing decisions on assumptions. Otherwise, these assumptions have the potential to affect the

adoption and meaningful use of EMRs. The following verbatim quotes support this:

(The following quotes were in response to this question: *"Explain whether and how you think lack of hardware affects the adoption of EMRs.")*

"[Y]ou have to buy the hardware, no. 1; and no.2 to maintain it..."

"… [I]nterestingly enough, both 2 companies that came to assess my system when I wanted quotes I have enough of the hardware already."

- **Software and hardware ownership**

There was an indication of doubt about who would be the owner of the hardware and/or software that the practice would use, when adopting EMRs. If not clarified, these doubts may potentially affect the adoption and meaningful use of EMRs in general practices. The following verbatim quotes support this:

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: On-going cost.")*

> "*The other problem is that almost every... company, who offers these software, they don't sell them. They lease them out, yes, and you pay a monthly... you know... a premium and then on top of that they also include what they call their service fee, because they would say "when you have a problem then you call us".*
>
> *But, the problem is that there's a lot of changes that they make in your system to suit their system that if... if down the line you were to change them, I'm just thinking that probably it would... it would probably mess you up.*"

(The following quote was in response to this question: *"But the fact that you would have to buy that hardware would not be a problem for you... financially?")*

"*[S]omebody lending me those things... it would put me at ease. Even if they could come, I could easily give them up and not resist.*"

- **System integration**

There was an indication of the desire to integrate an EMR with an existing computer based system in the general practice. The availability of this option, or its lack, may affect the adoption and meaningful use of EMRs. The following verbatim quotes support this:

(The following quote was in response to this question: *"Explain whether and how you think lack of incentives affects the adoption of EMRs.")*

> "*… [O]ne that is not going to add more unnecessary software to your - to your current software environment. Is integrated into your current program and you know everything is in 1 database.*"

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: On-going cost.")*

> "*What'll happen is that we'll obviously build it into our accounting system, so it's 1 record for both and pay the software people 1 amount per month to take care of all the data…*"

- **System reliability**

It became clear that the GP participants perceived that losing data, due to the unreliability of software, hardware and power, was a challenge that they may face when adopting an EMR. GPs need to be reassured about the existence of mechanisms that may prevent or minimize the chances of such a loss to prevent this perception from affecting the adoption and meaningful use of EMRs. The following verbatim quotes support this:

(The following quote was in response to this question: "List or discuss any other positive or negative aspects that you associate with the acquisition, implementation and use of EMRs in your practice."*)*

"LOSS OF DATA DUE TO SOFTWARES HARDWARE FAILURE"

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: On-going cost.")*

> *"… And easy to retrieve, in case we lose information here due to power failure."*

5.3.4. Environmental-technical factors affecting the adoption and meaningful use of EMRs in general practices

This section represents the factors that overlap between the environmental and technical sub-systems, as illustrated in Figure 5.4. The following factors, related to the environmental-technical sub-systems overlap, may have an impact on the adoption and meaningful use of EMRs:

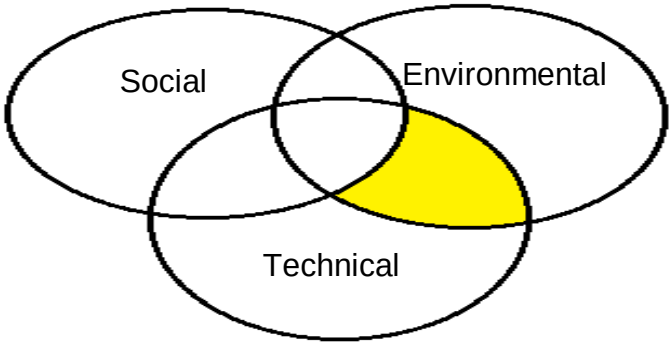


Figure 5.4: Environmental-Technical sub-system overlap

- **Patient perceptions**

The perceptions that the patient participants have about an electronic storage medium may have an influence on the adoption and meaningful use of EMRs in a practice. Patients are not direct decision makers, but they are the consumers of the service provided by the general practices and they may influence how the service is provided. Therefore, attention needs to be given to these perceptions to ensure that their influence is a positive one:

– Patient confidentiality

Some patient participants perceived that the use of an EMR would compromise the confidentiality of their information. Such patients need to be assured otherwise for them to be receptive to EMRs. Furthermore, utilizing their confidentiality concerns, when linked to the use of a paper-based system, this may promote the transition to EMRs which may have a positive effect on the adoption and meaningful use of EMRs in general practices. The following verbatim quotes support this:

(The following quotes were in response to this question: “I would be concerned about the confidentiality of my information if it were stored in an electronic format”, to which the participants agreed.)

"*Anyone can access them [consultation details]*"

"It is so easy these days to get someone's details from a computer than a filing cabinet without even using that doctor's computer"

- Fear of the unknown

Due to the number of years that the patient participants are familiar with the use of a paper-based system, there exists a certain level of comfort through the "familiarity" of this storage medium. Hence, some patient participants feared changing to another storage medium. Since aspects such as record accessibility were seen in a positive light by some patients, this may mean that they are familiar with technology in general, e.g. mobile devices. Therefore, by using the positive aspects that patients know or associate with technology, this may potentially "bridge" the familiarity gap to a certain extent and eliminate part of their fears.

- Computer literacy

A lack of computer literacy is one of the concerns that arose from this research. This is possibly because this concern is rooted in the perception that the use of an EMR, in a general practice, would require the patients to directly interact with it to access elements that are part of the care service afforded to them. Patients may need to be reassured that their lack of computer literacy will not obstruct the service or quality of care that is provided to them by the practice. The following verbatim quote supports this:

(The following quote was in response to this question: "Overall, I prefer my information to be stored in a/an", to which the participant chose a paper-based format.*)*

"*Because some people dont know how the computer works"*

- System availability and reliability

Some patient participants feared that the use of an EMR might hinder the availability of their information. This was due to the perceived lack of availability and reliability of an EMR in cases such as loss of power. Patients need to be reassured that the practice will have "Plan B" in place should such events

occur, e.g. automated backup generators, etc. The following verbatim quote supports this:

(The following quote was in response to this question: "Your consultation details are stored in a paper-based patient folder. Storing my information in this format has a negative impact on the quality of care provided to me", to which the participant disagreed.*)*

"k/Hh power cuts these days [paper] it's a much better option. You can still be seen by dr even if there is no electricity"

- Record safety

Some patient participants held the perception that their record may get lost when stored in an electronic medium. Some patient participants indicated the same concern about a paper-based practice, therefore, it is important to find a way to assure patients that the chances of their record getting lost in an electronic record are minimal. Failure to do this may affect the adoption and potential meaningful use of EMRs in a general practice. The following verbatim quote supports this:

(The following quote was in response to this question: "I prefer my General Practitioner/Doctor to use a computerised system to store my consultation details", to which the participant disagreed.*)*

"Your computer could crash and all Informartion will be lost"

- System security and privacy

Patient participants lacked knowledge about the security risks posed by the use of a paper-based system on their privacy, yet were attentive of the built-in security and privacy mechanisms that are available in an electronic record. However, there is a need for awareness and assurance, since some patient participants perceived that the security and privacy of an EMR may be vulnerable to unauthorized users, such as hackers. It is important to take into account that, in this research, the EMR security category had the most concerns in comparison with the other categories. The following verbatim quotes support this:

(The following quotes were in response to this question: "I would be concerned about the confidentiality of my information if it were stored in an electronic format", to which the participants agreed.*)*

"In this day and age, most people know how to hack systems and electronic…"

"If any passwords are given out or someone else knows about it, they can go into the system"

- Waiting time

Some patient participants perceived that using an EMR would equate to longer waiting times and this may negatively influence their views on EMRs and have a negative effect on the adoption and meaningful use of EMRs. However, some patient participants perceived that record retrieval, amongst other tasks, may be faster. This may be used to relate to them how the speed of tasks may lessen the perceived waiting time. The following verbatim quote supports this:

(The following quote was in response to this question: "I prefer my General Practitioner/Doctor to use a computerised system to store my consultation details", to which the participant disagreed.*)*

"I don't Agree because it will take time whilst other patient waiting for the doctor."

- Patient knowledge (Paper flaws VS EMR strengths)

Patient participants lacked knowledge and awareness about the flaws of a paper-based system and the strengths of EMRs. Unfortunately, this lack of awareness may have influenced their views about the current paper-based system and their perceptions about EMRs.

- Complete medical history

A number of patient participants held the impression that a paper-based system accommodates their complete medical history. These participants seemed unaware that the use of a paper-based system, at times results in the partial recording of complete clinical notes, therefore, challenging the completeness of their medical history. Few patient participants indicated an awareness of the fact that an EMR can be used to combat this challenge. The following verbatim quote supports this:

(The following quote was in response to this question: “Overall, I prefer my information to be stored in a/an”, to which the participant chose a paper-based system.)

“[Paper] that way you can record each detail.”

- Continuity of care

The empirical results of this research established that a large number of patient participants consulted with more than one GP. This challenges continuity of care, as GPs use paper-based systems to store the patient medical record, this makes sharing this information difficult. Few patients considered this, when it came to their patient records, therefore, there is a need for awareness.

- Diagnosis and treatment

Patient participants have the perception that storing their information in an EMR would make their records prone to errors and mixed-up patient records. This needs to be addressed because it may affect the adoption and potential meaningful use of EMRs in general practices. Some patient participants feared that this may result in misdiagnosis and treatment. The following verbatim quote supports this:

(The following quote was in response to this question: “I would be concerned about the confidentiality of my information if it were stored in an electronic format”, to which the participant agreed.*)*

“It [EMR] can be mixedup with another patient's file and I could get the wrong medication.”

- Quality of care

It was evident from the results of this research that the patient participants lacked knowledge about the impact that the use of a paper-based system can have on their quality of care. Previous research, as noted in section 1.1, disagrees with this sentiment, therefore, patients need to be educated or made aware of the reasons behind this disagreement. Patients need to be educated about the positive impact that an EMR may have on their quality of care. The following verbatim quote supports this:

(The following quote was in response to this question: "Your consultation details are stored in a paper-based patient folder. Storing my information in this format has a negative impact on the quality of care provided to me", to which the participant disagreed.*)*

"*I think that storing my info in this manner [paper] has a positive impact."*

– Eco-friendliness

The results of this research indicated low awareness about the negative impact that a paper-based system can have on the environment. A few patient participants illustrated the perception that using an electronic system may have a positive impact on the environment, but this was not a significant number of patient participants. Patients need to be educated about this.

5.3.5. Social-Environmental-Technical factors affecting the adoption and meaningful use of EMRs in general practices

This section presents the factors that overlap between all three sub-systems, namely the social, environmental and technical sub-systems, as illustrated in Figure 5.5. The following factors related to the social, environmental and technical sub-systems may have an impact on the adoption and meaningful use of EMRs:

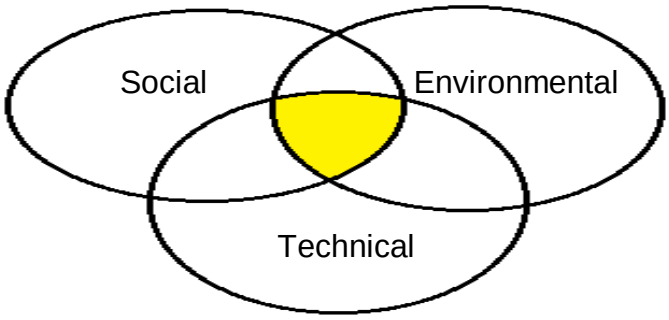


Figure 5.5: Social-Environmental-Technical sub-system overlap

- **Consultation time**

Healthcare providers perceived that consultation time might be affected by the introduction of EMRs into the consultation room, which would lead to longer consultation times. This perception may be intensified by the idea that the healthcare provider conducts a consultation, but while being required to accommodate new technology, thus, slowing down the process. There was an indication that the perceived extra time would only be experienced during the initial

stages of adoption, yet the negativity around the added consultation time cannot be completely disregarded. Disregarding this may be an error, because it may affect the adoption and meaningful use of EMRs in general practices. The following verbatim quotes support this:

(The following quotes were in response to this question: *"Explain whether and how you think lack of time during consultation affects the adoption of EMRs.")*

"*That would affect you, yes, because you're busy examining and talking to the patient and so on."*

"There will be some, definitely some delay initially"

- **Crime**

Crime prevalence in the locations in which some general practices are situated, seems to affect the adoption and potential meaningful use of EMRs. There was a fear of crime from GP participants. This fear was aligned to the perception that using an EMR, during a consultation, may expose electronic equipment, such as a laptop, to a patient. This may attract criminals and threaten the safekeeping of the equipment within the practice and potentially threaten the lives of all individuals within the premises of that general practice. The following verbatim quote supports this:

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: On-going costs.")*

> "*I'm in a township… If I understand you well, by electronic medical records that would mean me seating there with the computer and when he comes in and all the information punching in right in front of... in front of him in the computer? You know... there is still that element of not being safe in the township. He'll come today as a patient, you don't know when his left, what he'll be thinking. Thinking my having that laptop is money. Telling his friends to come and grab the laptop here. That's a disadvantage*"

- **Standards**

The lack of standardization between electronic systems seemed to be a concern amongst GP participants. As they might at times need to share information between their practice and another service provider. Effective communication and

exchange of data might prove challenging due to differences in functionality, collected data, etc. This concern may possibly affect the adoption and potential meaningful use of EMRs in general practices. The following verbatim quotes support this:

(The following quote was in response to this question: *"Explain whether and how you think lack of standardization affects the adoption of EMRs."*)

"…if there was standardization, perhaps where we're using the same platform, us, the labs, the Medical Aid, everything, it would be easier… you know."

- **Change requirements**

There was an indication from GP participants that as a requirement, EMRs need to offer the flexibility to accommodate additional fields that the particular general practice sees fit. An assurance about whether an EMR is able to accommodate such changes needs to be defined. This may prevent these uncertainties from negatively affecting the adoption and meaningful use of EMRs. The following verbatim quotes support this:

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: Change requirements."*)

"*It must be flexible, so we can maybe build our own data onto the existing database, you know, so if we need to add additional information like height and weight and things like that.*"

- **System security and privacy**

It was apparent through questioning the GPs that there is a need for security assurance, because there was a concern that the security and privacy of an EMR may be vulnerable to unauthorized users, such as hackers. Such security concerns need to be addressed to prevent them from negatively affecting the adoption and meaningful use of EMRs in general practices. The following verbatim quote supports this:

(The following quote was in response to this question: *"Any other factor that has not been covered?"*)

> *"[P]eople can hack moss into a system like that. The same way that you get phone calls from people you don't know selling you stuff. How did they get the information? Then you'll get your patient's information all over. People selling boosters to your HIV+ patients, they will have found that."*

- **Patient confidentiality**

Practice owners are sceptical about adopting an EMR without the assurance that patient confidentiality will be maintained. The doubt about such a guarantee being granted by the EMR service providers may affect the adoption and meaningful use of EMRs. This is due to the fear of their patients taking legal action against them, should their confidentiality be breached, either by an external unauthorized user or an internal user including the GP. The following verbatim quotes support this:

(The following quote was in response to this question: *"Please explain briefly why your practice does not use an EMR based on what is applicable from the following: Regulations."*)

> "*Confidentiality is very important - patient confidentiality - that the record doesn't get into the wrong person's hands or be accessed by unauthorized personnel. Either in the office or outside the office or that it gets hacked into, you know, on the internet or wherever the record is held.*"

(The following quote was in response to this question: *"Can you please explain the single biggest concern you have about using EMRs."*)

> *"Especially if it's a VIP that, that they want to hack into. Like if they want to hack into Jacob Zuma's record, I'll be in trouble, you know. The presidential record [laughs], or Barack Obama. As long as I have guarantees from our service provider that whatever we upload in the server is… will not be… is encrypted and not available to anybody, except the doctor and his patients.*"

(The following quote was in response to this question: *"Any other factor that has not been covered?"*)

> "*… Let's say I'm a female doctor and you are a female patient and now there is that other doctor that you have seen, that you have confided all your information. Now coming to this doctor, now you... you... you'll be*

terrified to know that this doctor knows that there is something that I didn't reveal that I revealed to that other doctor. You know patients... they see you and they assess and see if they'll be comfortable telling you everything. They'll tell... they'll be open to this other doctor about their HIV status, because they see you and they know that you are in their family, you are related to whomever, they won't be comfortable telling you their HIV status. And yet now, when they learn that you have managed to pick that up electronically, I don't think they'll like it."

- **Patient views (GP concerns)**

The views of the patients who visit a practice have the potential to affect the adoption and meaningful use of EMRs. This is because there may be educated and uneducated patients within a practice. The educated patients are perceived to welcome and appreciate the use of an EMR, however, uneducated patients are perceived to not care or value the introduction of this new technology. If a practice finds itself to mostly cater to uneducated patients, the decision maker may overlook the value that may be added by the use of an EMR. Additionally, GPs perceive that the use of an EMR may make information available to them, but in turn displease a patient. Therefore, patient views may potentially affect the adoption and potential meaningful use of EMRs in a general practice. The following verbatim quotes support this:

(The following quote was in response to this question: *"Explain whether and how you think patient views affect the adoption of EMRs.")*

"*You know we've got a wide spectrum: educated and uneducated. The educated ones, I suppose, they enjoy, because for example, they get emails from the Medical Aid telling them about the claim. You claim today and tomorrow the Medical Aid has already told her and she knows what's going on. She knows how much you claim; she knows what you are claiming for; she knows what she got, what she didn't get. So she queries it immediately. So I think it's worth it. But with the uneducated patients, I think they don't really care.*"

(The following quote was in response to this question: *"Can you please explain the single biggest concern you have about using EMRs.")*

"… [Y]ou will get into information that... will excite you as the doctor, but you don't know if it will excite the patient as well."

This section presented the findings of the research survey. The next section interprets these results.

5.4. Interpretation of Findings

This section interprets the findings that emerged during this research. This interpretation is based on the significance of the social sub-system; the influence of the established GP and the patient perceptions about the adoption and meaningful use of EMRs; and the complexity of the identified socio-technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices.

5.4.1. Significance of the social sub-system

After the literature review and the research survey it was evident that the social sub-system is most important. Its importance is confirmed by the following:

- Unlike the environmental and technical sub-system, there were factors identified which belong exclusively within the social sub-system.
- Except for those factors that belonged within the environmental-technical over-lap, all the identified literature-based and survey-based factors either belonged exclusively within the social sub-system or were part of an overlap between the social and other sub-system.
- In both literature-based and survey factors, the Social-Technical overlap had the most factors. This means that a lot of the concerns, within a general practice, with regards to adopting EMRs are about the GP; administrative staff members and the actual EMR technology.
- "People-related issues" generally have a major impact on organizational operations (Microsoft, n.d.). This implies that people can determine whether or not an organization succeeds in its everyday tasks. This further sustains the importance of people within an organization and thus the importance of addressing factors influenced by the social subsystem.

5.4.2. Influence of the GP/patient perceptions

Multiple perceptions emerged from the GP and patient participants during the analysis of the results of this research. However, it is important to note that not all of these perceptions translate into actual facts. This is no surprise, because all the research participants were inexperienced about EMRs. It is disconcerting to think that these perceptions, "untrue" as they may be, may influence the adoption and meaningful use of EMRs in general practices. De Oliveira *et al.*, (2009) argue that there is a link between a perception, decision-making and an action. In essence, the argument is founded on the basis that a perception may influence decision-making and thus, influence the subsequent action, since an action is dependent on the verdict of decision-making. Therefore this implies that the GP and patient perceptions may have an impact on decision-making regarding adopting and meaningfully using an EMR in a general practice. As noted, though patients are not direct decision-makers in a general practice, their views may impact whether or not an EMR is adopted. The probability of such an impact may be greater for GPs, because their role in the practice is not limited to acting as a medical consultant, but is inclusive of being the practice owner. Furthermore, Sablynski (n.d.) articulates that people have a tendency to "validate" their perceptions, though they may be proven untrue. Thus, having "false" perceptions may prove challenging to the adoption and use of EMRs.

5.4.3. Complexity of factors

The socio-technical factors identified during this research highlight the challenges found in encouraging the adoption and meaningful use of EMRs. This challenge results from the complexities represented by these factors. These complexities are as follows:

- The factors involve more than one sub-system (social, environmental and technical); therefore, there are several aspects that need consideration.
- Individually these sub-systems, are complex due to the following, but not limited to:
  - The social sub-system deals with people. They are multi-dimensional in nature and have differing variables (Bryant & Seebach, 1998). For instance, as evident in this research, a general practice may have more than one (1) administrative staff member. It may thus be possible for the GP to have good communication levels with one administrative staff

member but not the other. In such a case, it is difficult to generalise that communication is suffering or not between the GP and administrative staff members.

  - The environmental sub-system focuses on variables within the environment. It is evident from this research that a general practice does not have complete control over its environment. For instance, it was noted that a general practice may have different types of patients, both educated and uneducated. Therefore, patient views may differ, as was indicated by the GP participants, and the practice owner may be influenced towards different directions. However, these views may have an impact on the adoption and potential meaningful use of EMRs in general practices.
  - The technical sub-system focuses on an actual EMR as a technology. Technology is influenced by the environment and the people who use it, hence, the complexity. For instance, the availability of an EMR system may be negatively influenced if there are constant power cuts in the environment in which it is used. Service providers may have mechanisms in place to minimize service disruption but the environment remains independent of their control. Additionally, small general practices have been slow to adopt EMRs which implies their lack of experience with an EMR technology. Therefore, this sub-system is also influenced by the social subsystem, and is complex in its own right.

- Multiple factors belonged to more than one sub-system. This introduced the placing of factors within the respective overlaps or intersections. This further highlighted their complexity, because this means that a factor was identified as involving multiple aspects. Both literature-based and survey-based factors identified that the Social-Technical sub-system overlap had the most factors. This means that a lot of the concerns, within a general practice, with regards to adopting EMRs are about the GP; administrative staff members and the actual EMR technology.

These complexities mean that encouraging the adoption and meaningful use of EMRs may not be a simple undertaking.

The main purpose of this research was not to determine the most concerned participant; however, it is significant to note that when coding the results for analysis, no factors were specifically identified from the administrative staff members. Therefore, further exploration is required in this regard.

This section discussed the interpretation of the findings. The next section validates the formulated survey findings.

5.5. Validation of Factors

Two (2) GPs, of the four GP participants, were requested to review the factors that emerged from the conducted research survey. Their role was explained in the request letter, as presented in Appendix 8, and was verbally clarified. The researcher provided each of the two (2) reviewing GP participants a review document comprising the survey factors, including the request letter. The first reviewer accepted all the factors except the three discussed below. However, the second reviewer accepted all factors. It is important to note that none of the rejected factors are excluded because there was no evidence, in the conducted research survey, to indicate that the experience of the reviewer was generally applicable. Furthermore, as noted in section 5.6, due to the qualitative nature of this research, the inclusion of each survey factor was not based on popularity within the responses of participants.

Validation Input - First Reviewer

As noted, this reviewer accepted all the survey factors, except the following:

The discussion of these factors is structured in the followed manner:

- Rejected factor and comment from the reviewer in tabular format; and
- Support for inclusion of the factor.

5.5.1. Qualified staff

Comment from reviewer
"TRAINING MATRICULATED STAFF MEMBERS IN BASIC COMPUTER LITERACY AND USE OF COMMON SOFTWARE HAS NEVER BEEN A PROBLEM"

Though the abovementioned comment from the reviewer cannot be deemed irrelevant, in the conducted research survey there was no evidence to indicate that the experience of the reviewer was generally applicable. This is founded on the basis that one of the interviewed GP participants was of the opinion that administrative staff with Standard 10/Matric qualification or less may challenge the adoption of EMRs. Hence excluding the above mentioned factor would be an error. This factor is supported by the following quote:

(The following quote was in response to this question: "Explain whether and how you think lack of management support affects the adoption of EMRs.")

> *"… I think more than anything lack of [qualified] staff. For example, if I had a woman... with a tertiary qualification, even if its office administrative clerk, many things would be simpler here. Ja, if I had a..., but now you find that you get someone who has Std. 10. Like the one I have in [omitted as the mentioned area could possibly identify the participating practice], I don't even think that she went to school, you know. Maybe Std. 6."*

5.5.2. Learning time

Comment from reviewer
"INTRODUCTION OF NEW SOFTWARE HAS NEVER PROVED TO BE PROBLEMATIC AS THEY ARE USUALLY USER FRIENDLY"

The interviewed GP participants seemed fearful of the time it may take their administrative staff to learn to use an EMR, if it was adopted. As noted in section 4.5, all of the participating GPs were inexperienced with the use of an EMR. This inexperience resulted in a lot of perceptions, both "true" and "untrue". However, as indicated in section 5.4.2, GP perceptions may influence the adoption of EMRs. Therefore, regardless of the opinion of the reviewer, disregarding this would be a mistake. This factor is supported by the following quotes:

(The following quotes were in response to this question: "Explain whether and how you think lack of learning time affects the adoption of EMRs.")

"… [B]ecause, some of the ladies that we have are not as bright as they are supposed to be. As you can imagine, you know... this is a small scale."

"That's where I have question marks. That's where I have the.... some of my fears."

5.5.3. Negative staff perceptions

Comment from reviewer
"I DID NOT EXPERIENCE THIS WITH MY STAFF"

Though the reviewer had not experienced negative staff perceptions, towards technology, in his practice, it was evident from the conducted survey that this does not apply to all GPs. There was an indication of a perception, amongst the interviewed GP participants, that the administrative staff members may have negative perceptions towards EMRs within the practice. Therefore this factor is not excluded. This factor is supported by the following quote:

(The following quote was in response to this question: "Explain whether and how you think negative staff perceptions about using technology affects the adoption of EMRs.")

> *"… [A]t the way I'm looking at it, as you can imagine, it means more time now working that seating down doing nothing. Because as you can imagine now, it's not gonna be a matter of 'we are giving away a file and then entering the drugs', which they do at their own leisure time."*

Validation Input - Second Reviewer

As noted, the second reviewer accepted all factors. Additional to accepting the factors, he provided the following verbatim comment regarding the "Government subsidization" factor:

5.5.4. Government subsidization

Comment from reviewer
"Govt involvement would improve stats as far as Disease Control is concerned – this can be done only through a EMR system"

This comment makes it clear that government involvement may encourage the adoption and potential meaningful use of EMRs. However, since this comment is not focused specifically on subsidization, this indicated that healthcare providers may require government involvement for various reasons. Therefore, taking the reviewers comment into account, the header of this factor was changed from government "subsidization" (Chapter 5, section 5.3.2) to government "involvement". This change is reflected in the text and in Figure 5.6.

- **Government involvement**

It was evident that the lack of government involvement when adopting an EMR affects the adoption and potential meaningful use of EMRs. This was linked to the absence of government involvement in providing a national direction which promotes the adoption of EMRs. The presence of government involvement was perceived to improve national statistics of disease control. Thus, the lack of government involvement may negatively affect the adoption and meaningful use of EMRs in general practices. The following verbatim quote supports this:

(The following quote was in response to this question: *"What do you dislike about your current system?")*

> *"… [W]e need some subsidization of that system and the government probably needs to come in there as well and say for the country as a whole, we're going to use electronic systems, you know…"*

(The following quote was a comment from a reviewer*)*

> *"Govt involvement would improve stats as far as Disease Control is concerned – this can be done only through a EMR system"*

5.5.5. Literature review and research survey factors affecting the adoption and meaningful use of EMRs in general practices

Figure 3.6, in Chapter 3, presenting the factors identified by reviewing secondary data was revised by adding the factors identified from the primary data. Figure 5.6 was the result and it provides a summary of all the identified factors. The green text denotes a factor identified particularly through secondary data (literature); blue text denotes a factor identified particularly through primary data (empirical survey

results); and orange text denotes an overlap between a factor identified in both secondary and primary data.

Literature review and Research survey - Factors that affect the adoption and meaningful use of EMRs in general practices

Social

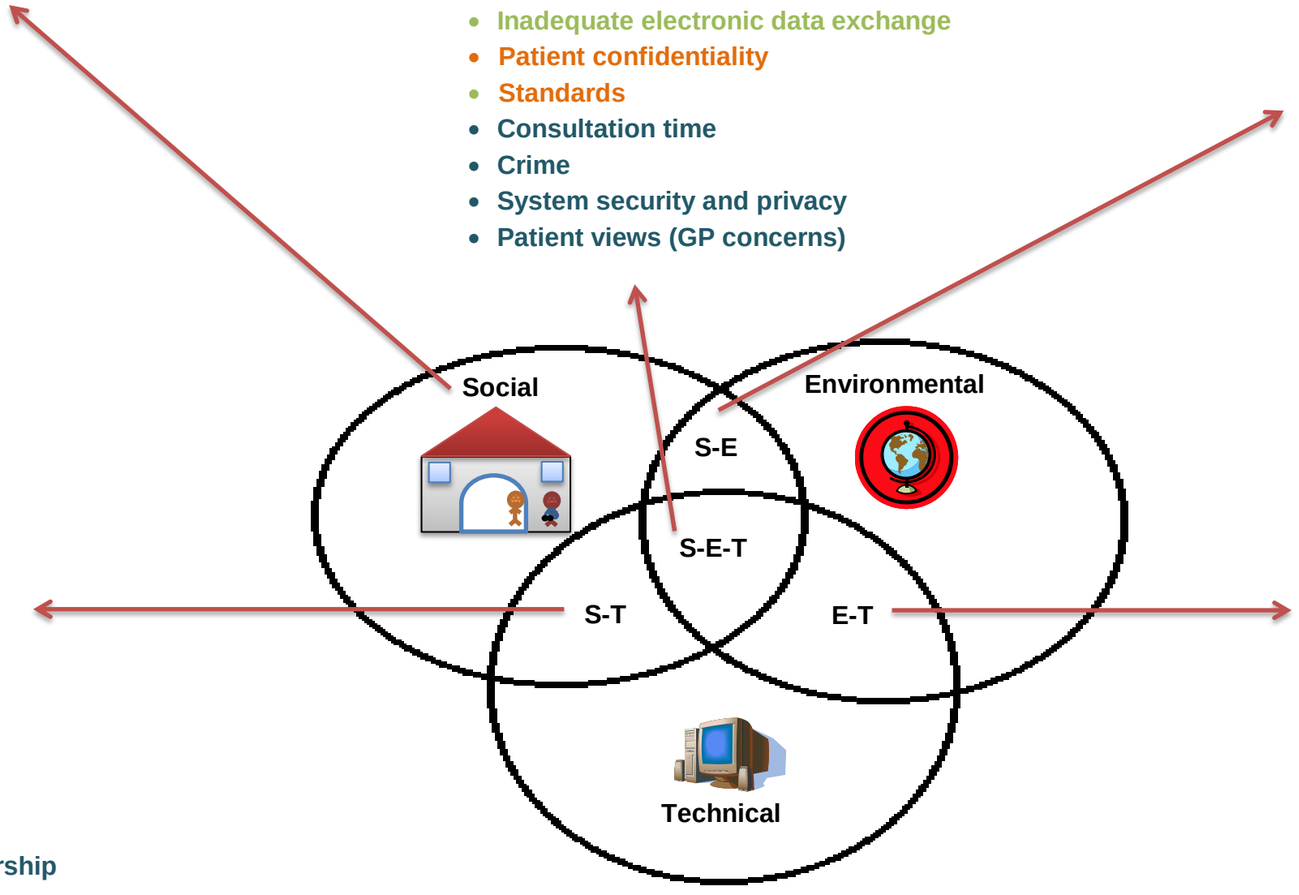
- Decision-making style
- Management support
- Communication
- Qualified staff
- Staff motivation

Social-Technical

- Workflow
- Computer literacy
- Control
- Learning time
- Backup
- Finances
- Maintenance support
- System integration
- Hardware
- Service provider continuity
- Ease of use
- Fear of the unknown
- Management knowledge
- EMR awareness
- Negative staff perceptions
- Staff knowledge
- Offices suitability
- Software and hardware ownership
- Change requirements
- System reliability

Social-Environmental-Technical

- Inadequate electronic data exchange
- Patient confidentiality
- Standards
- Consultation time
- Crime
- System security and privacy
- Patient views (GP concerns)



Social-Environmental

- Patient perceptions
  - GP-Patient relationship (Patient concerns)
- GP perceptions
  - Quality of care
- Legal requirements
- GP-Patient Relationship (GP concerns)
- Incentives
- Government involvement

Environmental-Technical

- Patient perceptions
  - Patient confidentiality
  - Fear of the unknown
  - Computer literacy
  - System availability and reliability
  - Record safety
  - System security and privacy
  - Waiting time
- Patient knowledge
  - Complete medical history
  - Continuity of care
  - Diagnosis and treatment
  - Quality of care
  - Eco-friendliness

Figure 5.6: Literature Review and Research Survey - Factors that affect the adoption and meaningful use of EMRs in general practices

Black text = Heading; Green text = Literature factor; Blue text = Survey factor; Orange text = Literature and survey factor.

5.6. Conclusion

This chapter investigated the socio-technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. Primary data was used to formulate factors based on the results of a research survey conducted in the context of general practices. These factors were formulated according to a STS approach.

After the literature review it was evident that the social sub-system is important and the survey supported this, because, as in Chapter 3, the identified factors were grouped according to social; social-environmental; social-technical; environmental-technical; and social-environmental-technical factors. It was noted that four (4) of the five (5) sets of factors, involved the social sub-system. Similar to Chapter 3, besides the exclusively social factors, all the factors belonged within an overlap of two (2) sub-systems or more. Hence, this chapter includes factors that were placed within an overlap of two or all three sub-systems respectively. Furthermore, these primary data-based factors were combined with the literature-based factors gathered in Chapter 3.

Due to the qualitative nature of this research, the inclusion of each of the abovementioned factors (primary data-based factors) was not weighted based on popularity within the responses of participants. Therefore, every derived factor was considered in its own right. After the presentation of the identified factors, the results were further interpreted and validated by reviews from two (2) of the GP participants. The purpose of the next chapter is to conclude this research.

CHAPTER 6

6. CONCLUSION

This chapter concludes the research and provides a summary of the research by reflecting on the conducted literature review and research survey. An overview of the benefits and limitations of this research and future research opportunities are provided.

Fade (2005) emphasizes that reflection comprises the following thought process:

- Looking back (retrospective reflection);
- Looking at what we are doing now (spective reflection); and
- Looking forward (prospective reflection).

Fade (2005) notes that retrospective reflection involves looking back. This is done by revisiting the problem statement and objectives.

6.1. Revisiting the Problem Statement and Objectives

Research has established that, within the modern society, patients are referred from one healthcare provider to the next which results in patient records being disjointed. It is clear that for healthcare providers to provide acceptable care, they need access to an accumulated medical history of patients. Thus, EHRs would offer a solution to this problem; however, the first step in realizing this goal is the adoption of EMRs. Research focused on EMRs has established that general practices are slow in their adoption. Therefore, the main purpose of this study was to identify factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices. This study focused on the private health sector. This is because prior research has mostly focused on the public health sector (Matshidze & Hanmer, 2007; Herbst *et al.*, 1999; Jack & Mars, 2008; Wharton University of Pennsylvania, n. d.).

6.1.1. The problem statement

The problem statement underlined the need for the adoption and meaningful use of EMRs. This led to the compilation of the research questions and objectives of this research.

6.1.2. Research objectives and sub-objectives

The main research objective of this study is as follows:

> Identify the factors that need to be addressed to encourage the adoption and meaningful use of Electronic Medical Records in general practices.

Initially, the aim was to identify social, environmental and technical factors that may affect the adoption and meaningful use of EMRs, but through the course of the research, it became clear that certain factors belonged to multiple sub-systems. However, merely duplicating the factor across both sub-systems misrepresented the relationship occurring between the respective sub-systems which would underestimate the complexity introduced by this factor. Therefore, the factors were placed within an overlap of two or all three sub-systems respectively, based on the sub-systems involved. Five (5) sets of factors emerged, namely social; social-environmental; social-technical; environmental-technical; and social-environmental-technical factors. None of the factors were purely environmental or technical.

The research objective was divided into smaller sub-objectives. These are as follows:

- Investigate the impact of the current patient record keeping in general practices on quality of care:
  This objective was addressed by conducting a literature review, to obtain an understanding of what other researchers had established.
- Explore the role that can be played by EMRs in improving quality of care:
  This objective was addressed by the use of data collected in a literature review to obtain an understanding of what is identified by previous studies.
- Identify the social factors that need to be addressed to encourage the adoption and meaningful use of EMRs:
  This objective was addressed by conducting a literature review, collecting data by means of administrative staff questionnaires and interviewing GPs.
- Identify the environmental factors that need to be addressed to encourage the adoption and meaningful use of EMRs:

This objective was addressed by a review of the existing literature, the collection of data through the use of patient questionnaires, GP questionnaires, administrative staff questionnaires and GP interviews.

- Identify the technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs:
  This objective was addressed by conducting a literature review, general practice surveys, staff questionnaires and GP interviews.

Table 6.1 presents a summary linking research questions and objectives to specific chapter(s).

Main Research Objective			**Achieved**
Identify the factors that need to be addressed to encourage the adoption and meaningful use of EMRs in general practices.			
Research Question	**Research Objective**	**Chapter**	
What is the impact of the current patient record keeping in general practices on quality of care?	To investigate the impact of the current patient record keeping in general practices on quality of care.	2	✓
What role can EMRs play in improving quality of care?	To explore the role that can be played by EMRs in improving quality of care.	2	✓
Which social factors need to be addressed to encourage the adoption and meaningful use of EMRs?	Identify the social factors that need to be addressed to encourage the adoption and meaningful use of EMRs.	3, 4 and 5	✓
Which environmental factors need to be addressed to encourage the adoption and meaningful use of EMRs?	Identify the environmental factors that need to be addressed to encourage the adoption and meaningful use of EMRs.	3, 4 and 5	✓
Which technical factors need to be addressed to encourage the adoption and meaningful use of EMRs?	Identify the technical factors that need to be addressed to encourage the adoption and meaningful use of EMRs.	3, 4 and 5	✓

Table 6.1: Research questions mapped to chapters

Fade (2005) emphasises the importance of spective reflection, hence after reflecting on how this research met its envisioned objectives, it is important to reflect on both its significance and its limitations.

6.2. Research Findings

As noted in section 6.1.2, the initial aim of this research was to identify social, environmental and technical factors that may affect the adoption and meaningful use of EMRs. Factors were identified from both literature and primary data acquired through a research survey. The research survey was conducted within four general practices in the Nelson Mandela Bay Metropolitan area. The study participants were of the following range:

- GP;
- Administrative staff; and
- Patients.

Through the use of the secondary and primary data, a total of 40 factors were identified. These factors are distributed as illustrated in Table 6.2. It is important to note that certain factors were identified in both the literature review and the research survey. Those factors are represented by the "Overlap" column.

	Literature	Overlap	Research survey
Social	2	1	2
Social-Environmental	3	2	1
Social-Technical	3	6	11
Environmental-Technical		1	1
Social-Environmental-Technical	1	2	4
Total	9	12	19

Table 6.2: Distribution of factors

6.3. Significance of findings

This research used STS theory as a lens to identify the factors that may affect the adoption and meaningful use of an EMR in a general practice. Chapter 1, section 1.1, noted that using a "techno-centric" approach which focuses mainly on technology and technological issues in an organization would be in error. The STS theory recommends viewing an EMR as an extension or part of the wider system

and not the main aspect of an organization. The following were recognised as significant:

- Importance of the social sub-system
  It was established in Chapter 5, section 5.4.1, that within the Socio-technical sub-systems, the social sub-system plays a key role. This is due to the following reasons:
  - There were factors identified which belonged exclusively within the social sub-system;
  - The majority of the identified factors either belonged exclusively within the social sub-system or were part of an overlap between the social and other sub-systems;
  - The Social-Technical overlap included the most factors; and
  - "People-related issues" generally have a major impact on organizational operations (Microsoft, n.d.).

This shows the importance of the social sub-system.

- Influence of GP and patient perceptions
  As noted in Chapter 5, section 5.4.2, multiple perceptions emerged from the GPs and patient participants during the analysis of the results of this research. These perceptions may have an influence on the adoption and potential meaningful use of an EMR in a general practice, since previous research has established that perceptions do have an impact on decision-making (De Oliveira *et al.*, 2009).
- Complexity of factors
  The emergent factors were deemed to be complex as described in Chapter 5, section 5.4.3, since:
  - The factors involve more than one sub-system;
  - The individual sub-systems were considered complex; and
  - The majority of the factors were positioned within two (2) or three (3) overlapping sub-systems, due to these factors belonging to more than one sub-system.

6.4. Limitations of the Research

Since the general practices used in this research were selected using purposive and convenience sampling, the practices chosen are within the Nelson Mandela Bay Metropolitan area. This means the collected primary data was only from the selected area. Even though the small samples yielded from this research satisfied the explorative nature of this research; it would be an error to imply that these factors apply to all small general practices. However, the fact that the researcher found international literature covering EMR adoption and meaningful use issues lends some credibility to whether these factors would be applicable, though further research would be required in specific environments to test the applicability of these factors.

It is necessary to identify aspects for future research after reflecting on the research significance and limitations. This involves prospective reflection.

6.5. Future Research

Since the factors formulated from the primary data represent the views from participants within a particular setting and these participants had no experience with the use of an EMR, to address meaningful use further research needs to be conducted. This research would be utilised to formulate meaningful use factors, using participants that have adopted an EMR within their practice.

Further research needs to be conducted using practices that have adopted EMRs, to gather:

- The main motivator for adopting EMRs; and
- The rate of meaningful use.

This information will assist in compiling guidelines for general practices who are adopting an EMR, to guide their adoption process and potentially increase their meaningful use of EMRs.

Additionally, further research is required to provide a solution guiding the practical encouragement of the adoption of EMRs. This research may focus on the reinforcement of informed perceptions, because it was clear from this research that perceptions play a role in the encouragement and discouragement to adopt EMRs.

6.6. Final Word

Though this research is of an explorative nature, the researcher hopes that it will contribute towards improving the rate of adoption and meaningful use of EMRs in small practices.

"Where the sun shines, there too is shadow. Be illumined by the light of knowledge no less than by its shadow." (Patton, 2002, p. 429)

APPENDICES

APPENDIX 1: ETHICS APPROVAL LETTER

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Nelson Mandela Metropolitan University
for tomorrow

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Annette.Leonard@nmmu.ac.za

Ref: H11-Eng-ITe-008
8 August 2011

Ms Melissa Masiza (s20639175)
School of ICT

Dear Melissa

FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

Your above-entitled application for ethics approval served at the Faculty RTI Committee of the Faculty of Engineering, the Built Environment and Information Technology.

We take pleasure in informing you that the application was approved by the Committee.

The Ethical clearance number is **H11-Eng-ITe-008**, and is valid for three years, from 27th July 2011 – 27th July 2014. Please inform the RTI-HDC, via your supervisor, if any changes (particularly in the methodology) occur during this time. An annual affirmation to the effect that the protocols in use are still those, for which approval was granted, will be required from you. You will be reminded timeously of this responsibility.

We wish you well with the project.

ANNETTE LEONARD

FACULTY RESEARCH ADMINISTRATOR

APPENDIX 2: PATIENT QUESTIONNAIRE

Nelson Mandela Metropolitan University
for tomorrow

PATIENT QUESTIONNAIRE

This general practice is participating in a research project about factors that need to be considered in order to encourage the adoption and meaningful use of Electronic Medical Records in general practices. Please find a couple of minutes to complete this survey. This survey is a means of determining how patients feel about having their information stored using a paper-based system. Your feedback is highly important to us. Please note that no patients/persons under the age of 18 may complete this survey. Participants are urged to remain anonymous. No personal information should be provided.

SECTION A – BIOGRAPHICAL INFORMATION

Gender	M	F	**Age**	18-24	25-34	35-44	45-54	55-64	65 plus							
Home language	English	Afrikaans	Xhosa	Zulu	Other Specify:	**Highest education level**	Grade 9/ Adult Basic Education	Grade 12	Certificate/ Diploma	Bachelor's Degree	Postgraduate Degree					

SECTION B – PATIENT VIEWS

1.	**Is this your first time as a patient at this general practice?**			Yes	No
2.	**If no, you visited this practice for**	< 1 year	1-2 years	3-4 years	> 4 years
3.	**Is this the only general practitioner you consult with?**			Yes	No
4.	**Your consultation details are stored in a paper-based patient folder. Storing my information in this format has a negative impact on the quality of care provided to me.**	Strongly Disagree	Disagree	Agree	Strongly Agree
5.	**Please motivate your answer.**				

Please turn over.

6.	**I prefer my General Practitioner/Doctor to use a computerised system to store my consultation details.**	Strongly Disagree	Disagree	Agree	Strongly Agree
7.	**Please motivate your answer.**				
8.	**I would be concerned about the confidentiality of my information if it were stored in an electronic format.**	Strongly Disagree	Disagree	Agree	Strongly Agree
9.	**Please motivate your answer.**				
10.	**I would be concerned about the confidentiality of my information if it were stored in a paper-based format.**	Strongly Disagree	Disagree	Agree	Strongly Agree
11.	**Please motivate your answer.**				
12.	**Overall, I prefer my information to be stored in a/an**	Paper-based format		Electronic format	
13.	**Please motivate your answer.**				

APPENDIX 3: GP QUESTIONNAIRE

GENERAL PRACTITIONER QUESTIONNAIRE

SECTION A – BIOGRAPHICAL INFORMATION										
Gender	M	F	**Age**	18-24	25-34	35-44	45-54	55-64	65 plus	
Home language	English	Afrikaans	Xhosa	Zulu	Other Specify:	**Highest education level**				
A	**Years in practice?**									
A	**Specify any role which you fill in addition to GP in this practice (e.g. practice owner/key decision maker)**									

SECTION B – LANGUAGE USE (Tick all that apply)						
1.	**Language of communication used in my daily work to communicate with patients**	English	Afrikaans	Xhosa	Zulu	Other Specify:
2.	**Do you use your home language to make handwritten clinical notes?**				Yes	No
3.	**Language you use to make handwritten clinical notes**	English	Afrikaans	Xhosa	Zulu	Other Specify:

SECTION C – PAPER-BASED SYSTEM USE			
4.	**Have you experienced problems whilst using a paper-based system?**	Yes	No
5.	**If yes, motivate your answer.**		

Please turn over

SECTION D – COMPUTER LITERACY						
A 6.	Rate your computer literacy on a scale of 1 (not computer literate) to 5 (expert or power user).	1	2	3	4	5

Rate computer usage as an expression of average use of applications in any one week:

7.	Never	Seldom (1 x per week or less)	Sometimes (2-3 x per week or less)	Most times (Once a day or less)	Always (Every day, multiple times)
Word processor application (e.g. typing on a word document)					
Spread sheet application (e.g. typing on an excel document)					
Internet (e.g. searching for information on google)					
Email (e.g Gmail)					
Social networking sites (e.g. Facebook, Twitter, etc.).					
Applications used in general practice.					

A	SECTION E – COMPUTER USE		
8.	Is a computer presently used during consultation in your practice?	Yes	No
9.	If any, briefly explain the purpose of such use		

Please turn over

10.	**If no, I do not use a compute during consultation, because (You may tick more than one item out of the six items)**	The cost of adopting a computerized system is too great	
		It will take too much time during consultation	
		There is no standardization	
		I do not have time to learn	
		It will affect the patient/doctor relationship	
		Other (Please list)	

SECTION F – ELECTRONIC MEDICAL RECORDS			
Electronic Medical Records (EMR) An EMR is comprehensive patient encounter information (e.g. patient demographics, encounter summaries, medical history, allergies, intolerances and lab test histories) that is kept electronically by a single provider, clinic, hospital, general practitioner (GP) or other (Porter Research, 2007; Ludwick and Doucette, 2009). The stored patient information can be uploaded to an EHR and other EMRs if need be. Patient information can also be downloaded from other EMRs.			
11.	**Are you aware of the existence of EMR software?**	Yes	No
12. A	**Which of the following functionality are you interested in, should you adopt and use EMRs?**		
	Pre-visit functionality (You can tick more than one):		
	Schedule and register a patient		
	Communicate with healthcare provider(s) about the scheduled patient		
	View the medical history of the patient in preparation for the visit		

Please turn over

	Visit functionality (You can tick more than one):		
	GP or other medical staff can type in information acquired from the examination of the health condition of the patient; electronically prescribe medication		
	Electronically order diagnostic tests and results from labs		
	Provide the patient with patient education material		
	Post-visit functionality (You can tick more than one):		
	Communicate with relevant healthcare provider(s) using electronic messaging		
	Make patient reminders related to the disease of the patient		
	Maintain and manage reports		
	Manage billing and receivables		
	Allow patients to request follow-up visits		
A **13.**	**Would using an Electronic Medical Record (EMR) reduce the risk of making medical errors?**	Yes	No
14.	**Please motivate your answer.**		
A **15.**	**Would widespread use of EMRs improve healthcare quality in South Africa?**	Yes	No
16.	**Please motivate your answer.**		

Please turn over

17.	**Please explain how the use of EMRs would impact your daily job.**	
18.	**List or discuss any other positive or negative aspects that you associate with the acquisition, implementation and use of EMRs in your practice.**	
	Positive	
	Negative	

Thank you.

APPENDIX 4: ADMIN STAFF QUESTIONNAIRE

ADMINISTRATIVE STAFF QUESTIONNAIRE

SECTION A – BIOGRAPHICAL INFORMATION																
Gender	M	F	**Age**	18-24	25-34	35-44	45-54	55-64	65 plus							
Home language	English	Afrikaans	Xhosa	Zulu	Other Specify:	**Highest education level**	Certificate/ Diploma	Bachelor's Degree	Postgraduate Degree	Other (Specify)						

SECTION B – LANGUAGE USE						
1.	**Language of communication used in my daily work to communicate with members of the community whom I serve**	English	Afrikaans	Xhosa	Zulu	Other Specify:

SECTION C – PAPER-BASED SYSTEM USE			
2.	**I have experienced problems whilst using a paper-based system.**	Yes	No
3.	**If yes, motivate your answer.**		

SECTIOND D – COMPUTER LITERACY						
5.	**Rate your computer literacy on a scale of 1 (not computer literate) to 5 (expert or power user).**	1	2	3	4	5

A

Please turn over

6.	Rate computer usage as an expression of average use of applications in any one week:				
	Never	**Seldom (1 x per week or less)**	**Sometimes (2-3 x per week or less)**	**Most times (Once a day or less)**	**Always (Every day, multiple times)**
Word processor application (e.g. typing on a word document)					
Spread sheet application (e.g. typing on an excel document)					
Internet (e.g. searching for information on google)					
Email (e.g Gmail)					
Social networking sites (e.g. Facebook, Twitter, etc.).					
Applications used in general practice.					

	SECTION E – COMPUTER USE			
A	**6.**	**Using an Electronic Medical Record (EMR) will reduce the risk of making medical errors.**	Yes	No
	7.	**Please motivate your answer.**		
A	**8.**	**Widespread use of EMRs would improve healthcare quality in South Africa**	Yes	No
	9.	**Please motivate your answer.**		

Please turn over

12.	**Please explain how the use of EMRs would impact your daily job.**	
13.	**List or discuss any other positive or negative aspects that you associate with the acquisition, implementation and use of EMRs in your practice.**	
	Positive	
	Negative	

Thank you.

APPENDIX 5: GENERAL PRACTICE SURVEY

GENERAL PRACTICE SURVEY

This general practice is participating in a research project about factors that need to be considered in order to encourage the adoption and meaningful use of Electronic Medical Records in general practices. Please find a couple of minutes to complete this survey. The researcher would like to obtain general details of the practice; the IT infrastructure; and use of IT within the practice as well as how it is constituted in terms of its staff. Your feedback is highly important to us. No personal information should be provided.

A

SECTION A – STAFF/PATIENT INFORMATION

1.	**Number of General Practitioners currently practicing in your practice**		
2.	**Number of non-clinical physician staff currently employed practicing in your practice**	**Staff**	**Number**
		Nurse	
		Radiologist	
		Pharmacist	
		Other Specify:	
3.	**Number of administrative staff currently employed practicing in your practice**		
4.	**Number of patients typically seen in a day**		
5.	**Target consultation duration**		

SECTION B – COMPUTER INFORMATION

6.	**Number of desktop computers in use in your general practice**						
7.	**Number of laptops in use in your general practice**						
8.	**Used by**	**Nurse** **Laptops** ☐ **Desktops** ☐	**GP** **Laptops** ☐ **Desktops** ☐	**Admin** **Laptops** ☐ **Desktops** ☐	**Radiologist** **Laptops** ☐ **Desktops** ☐	**Pharmacist** **Laptops** ☐ **Desktops** ☐	**Other (Please specify):** **Laptops** ☐ **Desktops** ☐

Please turn over

9.	**Type of internet connectivity used**	**None**	**ISDN**	**DSL**	**Wireless**	**T-3 Lines**	**Satellite**
		Analog/ Dial up	**B-ISDN**	**Cable**	**T-1 Lines**	**OC3**	**Other (Specify)**:

SECTION C – SOFTWARE INFORMATION

List all the software used in the practice and briefly explain the purpose of each.

10.	**Software**	**Purpose**	**Developer/Provider**	**Technical support provider**

A

SECTION D – USE DURING CONSULTATION

11.	**Patient clinical information is stored in a/an**	**Paper-based format**	**Electronic Format**
12.	**Specify information stored in a paper-based format, e.g. patient billing, clinical information, biographical information, etc.**		
13.	**Specify information stored in an electronic format, e.g. patient billing, clinical information, biographical information, etc.**		

Thank you.

APPENDIX 6: GP INTERVIEW QUESTIONS

GP INTERVIEW QUESTIONS

	1.	**Describe the flow of a typical consultation**	
A	2.	**When and where do you capture encounter notes?**	
A	3.	**What do you like about your current system?**	
A	4.	**What do you dislike about your current system?**	
A	5.	**On a scale of 1 to 5, where 1 is completely dissatisfied and 5 is extremely satisfied, what would you say your overall satisfaction is with your system?**	
A	6.	**Describe the role any of your computer based systems play while the patient is here for a consultation.**	
	7.	**Have you thought of or have you investigated the option of adopting an EMR in your practice?**	
A	8.	**Please explain briefly why your practice does not use an EMR.**	Initial Cos ☐ On-going ☐ Cost Regulations ☐ Change requirements ☐ Other reason ☐
	9.	**Does availability of maintenance support or lack thereof have an impact on the operation of your current system? How big of a problem would this be if you had to use an EMR?**	
	10.	**Explain whether and how you think … affects lack of adoption of EMRs**	☐ standardization ☐ learning time ☐ time during consultation ☐ communication ☐ management support ☐ incentives ☐ hardware ☐ negative staff perceptions about using technology (EMR) ☐ staff knowledge ☐ patient views
	11.	**Any other factor that has not been covered?**	

12.	**Should an unforeseen tragic event occur, such as fire, a flood, etc., what disaster discovery plan do you have in place for your patient medical information for the current paper-based system? Please explain.**	
13.	**Is information backup a concern for you in the electronic environment?**	
14.	**Why?**	
15.	**Can you please explain the single biggest concern you have about using EMRs?**	

APPENDIX 7: INTERVIEW TRANSCRIPT

Interview 1 of 4

Participant ID = GP1

Participant type = General Practitioner from 1st practice

Interviewer ID = I

Interview date = 12th of September 2011

Location = Central, Port Elizabeth

Transcriber = Melissa Masiza

 # Start of interview 1 #

I: *Describe the flow of a typical consultation*

GP1: *OK. Patient comes in; The receptionist writes up the file, I don't know whether to call it a file or to call it what, where she captures the name, the address, where the patient works, patient's phone number at work, the mobile phone number, the home number, the medical aid, the medical aid number; Verifies that the patient is who she says she is, in terms of ID and stuff like that; She verifies that the medical aid itself is valid, by phoning the medical aid and finding out if the patient is indeed a member and whether they have benefits to see this doctor. Then after that the patient comes in to me, then I consult the patient. Then I write on the file as to what I've seen, what I've found out; what my impression is and then what medication the patient should get. Either, she gets the medication here or I write a prescription, depending on the ailment and also on the medical aid, as to whether it allows me to give them medicine or it prefers that the chemist dispenses to the patient.*

I: *When and where do you capture encounter notes?*

GP1: *On the file*

I: *What do you like about your current system?*

GP1: *Well…, it's not a question of liking more than it's the system I'm used to, because what is happening is that… when I came 20 years ago, they were using this.*

I: *So you're familiar with it?*

GP1: I'm familiar with it, yes.

I: *But there is nothing you can point out?*

GP1: *Look, it's not as tedious and long as it sounds, as I'm putting. It's actually a quick thing to do... no1... and it makes up for a good filing system, you know, because we have to keep the files for 3 years, of the patient record, you know.*

I: *What do you dislike about your current system?*

GP1: *If there is more than 1 patient who comes in at the same time, then they must wait until the lady… finishes with 1, then the other, then they come and see the doctor, you know. It's not as quick as that… I mean, there, if its more than 1 person it's not as quick as you would like it to be.*

I: *On a scale of 1 to 5, where 1 is completely dissatisfied and 5 is extremely satisfied, what would you say your overall satisfaction is with your system?*

GP1: *3*

I: *Describe the role any of your computer based systems play while the patient is here for a consultation.*

GP1: *Ok. No role whatsoever, when the patient is here… no role. It's only when the patient has left, when we do the… the claim. When we submit a claim, we start using it. But now, but now, if it's an old patient… Remember that the scenario I've just given you is 1 of a new patient. But if it is an old patient, she comes in; she gives us the name and then we look it up in the computer. Then it's quicker, because the computer gives us the name and file no., then we go and check.*

I: *Have you thought of or have you investigated the option of adopting an EMR in your practice?*

GP1: *What's an EMR? [Explained] No.*

I: *Please explain briefly why your practice does not use an EMR based on what is applicable from the following:*

I: *Initial Cost*

GP1: *Initial cost*

I: *On-going Cost*

GP1: *On-going cost*

I: *Regulations*

GP1: *I am not sure what regulations say, but I don't think there is a regulation against… you know.*

I: *Change requirements*

GP1: *More staff; training of the staff.*

I: *Other reason*

GP1: *Familiarity and security*

I: *Does availability of maintenance support or lack thereof have an impact on the operation of your current system? How big of a problem would this be if you had to use an EMR?*

GP1: *Yes, too much. I can now imagine if I was dependent on it from A-Z, because now at least I'm dependent on it from Q-Z, because of the accounting part… because the support is not so good. It's not 24 hrs. And the people sometimes can't help you then and then with the problem. They will always say we'll come back to you, we'll investigate the problem... you know. It would be very big,*

because it'll mean... it'll now perhaps mean I'll have to see this patient without having all the data in the computer, because I can't get the people on the other side.

***I:** Explain whether and how you think lack of [each of the factors below] affects the adoption of EMRs*

***I:** Standardization*

***GP1:** Yes, yes… it affects it, because if there was standardization, perhaps where we're using the same platform, us, the labs, the medical aid, everything, it would be easier… you know. Where about, if you come in and you do the thing, the medical aid already tells you immediately that this patient you just captured is not good, does not have any benefits. If it was like that.*

***I:** Learning time*

***GP1:** Even that, severely, because some of the ladies that we have are not as bright as they are supposed to be. As you can imagine, you know... this is a small scale.*

***I:** Time during consultation*

***GP1:** I think it'll be quicker if we had the EMR, ja. I think actually the consultation would be quicker, because now if the patient comes in, I will not have to write on the pad. Perhaps, on my terminal here, I will capture the claim immediately. That this, and this and that, right there and then.*

***I:** Communication*

***GP1:** Yes, also that... lack of communication. No 2, it's not widely publicized.*

***I:** Management support*

***GP1:** Even that as well. And also, I think more than anything lack of staff. For example, if I had a woman... with a tertiary qualification, even if its office administrative clerk, many things would be simpler here. Ja, if I had a..., but now you find that you get someone who has Std. 10. Like the one I have in Motherwell, I don't even think that she went to school, you know. Maybe Std. 6. Supporting the staff would help, because even now, I'm familiar with the accounting system that we use, because I know some doctors are not. They don't know what's going on. The ladies do as they wish. The ladies go... I went for training first. I trained my lady. I know the accounting.*

***I:** Incentives*

***GP1:** Yes, for example, now Healthbridge is giving us an incentive that if we use their platform for chronic, they'll pay us R200 per patient. They are just trying it, it's something similar. They are trying it as a pilot, I think. I think with an incentive, if, I'm talking now about a basic incentive, like they would say if you are on Healthbridge and you are on the same... as in if you put a claim today, you will know tomorrow from the medical aid. That kind of seriousness thing. I think we would all go the desired route.*

***I:** Hardware*

***GP1:** It does, because you have to buy the hardware, no. 1; and no.2 to maintain it... That kind of thing.*

I: *Negative staff perceptions about using technology (EMR)*

GP1: *It also affects it, because no. 1: the staff is not motivated. Our staff is not that much paid. They are not paid as much. Look, we do our best. So you find that they don't like learning new things.*

I: *Staff knowledge*

GP1: *Yes, it's the same*

I: *Patient views*

GP1: *Yes, but I think those... You know we've got a wide spectrum: educated and uneducated. The educated ones, I suppose, they enjoy, because for example, they get emails from the medical aid telling them about the claim. You claim today and tomorrow the medical aid has already told her and she knows what's going on. She knows how much you claim; she knows what you are claiming for; she knows what she got, what she didn't get. So she queries it immediately. So I think it's worth it. But with the uneducated patients, I think they don't really care.*

I: *Any other factor that has not been covered?*

GP1: *Security, people can hack moss into a system like that. The same way that you get phone calls from people you don't know selling you stuff. How did they get the information? Then you'll get your patient's information all over. People selling boosters to your HIV+ patients, they will have found that.*

I: *Should an unforeseen tragic event occur, such as fire, a flood, etc., what disaster discovery plan do you have in place for your patient medical information for the current paper-based system? Please explain.*

GP1: *No, I'm ruined! Ja, I'm ruined.*

I: *Is information backup a concern for you in the electronic environment?*

GP1: *It is, it is. Ja.*

I: *Why?*

GP1: *For example the people who might be having the back up now… these people that I use for accounting, the EMD, I can always say to them "Give me my information" and they can give it to me.*

I: *Can you please explain the single biggest concern you have about using EMRs?*

GP1: *For me, it's the cost and the human resources involved. It's the cost generally, which is the human resources cost, the capital cost for the thing and the maintenance.*

 # End of interview 1#

Interview 2 of 4

Participant ID = GP2

Participant type = General Practitioner from the 2nd practice

Interviewer ID = I

Interview date = 23rd of June 2012

Location = Korsten, Port Elizabeth

Transcriber = Melissa Masiza

 # Start of interview 2#

I: *Describe the flow of a typical consultation*

GP2: *Ok. So what we do is when we interview a patient, we take hand-written notes, because that, at the moment, is the quickest way. Until we get electronic systems that can be as fast as the human encounter and the writing skill, you know. So we have developed a skill over the last 30-40 years in taking notes. Not perfect, not always complete, but adequate for our purposes up to this point in time. But times are changing, and obviously we have to try and have better notes and the more complete history taking examination record and treatment notes.*

I: *So by "hand", you mean you write them in the actual folder of the patient?*

GP2: *Yes, as I speak to the patient I'll start taking notes about the history, the examination, what kind of treatment that I initiate.*

I: *What do you like about your current system?*

GP2: *At least its permanent, ja, in the sense that it cannot disappear if the power supply goes off, you can still write notes. Ja, it's on hand, it's in a filing system. You can retrieve it at any time. So at the moment, it's not that difficult, but as you know we do use demographic data on computer-based systems. Which is similar to the patient record, it's just that it goes - the accounting stuff will go onto the record.*

I: *For claims?*

GP2: *For claiming purposes, ja and also for follow-ups you know. Like on that record we would remind ourselves of when the patient needs to come again and the appointments and stuff like that and the allergies. That we would also record there as well, you know. So we do have some kind of very simple electronic system at the moment.*

I: *What do you dislike about your current system?*

GP2: *Well its… it takes up a lot of space, you know. It does take up a bit. It's space intensive. Volumes of filing cabinets to keep records of patients. But obviously the electronic ones would be much better, because then everything is in your hard-drive, on the back-up as well, you know. That will actually be a better way of doing things in the long-term, but we need some subsidization of that system and the government probably needs to come in there as well and say for the country as a whole, we're going*

to use electronic systems, you know. Hospitals, clinics and general practices, we can all have one integrated system of everything, because at the moment, we are duplicating a lot of things. Because what the hospital does, I'm going to have to repeat again because we do not have access to the records, because they are based in paper-based files - which do get lost. That would be the disadvantage of paper files - misplaced, ja, misfiled and things like that.

***I:** On a scale of 1 to 5, where 1 is completely dissatisfied and 5 is extremely satisfied, what would you say your overall satisfaction is with your system?*

***GP2:** 3*

***I:** Describe the role any of your computer based systems play while the patient is here for a consultation.*

***GP2:** Well, we would, as soon as the patient walks into the office, we check and see if they are on our database to see they have been here before. Because some have been here 5 years or longer, so we may not remember that they were here before, so at least we can trace that. And address, phone numbers, things like that are on there already and their allergies and their previous medical history. Because we would have captured the diagnosis and treatment on the system when they came the previous time, you know.*

***I:** Is that on Excel?*

***GP2:** It's on a special database designed for that purpose, which is a medical record. It's an initial… it's an electronic system, basically with demographic information, diagnostic information. So we do use that. In fact in our immediate first place of contact, we'll check in there to see if the patient is on our database. We try and capture as many patients as possible onto our electronic systems, and then we can easily collect information on that patient and his family.*

***I:** Have you thought of or have you investigated the option of adopting an EMR in your practice?*

***GP2:** Yes, it's the - on our horizons. We are still looking in that direction slowly. As soon as it becomes easier to do it. We don't want bulky equipment on our desk and laptops and so on ja. Like an iPad would be fine. We are going to look at the iPad system, because it looks like the portable system that you don't have to leave on your desktop, you know. Because the problem with leaving information on your desktop is that other people can access it, but if it's a portable iPad you can close it and put it in your pocket and walk to the next room and carry on with your ah.... So that would be the way to go now. We just waiting for the software developers to come with a program on the iPad that we can use easily. The ease of use will always be the major consideration here, 'cause it's easy to make notes, but it's not so easy to work on a computer while you're working.*

***I:** Please explain briefly why your practice does not use an EMR based on what is applicable from the following:*

***I:** Initial Cost*

***GP2:** I think the cost is becoming less so, because computer software is not that expensive anymore. But I think the major thing would be, I think, a good EMR system that's easy to use.*

I: *On-going Cost*

GP2: *Yes, I suppose we'll have to look at it and say "what is the long-term cost of keeping an EMR system?" What'll happen is that we'll obviously build it into our accounting system, so it's 1 record for both and pay the software people 1 amount per month to take care of all the data, so it's safe and confidential, you know. And easy to retrieve, in case we lose information here due to power failure.*

I: *Regulations*

GP2: *Confidentiality is very important - patient confidentiality - that the record doesn't get into the wrong person's hands or be accessed by unauthorized personnel. Either in the office or outside the office or that it gets hacked into, you know, on the internet or wherever the record is held.*

I: *Change requirements*

GP2: *Ja, sure. It must be flexible, so we can maybe build our own data onto the existing database, you know, so if we need to add additional information like height and weight and things like that.*

I: *Does availability of maintenance support or lack thereof have an impact on the operation of your current system? How big of a problem would this be if you had to use an EMR?*

GP2: *[Nods] It will have to be maintained on a long-term basis, so that it must be up-to-date, working constantly without too many failures. Just like we have support in our Accounting side, it's upgraded all the time. Yes, we do have support for our current system.*

I: *Explain whether and how you think lack of[each of the factors below] affects the adoption of EMRs*

I: *Standardization*

GP2: *I haven't looked at the other - I haven't had insight into what is available in the market place. Sorry, I don't have a lot of experience. I've seen 1 electronic system, about 4 years ago. But it didn't look fantastic at that time to me, it didn't appeal to me, because it was difficult to use. Especially while you sitting at the patient, because you need to do - when you do your recordkeeping - you like to do it at the same time that you are conducting your interview, you know. Not do it half-an-hour or an hour later, ja, because you might have forgotten what you need to write in there. And we don't want to go from paper to electronic; we'd like to go straight into the electronic database. So I don't, I haven't seen a lot of programs. Hopefully, we will see a few American models, cause the Americans are doing it - in a big way and the government is funding it as well. So when those come through we may be able to adopt one of those.*

I: *Learning time*

GP2: *The computer literacy? No, not a problem anymore, because most of us do Windows and Excel and things like that, so that wouldn't be a concern, ja. Most doctors now are probably like computer literate, in the sense that they can work on a database to capture information. And the software people have made it very easy to use. So you aren't doing any major computational skills required, it's just basically capturing data.*

I: *Time during consultation*

GP2: *That would affect you, yes, because you're busy examining and talking to the patient and so on.*

I: *Communication*

GP2: *In what way? Patient-doctor or?*

I: *It could be internal or external communication, could be between you and the company that'll be offering you an EMR or it could be between you and your staff*

GP2: *I don't think it'll affect us much, ja. As long as there is a reasonable level of communication, it should be fine. It won't be a major impact in our practice, ja.*

I: *Management support*

GP2: *Ja, that won't affect us much ja. We should be able to cope within the office environment to capture information.*

I: *Incentives*

GP2: *Availability would be a major issue you know, and one that is not going to add more unnecessary software to your - to your current software environment. Is integrated into your current program and you know everything is in 1 database. Whenever there is a carrot that they are giving you it might make it easier to adopt, but even if it doesn't come with a carrot, we'll still be able to adopt that system without the incentive. We may not need incentives in other words, because in itself, it's a good thing to do, without even getting- without other benefits ja. We don't need financial benefits ja, because it will be valuable to us in its own right. It's got intrinsic value.*

I: *Hardware*

GP2: *Not anymore, because hardware is inexpensive. It's easy to get hold of, you know, hardware is not a major issue. Software would be [a major issue], proper software, ja. Proper electronic medical record software.*

I: *Negative staff perceptions about using technology (EMR)*

GP2: *Not anymore, no, we are positive towards electronic systems.*

I: *Staff knowledge*

GP2: *They, well, we teach them as we go along. They're also adapting quickly to EMRs, you know. I don't think they'd be able to do without it anymore. Like if they don't have computer databases with names and addresses, they will - it will be difficult for them ja. Cause when somebody calls about a patient, they just go to the keyboard and to the computer screen and look it up, ja. The lookup is very easy you know, finding the patients.*

I: *Patient views*

GP2: *By large, patients are becoming computer literate, cellphone literate, so they don't mind technology, you know, taking over - over their records.*

I: *Any other factor that has not been covered?*

GP2: *No, not much except to say that we don't have much of insight into what's available or what is coming through in the market place. And there are a few EMR available that I have seen, you know. I would like to see what they look like and see which is the best one for this practice and this area as well.*

I: *Should an unforeseen tragic event occur, such as fire, a flood, etc., what disaster discovery plan do you have in place for your patient medical information for the current paper-based system? Please explain.*

GP2: *Well, that's the biggest problem at the moment. If we have a fire, then everything disappears. Unfortunately, that is one of the drawbacks of having records on your premises, ja.*

I: *Is information backup a concern for you in the electronic environment?*

GP2: *No*

I: *Why?*

GP2: *Well, we'd like to store it outside the office. Like we do at the moment with our demographic database. We upload it to the server in Joburg and there is a copy there all the time. Ja, we get - we keep 3 copies, one is on our server in Joburg, one is on the server at the office and the 3rd one would be on my laptop, which I take home. So every day, I backup and take that. That one goes with me. So if this one fails in the office, the one fails in Joburg, I still have that individual copy. So, not anymore. It's used to be a concern in the past, you know, when the backup was very difficult, but now electronic backing up is very easy. We in fact do it, like 3 or 4 times a day, and we send our information up to the server in Joburg. They would - then it would be on the big server there.*

I: *Can you please explain the single biggest concern you have about using EMRs?*

GP2: *I think the major one would be confidentiality. That if someone hacks into our databases and some confidential information might come into the public domain, you know. Especially if it's a VIP that, that they want to hack into. Like if they want to hack into Jacob Zuma's record, I'll be in trouble, you know. The presidential record [laughs] or Barack Obama. As long as I have guarantees from our service provider that whatever we upload in the server is… will not be… is encrypted and not available to anybody, except the doctor and his patients. So, so far we don't have any major reasons to worry. I think the… their guarantees are coming through that all records are reasonably confidential, you know.*

 # End of interview 2 #

Interview 3 of 4

Participant ID = GP3

Participant type = General Practitioner from the 3rd practice

Interviewer ID = I

Interview date = 3rd of June 2012

Location = Njoli, Port Elizabeth

Transcriber = Melissa Masiza

 # Start of interview 3 #

I: *Describe the flow of a typical consultation*

GP3: *Ok, the… the patient would come in and be attended by the… there is a receptionist who'll then immediately get the file. Now at the present moment we have our cross-reference, where we are basically using Excel. That's where our patients and the file numbers are, so she'll just go there and try and find the file number and then get the file. Now, it's going to depend as to whether that particular patient is a... private patient, meaning is not on the medical aid and so else or not. If he is on a medical aid then she will need to... depending once again when last did that patient consult with us, if its recent, then she will probably just let her in, let him or her in, but if it's not recent, then she have to liaise with medical aid to check the funds whether they are available or not, then the next step is the patient would come in to see me. And I see the patient, consult and... as a dispensing doctor, I dispense medicine myself. And... from there on, then I fill the claim form... how much. The claim form then goes to the... the lady who is doing our claims. She used to be a bureau, but.... well maybe she is, because she is not helping me alone. I think there are about three of us who are being assisted by her... ja. She then uses... you know... QEDI? I think, that's it.*

I: *So that's the software that she uses?*

GP3: *The software that she uses? Now I'm gonna have to try and remember it... The name of the software... Uhhh... [Laughs] I forgot, forgot. I'll probably remember it. Ja she helps and then she passes them on to the medical aid. She is the one who reconciles them for us.*

I: *When and where do you capture encounter notes?*

GP3: *In the file. In the file, manually.*

I: *What do you like about your current system?*

GP3: *Ah… I think… I think it's because, I would say, I am in control.*

I: *What do you dislike about your current system?*

GP3: *The only part that I am not in control of is… is the actual sending away the claim to the medical aid, which is done by the lady. Now… the reason why that one… I don't like it is, because if I*

have sent her quite a number of claims, I don't know if she does them immediately or she does them when. That is the 1st thing. And the second thing is that, because she is not in-house these claims don't go away immediately and that has proven to be a huge, huge problem on my part. Because the problem is that... at times, probably most of the times, the patients are owing doctors, so what happens is that... when I submit my claim late, especially around mid-year, from this time on-wards up until towards the end of the year, the problem there is that some of the medical aids' funds are exhausted. And… and… and as you can imagine it has caused me to submit this claim, and it comes back a month later and the funds are exhausted! And if you take the level of income of the people that I am serving... they almost always don't have cash to pay me. That's almost always a huge problem. As a result what we were doing in the past, we were doing something illegal, because the patient would say "Doctor the best way I can pay you would be when my medical aid has funds in January, the following year, I'll come and sign and you can claim normally", but then as you can see it tends to be a recurring thing because you are already depleting the funds for the following year from the beginning. And remember this person's family hasn't shrunken, it's still the same number of people, so that has posed a problem, because it became a recurring decimal. That is a huge, huge problem.

I: *On a scale of 1 to 5, where 1 is completely dissatisfied and 5 is extremely satisfied, what would you say your overall satisfaction is with your system?*

GP3: *5*

I: *Describe the role any of your computer based systems play while the patient is here for a consultation.*

GP3: *The desktop… the desktop, the only thing that it does… There are only two things that it does, is one: to assist the receptionist to get the files; two: to enter the drugs that have been given to that patient, so that when we do the stocktaking we know where we are. That is the only thing... what this thing does, otherwise other than that, nothing else.*

I: *Have you thought of or have you investigated the option of adopting an EMR in your practice?*

GP3: *I… I have. I have on 2 occasions and already acquired even quotes. I already made up my mind to… you know… to… to... get one, BUT unfortunately it's the issue of the startup costs of these, which tend to be a little bit... too much, that's the 1st thing. The 2nd thing is, I must be honest, is... the fear of the unknown. For example, all the reconciliation, the follow-up with the medical aid, will be up to it. That's the thing, but looking at the close colleagues, who are already in it, I think it's probably not much of a problem, but those were my concerns I must say.*

I: *Please explain briefly why your practice does not use an EMR based on what is applicable from the following:*

I: *Initial Cost: You have already mentioned that initial costs are too high*

GP3: *[Nods]*

I: *On-going Cost*

GP3: *In terms of on-going costs, I think… taking into consideration the fact that it probably will mean that I am running my practice better than I am now. I... I don't think there would be much of a problem..., but of course I am also mindful of the fact that there might be not be much of a problem now, but I am not sure in the long-term. Because, unfortunately, these costs also rise... I mean increase. The other problem is that almost every... company, who offers these software, they don't sell them. They lease them out, yes, and you pay a monthly... you know... a premium and then on top of that they also include what they call their service fee, because they would say "when you have a problem then you call us". But then when you think about it, maybe the advantage would be that perhaps if the... you're not happy with them, because you haven't bought this thing you will be able to say "Look guys", but the problem is that there's a lot of changes that they make in your system to suit their system that if... if down the line you were to change them, I'm just thinking that probably it would... it would probably mess you up. But those are the things that I think personally, but they... they... they are not things that I'd say some of those that are dealing with these softwares are.... have come across.*

I: *Regulations*

GP3: *Ah... The issues of confidentiality... the issues of confidentiality, that is interesting because that is something that.... I never actually thought of. Now that you are asking the question, it is a good question, but one would assume that that must have been looked at. I guess there is no other way that one can control that, perhaps maybe I would have to check with the guys that already have that. Perhaps, what is happening they probably signed some agreement... you know... compelling themselves in making sure that people's confidential, private information doesn't leak. But otherwise in terms of what's happening in the practice, I think the same thing applies that even now the staff always has and... and... you rely on the agreement with the staff, you know, as part of their responsibility.*

I: *Change requirements*

GP3: *Having attended quite a lot of presentations, in our meetings, where the companies who are offering these... I think all these have been visited and I would want to believe that most of the... the people who are selling these software or who are renting these softwares have covered quite a number of issues the doctors are concerned of.*

I: *Does availability of maintenance support or lack thereof have an impact on the operation of your current system? How big of a problem would this be if you had to use an EMR?*

GP3: *The... ok. The current system really, the way it is... I don't necessarily need support from anybody. Ah... the support d... d... d... does get needed by the lady there, because for example at times she would tell me she had a problem and she is waiting for the guys to come and sort things out. Ah... ja, I won't be in a position to say how good and how bad that service is really. I don't think so, because what happens is that that's one of the… of the key elements that most of the companies who are offering these services put forward, because they do know almost everyone would ask about support.*

I: *So you're not worried that you could wait for a day or two for them to sort a certain problem?*

GP3: *I think that'll perhaps come if the guys don't... if they don't have the capacity that they claim they have. For example, I'm thinking if they have quite a number of people... of people whom they are servicing and perhaps maybe around a certain area then they get these calls of people needing help, maybe one may then experience those delays. I really do not know, I really do not know.*

I: *But that would not prevent you from adopting one?*

GP3: *No, not unless it was a complaint that was coming up regularly whenever the guys... because as I am saying this is something that I know I needed to do for some time now, so I've been doing my homework, but I never actually got to do it.*

I: *Explain whether and how you think lack of [each of the factors below] affects the adoption of EMRs*

I: *Standardization*

GP3: *No, no, because what I found ...what I found, with the homework I did, is that they operate almost the same. The issue once again is more about the support system and also the price.*

I: *Learning time*

GP3: *That's where I have question marks. That's where I have the.... some of my fears.*

I: *Time during consultation*

GP3: *I didn't really think about that as a ... no. You see why I have some concern about my staff is, because like now, we don't do much, but the internet is available to them when they want to, but they... they hardly, they hardly make use of it and... and that lack of interest to me it makes me have some question marks... you know. It makes me have some question marks.*

I: *Communication*

GP3: *Mhhhh... I'm not sure... Wow! Ah... perhaps... perhaps maybe that's also contributing a little bit... to my answer that, because you see what happens is... what I found with the staff is... is... is over a period of time, there is a period of time where you'll really see them pleasing you, but there are also a lot of times where you'll really think I'm not sure about them now and that maybe 1 or 2 of them... periods or something like that. It's difficult really to say, but if it were to be now, I would really experience problems now, because communication at this stage is not that good. But if you were to ask me... I would say about 18 months ago, I would have been upbeat, so it's really where the issues are.*

I: *Incentives*

GP3: *[Puzzled look]*

I: *For instance, in certain countries GPs are offered money or some other incentive, just so as to encourage them to adopt EMRs*

GP3: *Is it? I was not even aware of that. I don't think it's happening in our..., but what the companies who are selling, renting these softwares, they try to maybe look for something that might attract you against the opposition. That's what I heard they do, but I really don't have knowledge about any*

other incentives really. I don't see that happening here in this country, because the fact that the government don't see us as helping in the system. In fact we are being seen in a negative way. That is why one of the problems we have with NHI is that they don't seem to know exactly what to do with us, whereas unfortunately, the NHI if you go to any other country, the GPs are the key. If you don't have them with you, you're not gonna run it. So I'm not exactly sure... their thinking there and... and... as such I don't see them getting to that level, not in the near future. Ja, not in the near future and the companies themselves as they... they... they in South Africa, including these companies dealing with these software, they always see GPs as cash cards. So they actually see us as people to suck money... you know... by all means.

***I:** Hardware*

***GP3:** No, because interestingly enough, both 2 companies that came to assess my system when I wanted quotes I have enough of the hardware already. I think including the... the... some of the software, I do have it already.*

***I:** Negative staff perceptions about using technology (EMR)*

***GP3:** Yes, they would need to go through a certain training. Of which all of them they are promising to do with the staff. No, they have never said anything... the staff, but I think it's more of the fears, because I never saw any enthusiasm. There's that fear that "Are we gonna be up to it or not?" That's the 1st thing, the 2nd thing is also, at the way I'm looking at it, as you can imagine, it means more time now working that seating down doing nothing. Because as you can imagine now, it's not gonna be a matter of "we are giving away a file and then entering the drugs", which they do at their own leisure time.*

***I:** Patient views*

***GP3:** No, I really do not think so... I really do not think so. Some... some… another advantage that perhaps, maybe, would be that for example it goes with updating drug lists and the drug nature. That helps a lot, because one would be able to time and again, check and know the price of the drug. Because, unfortunately, they increase others on a monthly basis, believe it or not. That's the 1st thing, the 2nd thing is also the fact that when I complete that claim without prices, those prices get filled in by the lady when she is doing the claim, before they go away. So that means then.... I almost always don't have an idea, until I get the monthly report as to claims of the month that I have made.*

***I:** Any other factor that has not been covered?*

***GP3:** In my case in particular? Mhhh… No, no, except as I was saying, the issue of the… the price and running with it smoothly. Even though I did at some stage think that perhaps if I were to…you know maybe start slowly… Maybe take 1 or 2 medical aids that would be...*

***I:** Should an unforeseen tragic event occur, such as fire, a flood, etc., what disaster discovery plan do you have in place for your patient medical information for the current paper-based system? Please explain.*

***GP3:** [Laughs] It's gonna sound strange, I don't at the present moment have it. I had it, in the sense that what I was doing was that… I would ask the ladies every end of the day, that each of them*

have their USBs which they just update. Interestingly enough, I stopped that and perhaps even with them... they never even bothered to remind me, for reasons that are not clear to me. Ja, otherwise I would really be in trouble, yes I do have insurance covers for such a thing, but for the information itself, no.

I: *Is information backup a concern for you in the electronic environment?*

GP3: *[Shakes his head]*

I: *Why?*

GP3: *I think with the systems, that's one of the things that they use is a backup system, so that your information is not lost.*

I: *Can you please explain the single biggest concern you have about using EMRs?*

GP3: *I think it's… some of these companies, because one would rely on them, if anything goes wrong with them, that means one is in trouble. I think that is the biggest concern, which you have just asked me about. By the way, now that I am thinking about it, the other advantage even with me would be the fact that my claims lady is not here, so even if something happens here, I won't lose to those who are owing me. You know what I am saying, I would lose the information in terms of the files, but I won't lose in terms of the claim, yes, because that won't be here. And then that would also mean that when one does everything here, that perhaps would mean the papers would have to be kept away from here.*

 # End of interview 3 #

Interview 4 of 4

Participant ID = GP4

Participant type = General Practitioner from the 4th practice

Interviewer ID = I

Interview date = 10th of June 2012

Location = Njoli, Port Elizabeth

Transcriber = Melissa Masiza

 # Start of interview 4 #

I: *Describe the flow of a typical consultation*

GP4: *Ah… Unlike in other practices we don't follow… we don't see them by appointment. They just come… they just come in and then sit on the queue, if there is a queue, and then we see them as they come. And then go into the consulting room; we take history, get the problem entities and then treat, come up with medication, because we do dispense.*

I: *When and where do you capture encounter notes?*

GP4: *Uh… they… they… they... they tell you the problem and then you keep it in mind, what the problem is and then you ask relevant questions; and then you examine. And then you… I only… I only write down the positives, the positive points if someone has got a temperature... or the positive findings. For me that's what is important and then I dispense and then that's actually what I capture and write on the folder.*

I: *So you capture all those findings on the actual patient folder?*

GP4: *Ja, the positive findings. You don't write that "I... I checked the chest, the chest is fine. I check the ancronious..." You write what is wrong. If there were tonsils, if there was a temperature... you only write those things.*

I: *What do you like about your current system?*

GP4: *This system…? The paper-based? The fact that I write on the folder… all that? You can… you know when they come in and… for the next consultation, you are able to see and view, on my way to the consulting room, his past when... when he came in the past, what was his problem. So you get to... you... you can as well ask if you want, just to make him at ease, him or her, at ease. Ask how was the last consultation... whether you got him proculented off.*

I: *What do you dislike about your current system?*

GP4: *Ah… Maybe with my system, with my system here is that sometimes… Ah… eh… eh… files, they say they don't see the folder. I'm not sure whether it is my filing system or not and yet the patient was here in the past, but the file is not seen. [When such a case crops up then what do you do? Do you create a new file or what happens?] You know my staff, I've got old staff and I've got new*

staff. I've got part-timers and new staff. I know if I don't find the file over the weekend, tomorrow when my... when [name omitted] comes, she's one of the old. She's been with me since I started, she'll find the file.

***I:** Anything else you can think of, besides the difficulty in finding files?*

***GP4:** Uh no... Sometimes you run out of files and.... especially me, I use the A5 and most majority of the practices use the A4 size files. A5 files, I like them, because they are smaller. Problem is... sometimes they run out where we get them and we don't easily get them from Walton's and all these stationeries, so we have to order in good time. So maybe sooner or later, I'll run out of my A5 files.*

***I:** On a scale of 1 to 5, where 1 is completely dissatisfied and 5 is extremely satisfied, what would you say your overall satisfaction is with your system?*

***GP4:** 3, because it has its problems, it has its advantages.*

***I:** Describe the role any of your computer based systems play while the patient is here for a consultation.*

***GP4:** At least I know my filing is by Alcovet and then sometimes whilst they are still struggling to get the file, the patient is on medical aid and was on our system, computer system, we can see the number attached on that folder and it will be easier when they are checking. If they can't find it eh, eh, eh... on the right place on the alphabet, they can check because they've got numbers sticking out. So they can easily identify the number in case its misplaced. [So what you basically use it for is for the purpose of a medical aid and also for tracking the different folders] And also for checking if we were paid in the past or we've got any outstanding debts on the safe. Maybe his coming and his got a 60 day account on the system and that is not written on the folder, but on the computer it's reflecting. We don't have to continue seeing him and yet his medical aid is not paying us.*

***I:** Have you thought of or have you investigated the option of adopting an EMR in your practice?*

***GP4:** Adopting what?*

***I:** Electronic Medical Record*

***GP4:** Oh I've heard there is such a system maybe overseas going on and the NHI system and… maybe even you guys now you are just doing an investigation about that. It's gonna have its advantages and disadvantages. I… think, but its fine if its paper-less and we don't have to ask... you know there is something common with patients, especially the elderly patients, somebody knows that his hypertensive and his diabetic and yet he'll consult without carrying anything and he doesn't know all his medication his taking and his medication that he'll be taking for the rest of his life and he doesn't know the names!*

***I:** Please explain briefly why your practice does not use an EMR based on what is applicable from the following:*

***GP4:** I'm in a township… If I understand you well, by electronic medical records that would mean me seating there with the computer and when he comes in and all the information punching in right in*

front of... in front of him in the computer? You know is... there is still that element of not being safe in the township. He'll come today as a patient, you don't know when his left, what he'll be thinking. Thinking my having that laptop is money. Telling his friends to come and grab the laptop here. That's a disadvantage. Eh... and also, I'm not eh... you know you don't want to be distracted when consulting. You don't want to take your eye contact away from the patient... you jotting down or typing down somethings whilst his telling you his story and all of that. You want to give as if concentrated and listening to him attentively. So, there are times that, even on these paper records, you don't even write. You just keep everything in mind and you write everything when he has left.

***I:** Initial Cost*

***GP4:** Eh... I think the issue of security and safety here is... even with iPads coming in, you can point and write with them something..., but you, you, you... I don't think... It's not money. Money is not an issue; you can have those things and type when they are gone electronically. If everybody can do it, we'll do it as well.*

***I:** On-going Cost*

***GP4:** No, I don't think that will be a problem. I think even when we are electronically; I'll have to operate the same way. Ah... I would rather consult... eh... and not leave the eye-contact and rather ah, ah, ah... go electronical way when the patient is gone, to type all that information. Not immediately while the patient is here, I'll be typing and all that.*

***I:** Regulations*

***GP4:** As long as it's housed, as long as it will be available when needed, I don't think there will be an intervene with any law. As long as it will be found when it's needed, there's no crashing of some hard drives and all that and information loss. If that can be secured, then there wouldn't be any problem.*

***I:** Change requirements*

***GP4:** I'll motivate for the changes, to make it suit the way that I'd like it to operate.*

***I:** Does availability of maintenance support or lack thereof have an impact on the operation of your current system? How big of a problem would this be if you had to use an EMR?*

***GP4:** I do get support, I do get support. Even now, the fact that they don't have to physically come here... they can log in on the computer when there is a virus or we are stuck on the computer. Something else is backups... they are available all the time. As long as they'll be available online. I mean electronically, just like the guys who support me now electronically, that will not be a problem.*

***I:** Explain whether and how you think lack of [each of the factors below] affects the adoption of EMRs*

***I:** Standardization e.g. EMR service provider going bankrupt*

***GP4:** Ja, but do you think... I think that'll have to be signed from the start upfront as to what's going to happen, in case such a scenario [EMR service provider going bankrupt] occurs. I mean how... will I end-up losing all my records... patient records? Because I'll remain here even when they can be*

bankrupt, I'll be here. It's like when the practice, I'm no longer here. The doctor's leave, but the practice remains, the files they remain behind and doctors, they change. So they must not go bankrupt with our files and medical files.

I: *Learning time*

GP4: *I don't think so... eh... they learn, since I've started practicing... for the past 18 years, we've gone through 3 or 4 different kinds of medical softwares here and we all learn. Because there was EDI, there was another one in the past, now I've forgotten the name... but they change names.*

I: *Time during consultation*

GP4: *Maybe in the… in the beginning, because we were.... we won't be... we'll have to get used to it 1st and then we'll catch up. There will be some, definitely some delay initially, yes, but thereafter as we get used, we'll catch up.*

I: *Communication*

GP4: *Eh, it will... it will... I think... you mean having to remind patients with SMS and all that? That will be fine, but people they change cellphones. They change cellphones, eh, but that would be fine. I thought you were going to ask me in terms of... with other doctors. Communicating with other doctors, getting information and also when you are stuck and you have problems... you can check how... if the same patient was treated by another doctor with the same problem... How was he approached or how was he treated? That would help, the past medical history, how he was treated. And you can see on record if the patient has ulcers and is being given by other doctors this item and he keeps on getting this and this and he's not getting help, then it's time to try something else and not the same medication*

I: *Management Support*

GP4: *I should be, at least as the manager, I should be a bit clearer. I should be able to know it better than them. Give them advice, eh... I mean they look up to me when they are stuck, to be able to solve their problem.*

I: *So you would be able to provide them with support?*

GP4: *Yes.*

I: *Incentives*

GP4: *Eh...If I get paid? No, I'll have to look on my side, if it's helping me. Helping me see patients faster, at a faster rate. Its helping me access more information that helps me with my treatment of these patients and it helps my staff work faster and better and also at the same time, it improves their computer skills and all that. I'd be fine.*

I: *Hardware*

GP4: *Ah...We'd have to get used to it. Even if they send us iPads or laptops, eh, eh, I would use it, but the fact that there is crime here... it's not going to change, because having laptops here and these youngsters knowing there's laptops here, it will put our lives at risk.*

I: *But the fact that you would have to buy that hardware would not be a problem for you... financially?*

GP4: *No, no, but somebody lending me those things... it would put me at ease. Even if they could come, I could easily give them up and not resist.*

I: *You prefer to have them leased or rented to you instead of buying them?*

GP4: *Mhhmhh [Yes].*

I: *Negative staff perceptions about using technology (EMR)*

GP4: *I think they would appreciate it, because I see... sometimes we... you know when the time comes, when we have to change computers, ah… usually I keep a faster computer in my office than them. They always look forward to taking this one and me getting a new one. So they look forward to getting new staff, especially when it comes to computers.*

I: *So they aren't scared of learning something new?*

GP4: *No.*

I: *Staff knowledge*

GP4: *They are learning; they are willing to learn, they are not completely illiterate, so they quickly know.*

I: *Patient views*

GP4: *Ah... You see old people, and unfortunately we work in the township... some of them are not that literate, so eh, eh, eh, I don't think they care much as long as their information is kept. Especially if somebody has been here, they would like you to see that his been here or perhaps remember him that he was here. They get impressed when you tell them... you seem to remember and yet you have seen that on the file that he was here. So this and then the... now having to see you recall that he was here with a flu in the past, it's as if you've kept all that in your mind.*

I: *So they like to have a personal relationship in a way?*

GP4: *[Nods]*

I: *Any other factor that has not been covered?*

GP4: *The confidentiality part these days. Sometimes you know a patient, eh… is a… Let's say I'm a female doctor and you are a female patient and now there is that other doctor that you have seen, that you have confided all your information. Now coming to this doctor, now you... you... you'll be terrified to know that this doctor knows that there is something that I didn't reveal that I revealed to that other doctor. You know patients... they see you and they assess and see if they'll be comfortable telling you everything. They'll tell... they'll be open to this other doctor about their HIV status, because they see you and they know that you are in their family, you are related to whomever, they won't be comfortable telling you their HIV status. And yet now, when they learn that you have managed to pick that up electronically, I don't think they'll like it.*

I: *Should an unforeseen tragic event occur, such as fire, a flood, etc., what disaster discovery plan do you have in place for your patient medical information for the current paper-based system? Please explain.*

GP4: *You will… there's, there's electronic backups here. I suppose my information is backed somewhere... electronically, it's not here. In the past I was... we used to have memory sticks and CDs and backup and go home with them and now everything is done via internet, spontaneously. There is backups on these computer. I think such a system would have to have such a kind of thing actually. For now, what are we backing up? We are backing up what's in the software, the medical aid, and patient names and their contacts, ah... medical aids, what we've claimed and what they've paid and all that. That's what we backup, but we are not backing up their folders, their medical history... Although that can come up from the software, but it's a short... its short. It won't have everything. I've got patients since 1994, 95 folders here, they are in the folders, but because we've been changing systems and software, ah... the information we have it goes with the software. In terms of electronically now there is..., ok well it goes up to 1999, the information I have now on the computers... with patients. But in the folders and drawers it goes up to since we started. I won't have any recovery if there is fire here, that information is lost.*

I: *Is information backup a concern for you in the electronic environment?*

GP4: *Yes*

I: *Why?*

GP4: *Because you have to keep information.*

I: *Can you please explain the single biggest concern you have about using EMRs?*

GP4: Really that… but it will come with advantages, it will come with disadvantages. Ah... Advantages to the doctor, the fact that you'll be able to see this patient's past medical history; that medical history management and they don't have to be carrying their files around. That would help you as a doctor, on the other hand you will get into information that... it will excite you as the doctor, but you don't know if it will excite the patient as well. It will be known that I had this in the past; I was treated for this in the past. Ah... It will have advantages and disadvantages. Some will be happy that you know that he's a diabetic... getting this treatment. Others will be embarrassed, if you get to know that he was treated for this psychiatric illness, he was treated for this sexually transmitted disease in the past. Maybe he is with you with his wife, and yet he went to that other doctor without the wife and was treated for an STD and all that he got somewhere. So that will be embarrassing... All those things.

 # End of interview 4 #

APPENDIX 8: EXPERT REVIEW (GP PARTICIPANTS) - FACTORS

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26 October 2012

Ref: H11-Eng-ITe-008

EXPERT REVIEW

FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

This is to request your involvement as a reviewer for my findings. I am required to seek two GP participants to provide their input prior to their production of the final findings of this research. The reviews will assist in the validation of the formulated socio-technical factors. These factors emerged through conducting a research survey within selected General Practices in the Nelson Mandela Metropolitan area. Once I receive reviews, the suggested amendments will be incorporated in the final findings of this research.

Being a reviewer means you will inspect the formulated potential factors, not as an examiner, but as an expert in your field. The factors will be provided to you in writing. So as to not consume too much of your time, you will only be expected to tick off factors that you agree with. However, you are kindly asked to write a comment for factors that you disagree with. The factors will be provided to you as a printout (attached) and an electronic copy (via email). If you prefer to comment on hard-copy, I will collect the document from your practice. Otherwise, if electronic is preferred, you can send them via email.

If you accept the request, kindly sign below:

Kind Regards
Melissa Masiza (Researcher)

I, the undersigned, agree to be an expert reviewer:

SIGNATURE: …… **DATE: ……**

FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Communication The healthcare providers perceived lack of communication, between themselves and the staff, as a potential challenge to the adoption and meaningful use of EMRs. Though there was an indication that communication was not constantly suffering, it was apparent it is worth noting as a possible factor.		
Qualified staff The lack of high qualifications from staff already employed by a General Practice was perceived to be problematic when adopting EMRs in a practice. It was evident that there was a lack of confidence in the potential contribution of under qualified staff to the desired smooth transition from using a paper-based system to using an EMR. This lack of confidence could affect the adopting and meaningful use of an EMR in the practice.		
Staff motivation Practice owners feel that their staff lacks motivation, as they do not get satisfactory monetary compensation from their job. So practice owners doubt their willingness and commitment to learn when faced with new technology. Though practice owners are compassionate towards their staff, they lack the funds to increase their salaries. This compassion could make practice owners reluctant to require more from their staff, therefore affecting the adoption and meaningful use of EMRs.		

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FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
GP-Patient relationship There exists a perception that the use of an EMR could strain the relationship between a GP and a patient. GPs are of the opinion that their interaction with an electronic system during a consultation could distract them. They believe this distraction could result in the patient doubting the attentiveness of the GP. This perception could affect the adoption and potential meaningful use of EMRs.		
Incentives The lack of incentives could affect the adoption and meaningful use of EMRs. There was an indication that if practice owners were offered monetary or other benefit as motivation, this could affect adoption of EMRs. However, there was no indication of an awareness of such incentives in terms of EMRs.		
Government subsidization It was evident that the lack of government subsidies when adopting an EMR affects the adoption and potential meaningful use of EMRs. This lack of government subsidy was linked to the absence of government involvement in providing a national direction and thus promoting the adoption of EMRs. Lack of the government involvement could negatively affect the adoption and meaningful use of EMRs in General Practices.		
Service provider continuity Depending on an external party is one of the fears that transpired from probing the GPs about EMRs. Since GPs are used to having complete control over the patient medical records that they use to offer services to a patient, fear of relying on a third party for the availability of a patient record, could have an impact on the adoption and meaningful use of EMRs in General Practices.		

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FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Ease of use It is important for an EMR to be user-oriented, so as to ensure that healthcare providers find it easy to use and adapt to an EMR. This is especially true considering that healthcare providers with previous storage medium experience, paper-based or electronic system, will have an instant benchmark to use when comparing an EMR. This could potentially affect the adoption and meaningful use of EMRs.		
Fear of the unknown Lack of familiarity was cited as one of the factors that affect the adoption and meaningful use of EMRs by GPs. Though all the participating practices had a computer and/or a laptop, with applications such as Excel and/or billing applications, they were extensive paper-based system users. Adopting an EMR and meaningfully using it would mean completely abandoning the use of a paper-based system to store patient clinical data and leaping into unfamiliar ground. It is this leap that introduces a stumbling block for healthcare providers, which is the fear of the unknown. The GPs were of the opinion that this fear also haunted their admin staff.		
Management knowledge The deficiency of management knowledge about an EMR could affect the adoption and meaningful use of an EMR within the practice. According to the experience of healthcare providers, lack of knowledge in newly introduced technology within the practice, places practice owners in an unfortunate position. This position results in practice owners lacking the ability to provide support or assistance to the practice staff.		

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FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Learning time One of the factors that could affect the adoption and meaningful use of EMRs is the perception, amongst healthcare providers, that the actual time that it could take staff to learn the system might be too great. This perception makes healthcare providers undecided and thus reluctant to adopt EMRs. This reluctance could also challenge the meaningful use of an EMR, if a practice does adopt this system.		
EMR Awareness In the participating General Practices a healthcare provider also acted as the General Practice owner as well as the key decision-maker. Having decision makers unaware of the existence of EMRs as well as the benefits they offer could affect the adoption of EMRs. Merely providing an awareness of the existence of EMRs to decision makers is not sufficient. They need to view and interact with EMRs in the market for them to be attentive to EMRs enough to at least adopt and potentially meaningfully use an EMR.		
Negative staff perceptions GPs view the practice administrative staff as holding negative perceptions towards the use of EMRs in the practice. This is fuelled by the suspicion that the admin staff perceives the introduction of an EMR to demand more working time from them and thus less free time. GPs also believe that admin staff perceive an EMR to enforce stricter structure in terms of the when they carry out tasks. These perceptions could affect the adoption and potential meaningful use of EMRs a General Practice.		

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FACTORS AFFECTING THE ADOPTION AND MEANINGFUL USE OF ELECTRONIC MEDICAL RECORDS IN GENERAL PRACTICES

FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Staff knowledge The lack of enthusiasm from admin staff to gain knowledge about technology, so as to adapt to new technology, renders GPs doubtful about whether the admin staff would show interest and thus acquire the knowledge required to adopt and meaningfully use EMRs. This lack of interest to gain knowledge could affect the adoption and potential meaningful use of EMRs.		
Backup GPs showed concern about the unavailability of important data should an unforeseen event occur. It was apparent that GPs need assurance that information will be available when required and backups will be done without them having to deal with extra applications. The absence of an assurance of that nature could affect the adoption and potential meaningful use of EMRs in a practice.		
Finances The financial status of a General Practice could affect the adoption and meaningful use of EMRs. This is especially true since small General Practices tend to lack financial freedom. Practice owners are of the opinion that the adoption of EMRs could place them under financial strain based on perceived EMR financial demands. These owners perceive these demands to include the costs of human resources (hiring and training of staff); initial implementation; and operational costs. There was also a desire to integrate an EMR with an existing computer based system so as to centralize costs. The availability of an option to centralize costs, or lack thereof, could affect the adoption and meaningful use of EMRs.		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Office suitability GP participants indicated concern about the suitability of EMR hardware to the internal environment of a General Practice. Smaller hardware seemed to be the ideal preference, over larger hardware that could prove challenging to their working desk space limitations. There was also an indication that the GP participants are sometimes required to move between rooms when consulting with a patient. Therefore acquiring larger hardware would restrict a GPs movement and thus interfere with their job. It was thus apparent that this suitability concern could affect the potential adoption and meaningful use of an EMR in a practice.		
Maintenance support GP participants who had experience with the use of a computerized system billing system in their practice were exposed to either satisfactory or unsatisfactory technical support from the service provider of such systems. This experience could influence their perceptions on the availability of technical support when using an electronic system such as an EMR. Failure to acknowledge these perceptions and thus find means to reassure GPs, could affect the adoption and meaningful use of EMRs.		
Hardware Practice owners perceived that adopting an EMR would require the acquisition and maintenance of hardware. However, it became apparent that sometimes practice owners do not need to acquire hardware, as they are able to use hardware that was already in use at the practice. Thus practice owners need to be made aware exact hardware requirements, so as to prevent them from basing decisions on assumptions. Otherwise these assumptions have the potential to affect the adoption and meaningful		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
use of EMRs.		
Software and hardware ownership There was an indication of doubt in terms of who would be the owner of the hardware and/or software that the practice would use, when adopting EMRs. If not clarified, these doubts could potentially affect the adoption and meaningful use of EMRs in General Practices.		
System integration There was an indication of the desire to integrate an EMR with an existing computer based system in the General Practice. The availability of this option, or lack thereof, could affect the adoption and meaningful use of EMRs.		
System reliability From the data collected from GP participants it became clear that the participants perceived that losing data, due to unreliability of software, hardware and power, was a challenge that they could face when adopting an EMR. Thus in order to prevent such a perception from affecting the adoption and meaningful use of EMRs, GPs would need to be reassured the existence of mechanisms that could prevent or minimize the chances of such a loss.		
Consultation time Healthcare providers were found to be of the perception that consultation time might be affected by the introduction of EMRs into the consultation room, thus leading to longer consultation times. This perception could be brought on by the thought that not		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
only will a healthcare provider have to carry out the normal tasks required by a consultation, but whilst performing these tasks they will be required to accommodate new technology, thus slowing down the consultation process. Though there was also an indication that the perceived extra time would only be experienced during the initial stages of adoption, the negativity around the added consultation time cannot be completely disregarded. Disregarding this could be an error, since it could affect the adoption and meaningful use of EMRs in General Practices.		
Crime Crime prevalence in the locations, in which some General Practices are situated, seems to affect the adoption and potential meaningful use of EMRs. There was an indication of fear of crime from GP participants. This fear was founded on the perception that using an EMR, during a consultation, could expose electronic equipment, such as a laptop, to a patient. This exposition of this kind of equipment could attract criminals and thus threaten the safekeeping of the equipment within the practice including potentially threaten the lives of all individuals within the premises of that General Practice.		
Standards Lack of standardization seemed to be a concern amongst GP participants. As they might at times need an EMR to share information between themselves and other service providers. This concern could possibly affect the adoption and potential meaningful use of EMRs in General Practices.		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Change requirements There was an indication from GP participants that as a requirement, EMRs need to offer the flexibility to additional fields that the particular General Practice sees fit. An assurance, as to whether an EMR is able to accommodate such changes, would need to be defined. In so doing, this could potentially prevent such uncertainties from negatively affecting the adoption and meaningful use of EMRs.		
System security and privacy It was apparent from probing GP participants that there is a need for security assurance, since there was a concern that the security and privacy of an electronic medical record could be vulnerable to unauthorized users, such as hackers. Such security concerns need to be addressed; to prevent them from negatively affecting the adoption and meaningful use of EMRs in General Practices.		
Patient confidentiality Practice owners are skeptical to adopt an EMR without the assurance that patient confidentiality will be maintained. The doubt of whether such a guarantee could be granted by the EMR service providers could affect the adoption and meaningful use of EMRs. This is due to the fear of their patients taking legal actions against them, should their confidentiality be bridged, either by an external unauthorized user or someone internal within the practice (including the GP).		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
Patient views (GP concerns) The views of patients that visit a practice have potential to affect the adoption and meaningful use of EMRs. This is due to the fact that within a practice there could be educated and uneducated patients. The educated patients are perceived to welcome and appreciate the use of an EMR, however uneducated patients are perceived to not care or value the introduction of this new technology. If a practice finds itself to be mostly catering to uneducated patients, the decision maker could overlook the value that could be added by the use of an EMR. Additionally GPs perceive that the use of an EMR could make information available to them that could displease a patient. Therefore patient views could potentially affect the adoption and potential meaningful use of EMRs in a General Practice.		
Patient Perceptions The perceptions that patient participants held in relation to an electronic storage medium could have an influence on the adoption and meaningful use of electronic medical records in a practice. Though patients are not direct decision makers, they are consumers of a service provided by the General Practices; hence they could have an influence on how the service is provided. Therefore attention needs to be given to the following patient perceptions to ensure that their influence is positive:		
❖ **Patient confidentiality** Since some patient participants perceived that the use of an electronic medical record would compromise the confidentiality of their information, patients with similar concerns would need to be assured otherwise in order for them to be open to EMRs. Furthermore utilizing their confidentiality concerns, linked to the use of a paper-based		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
system, to promote the transition to EMRs could potentially have a positive effect on the adoption and meaningful use of EMRs in General Practices.		
❖ **Fear of the unknown** Due to the number of years that the patient participants were subjected to the use of a paper-based system, there was a certain level of comfort that was brought on by the "familiarity" of this storage medium. Hence, some of these patient participants feared changing to another storage medium. Since aspects such as record accessibility were found to be seen in a positive light by some patient participants, this could mean that patients are familiar with technology in general, e.g. mobile devices. Therefore using the positive aspects that patients know or associate with technology, could potentially "bridge" the familiarity gap to a certain extent and thus eliminate part of their fears.		
❖ **Computer literacy** Lack of computer literacy is one of the concerns that arose from this research. It is possible that this concern was routed in the perception that the use of an EMR, in a General Practice, would require patients to directly interact with an EMR in order to access elements that are part of service afforded to them. Patients might have to be reassured that their lack of computer literacy will not obstruct the service or quality of care that is provided to them by the practice.		
❖ **System availability and reliability** Some patient participants feared that the use of an electronic medical record might hinder availability of their record. This was due to the perceived lack of availability and reliability of an electronic medical record in cases such as loss of power. Thus patients need to be reassured that the practice will have "Plan B" in place should such events		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
occur, e.g. automated backup generators, etc.		
❖ **Record safety** Some patient participants were of the perception that their record could get lost when stored in an electronic storage medium. Though some patient participants indicated the same concern about a paper-based practice, it is important to find a way to assure patients that the chances of their record getting lost in an electronic record are minimal. Failure to do this could affect the adoption and potential meaningful use of EMRs in a General Practice.		
❖ **System security and privacy** Though patient participants lacked knowledge about the security risks posed by the use of a paper-based system on their privacy, some patient participants seemed to be attentive of the built-in security and privacy mechanisms that are available in an electronic record. However, there is a need for awareness and assurance, since some patient participants perceived that the security and privacy of an electronic medical record could be vulnerable to unauthorized users, such as hackers. It is also important to take into account that, in this research, the EMR security category had the most concerns in comparison with the other categories.		
❖ **Waiting time** Since some patient participants were of the perception that using an electronic medical record would equate to longer waiting times, this could negatively influence their views on EMRs and thus possibly have a negative effect on the adoption and meaningful use of EMRs. However, some patient participants perceived that record retrieval amongst other tasks could be faster. This could be used to relate to them how the fastness of		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
tasks could lessen the perceived waiting time.		
Patient Knowledge Patient participants lacked knowledge and awareness about the flaws of a paper-based system and the strengths of electronic medical records. Unfortunately, this lack of awareness possibly influenced their views about the current paper-based system and also possibly influenced their perceptions about electronic medical records. Though patients are not direct decision makers, they are consumers of a service provided by the General Practices; hence their lack of knowledge could have an influence on how the service is provided. The following are areas in which patient participants lacked knowledge:		
❖ **Complete medical history** The impression that a paper-based system accommodates their complete medical history was one that a number of patient participants seemed to be under. These participants seemed to be unaware of the fact that the use of a paper-based system, at times results in the partial recording of complete clinical notes; therefore challenging the completeness of their medical history. Few patient participants indicated awareness of the fact that an electronic medical record could be used to combat this challenge.		
❖ **Continuity of care** As depicted in the empirical results of this research, a large number of patient participants consulted with more than one GP. This challenges continuity of care, as GPs use paper-based systems to store the patient medical record, therefore making sharing this information difficult. Few patients think that far, when it comes to their patient records, therefore there is a need for awareness.		
❖ **Diagnosis and treatment** The concern launched by the perception, of patient participants, that storing their information in an electronic medical record would make their records prone to errors		

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FACTOR	ACCEPT (√)	COMMENT (ONLY FOR REJECTED FACTORS)
and mix-up patient records needs to be addressed, if not it could affect the adoption and potential meaningful use of EMRs in General Practices. Especially since some patient participants feared this could result in misdiagnosis and treatment.		
❖ **Quality of care** It was evident from the results of this research that the patient participants lacked knowledge about the impact the use of a paper-based system can have on the quality of care they receive from a General Practice. Since previous research disagrees with this sentiment, patients need to be educated or made aware of the reasons behind this disagreement; as well as the positive impact that use of an electronic medical record could have on the quality of care they are afforded.		
❖ **Eco-friendliness** The results of this research indicated low awareness about the negative impact a paper-based system can have on the environment. Though, a few patient participants illustrated the perception that using an electronic system could have a positive impact on the environment, this was not a significant number of patient participants. Thus, patients need to be educated about this.		

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APPENDIX 9: PAPER

(The following paper has been submitted for review to MedInfo)

Patients prefer electronic medical records – fact or fiction?

Melissa Masiza[a], Nicky Mostert-Phipps[a], Dalenca Pottas[a]

[a] *School of ICT, Department of IT, Nelson Mandela Metropolitan University*

Abstract

Incomplete patient medical history compromises the quality of care provided to a patient while well-kept, adequate patient medical records are central to the provision of good quality of care. According to research, patients have the right to contribute to decision-making affecting their health. Hence, the researchers investigated their views regarding a paper-based system and an electronic medical record (EMR). An explorative approach was used in conducting a survey within selected general practices in the Nelson Mandela Metropole. The majority of participants thought that the use of a paper-based system had no negative impact on their health. Participants expressed concerns relating to the confidentiality of their medical records with both storage mediums. The majority of participants indicated they prefer their GP to computerize their consultation details. The main aim of this research was to investigate the storage medium of preference for patients and the reasons for their preference. Overall, 48% of the 85 participants selected EMRs as their preferred storage medium and the reasons for their preference were also uncovered.

Keywords:

Electronic medical records, EMR, patient preference, Nelson Mandela Metropole, South Africa.

Introduction

Incomplete patient medical history compromises the quality of care provided to a patient [1]. Well-kept, adequate patient medical records are central to the provision of good quality of care [2]. This substantiates the importance of patient medical records. In modern society, patients have the option to move around from one healthcare provider to the next. This poses a challenge to achieving continuity of care, since the medical history of a patient is vulnerable to defragmentation [3]. Should these records be stored in a paper-based system or in an electronic medical record (EMR)? Do patients have a say in the decision? According to the South African Patient Rights Charter [4], "everyone has the right to participate in decision-making on matters affecting one's health". Since there are "clinical benefits" associated with continuity of care [5], it is important that patient views be considered when healthcare providers decide on a storage medium to store patient medical history. However, in the South African context, limited research has been conducted to establish the storage medium patients prefer to be used when storing their health records, and it clearly is important to know what the patient views are.

For this reason, the researchers investigated these views. Surveys were conducted within private general practices in the Nelson Mandela Metropole. The research is of an explorative nature, with the surveys using small samples. Patient participants were asked to state the storage medium they prefer. It was also important to the researchers to find the reasons why a storage medium is preferred. This was established by posing questions that further probed the participants for reasons. Eighty-five patient participants were reached, in their general practice environment, via the use of questionnaires. The collected data was analysed by use of conventional methods of content analysis. This article presents the results regarding which storage medium the participants preferred. The transpired reasons behind their preference are collectively formulated and presented in a tabular format.

Materials and Methods

An explorative approach was used in conducting surveys within selected general practices. The practices were selected using convenience and purposive sampling. Convenience sampling ensured that the practices were within reasonable reach to the researchers. Purposive sampling ensured that the selected practices met the requirements of the research. The selected practices, under study, had to be private general practices that are not part of a group practice.

Permission had to be sought from the practice owner of each practice, to conduct the research. Fifteen general practices were contacted, but only 4 were identified as interested participants. None of

the participating practices used an EMR to store patient medical records. Qualitative data collection methods were used to collect the data. Hence, questionnaires were placed in each practice, once permission had been granted. The administrative staff was asked to hand out the questionnaires to the patients when, entering the practice, they approached the front desk. The researchers made it clear that the patients were to be made aware that they were not obligated to participate in the research. However, the researchers also ensured that this was communicated to the participants in the actual questionnaire. A total of 85 of 140 questionnaires were received from the participating general practices, resulting in a 61% response rate. Conventional content analysis was used to analyse the collected data. Ethical approval was received from the NMMU Ethics Committee before the research proceeded.

Findings

Demographic Profile

The demographic profile of the 85 patient participants reveals that 68.2% are female, 28.2% are male and 3.5% of the participants did not specify their gender. The ages of the participants are distributed as: 18-24 years (17%), 25-34 years (29%), 35-44 years (26%), 45-54 years (13%), 55-64 years (9%), 65+ years (1%) and unknown (5%). Therefore the majority of the participants are between 25 and 34 years old. Only 9.4% of the participants were visiting the general practice for the first time, on the day they completed the questionnaire. Fifty per cent of the participants had been visiting, the practice in question, for more than four years. The rest of the participants had visited the practice as follows: < 1 year (13%), 1-2 years (15%), 3-4 years (9%) and unknown (13%).

The home language distribution of participants was Xhosa (60%), English (24.7%), Afrikaans (9.4%), Zulu (2.3%) and unknown (3.5%) The education profile of participants was Grade 9/Adult Basic Education (4.7%), Grade 12 (28.2%), Certificate/Diploma (35.2%), Bachelor's degree (14.1%), postgraduate degree (8.2) and unknown (9.4%).

Continuity of Care

It was revealed that almost half of the participants (47%) see more than one GP, whilst 51% see only one (1) GP. Two percent of the participants did not complete the question. This makes achieving continuity of care difficult, because their medical information is fragmented between the information systems of the GPs they visit. Continuity of care can be defined as the intersection of three aspects: interpersonal, informational and longitudinal continuity [6]. Interpersonal and longitudinal continuity are, therefore, challenging to achieve. Thus, there is a need for solid informational continuity, to ensure that the storage medium used has a minimum negative impact on the quality of care the patients receive.

Impact on Quality of Care

The researchers wished to establish whether the participants viewed the use of a paper-based information storage system as negatively impacting the quality of care provided to them. It was rather thought-provoking to discover that the majority of participants thought that the use of a paper-based system had no negative impact on their potential health care, as 32% strongly disagreed and 46% disagreed when asked. This result is presented in Figure 1.

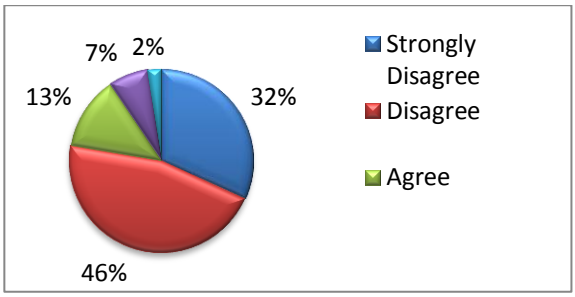

Figure 1: Perception of negative impact on the quality of care (paper-based system)

Tsai and Bond [7] seem to disagree, because they think that illegibility, incompleteness and poor organization linked to notes taken by hand, in the form of medical records, can make it difficult to guarantee quality of care.

Patient Confidentiality

There was a small difference of opinion between concerns of confidentiality for a paper-based system versus an electronic system. Of the participants, 14% (Strongly Agree) and 26% (Agree) expressed concerns about confidentiality with the use of a paper-based system to store their information, whereas 17% (Strongly Agree) and 27% (Agree) expressed concerns about confidentiality with the use of an electronic format. These results are presented in Figure 2 and Figure 3.

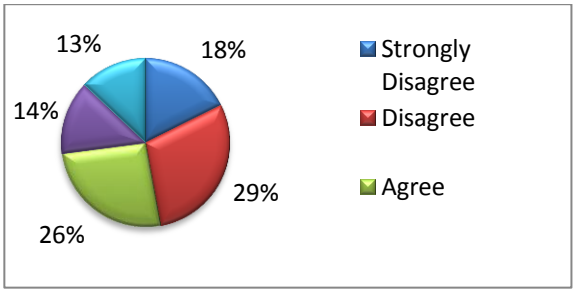

Figure 2: Perception of lack of information confidentiality (paper-based system)

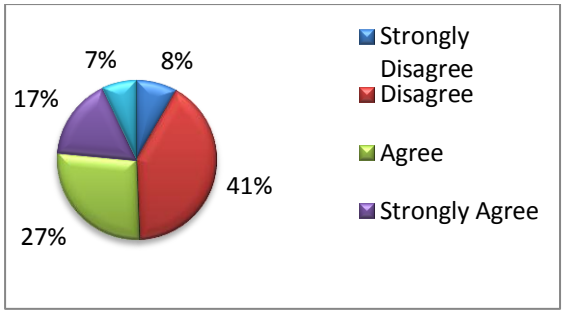

Figure 3: Perception of lack of information confidentiality (EMRs)

The system that is extensively used in each of the practices is a paper-based system. Hence it was interesting to find that patient participants displayed the same level of concerns about EMRs and paper-based systems.

Patient Storage Preferences

Forty per cent (Strongly Agree) and 17% (Agree) of the participants indicated they prefer their GP to use a computerized system to store their consultation details as presented in Figure 4.

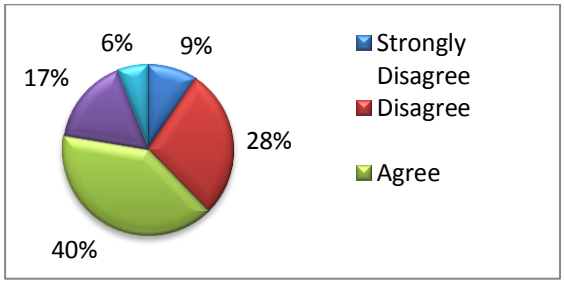

Figure 4: Perception that GP should use a computerised system

This corresponds with the 48% of participants who selected electronic medical records as their preferred storage medium, 8% indicated they preferred any of the two storage mediums while 27% preferred a paper-based storage medium and 17% of the participants did not specify their overall preferred storage medium on the questionnaires as presented in Figure 5.

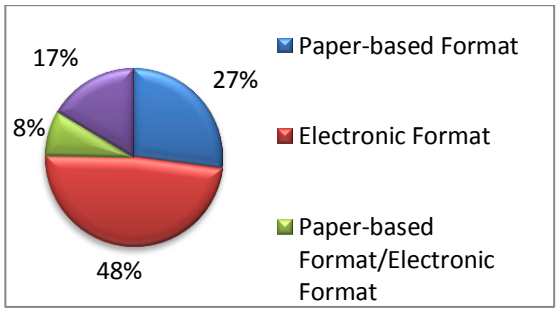

Figure 5: Overall storage medium preference

Discussion

It emerged that of the 85 participants, 27% preferred a paper-based system and 48% preferred EMRs. Prior to any conclusions on whether the patient participants preferred an EMR, it is important to further examine their reasoning. Therefore, this discussion focuses on trying to understand why the participants held their specific views about the two storage mediums, paper-based and electronic medical records.

The participants were provided with a comment field below each question in the questionnaire to acquire the qualitative data necessary to understand the reasoning behind the views of the participants. The researchers analysed this data using content analysis. Key phrases were, therefore, generated to understand why a specific storage medium was preferred. The categories that emerged from the key phrases are: clinical, environmental, social, security and technical as presented in Table I.

These categories, with key phrases, are listed in alphabetical order. No order of importance is implied. All the categories have columns which respectively represent the positive and negative aspects that the participants associated with the storage medium. Overlapping exists in certain positives and negatives.

The key phrases, within each category shown in Table I, are further discussed based on the gathered qualitative data (Note: the responses in italics the verbatim written comments by the participants):

Clinical category

Complete medical history: It was interesting to find participants who considered a paper-based folder as capable of accommodating their complete medical history, even though the physical build-up of such a file would make it difficult to manage.

"[Paper] that way you can record each detail."

Continuity of care: The researchers noted that of the participants (85), only 1.1% mentioned continuity of care as a perceived added benefit, should an EMR be adopted.

"... [EMR] easily accessible if need to consult with other doctors."

Correct diagnosis and treatment: It was disconcerting to find that some participants were under the impression that unlike a paper-based system, an EMR would provide the opportunity of incorrect diagnosis and treatment, due to the record of one of the patients getting mixed up with another patient record.

"... [Paper] can assist doctor to correctly diagnose and treat me accordingly."

"It [EMR] can be mixedup with another patient's file and I could get the wrong medication."

Quality of care: It was interesting to discover that most patients (32% Strongly Disagreed and 46% Disagreed) were of the view that the current information storage

medium used has no negative impact on the quality of care they receive.

"I think that storing my info in this manner [paper] has a positive impact."

Table 1: Likes and dislikes of paper-based system/an EMR (patient views)

Key phrase representing concept identified	Storage medium (Positive/Negative relationship)			
Clinical	**Paper**		**ER**	
Complete medical history	+		+	
Continuity of care			+	
Correct diagnosis and treatment	+			-
Quality of care	+	-	+	
Ecological	**Paper**		**ER**	
Costs			+	
Eco-friendliness		-	+	
Wide use			+	
Patient-doctor relationship	+		+	
Patient-other staff relationship	+			
Computer literacy	+			
Familiarity	+			
Human aspect	+			
Satisfaction	+			
Security	**Paper**		**ER**	
Confidentiality	+	-	+	-
Data capturing errors			+	
Computer distrust				-
Record integrity	+			
Record safety	+	-	+	-
System availability and reliability	+		+	-
System security and privacy		-	+	
Technical	**Paper**		**ER**	
Accessibility	+		+	
Backup	+		+	
Convenience	+		+	
Ease of use	+		+	
Efficiency	+		+	
Speed			+	
Less paper work			+	
Long-term storage			+	
Storage space			+	
Timeliness	+	-		-
Structured storage	+		+	
Question replication			+	
Total	**20**	**6**	**23**	**6**

Twenty per cent of the participants were in disagreement. However 2%, out of the 20%, gave contradictory justifications for their selection.

Ecological category

Costs: Interestingly, none of the participants referred to the costs that would be introduced by the use of an EMR, but rather distinguished cost reduction about the paper that would be used.

"…The use of computerised systems cuts down on paper costs"

Eco-friendliness: The researchers found it encouraging discovering participants who were aware of the impact a paper-based system has on the environment. Further research needs to be carried out to determine whether patient awareness in this aspect would positively affect the adoption of EMRs.

"It [paper] doesn't only have a negative impact [on quality of care, but] on the environment as well."

"… [T]he use of computerised systems cuts down on … CO2 emmissions in the long term."

Wide use: Some participants were of the view that migration to EMRs is inevitable and they would support their use.

"*Technology now a days is mostly used*"

Patient–doctor relationship/Patient–other staff relationship: It is possible that the views of the participants were aligned to the satisfactory relationship they had with their GP, which prevents them from disconnecting their feeling towards the current storage medium, from the relationship they have with their GP. However, further research needs to be carried out to verify this statement:

"THIS PRACTITIONER IS THE BEST TO ME"

"…The receptionist welcomes me with a smile and even the doctor…"

Computer literacy: Participants expressed a concern about computer literacy; hence they prefer a paper-based system, since no computer literacy is required.

"Because some people dont know how the computer works"

Familiarity/Human aspect: Research shows that it is human nature to seek familiarity [8]; therefore, it makes sense to reason that some patients preferred what they were already comfortable with a paper-based system.

"…Just used to files in a paper format…"

"I still believe in old human workforce beside, Computers Are taking over in job industry As it is."

Satisfaction: Some participants seemed to be satisfied with the current system. This is reflected by the following:

"I have been consulting my gp for over 10 years and up till now everything was and is ok."

Security category

Confidentiality: It was interesting to note that some participants were of the opinion that a paper-based system caters for the confidentiality of their information. Whereas a paper-based system does not have inbuilt security mechanisms, such as access authorization, when compared to EMRs. However, some participants were aware of this.

"[Paper] it kept confidential no one read my folder … [except] my doctor."

"Receptionist or anybody can read your file."

"… [EMR] ATLEAST MY PRIVATE ILLNESS WON'T BE KNOWN TO PUBLIC"

"[EMR] Cause anyone can go through my personal details if they have passport."

Data capturing errors: Some participants were under the impression that data captured in an EMR is always correct:

"*[B]ecause information Stored in an electronic Format has to be inputed Correct[l]y*"

Distrust computers: Some participants had a problem trusting computers, possibly due to past experience or lack thereof.

"*I DONOT TRUST COMPUTERS*"

Record integrity: Some participants were in favour of a paper-based system, because it presented them with an opportunity to sign their record. However, it is thought-provoking to wonder whether their preference would be swayed if they knew that the same is possible with EMRs, due to technology advancement.

"[Paper] you have op[p]ortunity to sign and is not easy to tamper with the information"

Record safety: Record safety seems to be a concern, as it was highlighted about in both storage mediums. However, some participants showed confidence in both storage mediums about record safety.

"*The information get stored in a lockable cupboard + Always a reasonable care is being taken*"

"[EMR] To prevent loss of record"

"[Paper] Information can go missing, anything can happen to the practice eg. Fire and all documentation & patient records destroyed"

"Your computer could crash and all Informartion will be lost"

System availability and reliability: Participants were concerned about the unavailability of their record should load-shedding occur, but some made note of the mobility aspect that is introduced by EMRs.

"k/Hh power cuts these days [paper] it's a much better option. You can still be seen by dr even if there is no electricity"

"INFORMATION SHOULD BE READILY AVAILABLE AT ALL TIMES AND ANYWHERE (USE OF LAPTOPS, TABLETS, ETC)."

System security and privacy: Some participants emphasised the advantage of the user control mechanisms introduced by EMRs, such as password use.

"[Paper] NOT STRONG ENOUGH TO HOLD SUCH PRIVATE AND CONFIDENTIAL DOCUMENTS."

"[P]asswords created stored with fire walls enabled no need for concern"

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"… [Paper] can assist doctor to correctly diagnose and treat me accordingly."

"It [EMR] can be mixedup with another patient's file and I could get the wrong medication.", that the category with the most negative aspects was the EMR security category.

Technical category

Accessibility: Participants displayed comfort with both storage mediums about accessibility.

"I feel that the storing of my information on a paper based folder makes it possible to access it if I want to"

"[EMR] It is easier to retrieve by the clerk when I visit the Doctor."

Backup: Participants were aware of the option to back up information. They were of the view that both systems cater for information back up.

"[Paper] It helps as a back-up sytem when computer is down."

"Computer system is safe for backup."

Storage space: Storage space was indicated as an advantage of using EMRs.

"[I]nformation can be stored electronically also to have the storage space"

Timeliness: It was disconcerting to learn that only 2% of participants mentioned that the use of a paper-based system results in longer waiting times. This is supported by the following quote:

"[Paper] Every time I come to see the doctor, the receptionist welcomes me with a smile and even the doctor, u don't even wait for long and a special[l]y when u are getting serious they Ask the person (NO 1) to put u in 1st."

Structured storage: It was interesting to note that the participants were of the view that a paper-based system stored records in a neat and organized manner:

"[M]y patient folder is kept neat at all times"

"[T]hings are kept neat and information is saved well"

Question replication: The use of EMRs was related to the elimination of the replication of questions when visiting the practice again.

"So that when, I come again, they mustn't ask me some stuff."

The following few concepts were mention, but were not elaborated on. Hence no quotes are provided:

Convenience: Convenience is one of the concepts that emerged and both storage mediums were associated with this concept.

Efficient and ease of use: Efficiency and ease of use were linked to both storage mediums.

Speed: Interestingly, none of the respondents linked speed to a paper-based system, but the association was made with EMRs.

Less paper work: Another perception that emerged was that the use of EMRs results in less paper work.

Long-term storage: One of the positives linked to EMRs was the perception that they cater for long-term storage.

Few (6) negative aspects were identified from the qualitative data, about a paper-based system or an EMR. However, a number of positive aspects were identified about both systems, regardless of the fact that the participants were unfamiliar with EMRs in the participating practices.

As mentioned, in the method section of this article, the surveys in this research yielded small samples. However, it satisfied the explorative nature of the research, identifying a number of areas requiring further research.

Conclusion

The patient record storage medium used within a general practice (medical) can have an impact on the quality of care provided to patients, and patients have the right to contribute to decision-making affecting their health; therefore, it was important to establish their views about the storage medium they saw suitable for storing their medical history. Hence, the main aim of this research was to investigate patient preferences and the reasons for their preference. It was found that about half of the participants preferred an EMR. The reasons for their preference were also uncovered. Further investigation, with a larger sample, needs to be conducted to verify the findings of this research, with expectation of the ability to generalise. Such research would have to investigate patient confidentiality concerns with storage mediums, their perceptions on quality of care as well as, but not limited to, patient storage preferences. However, the positive responses from participants used in this research led the researchers to think that one might safely analyse this as implying that patients could be open to the introduction of EMRs within the respective practices.

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