The Perspectives of Physiotherapists in Canterbury on the use of Electronic Health Records

A thesis submitted in partial fulfilment of the requirements for the Degree of Master of Health Sciences

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Abstract

The preferential use of electronic health records (EHRs) over other types of health record systems within healthcare settings in the 21st century is well documented (Buyl & Nyssen, 2009; Hailey, Yu, & Munyisia, 2014; Latha, Murthy, Sunitha, 2012; Menachemi & Collum, 2011; Walker & Clendon, 2016); however, there is a lack of research on the perspectives of EHR end-users, such as physiotherapists, towards EHRs, especially in New Zealand. The literature review provided insight on the importance of identifying the many perspectives that different end-user health professionals have towards the implementation and use of EHRs. Factors that will ultimately lead to the success of the New Zealand Government's plan to introduce a national EHR system consistent with the Digital Health 2020 strategic plan are identifying what health professionals perceive as advantageous and disadvantageous in EHR use, designing an EHR with the perspectives of health professionals in mind, and involving the many health professions during EHR implementation processes. The objective of this study was to explore the perspectives of the Canterbury-based physiotherapists on the implementation and use of EHRs. The study also investigated other potential factors including age, awareness of the Digital Health 2020 strategic plan, computer usage, educational background, and the sector of healthcare that physiotherapists are working in that may influence their perspectives towards EHRs.

The non-randomised convenience sample of Canterbury-based New Zealand Registered Physiotherapist (NZRP) participants (n = 132) were recruited through email from the Canterbury Branch of Physiotherapy New Zealand, the Physiotherapy Departments of the Canterbury District Health Board (DHB), and the private physiotherapy clinics of Canterbury registered in the Yellow Pages online directory. The study instrument, a survey consisting of 24 questions, was completed by participants online. Data consisted of the sociodemographic profiles of NZRP participants, the perspectives of NZRP participants, and potential factors that may influence their perspectives towards EHRs. Descriptive statistics, crosstabulations and chi-square statistics, and inductive content analysis were also performed and evaluated.

The results of the study showed that a large majority of the NZRP participants support the idea of a universal EHR system in New Zealand. Most of the NZRP participants were not aware of the Government's Digital Health 2020 strategic plan and had no heard of it prior to this study. A higher proportion of NZRP participants working in the private health sector agreed with the 10 listed advantages of EHRs and the eight listed disadvantages of EHRs than did their public health sector counterparts. The education backgrounds and age of NZRP participants were not major determinants on their perspectives towards EHRs. The NZRP participants use an average of just over two different types of information recording computer programmes within their physiotherapy practices. Lastly, the NZRP participants have a

positive attitude towards EHRs but have several concerns on its use including resource concerns, side effects, potential misuse, and its complex nature.

The study findings highlight the general lack of awareness that NZRP participants have towards Government health information technology (IT) initiatives, such as the Digital Health 2020 strategic plan, but confirms the support and positive outlook that NZRP participants have towards EHRs. Effective communication and involvement of NZRPs with other key stakeholders in the design, implementation, and use of the universal EHR system is vital to the system's success and acceptance by NZRPs and other health professionals. The significant contributions of this study include the perspectives that Canterbury-based NZRPs have towards the use and implementation of EHRs. Areas of future research were highlighted such as finding the perspectives of all the NZRPs in New Zealand and undertaking a qualitative interview research design with health professionals for further insight into the topic. In conclusion, the study identified the perspectives of Canterbury-based NZRPs on EHRs and confirms their support for a universal EHR system throughout New Zealand.

Chapter One: Introduction

Background

Many countries, industries, and people within the digital era of the 21st century argues that the world's most desirable resource is no longer oil, but data (The Economist, 2017). This can be observed today as IT makes rapid progressions in all types of industries around the world including the healthcare industry. Patient data recorded in medical health records are a necessity required by law and used by health professionals to "recall observations, to inform others, to instruct students, to gain knowledge, to monitor performance, and to justify interventions" (Reiser, 1991, p. 902).

Traditionally, paper-based health records (PHRs) were used in healthcare settings; however, through the advancements of IT, EHRs have since been generally accepted as the best way to store patient medical data by healthcare providers (Buyl & Nyssen, 2009). The Healthcare Information and Management Systems Society (HIMSS) define an EHR as "a longitudinal electronic record of patient health information produced by encounters in one or more care settings. The health information includes patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports" (HIMSS, 2013, p. 259). The advantages of EHRs have the potential to improve overall patient health outcomes through an enhanced quality of care (Buyl &

Nyssen, 2009; Hailey et al., 2014; Rieckmann, Weber, Braun, & Grueneberg, 2016; Walker & Clendon, 2016).

Internationally, the physiotherapy profession has been widely regarded as a key component in healthcare systems and plays a role in health promotion, acute care, and rehabilitation (Higgs, 2001). Physiotherapists provide healthcare interventions that maintain, restore, and develop a person's maximal movement and functional capabilities (World Confederation for Physical Therapy, 2016). Physiotherapy is useful to anyone who experiences a decline in functional movements due to ageing, medical diseases or disorders, or environmental factors. Overall, the World Confederation for Physical Therapy (2016) defines the profession as one who "help people maximize their quality of life, looking at physical, psychological, emotional and social wellbeing".

Following the release of the Health Information Strategy in 2005, the New Zealand Ministry of Health has established the Digital Health 2020 strategic plan which aims to "progress the core digital technologies presented in the New Zealand Health Strategy" under carefully planned digital investments in its health and disability sector (Ministry of Health, 2017). One of its five core components is to achieve a universal EHR throughout New Zealand for its citizens (Ministry of Health, 2017b). By following this government-developed

framework, the Ministry of Health intends their goals to come to fruition by the year 2020.

Problem Statement: EHRs and End-User Physiotherapists

In order for health IT systems such as EHRs to be successful, it is important for end-user healthcare providers to be involved in the implementation process. Examples and studies from other countries such as Australia and England have proven the importance of this point (Greenhalgh et al., 2008; Hailey et al., 2014). Within New Zealand, there has been limited research published for physiotherapists and the rest of the healthcare professionals in allied health on their perspectives towards EHRs.

Greenhalgh et al. (2008) concluded that in order to have successful implementation of EHRs in a health system, the technical innovation must not only be accepted by individual patients and individual healthcare staff, but also embedded within organisational and inter-organisational routines. This means acceptance must be achieved on a micro-level (the individuals involved and their perspectives), meso-level (the healthcare organisations involved and their readiness), and macro-level (the governing bodies involved and their socio-political forces) (Greenhalgh et al., 2008). The implementation of EHRs will be impeded if there is not acceptance at each of these three levels.

Within the micro-level, studies have generally focused on the use of EHRs by doctors, nurses, and pharmacists with limited focus on other healthcare professionals such as those from allied health. This created a situation where policy makers were less informed on EHR use by the allied health professions and were less likely to make beneficial health IT initiatives for them. As a result, Hailey et al. (2014) argues this issue in their study where they found limited uptake of EHRs by allied health professionals in Australia. Furthermore, little has been done to address this issue and the potential needs that these health professionals require to successfully implement EHRs into their daily work routine (Greenhalgh et al., 2008; Hailey et al., 2014). This will be a significant problem if there was limited insight towards these allied health professionals, whom the health system relies on to provide a vast range of technical diagnostic and therapeutic care for patients because they are less likely to adopt EHRs as a result.

The current lack of insight into what NZRP perceive towards the use and implementation of EHRs will ultimately affect how successful the Digital Health 2020 strategic plan will be when the plan's universal EHR system is introduced nationally. NZRPs must have the desire to adopt the universal EHR system into their everyday practice following the system's introduction in the future and understanding their preferences through research will help create an EHR system that is attractive to NZRPs thereby increasing its

adoption by them. Failure to find the perspectives of NZRPs could prove to be a costly lesson for New Zealand's publicly funded health system. Addressing this situation and finding out what the perspectives are, for members within the physiotherapy profession, towards EHRs will provide a vital piece of information to guide the Digital Health 2020 strategic plan and the Ministry of Health towards a better future. This study will be the first of its kind conducted in New Zealand where specific emphasis is placed on investigating the knowledge and attitudes that physiotherapists have towards EHRs.

Purpose of the Study

Physiotherapists in Canterbury. The history of physiotherapy in New Zealand can be traced back to as early as 1913 when a School of Massage began at the University of Otago with a strong focus on therapeutic massage, and then from 1918 when the movement of active rehabilitation was introduced from Europe (University of Otago, 2013). The role of physiotherapists grew as significant national health issues arose in conjunction with the world wars (University of Otago, 2013). Polio epidemics that left New Zealanders in various states of paralysis, the widespread of tuberculosis which compromised the cardiopulmonary system, and war veterans with various degrees of disabilities, including amputations meant there was a significant need for rehabilitative medicine which were provided by physiotherapists (University of Otago, 2013). With these events in mind, the popularity of physiotherapy grew

in Canterbury and throughout many regions in New Zealand as there was a need for the profession's services.

The beginnings of the Canterbury Association of Physiotherapy in 1923 which advocated and promoted the interests of Canterbury's physiotherapists remain uncertain with no recorded account in its archives despite the association's formation being linked to the introduction of the New Zealand's Masseurs Registration Act of 1920 because of their similar introduction time frames (Godsall, 2013). The Canterbury Association was nationally influential in the 1920s where it arranged the first Dominion Conference in 1927 which gathered the nation's physiotherapists across the country to the Chamber of Commerce Hall in Christchurch (Nicholls, 2013). There, they discussed the future directions of the profession and shared rehabilitation knowledge amongst one another over a two-day period (Nicholls, 2013).

Present day, the Canterbury Association of Physiotherapy is now known as the Canterbury Branch of Physiotherapy New Zealand who advocates for physiotherapists across the country. The branch regularly provides Continuing Professional Development for its members and emphasizes the physiotherapy standards of practice to ensure that Canterbury's NZRPs maintain high standards of practice and professionalism (Godsall, 2013). Membership

is not compulsory for NZRPs, but almost all NZRPs are members due to the professional liability insurance that is offered by Physiotherapy New Zealand for its members.

The New Zealand wide workforce consists of one-third male physiotherapists and two-thirds female physiotherapists with an average age of 35 years (Stokes, Dixon, & Nana, 2014). In the latest comprehensive physiotherapy workforce report, there were 4,040 NZRPs who hold an Annual Practising Certificate and were able to legally practise physiotherapy in the country during the year 2013/2014 (Stokes et al., 2014). Of that number, 15% (606) NZRPs reside in the Canterbury region where they practise physiotherapy in public, private, and community healthcare settings (Stokes et al., 2014). One-third of the physiotherapists were born outside of New Zealand and 85% of the physiotherapists were ethnically European, followed by 6% Asian, 5% Maori and 4% other (Stokes et al., 2014). No Canterbury specific information was provided in the report other than the number of physiotherapists residing in the region.

The Physiotherapy Board of New Zealand believes a ratio of one physiotherapist per 1,055 people in the population is required to ensure quality physiotherapy is delivered to the population (Stokes et al., 2014). The Canterbury region currently has a population of approximately 540,000 which means the region has an abundance of physiotherapists with a

ratio of one physiotherapist per 892 people (Ministry of Business, Innovation, and Employment, 2017). Through the Canterbury DHB, the Ministry of Health delivers healthcare to the people of Canterbury who are "fairly similar to the national average in terms of age" and has a slightly higher ethnically diverse population compared to other DHBs across the country (Ministry of Health, 2016c). This provides a situation where the physiotherapy workforce in Canterbury will experience similar diversity and experience compared to the rest of the country's physiotherapists and is therefore ideal for conducting research studies with limited resources.

The purpose of this study is to examine the perspectives of physiotherapists in Canterbury on the use of EHRs. The study aims to achieve this purpose through investigating how knowledgeable the Canterbury-based NZRPs are on the use of EHRs as well as their understanding of the Government's health IT investments within New Zealand. The study also aims to identify any difference in perspectives between physiotherapists who work in the public and private health sectors. Social demographics, usage of the computers, and the type of information system currently used by different physiotherapists will also be examined to see if there is an association between these factors and the perspectives they have on the use of EHRs. Finally, the study explores whether Canterbury NZRPs are supportive of, and committed to, the New Zealand Government's plan for a universal EHR system.

The study is anticipated to yield results that support overseas studies such as those of Carins (2016), Greenhalgh et al. (2008), Levine (2012), Rieckmann et al. (2016), Vreeman, Taggard, Rhine, and Worrell (2006) and which demonstrate the physiotherapy profession's knowledge on the advantages and disadvantages of EHRs, identify the different perspectives that physiotherapists will have on EHRs based on the different contexts and incentives of their work environment, confirm the link between computer usage and positive perspectives on EHRs.

Research Hypothesis

The participant's age, computer usage, highest education attained and the sector of healthcare they are working in will influence their perspectives and attitudes on the use of EHRs.

Research Implications

Traditionally, healthcare professionals have recorded patient medical health information through paper-based record systems. However, in the current digital era, it is important to look at whether other systems are viable to implement so that the quality of healthcare can advance along with other industries around the world through IT. One such system is the EHR system which has been globally adopted in the last decade.

The physiotherapy profession has had a long-standing history in New Zealand for providing essential healthcare for its citizens, but little to no study has been carried out to identify the profession's needs in particular towards their perspectives on EHRs. Failure to identify and then address the end-user's perspectives when implementing new IT systems have been reported to create issues and inefficiently waste resources on a national scale (Greenhalgh et al., 2008).

The perspectives that NZRPs have on EHRs must be identified for the physiotherapy profession to accept the use of EHRs when the Ministry of Health finalises their singular universal EHR system through the Digital Health 2020 strategic plan. Researching and understanding this perspective will help progress the integration of EHRs to the health system and benefit all stakeholders who are involved in this matter including the Ministry of Health, NZRPs, other health professionals, and most important of all, the patients themselves.

The Canterbury region is an ideal location to conduct such a research because not only are its inhabitants' characteristics similar to national averages; there is also an abundance of NZRPs who work in the region to deliver the required physiotherapy services in the region (Ministry of Health, 2016c; Stokes et al., 2014). This is coupled with an active Canterbury DHB who is leading the country in Electronic Medical Record Adoption Model development

as it primes itself ready for a universal EHR system from the government (Ministry of Health, 2017a).

Together, these factors create a demand for better understanding what end-user physiotherapists perceive on the use of EHRs so that the government can implement their strategic plan in an effective manner and allow the physiotherapy profession to have a voice within the plan. As a result, the quality of physiotherapy services delivered to the population can also be further improved. The implication of the research hypothesis above is that if the perspectives of the Canterbury-based physiotherapists are identified, the Government can take these perspectives and make better decisions to target and address variables which ensures greater success of the Digital Health 2020 strategic plan.

Aims of the Research

Broad aims. The study is a cross-sectional survey design that aims to explore the perspectives of NZRP participants, who are Canterbury-based, on the use and implementation of EHRs.

Specific Aims. 1. To investigate whether Canterbury-based NZRP participants have heard of the Government's Digital Health 2020 strategic plan where they aim to progress

digital technologies in the health and disability sector through its five core components.

2. To investigate if there are different perspectives among Canterbury-based NZRP participants:

- who work in the public sector or private sector,
- who have different education levels,
- who use computers for longer durations at work compared to participants who use computers for shorter durations at work.

3. To identify what Canterbury-based NZRP participants perceive as advantages and disadvantages of using EHRs.

4. To discover what type of information recording systems are Canterbury-based NZRP participants currently using in their work environment.

5. To explore what the attitudes are for Canterbury-based NZRP participants towards EHRs and health IT

Research Questions

Primary Research Question. What are the perspectives of NZRP participants, who are Canterbury-based, on the use and implementation of EHRs?

Supplementary Research Questions. 1. Have NZRP participants heard of the Government's Digital Health 2020 strategic plan where they aim to progress digital technologies in the health and disability sector through its five core components?

2. Will there be different perspectives among NZRP participants who work in the public sector and those who work in the private sector on EHRs?

3. Will there be different perspectives among NZRP participants for those who have a bachelor's degree or below versus those who have a postgraduate certificate or above towards the idea of a universal EHR system?

4. Will there be different perspectives among NZRP participants who use computers more frequently in their work environment?

5. What do NZRP participants perceive as advantages and disadvantages of using

EHRs?

6. What type of information recording systems are NZRP participants currently using in their work environment?

7. What are the attitudes that NZRP participants have towards EHRs and health IT?

Expected Outcome

This research study will survey and discuss the perspectives that NZRPs, who live or work in the Canterbury region, have in regards to the use and implementation of EHRs. The expected results will contribute to further understanding of the physiotherapy profession so that:

1. a scientific report will be available to identify the views and concerns of NZRPs,
2. any potential concerns that end-user NZRPs may have can be addressed prior to the introduction of New Zealand's universal EHR system, and
3. future health IT strategic plans formulated by key stakeholders will have a clearer direction for their plans to be successfully implemented.

Summary

With the advancement of IT in the digital era of the 21st century, EHRs have the upper hand over PHRs in the healthcare industry to improve the overall quality of healthcare services. Many countries have realised the potential of EHRs and have begun to reshape their health care systems and New Zealand is no exception. The Ministry of Health (2017b) has introduced its Digital Health 2020 strategic plan where one of its core components aims to implement a universal EHR system nationally by the year 2020. In order for this to be successful, the perspectives that end-user health service providers have towards EHR systems must be identified to prevent the risk of failure to adopt the new system (Greenhalgh et al., 2008). Physiotherapists are one of the end-users who will need to operate the new system in order to provide their healthcare services when the system is introduced.

The purpose of this research is to investigate the perspectives of NZRPs, who live or work in Canterbury, on the use and implementation of EHRs. Determining their perspectives will provide vital information to ensure successful adoption and prevent catastrophic failure as well as the waste of resources by the key stakeholders involved in the process (Buyl & Nyssen, 2009; Carins, 2016; Greenhalgh et al., 2008; Hailey et al., 2014; Walker & Clendon, 2016).

Analysis and results produced from this study will allow the New Zealand Government, the physiotherapy profession, the patients, and other key stakeholders to understand the perspectives that the Canterbury-based NZRPs have on EHRs so they can take advantage of the recommendations and findings from this study and work towards a better future for the New Zealand health system.

Chapter Two: Literature Review

Introduction

Information and communication technology is a rapidly expanding field in all types of industries around the world; the healthcare industry is no exception. This rapid expansion is driven by the opportunities for a higher quality of life which ensures the best possible outcome for users and providers in the healthcare sector. In fact, literature specifically on health IT have shown many promising possibilities that it can positively bring to the healthcare sector such as raising data retrieval efficiency, enhancing disease surveillance, increasing provider's adherence to guideline standards, and decreasing medical errors (Chaudhry et al., 2006). Together, healthcare providers and health IT have the ability to create the perfect utopian environment for quality healthcare delivery.

The main purpose of any type of clinical health record is to provide information about a patient's clinical presentation as well as documenting the treatment and care procedures that the patient has received (Barry, Jones, & Grimmer, 2006). This serves as a reminder for the clinician who is providing care and helps with communication for future providers of the patient (Barry et al., 2006). Within health IT, EHRs have generally been accepted as the best way to store patient medical data by healthcare providers (Buyl & Nyssen, 2009).

The driving forces behind adopting EHRs in healthcare settings are its abilities to store large volumes of records in small physical spaces, to overcome logistical barriers of moving records between different healthcare facilities, and to allow greater communication between different healthcare professionals (Barry et al., 2006; Rieckmann et al., 2016). These benefits, along with other advantages that EHRs can provide, are now convincing healthcare providers to operate EHR systems over traditional PHR systems which have long been backed by the clinicians' familiarity of its use (Barry et al., 2006; Buyl & Nyssen, 2009). This means EHRs have the power to alter how healthcare is managed whether in settings with interdisciplinary teams or multidisciplinary teams.

In healthcare settings, an interdisciplinary team approach towards a patient case involves an integration of multiple healthcare disciplines into a single consultation (Jessup, 2007). The subjective and objective assessments, short-term and long-term management goals, as well as diagnostic investigations and conclusions are conducted as a team together often at a single point of time. A multidisciplinary team approach involves multiple healthcare disciplines approaching a patient case with their own perspectives often through multiple separate consultations (Jessup, 2007). Assessments, management, and intervention goals are conducted separately and then shared among the team during case conference discussions to formulate future management plans of patients under their care (Jessup, 2007).

Both team approaches involve healthcare professionals from different areas of specialisation to provide comprehensive healthcare for patients. In doing so, teams will generally consist of more than just doctors, nurses, and pharmacists, but also other allied health professionals. Among allied health, physiotherapists are often given specialised roles in the rehabilitation of patients.

Physiotherapy is a specialised field of healthcare where the main goals are to restore and maintain optimal physical function of patients, as well as pain management (Fransen, 2004). Patient education, manual therapeutics, lifestyle change promotions, combined with retraining cardiopulmonary, neurological, and musculoskeletal areas of the human body all contribute to the greater picture of what physiotherapy brings to healthcare (Fransen, 2004). Physiotherapists play an important role in both the public and private healthcare sectors in the New Zealand health system.

The Medical Council of New Zealand (2011) describes the current New Zealand health system as one that is based on the British-derived Beveridge model and involves predominantly the public healthcare system that is complimented by the private healthcare system. The publicly funded New Zealand health system accounts for 83% of total healthcare expenditure in 2010 while the rest is privately funded through insurance companies and

healthcare consumers themselves (Thomson, Osborn, Squires, & Jun, 2012). This includes publicly funded partial subsidies by the Government-monitored Accident Compensation Corporation for visits to the general practitioners, physiotherapists, and other health professionals in primary care. The New Zealand Government has the main role of establishing healthcare policies and service requirements for the country's health system (Thomson et al., 2012). As a result of the New Zealand Health Strategy 2016, the Digital Health 2020 strategic plan was established in 2016 to progress the core digital technologies that are invested in the country's health and disability sector in the next five years (Ministry of Health, 2017). One of Digital Health 2020's five core components is to introduce and implement a universal EHR system for New Zealanders that is accessible to the consumers, carers and decision makers (Ministry of Health, 2017b).

Overall, the healthcare professionals in New Zealand, the New Zealand Government, the New Zealand public healthcare system, the healthcare consumers, and the vendors who provide EHR systems will be the key stakeholders under the Digital Health 2020 strategic plan. Understanding how healthcare professionals view and interact with the other stakeholders is required to ensure successful implementation of an EHR system (Greenhalgh et al., 2008). For this reason, finding the perspectives of healthcare professionals, including that of physiotherapists, must be achieved to meet the objectives of the Digital Health 2020

strategic plan.

Literature Search Overview

A full comprehensive database literature review on this research study's topic was conducted across three major medical databases. The three databases were MEDLINE, and SPORTDiscus and the Cumulative Index to Nursing and Allied Health Literature (CINAHL), which were reviewed together because the two databases are interoperable.

In MEDLINE, 8,256 articles were identified as having the keywords *Physical Therapis*t (926), *Physical Therapy Specialty* (2,483), or the word *physiotherapist* (5,801). 24,600 articles were identified as having the keyword *Electronic Health Records* (12,095), the words either *electronic health record* or *electronic medical record* (17,213), or the acronym *EHR* (4,206). When both searches were combined, only 23 viable articles were found. Because of this, other specialised health professions from the greater allied health sector were included to yield a greater search result.

30,757 articles were identified as having the keywords *dentists*, or *nutritionists*, or *occupational therapists*, or *optometrists*, or *pharmacists*. When combined with the 24,600 articles that were related to EHRs, 166 articles were found. To ensure these articles meet the

research topic, 150,475 articles including the keywords *attitude* or *attitude of health personnel* were also identified. Combined together, 13 viable articles were found. Thus, the total articles found through the MEDLINE database was 36.

In the SPORTDiscus and CINAHL databases, 5,784 articles were identified as having the keywords *physical therapists*, *sports physical therapists*, *women physical therapists* or the word *physiotherapist*. 584 articles identified as having the keyword *electronic health records*, *electronic medical record*, or the acronym *EHR*. When both searches were combined, seven viable articles were found. Further searches in the databases were not conducted because they were unlikely to yield viable articles related to this research study's topic. Combined together, the three databases yielded a total of 43 potential articles.

The 43 articles were manually sifted and then examined to see if they fit the criteria required to be relevant for the research topic. The articles must include the perspectives of either physiotherapists or other allied health professionals on the topic of EHRs. These may include any qualitative and quantitative research conducted to examine and suggest what is required in EHRs to encourage a higher uptake by healthcare professionals. Overall, 10 articles were found to be relevant and viable. These articles along with other relating and supporting literature will be discussed in the review in sections organised into their respective

themes.

The Electronic Health Record

Literature and research have described the existence and use of EHRs in the healthcare industry since the early 1990s following the advancements of computer IT which also resulted in the implementation of similar technologies across multiple industries around the world (Latha et al., 2012). However, computer IT has progressed slowly in the healthcare industry when compared to other industries such as that of business or finance (Anderson, 2007; Greenhalgh et al., 2008; Menachemi & Collum, 2011). This is due to the highly complex and multi-layered nature of the healthcare industry itself that encompasses many clinical variables, patient factors, and social barriers towards the implementation of computer IT (Anderson, 2007; Goldzweig et al., 2015; Greenhalgh et al., 2008).

Advantages of electronic health records. EHRs have distinct and unique features that allow its implementation to be advantageous in healthcare settings. The Institute of Medicine of the National Academies in the United States have identified eight core care delivery functions that can be provided by EHRs to allow healthcare delivery to be better in quality, safety and efficiency towards patients (Gardner, Middleton, Mohr, & Warren, 2003). These eight functions include EHRs ability to: 1) record health information and data, 2)

facilitate result, 3) facilitate order management, 4) provide clinical decision support, 5) allow electronic communication and connectivity, 6) provide patient support, 7) allow administrative processes and reporting, and 8) aid in reporting population health statistics (Gardner et al., 2003). EHRs have the advantage to help provide high-level integrated healthcare regardless of the time and location of which health professionals deliver care (Latha et al., 2012; Menachemi & Collum, 2011).

Latha et al. (2012) reported that EHRs can be used to acquire better treatment options and better development of curative results through its ability to efficiently gather high volumes of data for public health research. EHRs are highly accessible and can be used at any point of time by multiple healthcare providers who are involved in the direct care of patients (Latha et al., 2012). Furthermore, EHRs can "help individual practitioners and healthcare provider institutions manage and evaluate the quality and costs of care" so that resources can be better distributed and utilised (Latha et al., 2012, p. 6).

EHRs have the potential to "improve communication between physicians and patients by making data more readily available" (Zandieh et al., 2008, p. 755). The sharing of medical information through EHR systems between different health professionals and healthcare centres will improve information access which will result in better quality and safety of

healthcare (Chhanabhai & Holt, 2007; Zandieh et al., 2008). One of the main advantages will be a significant decrease in time spent on retrieving health information and patient charts especially between different treatment sites such as between inpatients and outpatients settings (Khangura, Grimshaw, & Moher, 2010; Zandieh et al., 2008).

EHRs can reduce costs and raise the efficiency of healthcare services by decreasing the time spent by health professionals who take large amounts of time to locate certain medical records and wait in line to gain access to one copy of information (Latha et al., 2012). EHRs nullify the difficulties that health professionals can have on reading each other's handwriting which can often be unintelligible (Latha et al., 2012; Zandieh et al., 2008). Most importantly, it can improve the security of sensitive health information through password authentication processes that can only be accessed by the health professionals involved in the direct care of patients (Anderson, 2007; Menachemi & Collum, 2011). Furthermore, health IT can be programmed to pinpoint who had access to which specific health information at which specific point of time in a healthcare setting.

Overall, EHRs have many advantages that will justify its use in clinical healthcare settings. EHRs have Computerised Clinical Decision Support systems that can not only decrease inappropriate use of diagnostic imaging, but also remind practitioners to follow-up

on patients and remind them when health check-ups are due (Goldzweig et al., 2015). EHRs will have the ability to collect a patient's health information from multiple healthcare sites into one place that can be regularly updated (Gardner et al., 2003; Greenhalgh et al., 2008; Ross, Wei, & Ohno-Machado, 2014).

Disadvantages of electronic health records. EHRs have disadvantages and barriers that will be present during its use and implementation despite the many benefits it can provide to healthcare settings. A lack of adoption by healthcare organisations towards EHRs stated reasons such as "physician resistance, financial costs, concerns about privacy, lack of uniform standards, and little information about best practices for implementation" (Zandieh et al., 2008, p. 756). In the qualitative study carried out by Zandieh et al. (2008) it was found that even though many practices had the ability to use EHRs to generate medical prescriptions electronically, the majority of practitioners continued to manually handwrite prescriptions and show clinician resistance towards health IT.

Funding issues and the high cost of initial implementation processes for EHRs and its ongoing maintenance fees for software and hardware updates prove to be a disadvantage that is often mentioned by hospitals and health practitioners looking to adopt the system (Anderson, 2007; Khangura et al., 2010; Menachemi & Collum, 2011; Zandieh et al., 2008).

A temporary short-term loss of workflow and productivity as clinicians adjust to EHR systems is also present and is especially significant for smaller healthcare facilities where resources are limited and declines in revenue are more challenging to deal with (Greenhalgh et al., 2008; Menachemi & Collum, 2011). Initial and ongoing training and support to learn how to use EHRs from health IT vendors are both time and cost consuming for healthcare providers (Menachemi & Collum, 2011). Estimates show that these education sessions and maintenance fees for American-based healthcare facilities can cost an average of USD8,412 per clinician that implements EHRs in their daily work routine (Menachemi & Collum, 2011).

A major disadvantage of EHRs is the potential loss of professional autonomy from practitioners due to the rigid and inflexible nature of EHR systems (Khangura et al., 2010; Menachemi & Collum, 2011). For example, health professionals may experience strong negative emotions when they lose the "autonomy in making patient decisions because an EHR blocks the ordering of certain tests of medications" (Menachemi & Collum, 2011, p. 52). The potential of overdependence on Computer Clinical Decision Support systems and reliance on EHR technology can also hinder productivity especially when there is a sudden disruption or shut down of EHR systems with no contingency plans to counter these issues (Menachemi & Collum, 2011).

Overall, a lack of knowledge on how to run EHR systems and subsequent resistance by clinicians prove to be significant disadvantages of EHR implementation (Anderson, 2007). From there, problems such as cost, loss of productivity, and fear of losing professional autonomy come into play (Anderson, 2007). Many different EHR systems stemming from multiple EHR vendors competing against each other also brings about concerns of interoperability and the ability to share clinical information between practices, laboratories, and hospitals (Anderson, 2007; Khangura et al., 2010). Lastly, privacy concerns as to whether many web-based EHR systems will be secure and not breached by hackers, who do not need to be physically in front of medical records to access sensitive electronic-based information, is also present (Chhanabhai & Holt, 2007).

Concerns and issues of electronic health records in New Zealand compared with the United States of America and England. The concerns and issues regarding the introduction of EHRs in New Zealand compared to the United States of America and England internationally can be outlined. The United States of America have been "trailing European countries as well as Canada, Australia and New Zealand in the use of IT in primary care" (Anderson, 2007, p. 480). One of the main issues regarding the United States of America's lack of adoption towards EHRs in 2007 was the lack of financial incentives such as quality-based reimbursement programs where the Government "reward practices for specific quality

improvement actions or use of specific IT applications" (Anderson, 2007, p. 482). Since 2009, the United States of America have addressed this issue through the Health Information Technology for Economic and Clinical Health (HITECH) Act where financial incentives were made available for physicians practising through Medicare and Medicaid programs (Menachemi & Collum, 2011). In general, a lack of government funding combined with a lack of facilitation from health professional associations towards the adoption of IT will be of great concern towards EHR implementation (Anderson, 2007).

The case study conducted in England by Greenhalgh et al. (2008) on the centrally stored and shared EHR (known as the summary care record) concluded that "shared electronic records are not plug-in technologies. They are complex innovations that must be accepted by individual patients and staff and also embedded in organisational and inter-organisational routines" (Greenhalgh et al., 2008, p. 1). This means acceptance by the public, who are all healthcare consumers, and preparation by the healthcare organizations, who are the healthcare providers, will be a key concern towards EHR implementation. Successful implementation will depend on factors throughout all levels of healthcare which are "influenced at the micro-level by the material properties of the technology, individuals' attitudes and concerns, and interpersonal influence; at the meso-level by organisational antecedents, readiness, and operational aspects of implementation; and at the macro-level by

institutional and socio-political forces" (Greenhalgh et al., 2008, p. 1).

Within New Zealand, the majority of health care records still exist as paper records despite being regarded as a global leader in merging health information with IT (Chhanabhai, Holt, & Hunter, 2006). Most clinicians only record information that is advantageous towards their specialty whilst keeping their own records to themselves (Chhanabhai & Holt, 2007). This results in frequent unclear overviews of an individual's total health status and a lack of informational exchange between healthcare providers (Chhanabhai et al., 2006). The current use of IT systems such as EHRs from multiple vendors throughout different healthcare providers contributes to the problem where there is a lack of a standardised and uniformed system that can collect and exchange information effectively throughout healthcare provider sites (Chhanabhai et al., 2006; Menachemi & Collum, 2011).

The Health Information Strategy for New Zealand 2005 announced by the Ministry of Health addressed the importance of involving patients who are healthcare consumers and their security concerns in regards to introducing EHRs (Chhanabhai et al., 2006; Ministry of Health, 2005). The cross-sectional healthcare consumer survey carried out by Chhanabhai & Holt (2007) reinforced the importance of consumer involvement and their perception of IT security towards the successful implementation of EHRs in New Zealand. Patients are now

regarded as consumers whereas medical care, which focuses mainly on physician administered processes, are now regarded as health care and "encompasses a broader range of services and procedures such as self-wellness and holistic approaches" (Chhanabhai & Holt, 2007, p. 3).

The security of an EHR system should be "of the highest level, and needs to be constantly monitored and updated" as privacy and confidentiality will be the foremost concern of healthcare consumers (Chhanabhai & Holt, 2007, p. 2). Security is important in healthcare settings as trust towards health professionals from patients are universally built upon confidentiality (Chhanabhai et al., 2006). New Zealand healthcare consumers put great emphasis towards the security of their medical records and many fear that their sensitive information may be accessed by unauthorised people (Chhanabhai & Holt, 2007). The media and its reports on incidents where the security of electronic information systems have been compromised is a constant player that will influence the consumer's perception towards EHR security. This concern must be addressed through campaigns and programs where healthcare consumers are introduced to the concepts of firewalls, data encryption, audit trails and anti-virus software which safeguard their medical information in EHRs (Chhanabhai et al., 2006). Informing consumers of the five key security requirements of EHRs being: 1) authentication, 2) access control, 3) accountability, 4) authorisation and 5) availability will further resolve

this concern (Chhanabhai et al., 2006).

Overall, concerns and issues regarding the introduction of EHRs in New Zealand compared to the United States and England must be acknowledged and addressed. Funding and financial incentives, practitioner and public acceptance, healthcare consumer involvement, as well as EHR security and confidentiality must all be present for EHRs to be successfully implemented. In this manner, the EHR, in comparison to the PHR, will likely enhance the quality of health professional practice and improve patient health outcomes.

The Current Perspectives of Physiotherapists and other Allied Health Professionals on Electronic Health Records

What is Allied Health? The New Zealand professional health and disability workforce divides itself into three primary professional groups: the medical professions, the nursing professions, and the allied health professions. Allied Health Aotearoa New Zealand (2011) defines allied health professionals as "scientific and technical health professionals that work directly with patients". They provide healthcare that involves the prevention, assessment, and identification of health disorders, as well as the rehabilitation, advocacy, and promotion of a person's health and wellbeing, and also the education, research, and leadership of each of these professional groups. In New Zealand, there are 28 scientific and

technical health professional associations which are classified under allied health (Allied Health Aotearoa New Zealand, 2011).

Through the services they provide, allied health professionals improve patient health outcomes by increasing their overall quality of life and maintain a health pathway continuum for people after their stay in hospital care (Allied Health Aotearoa New Zealand, 2011). Furthermore, allied health professionals vastly reduce the financial strain in the healthcare industry by preventing avoidable emergency attendances and hospital admissions, reducing the length of stay through supporting timely hospital discharges, and by improving the overall efficiency of general healthcare practices in the community (Allied Health Aotearoa New Zealand, 2011). Allied health represents a large variety of professions including audiologists, dietitians, exercise physiologists, occupational therapists, osteopaths, orthotists, perfusionists, pharmacists, physiotherapists, podiatrists, social workers, speech pathologists, and a variety of health technicians (Health Times, 2017).

Perspectives on electronic health records. Although the health professions in allied health make up one of the three main healthcare workforces in New Zealand, there is very little research carried out to identify what their opinions, ideas, and overall perspectives are towards EHRs and healthcare in general when compared to that of the medical and nursing

professions. Identifying their perspectives would benefit not just the professions that make up allied health, but also the patients who receive allied health services, the New Zealand Government who funds allied health, and the national health system. Therefore, scientific evidence on their perspectives is key on a financial basis, outcome basis, and satisfaction basis.

A pilot study carried out by Barry et al. (2006) in Australia involved five experienced physiotherapists (with at least two years' experience) in a scripted neuro-musculoskeletal patient scenario, who were asked to assess the patient and document their findings through traditional PHRs. Three of the physiotherapists were then given a 90-minute guided demonstration on an EHR system and were asked to repeat their assessments three to four weeks later, but this time document their findings using the EHR system through a laptop computer. The other two physiotherapist participants were given a brief 20-minute software demonstration and were asked to perform the same tasks as the other three physiotherapist participants who received longer EHR software demonstrations. None of the five participants had any prior experience with the EHR system provided in the study.

Barry et al. (2006) found that, on average, physiotherapist participant documentations through the EHR system took 10 minutes longer than that of a traditional PHR system upon

initial patient assessments. The amount of information recorded in the EHR was greater and more comprehensive than that of the traditional PHR because the EHR was structured to facilitate and prompt the physiotherapists to record specific patient symptoms, social histories, and physical examination findings. This result correlates to the general consensus in the healthcare industry that EHRs are better recording systems than traditional PHRs (Buyl & Nyssen, 2009; Greenhalgh et al., 2008; Hailey et al., 2014). The perspectives of what the physiotherapist participants thought of the EHR were then collected in a survey.

Physiotherapist participants voiced their initial concerns about taking up the unfamiliar non-traditional EHR system and took a lot of time and practice before they felt confident enough to operate the health record system on the same level as the traditional PHR system (Barry et al., 2006). Furthermore, physiotherapist participants felt that typing on the laptop computer during assessments often interrupts their flow of conversation with their patients and the non-tailored EHR software did not allow them to draw pictures that depict the patient's site of injury (Barry et al., 2006). The reminders and prompts given by the EHR system, however, aided the physiotherapist participants on multiple occasions in ensuring all vital clinical and legal information were documented (Barry et al., 2006). The more time that was spent on the EHR system the more the physiotherapist participants felt they were saving time compared to the traditional PHR system because there was less writing involved and

thus less physical demand on them (Barry et al., 2006). Furthermore, information on the patient could be easily retrieved with the click of a button (Barry et al., 2006).

Overall, the study showed that initial resources and support must be provided for physiotherapists when they adopt a new EHR system into their work setting (Barry et al., 2006). In addition, physiotherapists must feel confident and satisfied with operating the new EHR system so that they perceive the new option as one that is better than the accustomed traditional PHR system (Barry et al., 2006). Health policy makers need to take action and persuade Australian physiotherapists to adopt EHRs in the same way that they have had to do with medical practitioners (Barry et al., 2006). Ultimately, physiotherapist participants feel there is a lack of drive from health policy makers and little to no resources have been provided for them to adapt to a new EHR system (Barry et al., 2006).

Buyl and Nyssen (2009) produced a software framework for electronic physiotherapy records in Belgium using a generic approach so that their EHR system model would be relevant for physiotherapists residing in other countries as well. Their research was driven by a law issued on December 7th, 2005 where Belgium physiotherapists and a number of other health professionals must now keep electronic physiotherapist registries which contains all of the medical information and interventions produced during their encounters with their

patients. Prior to this law, physiotherapists in Belgium provided a monthly hand-written paper-based version of all their clinical patient encounters that had page numbers and was bound into a booklet for medical documentation inspections or auditing purposes by different governing bodies and authorities in Belgium (Buyl & Nyssen, 2009).

Buyl and Nyssen (2009) developed a physiotherapy centred EHR software package with an emphasis on integration and communication of general practitioners and other health professionals involved in patient care. Special attention was given towards Belgium general practitioners (home physicians) because they were the main healthcare providers responsible for archiving a patient's complete medical record, which includes physiotherapy prescriptions and interventions (Buyl & Nyssen, 2009). The EHR software they proposed allowed for physiotherapists to follow guided steps to record their patient encounters as well as linking up the exchange of medical data between the physician-based EHR system and the proposed physiotherapy-based EHR system (Buyl & Nyssen, 2009).

During their research on what should be included in their physiotherapy-based EHR system, Buyl and Nyssen (2009) identified key factors that need to be addressed for their software to be successful. First, end-user physiotherapists must be persuaded into believing that EHRs are the superior health record system that can reduce administrative work and so is

worth their time and money investments (Buyl & Nyssen, 2009). This can be reinforced through EHR certification procedures carried out nationally by the Belgian Ministry of Health, who can promote and provide incentives through health policies that encourage EHR uptake (Buyl & Nyssen, 2009). Second, the attitudes and opinions that physiotherapists have towards EHRs must be addressed during the system developmental process to ensure that there is adequate physiotherapist interest in operating the proposed EHR system (Buyl & Nyssen, 2009). Physiotherapist opinions can be collected through surveys to see what they view as advantages and disadvantages of EHR use (Buyl & Nyssen, 2009). Universities and educational institutions will also play a key role in the attitudes that physiotherapists have towards the use of EHRs because they can influence how future physiotherapists perceive EHRs by promoting the benefits of its use in their educational courses (Buyl & Nyssen, 2009). Lastly, careful attention must be given when designing and structuring an EHR that follows a physiotherapist's clinical reasoning, work flow method, and patient information gathering tendencies (Buyl & Nyssen, 2009). This will allow physiotherapists to better see the benefits and positive returns that EHRs have over traditional PHRs (Buyl & Nyssen, 2009).

Greenhalgh et al. (2008) concluded that in order to have successful implementation of EHRs in a health system, the technical innovation must not only be accepted by individual

patients and individual healthcare staff, but also be embedded in organisational and inter-organisation routines. This means acceptance must be achieved on a micro-level (the individuals involved and their perspectives), meso-level (the healthcare organisations involved and their readiness), and macro-level (the governing bodies involved and their socio-political forces) (Greenhalgh et al., 2008). The implementation of EHRs can be impeded if there is no acceptance at any one of these three levels.

At the micro-level, studies have generally focused on the use of EHRs by doctors, nurses, and pharmacists with limited focus on other healthcare professionals such as those from allied health. Hailey et al. (2014) argues this issue in their study where limited uptake of EHRs by allied health professionals in Australia was identified. Furthermore, little has been done to address this issue and the potential needs that these health professionals may require to implement EHRs in their daily work routine (Greenhalgh et al., 2008; Hailey et al., 2014). This will be a significant problem if there is limited insight towards these allied health professionals who work in the health system to provide a vast range of technical diagnostic and therapeutic care for patients.

Currently, there is limited knowledge on how allied health professionals in Australia perceive the usage of health IT, specifically their use of EHRs (Hailey et al., 2014). Allied

health practices in Sydney were invited to a qualitative interview study to better understand what their perspectives are towards the adoption of health IT as they each begin their pre-implementation stage of introducing an Australian certified e-health standard compliant EHR system in their respective practices (Hailey et al., 2014). Three of the four participating clinics mainly provided physiotherapy services while the fourth provided psychotherapy services in their daily clinical practices (Hailey et al., 2014).

In all four participating clinics, allied health professionals and their managers were dissatisfied with the labour intensive process involved with gathering and tracking information scattered between their multiple computer software and electronic systems (Hailey et al., 2014). For example, two of the participating clinics used three to four different software systems simultaneously to manage patient appointments, medical information, referrals, and billing because there was no universal system that could provide all of the above requirements (Hailey et al., 2014). This discouraged their health IT and EHR use because they could clearly feel the inefficient nature of the non-tailored software produced by health IT vendors (Hailey et al., 2014).

Allied health professionals in the study felt communication with other health professionals was essential and important but often lacking (Hailey et al., 2014). Most of the

communication with health professionals outside of their respective clinics involved mailing physical paper copies of information through postal services because a large proportion of the workforce do not use emails which subsequently stunts the progress, review, and treatment of their patients (Hailey et al., 2014). Major referral sources such as general practitioners still send in their referrals through hard-copy letters or faxes which then have to be scanned into electronic copies in order for them to be electronically documented (Hailey et al., 2014).

Overall, research on the involvement of allied health professionals on the use of EHRs was found to be very limited in Australia (Hailey et al., 2014). However, the managers of the participating allied health clinics felt very positive and eager towards the introduction of a certified Australian e-health standards compliant EHR system because they believe the system will bring about many strengths and benefits into their practices (Hailey et al., 2014). All of the participating allied health professionals felt very eager to have an "easy-to-use EHR system that integrates patient details, diaries, billing and secure electronic messaging in one place that standardises their practices. They also wished the new system to work equally well on a desktop, an iPad or a phone" (Hailey et al., 2014, p. 50). Successful implementation of new health IT would ultimately require adequate group training to end-users as well as individual tailored training for different computer-literate practitioners (Hailey et al., 2014).

The introduction of any new technology in workplace settings often implies a redistribution and not a reduction of work in an organisation (Haland, 2012). Health professionals practising in a Norwegian hospital acknowledged that computer-based information systems do not simply just integrate into their current practice (Haland, 2012). Rather, they noted its significant impact on multiple areas including the organisational structure as a whole, the additional work that is involved, and the way they deliver healthcare services (Haland, 2012). Essentially, EHRs are not straightforward replacements of PHRs because they alter the boundaries between different groups of people who work in the health sector (Haland, 2012).

Semi-structured interviews involving four doctors, five nurses, two physiotherapists, two office staff, and six workers from the IT services centre of the Central Norway Regional Health Authority were carried out to find their unique perspectives on EHRs and its affect in their work practices (Haland, 2012). The four doctors expressed disfavour of EHRs because they used to dictate their reports to the secretaries but now they must type the information themselves into identity verified EHR systems (Haland, 2012). Haland (2012) concluded that this particular shift in workload assignments implied that doctors have to do more office work and was seen as a threat of their profession and privileges. After the implementation of the EHR, additional cooperation with the multidisciplinary team was required by doctors because

they viewed this as an undermining of their psychosocial dominance as well as the beginning of a restructure and redefinition of everyone's role in their work environment (Haland, 2012).

In contrast, other health professionals from the multidisciplinary team including nurses and physiotherapists felt the new EHR system benefited their day to day practice (Haland, 2012). They no longer had to chase after the doctors, or anyone else, for patient records nor did they need to fight for patient appointment books, which they believed was a huge advantage that EHRs bring to their professional practices (Haland, 2012). The introduction of EHRs allowed them to have access to the doctors-patient documentation and granted them new rights and jurisdictions to proof read and add into the existing medical documentations (Haland, 2012).

Haland's study demonstrates the diverse and complex nature that the implementation of a new EHR system entails. Successful implementation of an EHR not only relies on the overall quality and user-friendly aspects required of the system, but also how the different end-user professions perceive the system. If the study focused solely on the doctor's perspectives then the new EHR system that the Norwegian hospital implemented could be viewed as an inefficient one which impeded medical care for its patients. However, once the perspectives of the other healthcare workers were identified and included, the new EHR

system was viewed as empowering and more efficient for the multidisciplinary team.

Many physiotherapists believe that the documentation process of patient medical information is the least appealing aspect of physiotherapy practice (Levine, 2012), but, the lack of focus on clinical documentation by physiotherapists over the past few decades has led to significant issues in the United States of America's healthcare settings (Levine, 2012). These issues include patient denial and refusal to pay for treatment sessions, unclear identification of therapeutic interventions and their outcomes, accusations of fraud and abuse by patients and governing bodies, and the inability to demonstrate professionalism and value of physiotherapy services to key stakeholders (Levine, 2012).

Levine (2012), an American physiotherapist and EHR development consultant, perceives EHRs as the key to improving the quality and quantity of physiotherapist clinical documentations, which can address the significant issues stated above. Computerised Clinical Decision Support systems during point of care documentation in patient encounters have the potential to improve a clinician's decision on individual patients with software designed to evaluate and incorporate practical guidelines and valuable research resources (Levine, 2012). In theory, the core components of computerised Clinical Decision Support systems will include:

- Recommendations based on specific examination findings,
- Clinical guidelines,
- Electronic alerts,
- Documentation prompts,
- Reference materials,
- Reports related to captured patient data (Levine, 2012)

Operating EHRs during point of care patient encounters often appears to have positive effects on provider-patient interaction experiences which not only show professionalism, but also improves the speed of documentation and productivity of physiotherapists (Levine, 2012). For this reason, the portability of EHR hardware must be addressed to ensure physiotherapists can operate the system whether in the treatment area or elsewhere in the practice environment (Levine, 2012). Ultimately, Levine (2012) perceives EHRs as the key to progressing the physiotherapy profession and believes tailor-made software for physiotherapists, that incorporates their practice methods, will be the key to successful EHR implementation.

The United Kingdom's Charter Society of Physiotherapy and its governing council have been urging its physiotherapists to take part, provide input, and debate with the

country's National Programme of IT to guarantee an EHR system that moulds effectively into the healthcare sector and their professional practices (Limb, 2005). The organisation, who advocates on behalf of British physiotherapists, believe physiotherapists need to be given the opportunity to work with health IT software programmers to ensure an EHR system is developed with health practitioners and patients in mind (Limb, 2005). For this vision to be realised, the beginning stages must involve building positive relationships through transparent communication between all professional bodies of allied health, health IT vendors, and the Government's Department of Health which funds the initiative (Limb, 2005).

Rieckmann et al. (2016) conducted an online survey of physiotherapists in Germany to determine what they perceived as elements that facilitated and created barriers to using EHR systems in their daily clinical practice. A literature review was conducted before composing the survey questions, which were then distributed through two German physiotherapy associations, three German physiotherapy journals, and three local physiotherapy newsletter mailing lists (Rieckmann et al., 2016). The responses of the 538 respondents were analysed to determine their views of EHRs (Rieckmann et al., 2016).

In total, 79% of the physiotherapist respondents could imagine the use of EHR

systems in their clinical practice and believe the advantages EHRs brings will outweigh its potential disadvantages (Rieckmann et al., 2016). German physiotherapist respondents believed that implementing EHRs over PHRs in their clinical practice would save time, simplify data back-up, simplify maintenance and archiving, achieve interoperability, increase intra- and inter-professional communication, improve professional image, and prove the objectives and outcomes of physiotherapy interventions (Rieckmann et al., 2016). They also expressed their concerns about EHR use and implementation. Barriers and disadvantages described by physiotherapist respondents are lack of time to adopt a new system, training requirements to operate EHR systems, cost factors associated with the implementation of the EHR, logistical problems, data protection and data security, reliability and integrity of the IT systems, and IT knowledge and technical dependency (Rieckmann et al., 2016).

Vreeman et al. (2006) investigated the role of EHR systems in physiotherapy practice through a critical review of literature. Article databases including MEDLINE, the CINAHL, Ovid's All Evidence-Based Medicine Reviews, and conference proceedings from the American Medical Informatics Association Annual Symposium were searched which yielded 18 articles relevant to the research topic (Vreeman et al., 2006). Three researchers then evaluated and reviewed the identified articles for evidence and information that details EHRs and physiotherapy in the United States of America (Vreeman et al., 2006). The reviewed

articles included articles that provided evidence of physiotherapist perceptions as well as on the greater picture of the relationship between EHRs and the physiotherapy profession (Vreeman et al., 2006).

Overall, the critical literature review indicated that EHRs can have positive benefits in the physiotherapy profession (Vreeman et al., 2006). The benefits of EHR use include an overall improvement in clinical reporting, operational efficiency, interdepartmental communication, data accuracy, as well as providing significant data for future research (Vreeman et al., 2006). The main barriers for EHR use included workflow and behaviour modification, software or hardware inadequacy, and the need for further staff training (Vreeman et al., 2006). The key factors for successful EHR implementation are ensuring end-user participation in the development process, data standardisation and guidelines, adequate staff training, and incorporating workflow analysis into the system design (Vreeman et al., 2006).

Allowing room for end-user health professionals such as physiotherapists to express their perspectives and feedback in EHR software development is important for the overall success of the implementation of EHR software (Vreeman et al., 2006). In addition, the clinical physiotherapy staff must play an active role and be involved in the ongoing

maintenance of the EHR system, as well as consistent communication with the EHR system's software vendor (Vreeman et al., 2006). This can be achieved by establishing a physiotherapy committee who can communicate with other key stakeholders, who drive the processes of the implementation of an EHR, to ensure physiotherapist perspectives are acquired and used throughout every step of the process (Vreeman et al., 2006).

Although there is currently a lack of research on New Zealand allied health professionals and their relationship with EHR systems, similar research has been carried out locally for New Zealand's nursing profession (Walker & Clendon, 2016). The primary aim of Walker and Clendon's (2016) study was to explore the views, expectations, and attitudes that New Zealand Registered Nurses have towards the use of EHRs in their clinical settings. Semi-structured qualitative interviews were conducted among 36 participants including nurse leaders, nurse managers, professional nurse advisors, practice nurses, district nurses, and nursing students (Walker & Clendon, 2016).

All of the nursing respondents perceived EHRs as positive and helpful for their profession as well as their clinical practices (Walker & Clendon, 2016). First, they believed the computerised Clinical Decision Support system in EHRs allowed for better patient care experiences and that the overall communication with their patients was more comprehensive

(Walker & Clendon, 2016). Second, they perceived EHRs as being fully transparent and highly accessible patient health records that can be efficiently utilised in multidisciplinary team settings to enhance overall patient care (Walker & Clendon, 2016). Lastly, nursing respondents had a positive attitude in regards to the safe-keeping and privacy protection capabilities of EHRs and felt they had adequate clinical and computational knowledge to enforce these capabilities in their clinical practice (Walker & Clendon, 2016). New Zealand nurses appear to be in tune with health IT and the benefits it brings over traditionally used methods.

Although nursing respondents welcomed health IT, they believed barriers and disadvantages will exist in the implementation and use of EHRs in their daily clinical practices (Walker & Clendon, 2016). First, access to appropriate computer software and hardware technology and devices, which run EHRs, can often be difficult to afford depending on the amount of investments and resources that are provided to them by employing organisations (Walker & Clendon, 2016). Second, end-user rejection from the older nursing population was apparent due to the unfamiliarity and lack of confidence with operating computer technology in their work lives as well as in their private lives (Walker & Clendon, 2016). Third, the lack of standardisation between EHR systems in different healthcare facilities created inefficiencies in understanding their potential uses and communication with

other healthcare providers (Walker & Clendon, 2016). These concerns that nursing respondents have confirm the overall issues that many health professionals have encountered globally in their clinical practices.

End-user involvement is strongly advocated by the New Zealand nursing profession through all processes of the implementation of an EHR and its use (Walker & Clendon, 2016). Nursing respondents felt their feedback and opinions on the design structure of EHR systems needed to be heard and accepted to ensure acceptance of the system in their profession (Walker & Clendon, 2016). Financial and technical resources need to be provided for all end-users to ensure New Zealand Registered Nurses operate EHR systems effectively (Walker & Clendon, 2016). These strategies will help address the decrease in work efficiency that has been well documented in the beginning stages of the implementation of EHRs, as well as improve the acceptance and adherence rates of EHR use in healthcare settings (Walker & Clendon, 2016).

Physiotherapy in New Zealand. Physiotherapists are healthcare providers who have a specialty in physical medicine and rehabilitation and work to restore function, promote independence, and improve the quality of life for their patients. Currently, there are four scopes of practice for which physiotherapists can obtain registration from the Physiotherapy

Board of New Zealand, the profession's regulatory body (Physiotherapy Board of New Zealand, 2012a). The four scopes of practice are listed below:

1. General Scope of Practice - Physiotherapist:

"Services to individuals and populations to develop, maintain, restore and optimise health and function throughout the lifespan. This includes providing services to people compromised by ageing, injury, disease or environmental factors. Physiotherapy identifies and maximises quality of life and movement potential by using the principles of promotion, prevention, treatment/intervention, habilitation and rehabilitation. This encompasses physical, psychological, emotional, and social wellbeing" (Beggs, 2008).

2. Specialist Scope of Practice – Physiotherapy Specialist:

Expert physiotherapists with advanced knowledge, education, and skills in a specific area of clinical practice who show leadership qualities in consultancy, education, and research (Beggs, 2012).

3. Special Purpose Scope of Practice – Postgraduate Physiotherapy Student:

Physiotherapy postgraduate students who provide physiotherapy services as part of the postgraduate study on which the application is based (Beggs, 2009). This allows

physiotherapists who are recognised in other countries and are involved in postgraduate study at New Zealand physiotherapy schools to practice in the scope of their research.

4. Special Purpose Scope of Practice – Visiting Physiotherapy Presenter/Educator:

Educators and presenters in physiotherapy who are visiting New Zealand to present and educate their knowledge to New Zealand organisations/institutions in their area of expertise (Beggs, 2009).

As physiotherapy gained traction and became popularised in the country, The Physiotherapy Act in 1949 was introduced and its administration was delegated to the Physiotherapy Board of New Zealand (Grbin, 2013). The new act required physiotherapists to hold an Annual Practising Certificates which was obtained by the Physiotherapy Board of New Zealand following their review and approval of the practitioner (Grbin, 2013). The Physiotherapy Act 1949 and the responsibility it placed onto the Physiotherapy Board of New Zealand allowed the profession to further evolve and raise the standard of newly trained physiotherapists to be safe, effective, science-based, and knowledgeable (Grbin, 2013).

The final and current piece of legislation that replaced the Physiotherapy Act in 1949 was the Health Practitioners Competency Assurance Act in 2003. The act united 19

professional groups under one piece of legislation and required these groups to assure the public of continual competence, fitness to practise, and a scope of practice for each of their health disciplines (Grbin, 2013). PBNZ was given this authority and responsibility for enforcing this legislation to physiotherapists residing in the country. Since then, the physiotherapy profession in New Zealand continued to grow in strength and numbers becoming well respected internationally (University of Otago, 2013).

In the latest physiotherapy workforce report, there were 4,040 NZRPs who hold an Annual Practising Certificate and are able to legally practise physiotherapy in the country during the year 2014 (Stokes et al., 2014). Apart from being registered and holding a current Annual Practising Certificate, NZRPs must also have a physiotherapy bachelor degree or equivalent (Stokes et al., 2014). These physiotherapists were allowed to use PHRs, EHRs, or a combination of both health records and are not required to be computer literature when working in their practises according to the Physiotherapy Competencies set out by the Physiotherapy Board of New Zealand (2009). This is a significant contrast to the Competencies for Registered Nurses set out by the Nursing Council of New Zealand where Competency 2.3 states that nurses must demonstrate “literacy and computer skills necessary to record, enter, store, retrieve and organise data essential for care delivery” (Nursing Council of New Zealand, 2009, p. 16).

The Physiotherapy Board of New Zealand believes a ratio of one physiotherapist for every 1,055 people in the country is necessary to meet the physiotherapy demands of the New Zealand population (Stokes et al., 2014). Currently, the physiotherapy workforce is able to meet these demands; however, the New Zealand population is projected to grow to 5.3 million which means the number of NZRPs with an Annual Practising Certificate will need to grow from 4,040 in 2014, to 4,985 in 2035 (Stokes et al., 2014). This would mean 355 new physiotherapists will need to enter the physiotherapy workforce each year between 2014 and 2035 in order to ensure an adequate number of working physiotherapists are available to counter physiotherapists who leave the workforce (Stokes et al., 2014). Due to this demand, physiotherapy in New Zealand is growing and becoming a profession whose healthcare services are greatly sought after.

According to the latest census report, the average age of physiotherapists in New Zealand is 35 years old and one-third of the workforce reported their gender as male which follows the trend among Commonwealth countries where the physiotherapy profession is a female-dominated one (Stokes et al., 2014). Eighty-five percent of physiotherapists in New Zealand were of New Zealand European or European ethnicity and the remaining 15% consist of Asian (6%), Maori (5%), and other ethnicities (4%) such as Samoan or Tongan (Stokes et al., 2014). One-third of physiotherapists in New Zealand were born outside of New

Zealand, almost half (47%) originated from the United Kingdom, the rest of Europe (14%), and South Africa (9%) (Stokes et al., 2014).

In terms of geographic spread, 60% of physiotherapists in New Zealand reside in Auckland (35%), the largest city in the country, Wellington (10%), the capital city, and Canterbury (15%), which hosts the largest city in the South Island (Stokes et al., 2014). The remainder of physiotherapists in New Zealand reside in the rest of the North Island (28%) and the rest of the South Island (12%) (Stokes et al., 2014). In 2013, physiotherapists earned an average income of NZ$50,950, whereby 70% of physiotherapists worked for 30 hours or more each week (Stokes et al., 2014).

To earn a Bachelor of Physiotherapy degree in New Zealand, students must enrol and train at either the Auckland University of Technology or the University of Otago for the four-year course (Stokes et al., 2014). In the period 2008 - 2012, an average of 950 students were enrolled at one or the other of the two universities at differing stages of the four-year degree (Stokes et al., 2014). Despite the degree's popularity, there has been little growth in enrolment numbers in both universities due to the limited number of places allowed each year (Stokes et al., 2014). This is due to funding restrictions from the Tertiary Education Commission which delegates funding and resources to universities across all subject areas to

ensure a set number of places are provided annually in different undergraduate programmes (Stokes et al., 2014).

The New Zealand Government's Digital Health 2020 Strategic Plan

Following the release of the Health Information Strategy in 2005, the New Zealand Government's Ministry of Health established the Digital Health 2020 strategic plan which aims to "progress the core digital technologies presented in the New Zealand Health Strategy" under carefully planned digital investments in its health and disability sector (Ministry of Health, 2017). The Technology and Digital Services Business Unit oversees the Ministry of Health's eHealth programme through the strategic outcomes in the New Zealand Health Strategy and Digital Health 2020 (Ministry of Health, 2017). Through Digital Health 2020, the New Zealand Government have made digital investments that are expected to occur between the years 2016 to 2020 (Ministry of Health, 2017). In this manner, the Ministry of Health hopes to encourage different health organisations around the country to invest in the strategy, as well as health IT, with clarity and confidence in order to align all of the health sector's digital investments together (Ministry of Health, 2017).

There are five core components to Digital Health 2020:

- Single Electronic Health Record,

- Health and Wellness Dataset,
- Preventative Health IT Capability,
- Digital Hospital,
- Regional IT Foundations (Ministry of Health, 2016).

The first three core components will be projects led by the Ministry of Health itself while the latter two core components will be projects regionally led by the country's 20 DHBs (Ministry of Health, 2016). Throughout all five components, the Ministry of Health will work to establish common architecture and standards through all proposed processes, initiate information governance through all districts, and provide common capabilities of information and communication technologies throughout the health sector (Ministry of Health, 2017). Monthly reports are compiled and made public by the Ministry of Health and other key stakeholders involved so that progress can be monitored and assessed closely (Ministry of Health, 2017e).

The first core component is the Single Electronic Health Record which aims to establish a singular or universal EHR system that allows for health information to be accessible for consumers, carers and decision makers (Ministry of Health, 2016). This core component of the Digital Health 2020 strategic plan would allow for more efficient

healthcare services as patients will no longer need to repeat their presenting medical condition details multiple times to different healthcare service providers. Second, healthcare providers will have a more complete and thorough patient health record to use as a basis for their clinical decisions which will support accurate diagnosis and timely treatment interventions (Ministry of Health, 2017b). And last, decision makers and key stakeholders will be able to use the data collected on the EHR system to ensure correct investment decisions are made that target public health initiatives and monitor the effectiveness of healthcare programmes (Ministry of Health, 2017b). This means the Ministry of Health will be able to have more efficient responses and send out health professionals to specific regions who have a higher need of healthcare services to ensure the regional population demands are met. This universal EHR system will help pave the pathway for the second core component of the Digital Health 2020 strategic plan.

The second core component is the Health and Wellness Dataset which aims to establish transparent access of key health data to support the government, health organisations, and researching individuals so that evidence-based decisions can be made to aid New Zealand's healthcare investment approaches (Ministry of Health, 2016). First, a health IT framework and infrastructure will be produced to allow health data to be securely shared between governmental agencies and non-governmental agencies so that both parties

can make logical decisions for the wellbeing of the New Zealand population (Ministry of Health, 2017c). Second, a Data and Information Governance group within the Ministry of Health will be formed to provide strategic leadership and facilitate the sharing of health data which ensures all key stakeholders will be in agreement and updated regularly on the component's process (Ministry of Health, 2017c). Third, the Ministry of Health, Governmental agencies such as Statistics New Zealand, and healthcare providers, will be tasked to provide health data to the data exchange platform so that all key stakeholders can have access to the information they need with the objective of raising New Zealander's quality of life (Ministry of Health, 2017c). This Health and Wellness Dataset component will help improve the overall function of the third core component of the Digital Health 2020 strategic plan.

The third core component is the Preventative Health IT Capability component which aims to allow further information and communications technology capability in healthcare settings to capture and provide health information to improve the targeting of screening, immunisation, and other public health initiatives in preventative health (Ministry of Health, 2016). This component of the Digital Health 2020 strategic plan will focus on advancing IT systems in preventative health to improve the quality, efficiency, and overall experience of publicly funded screening of diseases, immunisation programmes, and health checks

(Ministry of Health, 2017g). This includes the Government's national bowel screening programme, cervical cancer screening, breast cancer screening, new-born hearing screening, and health and development checks for four-year-old children (B4 School Check) (Ministry of Health, 2017g). At present, the attention of Preventative Health IT Capability is directed at the national bowel screening programme which has received 39.3 million dollars in funding over the next four years to design, plan, set up, and implement the screening programme (Ministry of Health, 2017f). This funding will allow the Digital Health 2020 strategic plan to develop the IT needed for this national programme to be successful. These first three core components which are led by the Ministry of Health will occur simultaneously with the fourth and fifth components that are led by the DHBs as the country looks to upgrade its health IT capabilities.

The fourth core component is called Digital Hospital and aims to lift the digital capabilities in public hospitals and integrate them with the wider health sector (Ministry of Health, 2016). The strategy will convert paper-based work processes in hospitals into paperless electronic or digital-based work processes (Ministry of Health, 2017a). This will involve a shift from traditional physical medical imaging systems to digital electronic imaging systems, and paper-based medical drug prescribing to electronic prescribing, dispensing and administering of medicines. All of New Zealand's public hospitals are

currently being assessed against an international benchmark called the Electronic Medical Record Adoption Model (EMRAM) which consists of eight stages that concludes with a completely digitally enabled hospital (Ministry of Health, 2017a). This core component pushes all public hospitals in all DHBs to submit regional service plans that must include digital investments and recommendations in the development of their hospital systems (Ministry of Health, 2017). Annual EMRAM assessments have been conducted and published since 2016, and the 2017 one is currently being analysed, with a repeat scheduled for 2018 (Ministry of Health, 2017a). This will be a driving factor for public hospitals to act and update their hospital environments into digital formats. The final and fifth core component will complete the Digital Health 2020 strategic plan's vision for a digitally advanced health sector in New Zealand.

The fifth core component is the Regional IT Foundations component which aims to create multiple regional foundations to support better access in health information (relating to the second core component) in the delivery of the Single Electronic Health Record component, and in the promoting of the fourth core component by lifting digital capabilities in public hospitals (Ministry of Health, 2016). The Northern Regional Alliance, the Midland Regional Alliance, the Central Regional Alliance, and the South Island Alliance have been established by the 20 DHBs of New Zealand since 2013 so all DHBs can work together with

their neighbouring counterparts to achieve better health outcomes and health targets for their respective populations (Central Region Alliance, 2016; Ministry of Health, 2017i; Northern Regional Alliance, 2016). Each of these four regional alliances were tasked to develop regional service plans which will now incorporate the investment of resources into IT foundations to create projects for more efficient sharing of health information through IT (Ministry of Health, 2017i). In this manner, multiple IT foundations in New Zealand will progress at a better pace following this particular core component of the Digital Health 2020 strategic plan.

Summary

As IT continues to progress rapidly in the 21st century, EHRs are rapidly becoming prevalent and essential in the health sector. Following the release of the Health Information Strategy in 2005, the New Zealand Ministry of Health has established the Digital Health 2020 strategic plan which aims to "progress the core digital technologies presented in the New Zealand Health Strategy" under carefully planned digital investments in its health and disability sector (Ministry of Health, 2017). In order for this to be successful, examples and studies from other countries such as Australia, England, and the United States of America have shown how it is important for end-user healthcare providers to be involved in the process (Greenhalgh et al., 2008; Hailey et al., 2014; Menachemi & Collum, 2011).

Physiotherapists are healthcare professionals who work to promote people's well-being by restoring function and independence that have been lost due to disabilities, disorders, and problems caused by the body's musculoskeletal, cardiopulmonary, or neurological system (World Confederation for Physical Therapy, 2016). The perspectives that physiotherapists have on EHRs must be identified in order for physiotherapists to accept its use effectively when the Ministry of Health finalises the singular EHR system. After all, physiotherapists and the rest of the healthcare providers in New Zealand will be the ultimate end-users who operate this electronic system. Without a clear understanding of their concerns or views the New Zealand Ministry of Health will risk repeating the same mistakes that other countries have made in the past when they introduced an IT system into the health sector.

Effective communication between the directors of the Digital Health 2020 strategic plan, the Ministry of Health, the DHBs, PNZ, and PBNZ is required especially in the implementation process of the universal EHR system throughout the country. The physiotherapy profession and its governing bodies must put in effort to understand the strategic plans and initiatives set out by the Government in order for them to contribute towards the imminent implementation of EHRs in their workplace environment. In return, the Ministry of Health and the directors of the Digital Health 2020 strategic plan must take action to understand the mindset of physiotherapists and what they perceive towards the use of

EHRs in the health system. In this manner, the quality of physiotherapy can progress to a higher level where physiotherapists can effectively utilise what the Government has invested in health IT for the New Zealand population.

Chapter Three: Methods

Introduction

The purpose of this research is to investigate the perspectives of NZRPs, who are Canterbury-based, on the use of EHRs in their day to day physiotherapy practice. This research will further attempt to identify how much these NZRPs understand about EHRs and the Government's current initiative towards digital technologies within the health sector.

Study Protocol

Approval for this research was granted on 5 May 2017 by the University of Canterbury's Human Ethics Committee. Ref: HEC 2017/16/LR (Appendix A) and on 11 May 2017 by the University of Canterbury's School of Health Sciences. Additionally, the research involved the partnership and cooperation with Physiotherapy New Zealand and its Canterbury Branch who aided in the distribution of the electronic survey through their membership emailing system. The Physiotherapy Department at both Burwood Hospital and Christchurch Hospital (Canterbury DHB) helped in the promotion of the research survey through the internal physiotherapy staff email lists. Table 3.1 presents a research design flowchart that details the different processes taken to complete this project.

Research Design Flowchart

Table 3.1: The Research Design Flowchart

Recruit subjects (n = 132): NZRPs who identify as working or living in Canterbury
↓
Survey design: use of Qualtrics software, an online survey design tool
↓
Survey refinement: continuous refinement with supervisor and university research support team to check for overall design and standard with modifications made where necessary
↓
Pilot test of online survey: NZRPs who are not research participants were asked to check the survey for wording and understandability of the survey with modifications made where necessary
↓
Research administered and distributed: online survey distributed through Quatrics software by Physiotherapy New Zealand, Canterbury DHB, and the researcher
↓
Collection of data: Collection and follow up of completed surveys
↓
Aggregate and cleaning of the collected data for analysis using International Business Machines Corporation (IBM) Statistical Package for the Social Sciences (SPSS) (version 24) software
↓
Analysis of data: descriptive statistics, frequencies and cross-tabulations for all relevant variables related to the main research question and supplementary questions
↓
Results: production of meaningful results through scientific analysis of data
↓
Discussion and limitations to research that was carried out
↓
Conclusion and further recommendations from the research study

Recruitment

The NZRP participants who were invited to the research survey were recruited from the Canterbury Branch of Physiotherapy New Zealand, the Canterbury DHB, and the registered physiotherapy clinics within the Yellow Pages online directory. Communication and cooperation with the administrators of Physiotherapy New Zealand was made to finalise the content of the recruitment and invitation email letter before the research survey was electronically distributed by Physiotherapy New Zealand and the Canterbury Branch's secretary to its members. The recruitment and invitation emails, which contained the link to the online research survey, were sent out twice during the three-month data collection period (11 May 2017 - 11 August 2017). Emails were sent to the 480 NZRP Canterbury Branch members of Physiotherapy New Zealand on 11 May 2017 and 11 July 2017.

In addition to this, to increase the number of NZRP participants, individual emails were written and sent to the email addresses provided by all the registered physiotherapy clinics in Canterbury that were in the Yellow Pages online directory. 126 registered physiotherapy clinics in Canterbury provided their email address in the Yellow Pages online directory out of a total of 134 clinics. As such, a total of 126 emails were sent out individually to invite the NZRPs in these clinics to participate in the study's survey. Because of the large volume, these emails were sent from 1 June 2017 to 14 June 2017, to target the NZRPs who

worked in the private sector.

To further increase the number of participants, emails and then person-to-person contact were made to the physiotherapy managers in the Canterbury DHB. After finalising and receiving approval from the Canterbury DHB, recruitment and invitation emails were sent through the DHB's physiotherapist staff emailing list which specified its intention for their physiotherapy staff to voluntarily contribute to the research survey. A total of 156 emails were sent from the DHB's physiotherapy staff mailing list. Public hospitals belonging to Canterbury DHB included Ashburton Hospital, Burwood Hospital, Christchurch Hospital, Christchurch Women's Hospital, Hillmorton Hospital, and other smaller rural hospitals and facilities. These emails were targeted towards the NZRPs who worked in the public sector.

No attempts were made by the researcher to sample the number of NZRPs working or living within the Canterbury region. Rather, contact was made with all of the NZRPs that were affiliated to the Canterbury Branch of Physiotherapy New Zealand which involved 480 NZRPs out of 606 NZRPs working or living within Canterbury according to estimates from the latest physiotherapy workforce survey (Stokes et al., 2014). Furthermore, contact was made with all the registered physiotherapy clinics found through the Yellow Pages online directory as well as the 156 NZRPs working in the Canterbury DHB. Sample size

calculations were not relevant because the study utilised a non-randomised convenience sample. The researcher does not believe there will be a significant demographic difference that would affect the results of the study between NZRPs who are affiliated to Physiotherapy New Zealand, the Canterbury DHB, or NZRPs working in private clinics found through the Yellow Pages online directory compared to those who are not.

Although participant recruitment for the study was completed through email invitations towards three different population groups, it is vital to take into account that the NZRPs among each group will not be mutually exclusive to each other. That is to say, NZRPs who work in the Canterbury DHB may also be working in private physiotherapy clinics, while also being an affiliated member to the Canterbury Branch of Physiotherapy New Zealand. Thus, there is a high likelihood of an overlap of email invitations to the same individuals will occur because NZRPs may belong to one, two, or all three population groups.

Screening and Cleaning of Data

The electronic survey, which was administered online through Qualtrics, allowed for the data recorded to be organised by its software into comma-separated values (.csv) files. Although a paper-based version of the research survey was offered as an alternate option (see Appendix B), no participants requested this. There was, therefore, no requirement for any

survey to be converted into an electronic format because all participants recorded their responses electronically online.

With the assistance of the Statistical Advisor from the University of Canterbury's School of Health Sciences, data was cleaned and checked for errors before any analysis was performed. This was done to ensure that the results and interpretations produced from the data would be accurate and representative of the participant population. Checks were performed by the Statistical Advisor and the researcher to ensure that any one participant had not replied the survey more than once and that partially completed surveys were excluded from analysis. During the data cleaning process, the data was filtered and scanned for any existing outliers and errors among its variables. Any identified abnormalities were corrected and adjusted accordingly.

Coding

Coding in this research study involved the renaming, defining, and labelling of the variables collected through the research survey. Numbers and values were manually coded to replace variables that contained any non-numerical data or complex multi-worded data. As for open-ended responses, the data collected were manually examined and either allocated to existing variables or new ones were created to include the data into analysis. These were

coded accordingly for the computer software to interpret correctly.

Following data collection, the data were coded to be better analysed by the International Business Machines Corporation (IBM) Statistical Package for the Social Sciences (SPSS) (version 24) software. For data that were collected from multiple response choice questions, the number 1 was coded for participants who chose specific responses while the number 0 was coded for participants who did not choose specific responses. For data collected from single choice questions, the responses were cleaned to make sure the analytical software could interpret the responses such as *yes*, *no*, or *neither yes or no*. Afterwards, the descriptive statistics produced by IBM SPSS (version 24) allow the raw findings to be further analysed through cross-tabulations, chi-square statistics, and the production of meaningful graphic representations.

Survey Design

The survey consisted of a total of 25 questions which were formulated by the researcher and the supervisor of this research study. The researcher brainstormed potential questions organising them and presenting them to the supervisor for further refinement. The majority of the survey were close-ended questions, while six were partially close-ended questions or open-ended questions, and only the second to last question was open-ended to

allow participants to voice any of their thoughts towards the topic of interest after completing the research survey.

The paper-based version of the research survey was created through transcribing the questions created from the Qualtrics software onto a Microsoft Word document which was then printed. For open-ended and partially close-ended questions, writing lines were created for participants to write on while participants were asked to tick the answers they agree with for close-ended questions. The survey was separated into four different sections with each section having a similarity in the types of questions that the research survey wished to inquire of the participants.

Instrument for the Study

The study instrument was divided into four different sections:

1. Section 1: “The Electronic Health Record (EHR)” and the different perspectives of the research participants (Questions 1 to 7).

2. Section 2: “Computer Usage Information”, an insight towards the amount of computer usage as well as what type of usage (Questions 8 to 12).

3. Section 3: “Current Practising Information”, identifies which sectors the research participants are practising in and their satisfaction towards their current health record information system (Question 13 to 16).

4. Section 4: “Physiotherapist Sociodemographic Information” to recognise the specific backgrounds of each research participant demographically and socially (Questions 17 to 23).

5. And two final questions: Question 24 is an open-ended question that allows participants to voice any of their thoughts in regards to the survey or the research topic at hand, and Question 25 is an option for participants to provide their contact information should they wish a summary of the results from the research study.

The initial explanation and definition of EHRs at the beginning of the survey was sourced from HIMSS (2013, p. 259).

Question 1 to 7 in Section 1 seek to understand the perspectives and knowledge of NZRP participants on EHRs and whether or not they have heard of Digital Health 2020, the Government’s five-year strategic plan for New Zealand’s health IT. This understanding is

vital to the future of New Zealand's health IT as previous studies have shown the importance to find the perspectives of health professional end-users and the importance for them to be involved in EHR design and implementation (Greenhalgh et al., 2008; Hailey et al., 2014). The options for Question 5 and Question 6, which aim to find what NZRP participants perceive as advantages and disadvantages of EHRs, were identified through multiple research studies and sourced from Anderson (2007), Chhanabhai & Holt (2007), Gardner et al. (2003), Goldzweig et al. (2015), Khangura et al. (2010), Latha et al. (2012), Menachemi & Collum (2011), Ross et al. (2014), and Zandieh et al. (2008).

Questions 8 to 12 in Section 2 were created to gain an understanding of the computer usage for NZRP participants both in their working environment and in their private environment. Greenhalgh et al. (2008) observed in their study the lack of familiarity towards new health IT that older health professionals frequently have in the healthcare workforce population which contributed to the failure of EHR implementation in an English healthcare setting. Understanding how much personal computer use that NZRP participants have can then be used to identify potential correlations between personal computer use and the willingness to support a health record system operated through digital technology such as computers, laptops, tablets, and smart phones. Within the business sector, familiarity towards Internet-based product-brokering recommendation agents from investors causes investors to

trust in certain agents more than other agents in a cognitive and emotional aspect (Komiak & Benbasat, 2006). Within this research, it is hypothesised that the more the research participants spend using computers and associated software, the more likely are they to support health IT. Gathering information on what computer software are used in their day to day practice as a physiotherapist will be important to understanding what research participants do when they are operating computers during work.

Questions 13 to 16 in Section 3 and Questions 17 to 23 in Section 4 were designed to gain a better understanding of the sociodemographic profiles of the NZRP participants of the study. It is important to understand where in Canterbury these participants are located and how long they have been practising physiotherapy. In this way, the sociodemographic data collected from the research survey can then be used to compare with the overall physiotherapy workforce in New Zealand to see how similar the Canterbury-based participant population is to the rest of New Zealand. This is then used to determine whether the results of the research are relevant to the rest of the country's physiotherapists.

Question 24 was asked to gain any further qualitative data that research participants wish to voice in regards to the research survey and its topic in general. Question 25 allows for research participants to include an optional email address for a summary of the survey

findings to be sent out to them once data analysis is complete. The survey instrument of the study allows for a comprehensive collection of research data which provides adequate opportunities to identify vital findings for the research questions within the study.

Questions and Research Hypotheses

The sections below details the questions asked in the survey as well as the research hypotheses and reasoning behind each question.

Section 1 of 4: The Electronic Health Record (Questions 1 to 7)

Question 1: Would you support the idea of a universal electronic health record that will be used and accessed by healthcare providers from all of New Zealand?

- *Yes*
- *No*
- *Neither yes or no*

Research hypothesis: Participants are more likely to support the use of a universal electronic health record.

Question 2: Have you heard about the Government's Digital Health 2020 strategic plan

where they aim to introduce a universal electronic health record that can be used and accessed by healthcare providers from all of New Zealand?

- *Yes*
- *No*
- *Cannot remember*

Research hypothesis: The majority of participants would not have heard of the Government's Digital Health 2020 strategic plan.

Question 3: Would you be committed to using a universal electronic health record introduced by the government if there was no formal support, training, or funding?

- *Yes*
- *No*
- *Neither yes or no*

Question 4: Would you be committed to using a universal electronic health record introduced by the government if formal support, training, and funding are provided to you?

- *Yes*
- *No*

- *Neither yes or no*

Research hypothesis: More participants would be committed to using a universal electronic health record introduced by the government if there was formal support, training, and funding compared to without.

Question 5: What do you think are the advantages of using electronic health records?

- Provide integrated healthcare across different healthcare locations
- Be accessed anytime and anywhere by healthcare professionals involved in the direct care of patients
- Effectively evaluate the quality of the care provided
- Efficiently calculate the cost of the care provided
- Allow healthcare providers of different professions to communicate with each other
- Save time on locating and retrieving health information and patient charts
- Provide more than one copy of the same patient information at any given time
- Nullify the difficulties that healthcare professionals may have on reading each other's unique handwritings that may often be unintelligible
- Determine who had access (an "electronic footprint") to which patient health

information by requiring each user to be registered to the electronic health record

- Provide security to sensitive health information through password authentication processes
- Other advantages, please write in the box below

Question 6: What do you think are the disadvantages of using electronic health records?

- Extra cost of additional resources such as money and time to train healthcare professionals to use electronic health records
- Lack of acceptance by healthcare professionals who choose not to use electronic health records
- Ongoing cost to maintain the required software and hardware to keep the electronic health record system up to date
- Lack of autonomy and flexibility for healthcare professionals to record health records the way they want to rather than the rigid structured format of the electronic health record
- Potential threat of security breaches by hackers or malicious software that can access sensitive healthcare information from anywhere
- Healthcare providers can access healthcare information who are not in their

direct care

- Non-healthcare providers who produce, maintain, and service the electronic health record system will have access to sensitive health information when working on the system
- Other disadvantages, please write in the box below

Research hypothesis: a) Participants would see integration with other health professions, communication with other health professionals, and ease of accessibility as the main advantages of electronic health records. b) Participants would see the potential breach in security, the lack of flexibility in the software, and unjustified access to health records as the main disadvantages of electronic health records.

Question 7: Have you ever had any formal training on operating electronic health records before?

- *Yes*, please state this training
- *No*

Research hypothesis: The majority of participants are likely to have received formal training on operating EHRs and other types of computer software used in their physiotherapy

practices.

Currently, many health professionals view EHRs as the more superior health record system compared to other systems (Buyl & Nyssen, 2009; Hailey et al., 2014; Goldzweig et al., 2015). However, the Government's Digital Health 2020 strategic plan does not involve official promotions from the Government to raise awareness of their intention to introduce a universal EHR system across New Zealand (Ministry of Health, 2017). If there is effective communication, funding, and support for health professionals during the implementation of EHRs, then health professionals will be more committed during its implementation process (Greenhalgh et al., 2008; Menachemi & Collum, 2011).

Section 2 of 4: Computer Usage Information (Questions 8 to 12)

Question 8: Do you use a computer for work?

- *Yes*
- *No*

Question 9: On average, how much time do you spend using a computer for work each day? Please select an answer by click on the dropdown list below.

Question 10: Do you use a computer for personal purposes?

- *Yes*
- *No*

Question 11: On average, how much time do you spend using a computer for personal purposes each day? Please select an answer by clicking on the dropdown list below.

Research hypothesis: a) Almost all of the participants would be using a computer for work each day for more than two hours on average. b) Participants are likely to use computers for personal purposes and will spend more than an hour on average each day using computers for personal purposes.

Question 12: What computer software are used in your day to day practice as a physiotherapist? Please write in the box all those you use.

Research hypothesis: Multiple computer software will be used by participants in their day to day practice as NZRPs.

Because EHRs are regarded as the ideal record system in healthcare, the day to day

practice of healthcare providers would likely involve operating computers that run these electronic systems. Due to the lack of progression in IT in the health industry compared to other industries, it is highly possible that health professionals would spend more time operating computers for personal purposes such as managing their finances or for social interactions than for work purposes such as operating EHRs (Anderson, 2007; Greenhalgh et al., 2008; Menachemi & Collum, 2011). Due to the lack of a universal EHR system within New Zealand, health professionals will be operating a variety of computer software in order to meet the demands of their day to day practice.

Section 3 of 4: Current Practising Information (Questions 13 to 16)

Question 13: As a New Zealand Registered Physiotherapist, are you currently:

- Practising as a physiotherapist
- Not practising as a physiotherapist (if so, you are not required to answer Questions 14 to 16 and may continue on to Question 17 in the next section. Thank you)

Research hypothesis: Participants, who are all NZRPs, are likely to be practising as physiotherapists.

Question 14: If you are currently practising as a physiotherapist, what type of work setting do you practice in?

- Private sector
- Public sector
- Both sectors

Research hypothesis: A larger proportion of participants will come from a background where they work in the private health sector.

Question 15: If you are a currently practising as a physiotherapist, when recording patient notes, does your workplace use:

- Electronic health records
- Paper-based health records
- A mix of both types

Research hypothesis: The majority of participants would be using EHRs in their day to day practice as a physiotherapist.

Question 16: If you are currently working as a New Zealand Registered Physiotherapist, are

you satisfied with the current health record information system that you are using in your day to day practice?

- *Yes*
- *No*
- *Neither yes or no*

Research hypothesis: A large proportion of participants would not feel satisfied with their current health record information system in their day to day practice as NZRPs.

The NZRP participants in this study were invited through the Canterbury Branch of Physiotherapy New Zealand, and are members belonging to the organisation. As such, there will likely be a higher proportion of NZRPs who come from working in a private setting as opposed to a public setting. Furthermore, the majority of participants will likely be practising physiotherapy. This will be due to the many membership benefits that are provided by Physiotherapy New Zealand.

One of the main benefits offered by Physiotherapy New Zealand for its members is the Professional Liability Insurance which is a policy that covers practising physiotherapists for up to NZ$1,000,000 dollars during the term at a low cost (Physiotherapy New Zealand,

2017a). This is beneficial to participants who practice in the private health sector and have to seek out insurance policies individually, which is often time consuming and costly. This is a stark contrast compared to health professionals working within the public health sector where DHBs provide insurance policies through NZ Health Partnerships Limited (Canterbury District Health Board, 2016).

Participants of the study are more likely to come from the private health sector where they will be using EHRs rather than PHRs for better work efficiency in their day to day practice. This is likely due to the advantages mentioned previously where EHRs can evaluate and calculate the cost and quality of healthcare services for the better managing of resources. In addition, from the information provided by Canterbury DHB's People and Capability Advisor and Stokes et al. (2014), there are more Canterbury-based physiotherapists working in the private health sector than the public health sector. However, due to the lack of a universal EHR system in New Zealand, participants are likely to be dissatisfied with their current health recording system because it may involve multiple software packages and the consequent complexities.

Section 4 of 4: Physiotherapist Sociodemographic Information (Questions 17 to 23)

Question 17: What was the year that you first registered as a physiotherapist in New Zealand?

Please select an answer by clicking on the dropdown list below.

Question 18: What was the year that you graduated with a physiotherapy qualification?

Please select an answer by clicking on the dropdown list below.

Question 19: What is your highest education qualification? Please select one.

- Diploma
- Bachelor Degree
- Postgraduate Certificate
- Postgraduate Diploma
- Masters
- PhD
- Other, please state

Research Hypothesis: Participants with a postgraduate certificate qualification or above will support EHR use and implementation more so than those with a bachelor's degree or below.

Question 20: How many total years have you worked as a physiotherapist? This means to exclude the times where you did not practice physiotherapy but have a physiotherapy

qualification. Please select an answer by clicking on the dropdown list below.

Question 21: What is your gender?

- Male
- Female
- Other, please specify

Research hypothesis: The sample would consist of a larger proportion of female participants than male participants.

Question 22: What year were you born? Please select an answer by clicking on the dropdown list below.

Research hypothesis: The mean age of participants would be around 35 years old (born in the 1980s).

Question 23: What is your ethnicity? Please select all that apply to you.

- New Zealand European
- Maori

- Asian
- Pacific Islander
- Other, please state

Research hypothesis: The majority of participants would primarily identify themselves ethnically as New Zealand European.

According to the New Zealand physiotherapy workforce report conducted by the Physiotherapy Board of New Zealand, the average age of physiotherapists in New Zealand was 35 years old and females made up two-thirds of the entire workforce (Stokes et al., 2014). Furthermore, 85% of physiotherapists in New Zealand identify their primary ethnicity as New Zealand European or European (Stokes et al., 2014). Currently, the minimum requirement for new and upcoming potential physiotherapists is to attain a Bachelor of Physiotherapy either the Auckland University of Technology or the University of Otago (Stokes et al., 2014).

The recruitment process for research participants did not show bias towards the gender, ethnicity, age, or education level and therefore, it is likely that the participant sociodemographic profiles will be similar to that of the census report. Although education

levels were not reported in the census report, it plays an important role in allowing participants to understand and support EHRs (Greenhalgh et al., 2008)

Question 24: If you have any comments regarding the questions within this survey, please feel free to make any comments in the space provided below.

Question 25: If you wish to have a summary of the survey findings sent to you, please provide me with your email address in the given space below.

Data Analysis

The statistical analysis software used in the research was the IBM SPSS Version 24. Elliott and Woodward (2007) and Argyrous (2011) explain how the descriptive statistics produced through the analytical program are useful for the describing and creating summaries about the sample and the measures. The SPSS software program uses the data provided to create graphical analysis, quantitative analysis, and data frequencies through frequency distribution tables.

Cross-tabulations were performed between study variables of interest to explore potential associations which addresses the research questions and hypotheses in the study.

The research questions direct and lead the researcher to unique and specific characteristics of distributions for the given variables. Through Microsoft Excel and its data computing formulae, calculations were performed to determine whether the results would be statistically significant within a 95% confidence interval. This involved identifying values for proportion, standard deviation, upper and lower bounds with the confidence interval, z-score, and the p-value. To determine whether there is a statistical significance or not, the p-value must be 0.05 or less. If the level of significance is above 0.05, then the relationship would be concluded as not statistically significant (Elliott & Woodward, 2007).

Inductive content analysis was performed on the qualitative data collected at the end of the survey where NZRP participants were given the opportunity to voice any comments or opinions towards the research topic. As described by Elo & Kyngas (2008), the qualitative content analysis process is frequently used in studies of health sciences and public health where its inductive method is carried out when there is a lack of former knowledge about the topic at hand. The inductive content analysis approach involves the analysis of data from specific or similar words into broader umbrella themes and topics (Elo & Kyngas, 2008). Qualitative data from the survey were coded, grouped, and then categorised into conceptual themes that represents the attitudes of the NZRP participants towards EHRs and health IT. For this reason, the participants were allocated numbers to keep track of their comments or

opinions.

The detailed analysis of the research data and its results are presented in the results section of the study where research questions are answered through analysing data that are relevant to the research questions.

Sample Size and Margin of Error

Altogether, 762 invitations were sent throughout Canterbury to invite the NZRPs who are based within the region to take part in the research study's survey. These include 480 email invitations sent to the NZRPs who are members of Physiotherapy New Zealand, 126 email invitations sent to the private physiotherapy clinics registered to the Yellow Pages online directory, and 156 email invitations sent to the NZRPs working in the Canterbury DHB. A total of 132 NZRPs completed the survey during the three-month data collection period. This represents a response rate of 17.3% while taking into account that the NZRPs belonging to each group are likely not mutually exclusive and that private physiotherapy clinics are likely to have more than one NZRP who may work in multiple clinics during this data collection period.

The margin of error is defined by the following formula: the margin of error in a

sample size = 1 divided by the square root of the sample size. The figure is then multiplied by 100 to determine its percentage value. According to this definition and formula, the margin of error for the study's sample size (n = 132) is 9% (up to 1 significant figure). Therefore, the researcher in this study will be 95% confident that the true population value of the sample estimate lies in plus or minus 9% from what is reported by the sample respondents or participants. In other words, if 60% of the respondents answered a question in the survey in a certain manner, the research study will have 95% confidence that the true population value is 60% plus or minus 9% and would lie between 51% to 69%.

Anonymity and Freedom to Withdraw

The research study's participant information sheet and consent form were provided electronically to the research participants through the same Qualtrics survey design software that was used to design the research's survey. Once the research participants had read through the information sheet and had provided their consent, they were then transferred to the research study's survey automatically. The electronic data storage folder used to store the participants' consent forms was kept separate and independent to the electronic data storage folder used to record the participants' survey responses in Qualtrics. This allowed for the collection and proof of the participant's consent to the survey, while also allowing the survey responses to not be linked to the consent forms. In this way the survey responses collected

from the research participants remained anonymous.

The participants of the study were provided with the freedom to withdraw at any stage of the survey without penalty. The participants were informed prior to the beginning of the survey that their responses would not be recorded in the electronic data storage folder until they had reached the final page of the survey and had clicked the submission button. This means that the participants could close the online survey at any point, regardless of progress, and withdraw from the study with no consequence. These features added into the survey design ensured that the survey met the standard guidelines set out by the Human Ethics Committee.

Chapter Four: Results

Introduction

After the methods chapter, which outlines the research study's design, the data collected from the 132 Canterbury-based NZRP participants, and the details of data analysis through the IBM SPSS Version 24 statistics software programme, this chapter focuses on the results of the participants' survey responses. This chapter includes the sociodemographic characteristics of the participants such as the year they were born, their current physiotherapy practising situation, and their computer use and it also gives the results of the survey, which address the primary research question, the supplementary research questions, and the research hypotheses described in the methods chapter. Sociodemographic characteristics of the participants, such as the year they were born, their current physiotherapy practising situation, and computer use are also presented.

Descriptive Statistics

Descriptive statistical analysis was carried out on all data that were relevant for the investigation of the sociodemographic characteristics of the NZRP participants and for the investigation of the research questions of this study.

The Sociodemographic Characteristics of the Sample Participants

Three quarters (77%) of the Canterbury-based NZRP participants were female (n = 99), while 23% were male (n = 29). This supports the research hypothesis that the sample would consist of a larger proportion of female participants. The age of the participants ranged from 23 years old (born in 1994) to 75 years old (born in 1942) with a mean age of 43 years old (born in 1974) and a standard deviation of 12.9 years. Ninety-six percent (126) of participants provided data on the year they were born and thus their age. A third of these participants were aged 23 to 34 years (41 participants), another third were aged 35 to 49 years (41 participants), and 44 participants (34%) were aged 50 to 75 years. These results do not support the research hypothesis that the mean age of participants would be around 35 years old, which is the national average of practising physiotherapists in New Zealand.

In regard to self-identified ethnicity, the NZRP participants comprised 107 New Zealand European (81%), five Asian (4%), two Maori (2%), one Pacific Islander (1%), and 17 (13%) self-reporting other ethnic identifications which included British, Irish, African, Moriori, Dutch, and unspecified European (see Figure 4.1). These results show the participant's primary ethnicity and involved the reallocation of two of the participant's ethnicities, where they selected "New Zealand European" and "Others", in according to the code of ethnic prioritisation set out by the New Zealand Ethnicity Data Protocols for the

Health and Disability Sector (Ministry of Health, 2004). For “Others”, these two participants stated “Moriori” and “British” and were reallocated to the other ethnicities instead of New Zealand European. The results support the research hypothesis that the majority of participants would primarily identify themselves ethnically as New Zealand European.

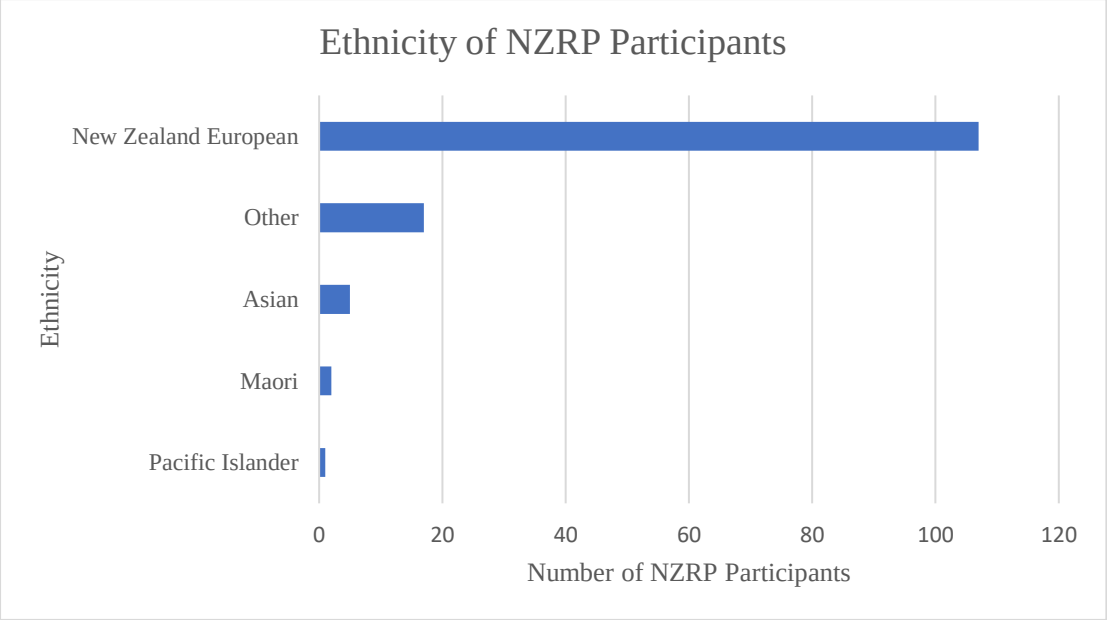


Figure 4.1: The participant’s self-identified ethnicity

In the survey, participants were asked to indicate in which year they graduated with a physiotherapy degree and also in which year they first registered as a NZRP. The mean reported year in which participants graduated with a physiotherapy degree was 1996 and ranged from 1962 to 2016. The year in which participants first registered as a NZRP ranged from 1963 to 2017 with the mean reported year being 1998. The differences in these results is

due to the delay in which participants registered after graduation, typically in the year following graduation. In addition, the results show that 128 participants (99%) are currently practising physiotherapy while one participant (1%) is registered but not practising as a NZRP. This supports the research hypothesis that participants, who are all NZRPs, are likely to be practising as physiotherapists. This may also represent the sampling strategy that targeted practising physiotherapists and did not actively identify and recruit non-practising physiotherapists.

Table 4.1 presents the results of the education level of the participants. To qualify as physiotherapists in New Zealand, individuals must attain either a Diploma in Physiotherapy (pre-1991) or a Bachelor of Physiotherapy (1991 and onwards) (Physiotherapy New Zealand, 2017). The data were, therefore, organised into two different groups: *Bachelor's Degree or below* (which included the choices of *Diploma* and *Bachelor Degree*) and *Postgraduate Certificate* or above (which included the choices of *Postgraduate Certificate*, *Postgraduate Diploma*, *Master's Degree*, and *PhD Degree*) to show which participants had further tertiary level education after attaining the minimum criteria to qualify as a NZRP. Sixty-four participants (49%) have a Bachelor's Degree or below while 68 participants (51%) have a Postgraduate Certificate or above.

Table 4.1: The education level of NZRP participants

Education Level	Frequency	Percent
Bachelor's Degree or below	64	48.5
Postgraduate Certificate or above	68	51.5
Total	132	100

When participants were asked if they use a computer for personal purposes (excludes smartphone, tablet, cell phone use and the like), 124 participants (95%) responded that they do while six participants (5%) responded that they do not use a computer for personal purposes (see Figure 4.2). Following this question, participants were asked to indicate how much time they spent using a computer for personal purposes on average each day. Participants reported that they spent a mean time of 1.37 hours (82 minutes), and a median and mode time of 1 hour, (n = 51) on a computer for personal purposes. These results support the research hypothesis that, “participants are likely to use computers for personal purposes and will spend more than an hour on average each day using computers for personal purposes.”

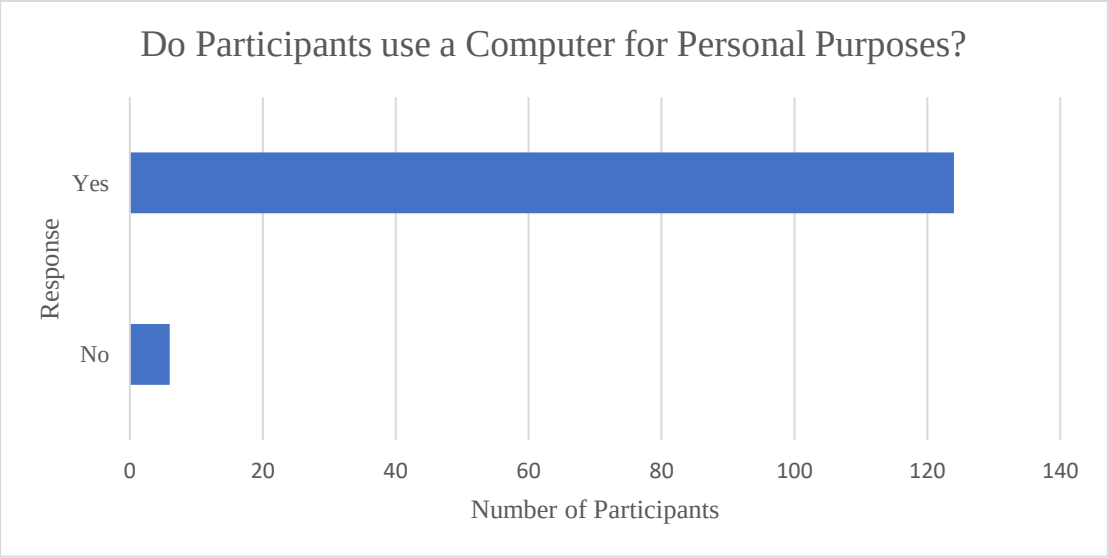


Figure 4.2: The participants' responses on computer use for personal purposes

Eighty-eight participants (69%) reported working in the private sector, 28 participants (22%) in the public sector, and 12 participants (9%) in both sectors of the healthcare industry. Among the participants who are currently practising physiotherapy, 72 participants (56%) use EHRs in their workplace, 15 participants (12%) use paper-based health records, and 41 participants (32%) use a mix of both types (see Figure 4.3). These results support the research hypotheses that, "a larger proportion of participants will come from a background where they work in the private sector" and that, "the majority of participants would be using EHRs in their day to day practice as a physiotherapist."

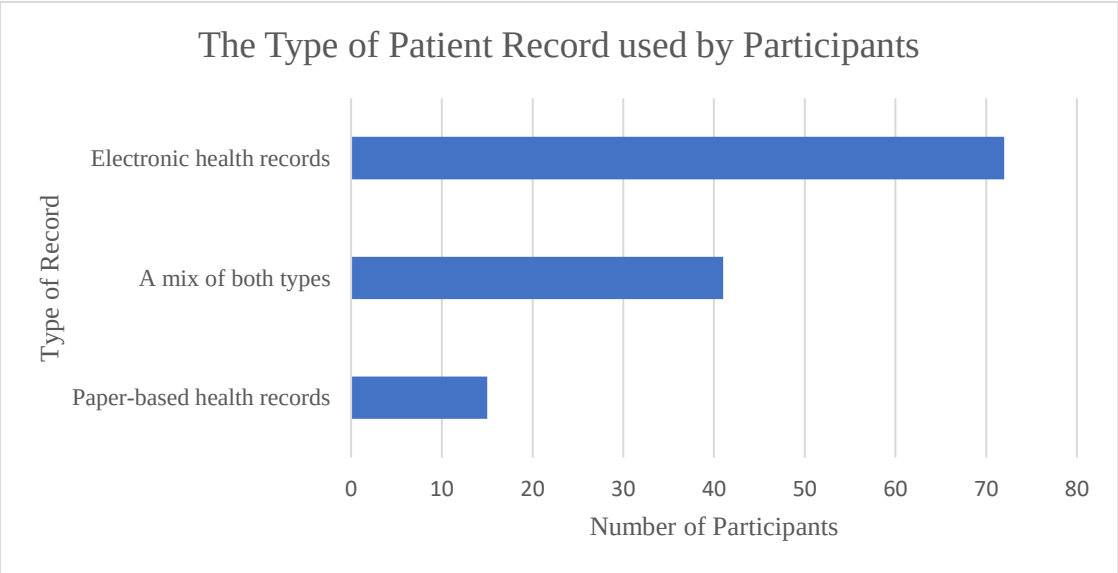


Figure 4.3: The type of patient record used by participants

Summary. The survey's NZRP participants are predominantly female (77%) and this mirrors the latest physiotherapy workforce survey which reports the profession as being a female dominated one with 67% female (Stokes et al., 2014). The mean age, however, of participants in the study, 43 years, which is older than that of the mean age of NZRPs in New Zealand, which is 35 years (Stokes et al., 2014).

The majority of NZRP participants self-reported New Zealand European ethnicity (81%), followed by Asian (4%), Maori (2%), Pacific Islander (1%) and other ethnicities (13%). This is similar to the latest physiotherapy workforce survey which reports the country's NZRPs to be mainly of New Zealand European or European ethnicity (85%), followed by Asian ethnicity (6%), then Maori ethnicity (5%), and finally other ethnicities (4%) such as Samoan or Tongan (Stokes et al., 2014). Almost half (49%) or 64 NZRP

participants have either a Diploma in Physiotherapy or Bachelor of Physiotherapy compared to 51% (68) NZRP participants, who have postgraduate qualifications.

The mean reported year in which the NZRP participants completed their physiotherapy qualification was 1996. There is a 23-year difference compared to the mean reported year in which these participants were born, which was 1973. This means that upon graduation participants are likely to be, on average, 23 years old. Participants would then apply to be registered as physiotherapists two years' after their graduation with a physiotherapy degree. This can be seen from the mean reported year in which participants first registered as NZRPs, which was 1998. Almost all of the participants are currently practising physiotherapy (99%).

Currently, there is no law or regulation in regards to what type of patient record should be used by NZRPs. Over half of the participants (56%) solely use electronic health records in their day to day practice as a physiotherapist, a minority of participants (12%) use paper-based health records, and almost a third (32%) of participants use a mix of both types. Over two-thirds (69%) of participants are working in the private sector, less than a quarter of participants (22%) are working in the public sector, while only 12 participants (9%) of participants are working in both sectors. Compared to the latest physiotherapy workforce

survey, New Zealand has 31% of its NZRPs working in the public sector, 54% working in the private sector, and the remaining NZRPs working in other settings such as in educational or research environments (Stokes et al., 2014). Hence, the study sample of NZRPs over represents private sector physiotherapists and under represents public sector physiotherapists. This may be due to how NZRPs were recruited in the study whereby two of the three recruitment groups were likely to be more private sector dominated.

The NZRP Participants and their Perspectives on the Implementation of a Universal EHR

The primary research question of the study asks, "What are the perspectives of NZRP participants, who live or work in Canterbury, on the use and implementation of EHRs?" The results show that NZRPs, who live or work in Canterbury, have very similar perspectives towards EHR use and implementation. Figure 4.4 depict how a large proportion of sample participants (92%) support the idea of a universal EHR that can be used and accessed by healthcare providers throughout New Zealand. Only two participants (2%) rejected the idea of a universal EHR and nine participants (7%) were indifferent and answered with "Neither yes or no". The results support the research hypothesis that most participants are likely to support the use of a universal EHR.

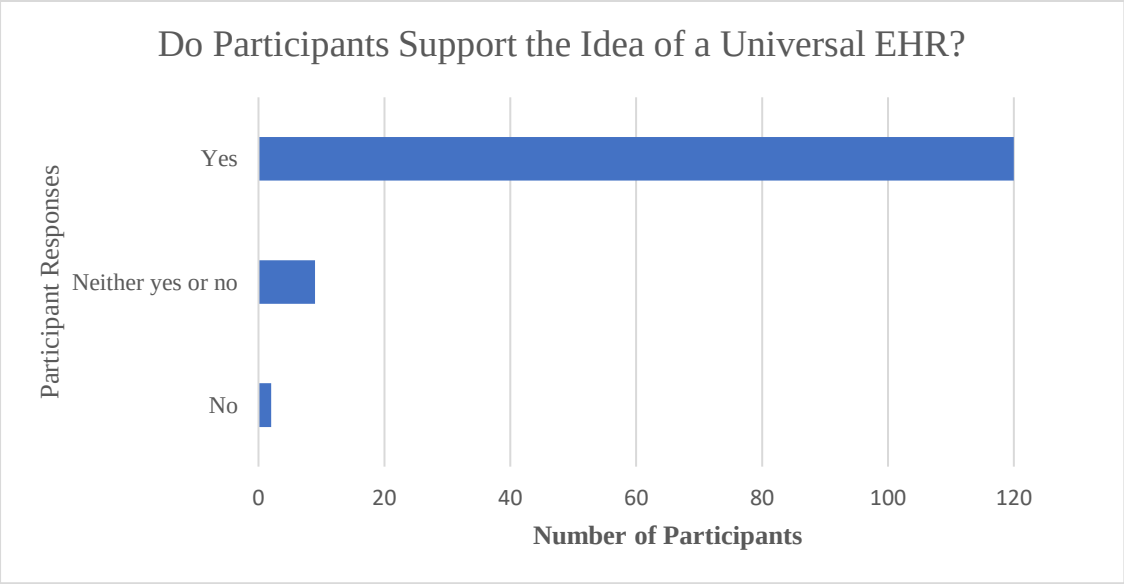


Figure 4.4: The sample participants' views towards the idea of a universal EHR throughout New Zealand

The survey further explored the difference in perspective when formal support, training, or funding are added to the context of EHR use. Figure 4.5 detail how more than three-quarters (81%) of the sample will not be committed to using a universal EHR introduced by the Government should the Government decide not to provide any forms of support, training, or funding. On the contrary, Figure 4.6 details how almost all (95%) of the respondents would be committed to using a universal EHR introduced by the Government should the Government decide to offer and provide formal support, training, or funding.

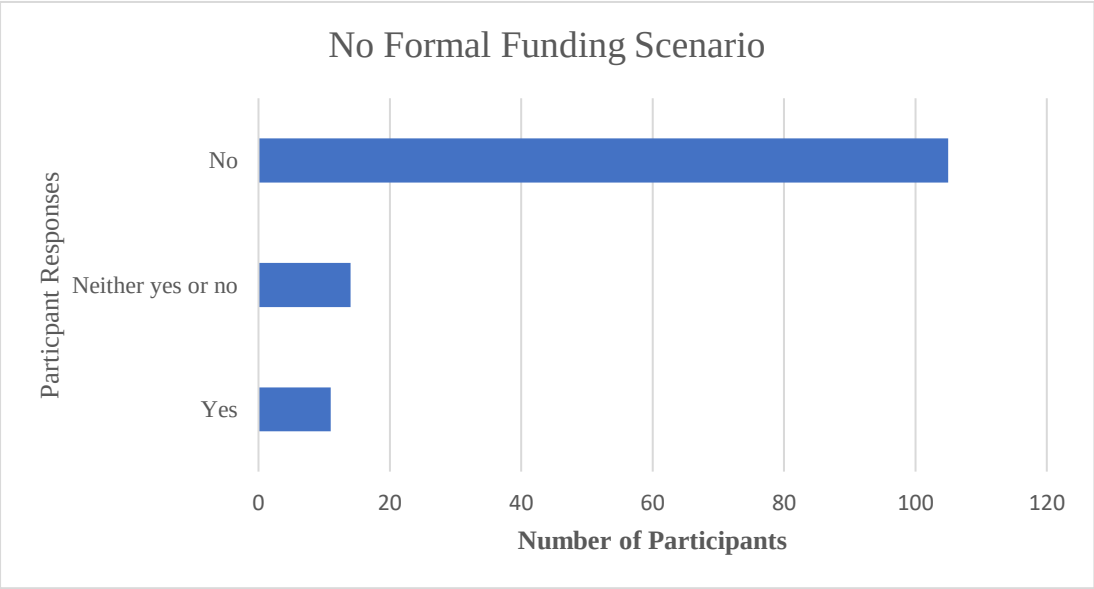


Figure 4.5: Participant commitment to a universal EHR introduced by the Government if there were no formal support, training, or funding

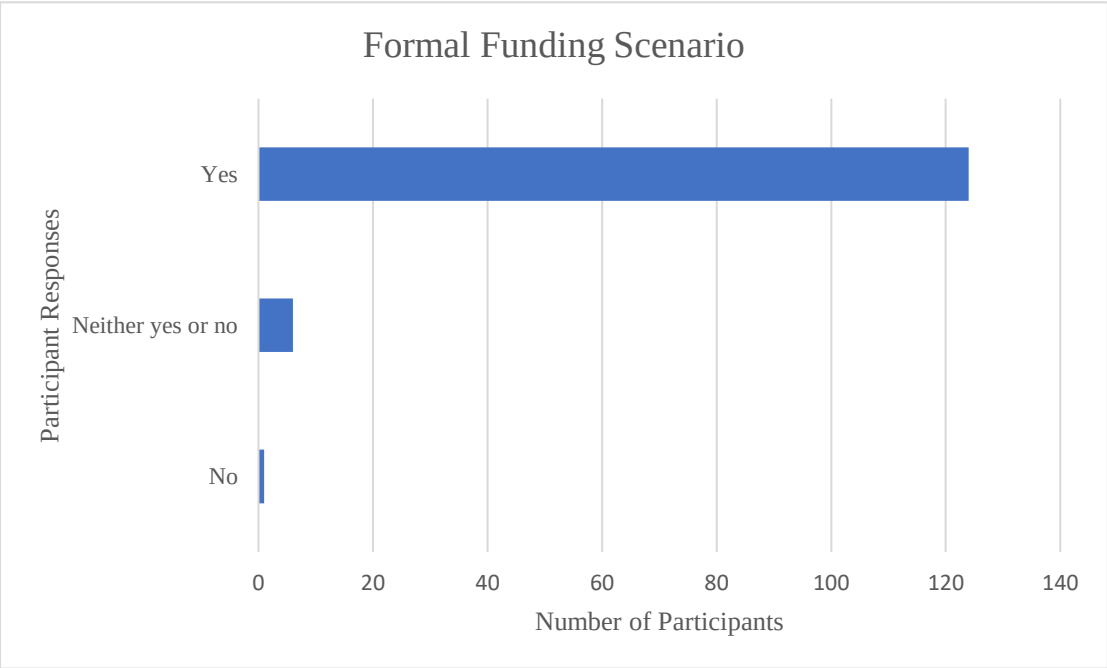


Figure 4.6: Participant commitment to a universal EHR introduced by the Government if there were formal support, training, and funding

The results yielded from the two different scenarios described above reveal valuable insights towards the perspectives on the implementation of an EHR and the important enabling factors of formal support, training, and funding. As the scenarios provide different perspectives on the implementation of an EHR, cross-tabulation across them was conducted to demonstrate how many NZRP participants altered their responses on the basis of the Government providing, or not providing, formal support, training, and funding. Table 4.2 details how 98 participants (75%) out of 130 participants who answered both Question 3 (no funding scenario) and Question 4 (funding scenario) of the survey, altered their responses from *No* to *Yes* towards committing to a universal EHR should the Government provide formal support, training, and funding. The results in this section support the research hypothesis that most participants would be committed to using a universal EHR introduced by the Government if there was formal support, training, and funding compared to the introduction of EHRs without such support mechanisms.

Eleven participants said *Yes* to using an EHR whether funding was available or not, that is, funding per se did not affect their decision to use an EHR. However, for the majority of the participants funding was an influence in using an EHR. Ninety-eight participants said they would not use an EHR if funding were not available but would use an EHR if funding was available. In addition, a further 14 participants who responded *Neither yes or no* to the no

funding scenario responded *Yes* to the funding scenario, giving a total of 123 participants out of 130 (95%) who would use an EHR if funding support were provided.

Table 4.2: The participant's commitment to a universal EHR introduced by the Government if there were, or were not, formal support, training, or funding

		Funding Scenario			
		Yes	No	Neither yes or no	Total
No Funding	Yes	11	0	0	11
Scenario	No	98	1	6	105
	Neither yes or no	14	0	0	14
	Total	123	1	6	130

Sixty-one participants (48%) were satisfied with their current health record information system, 38 participants (30%) were not satisfied, and 28 participants (22%) were neither satisfied nor unsatisfied (see Figure 4.7). This result supports the research hypothesis that, "a large proportion of participants would not feel satisfied with their current health record information system in their day to day practice as NZRPs." In the sample, 88 participants (69%) were working in the private sector and 28 participants (22%) were working in the public sector. Cross-tabulation was conducted with participants' satisfaction with their current health record information system and which health sector they are working

in (see Table 4.3).

A chi-square test was performed to test the hypothesis of no association between which sector the participants are working in and whether or not they are satisfied with the current health record information system that they are using in their day to day practice. A higher proportion of participants working in the private sector (61% or 54 of 88) were more satisfied with the current health record information system that they are using in their day to day practice compared to participants working in the public sector (14% or 4 of 28), χ^2 (4, N = 127) = 28.8, $p < 0.001$.

The above result is consistent with being able to reject the null hypothesis at the $\alpha = 0.05$ level and thus conclude that there is a statistically significant relationship between which sector the participants are working in and whether or not participants are satisfied with their current health record information system that they are using in their day to day practice.

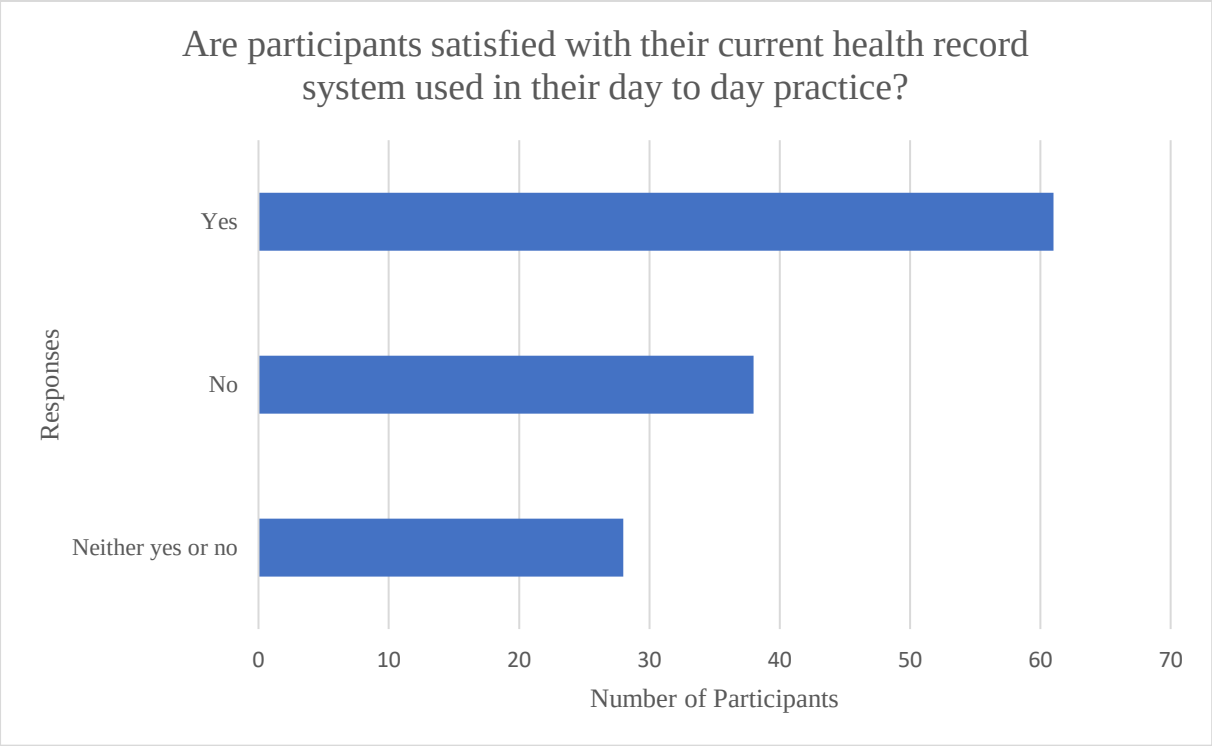


Figure 4.7: The sample participants' satisfaction towards their current health record system used in their day to day practise

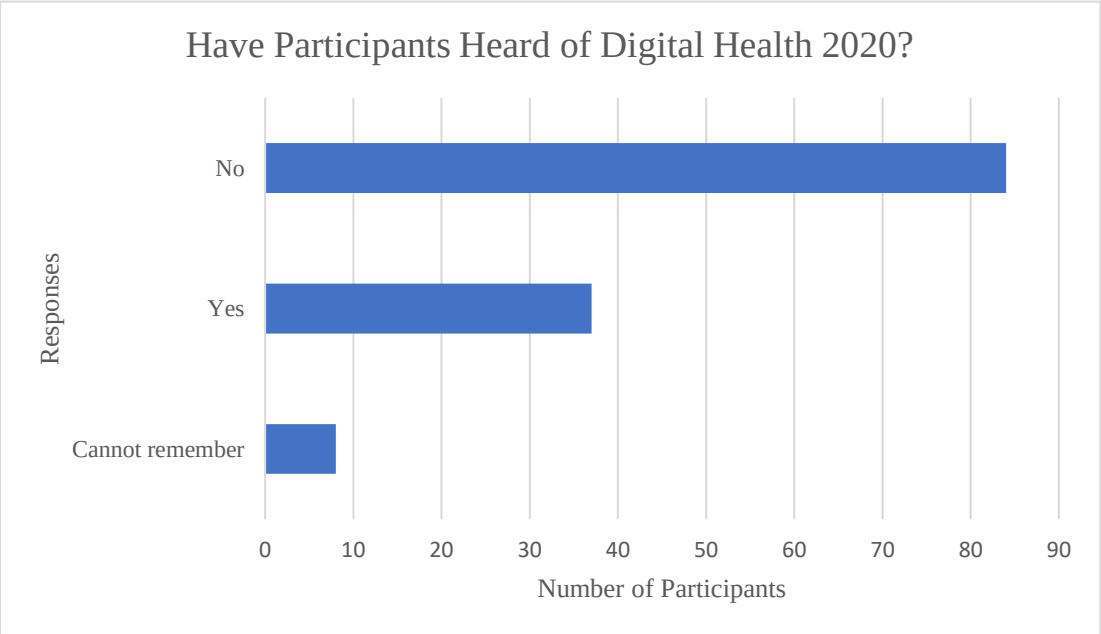
Table 4.3: The participants' satisfaction towards their current health record system compared to which sector the participants are working in

		Satisfaction with Current EHR System			
		Yes	No	Neither yes or no	Total
Where	Public sector	4	18	6	28
Participants	Private sector	54	16	17	87
Work	Both sectors	3	4	5	12
	Total	61	38	28	127

The NZRP Participants and the New Zealand Government's Digital Health 2020 Strategic Plan

The first supplementary question aims to identify whether NZRP participants are aware of the Government's latest health IT strategic plan called Digital Health 2020. The results indicate that 37 participants (29%) have heard of Digital Health 2020, 84 participants (65%) have not heard of Digital Health 2020, and eight participants (6%) cannot remember whether or not they have heard of Digital Health 2020 (Figure 4.8). These results are in line with the research hypothesis that the majority of participants would not have heard of the Government's Digital Health 2020 strategic plan.

Figure 4.8: Whether or not NZRP participants have heard about the Government's Digital Health 2020 strategic plan



The Perspectives among NZRP Participants who work in the Public Sector compared with NZRP Participants who work in the Private Sector on EHRs

The second supplementary research question asks, "Will there be different perspectives among NZRP participants who work in the public sector and those who work in the private sector on EHRs?" Within the sample, 88 participants (68%) are practising physiotherapy in the private sector, 28 participants (22%) in the public sector, 12 participants (9%) in both sectors, and one participant (1%) is currently not practising physiotherapy (see Figure 4.9). The responses that participants, who are practising in the private sector, versus the participants who are practising in the public sector have towards the advantages of using EHRs were compared with each other to find any potential differences between the two groups. Due to the low number of participants who reported working in both sectors (n = 12 or 9%), no further results were produced from this group as the small amount of data may misrepresent NZRPs who work in both sectors in general and its results do not address the research question at hand.

Table 4.4 presents the summary words derived from the full sentences used to describe the advantages that were listed out for participants to choose from in Question 5 of the survey (see Appendix B). The summary words are used in this section in place of the full sentences of the listed advantages of EHRs. The results show that all of the participants who

practice in the public sector see “integration” (see Table 4.4) as an advantage of EHRs compared to 92% who practise in the private sector. Only 29 participants (33%) who practise in the private sector and six participants (21%) who practise in the public sector view “calculation” as an advantage of EHRs. Half of the participants (50%) who practise in the public sector see “multiple copies” as an advantage of EHRs whereas only 27 participants (31%) who practise in the private sector agree on this advantage (see Table 4.5 and Figure 4.10).

An overall chi-square test was performed to test the hypothesis of no association between which sector (public or private) the participants are working in and whether or not participants agree with the 10 listed advantages of EHRs. A higher proportion of participants working in the private sector agree with the 10 listed advantages of EHRs compared with the participants working in the public sector, χ^2 (10, N = 116) = 19.6, p = 0.033. The individual chi-square test between which sector (public or private) the participants are working in and whether or not participants agree with each one of the 10 listed advantages of EHRs are also reported in Table 4.6. The size of these statistics and accompanying p-values indicate the relative contribution of each advantage to the overall chi-square statistics. It can be seen from Table 4.6 that “communication” was the advantage which provided the largest difference of views between public and public participants.

The results are consistent in being able to reject the null hypothesis at the $\alpha = 0.05$ level and thus conclude that there is a statistically significant relationship between which sector (public or private) the participants are working in and whether or not participants agree with the 10 listed advantages of EHRs.

Table 4.4: The key table for the summary words used in the results and analysis section that represents the different advantages of EHRs

	Summary Words	Complete Sentences of the Advantages
Advantages	Integration	Provide integrated healthcare across different healthcare locations
	Accessibility	Be accessed anytime and anywhere by healthcare professionals involved in the direct care of patients
	Evaluation	Effectively evaluate the quality of the care provided
	Calculation	Efficiently calculate the cost of the care provided
	Communication	Allow healthcare providers of different professions to communicate with each other
	Timely	Save time on locating and retrieving health information and patient charts
	Multiple Copies	Provide more than one copy of the same patient information at any given time
	Clear Reading	Nullify the difficulties that healthcare professionals may have on reading each other's unique handwritings that may often be unintelligible
	Electronic Footprint	Determine who had access (an electronic footprint) to which patient health information by requiring each user to be registered to the electronic health record
	Security	Provide security to sensitive health information through password authentication processes

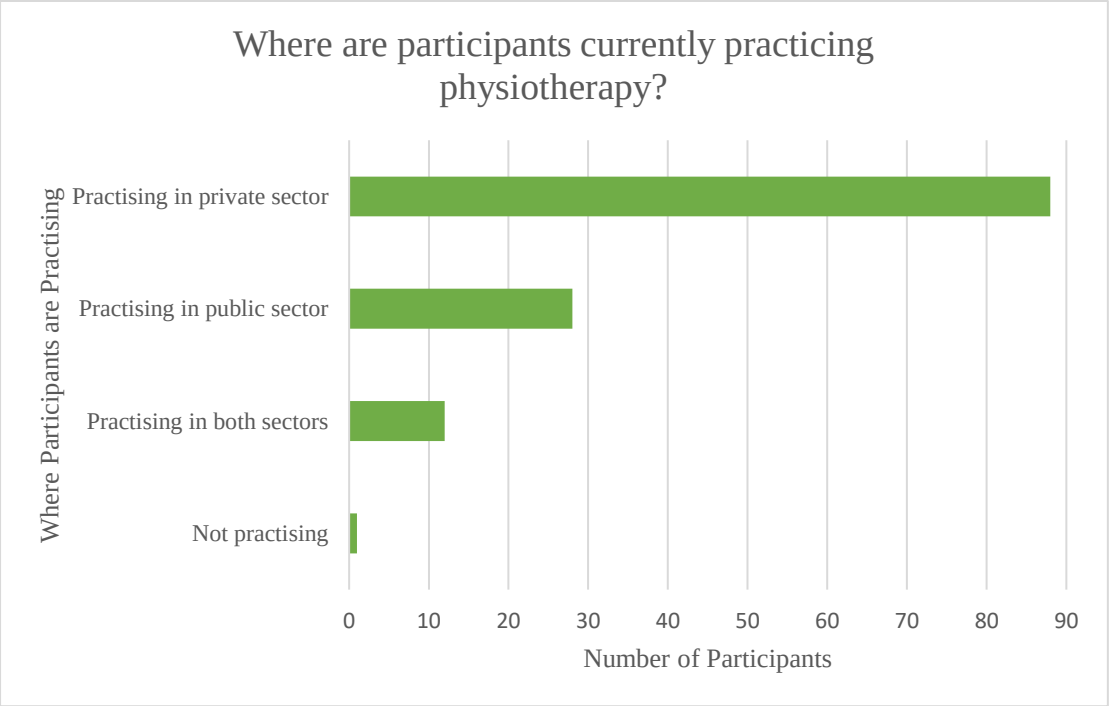


Figure 4.9: Where NZRP participants are currently practising as physiotherapists

Table 4.5: What NZRP participants view as advantages of EHRs compared to which sector these participants practise physiotherapy in

		Working Sectors			
		Private		Public	
		n	Percentage	n	Percentage
Advantages	Integration	81	92.0%	28	100.0%
	Timely	81	92.0%	27	96.4%
	Accessibility	78	88.6%	25	89.3%
	Communication	85	96.6%	24	85.7%
	Clear Reading	53	60.2%	22	78.6%
	Electronic Footprint	48	54.4%	17	60.7%
	Security	52	59.1%	15	53.6%
	Multiple Copies	27	30.7%	14	50.0%
	Evaluation	37	42.0%	7	25.0%
	Calculation	29	32.9%	6	21.4%

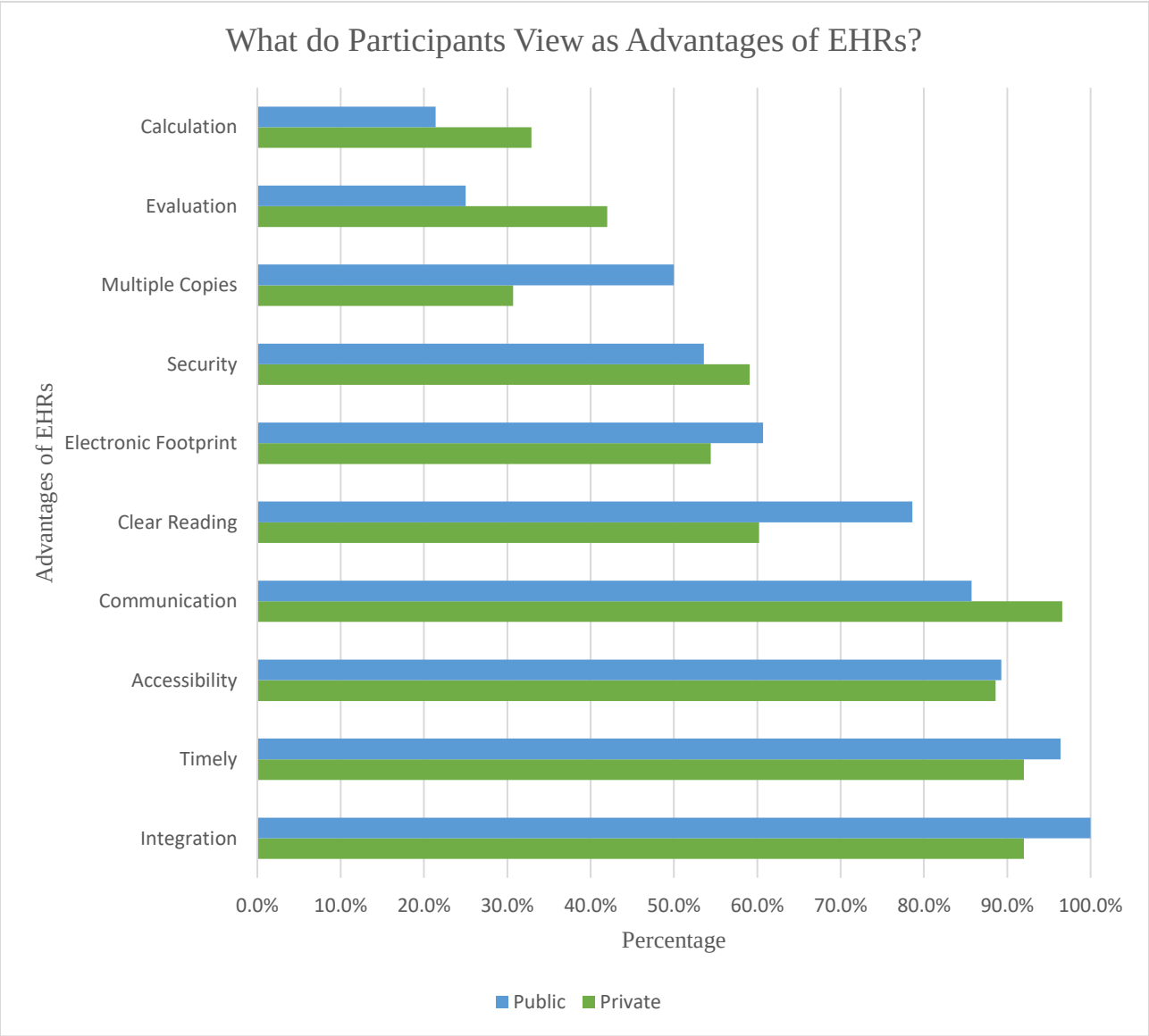


Figure 4.10: What NZRP participants view as advantages of EHRs compared to which sector these participants practise physiotherapy in

Table 4.6: The statistical values of the advantages of EHRs and which sector (public or private) the participants work in

		Pearson Chi Square Value	df	p-value
Advantages	Integration	2.370	1	0.124
	Accessibility	0.009	1	0.924
	Evaluation	2.621	1	0.105
	Calculation	1.339	1	0.247
	Communication	4.432	1	0.035*
	Timely	0.636	1	0.425
	Multiple Copies	3.469	1	0.063
	Clear Reading	3.128	1	0.077
	Electronic Footprint	0.328	1	0.567
	Security	0.265	1	0.607

* denotes the p-value is statistically significant at the $\alpha = 0.05$ level

Table 4.7 presents the summary words used to describe and represent the disadvantages that were listed out for participants to choose in Question 6 of the survey (see Appendix B). The summary words are used in this section in place of the full sentences of the listed disadvantages of EHRs. “Insecurity” (see Table 4.7) was seen as the greatest disadvantage of EHRs by participants who work in the private sector (82%) and participants who work in the public sector (79%). “Vendor access” was the least agreed upon

disadvantage by both the public sector (29%), and the private sector participants (33%). Over half of the participants (57%) who practise in the private sector view “inflexibility” as a disadvantage of EHRs while only 10 participants (36%) who practise in the public sector agree (see Table 4.8 and Figure 4.11). Due to the low number of participants who report working in both sectors (9% or n = 12), no further results were produced from this group as the small amount of data may misrepresent NZRPs who work in both sectors in general and its results do not address the research question at hand.

An overall chi-square test was performed to test the hypothesis of no association between which sector (public or private) the participants are working in and whether or not participants agree with the eight listed disadvantages of EHRs. A higher proportion of participants working in the private sector agree with the listed disadvantages of EHRs compared with the participants working in the public sector, although this difference did not reach statistical significance, χ^2 (8, N = 116) = 3.75, p = 0.879. The individual chi-square tests between which sector (public or private) the participants are working in and whether or not participants agree with each one of the eight listed disadvantages of EHRs are also reported in Table 4.9 below. The size of these statistics and accompanying p-values indicate the relative contribution of each disadvantage to the overall chi-square statistics. It can be seen from the table that “inflexibility” was the disadvantage that provided the largest difference

between private and public participants.

The results are consistent in not being able to reject the null hypothesis at the $\alpha = 0.05$ level and therefore there is no statistically significant relationship between the sector (public or private) the participants work in and whether or not participants agree with the eight listed disadvantages of EHRs.

Table 4.7: The key table for the summary words used in the results and analysis section that represents the different disadvantages of EHRs

	Summary Words	Complete Sentence of the Disadvantage
Disadvantages	Extra Cost	Extra cost of additional resources such as money and time to train healthcare professionals to use electronic health records
	Non-acceptance	Lack of acceptance by healthcare professionals who choose not to use electronic health records
	Ongoing Cost	Ongoing cost to maintain the required software and hardware to keep the electronic health system up to date
	Inflexibility	Lack of autonomy and flexibility for healthcare professionals to record health records the way they want to rather than the set rigid structured format of the electronic health record
	Insecurity	Potential threat of security breaches by hackers or malicious software that can access sensitive healthcare information from anywhere
	Incorrect Recording	Possibility of recording wrong healthcare information due to operating the electronic system incorrectly
	Unjustified Access	Healthcare providers can access healthcare information of patients who are not in their direct care
	Vendor Access	Non-healthcare providers who produce, maintain, and service the electronic health record system will have access to sensitive health information when working on the system

Table 4.8: What NZRP participants view as disadvantages of EHRs compared to which sector these participants practise physiotherapy in

		Working Sectors			
		Private		Public	
		n	Percentage	n	Percentage
Disadvantages	Insecurity	72	81.8%	22	78.6%
	Incorrect Recording	49	55.7%	16	57.1%
	Unjustified Access	45	51.1%	12	42.9%
	Inflexibility	50	56.8%	10	35.7%
	Non-acceptance	43	48.9%	12	42.9%
	Ongoing Cost	36	40.9%	9	32.1%
	Extra Cost	29	32.9%	8	28.6%
	Vendor Access	28	31.8%	8	28.6%

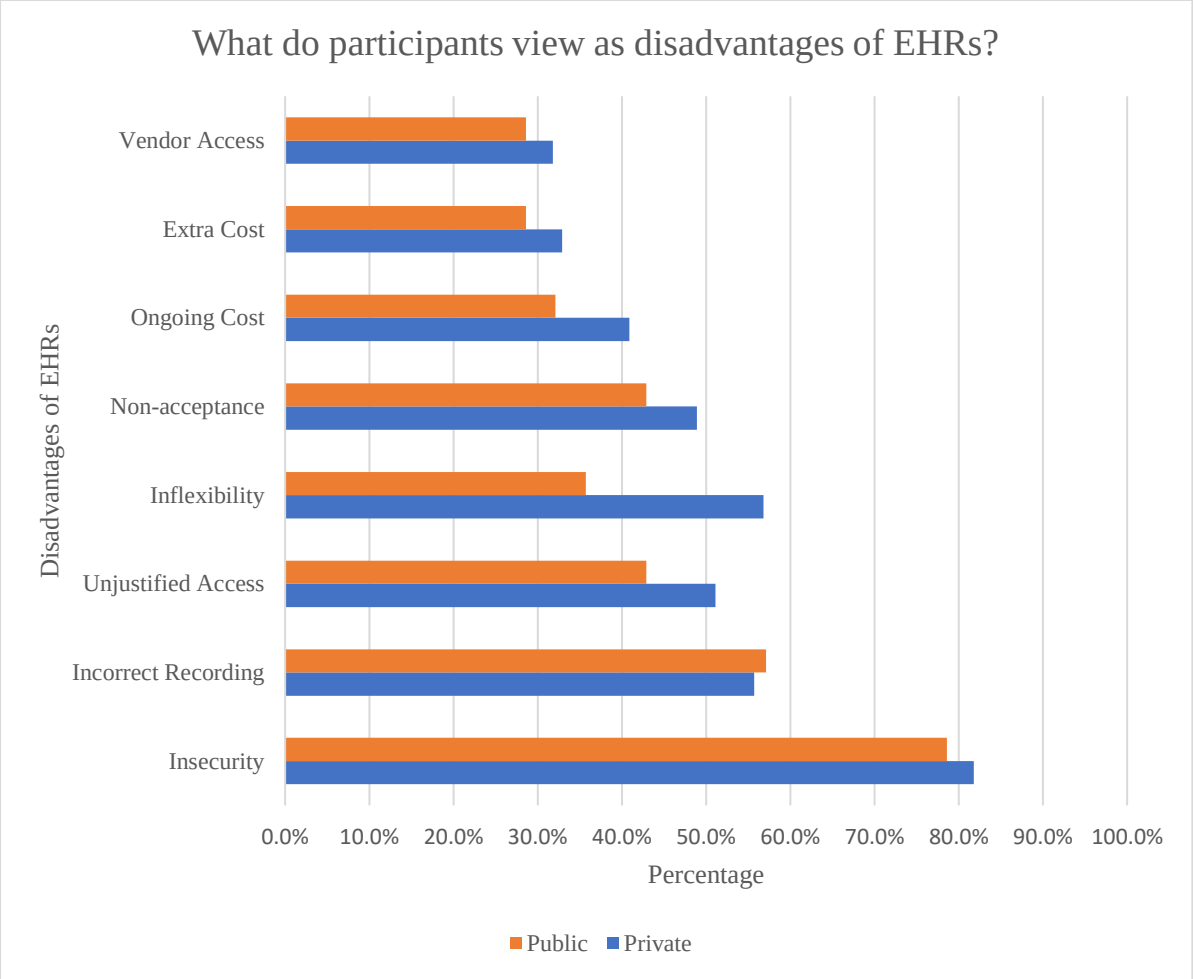


Figure 4.11: What NZRP participants view as disadvantages of EHRs compared to which sector these participants practise physiotherapy in

Table 4.9: The statistical values of the disadvantages of EHRs and which sector (public or private) the participants work in

		Pearson Chi Square Value	df	p-value
Disadvantages	Extra Cost	0.188	1	0.665
	Non-acceptance	0.307	1	0.579
	Ongoing Cost	0.687	1	0.407
	Inflexibility	3.789	1	0.052
	Insecurity	0.146	1	0.703
	Incorrect Recording	0.018	1	0.892
	Unjustified Access	0.583	1	0.445
	Vendor Access	0.105	1	0.746

The Educational Backgrounds of NZRP Participants and their Support towards a Universal EHR

The third supplementary research question seeks to identify any different perspectives that NZRP participants may have towards a universal EHR because of their differing education levels. The research study has 64 participants (49%) with an education level of Bachelor's Degree or below and 68 participants (51%) with an education level of Postgraduate Certificate or above (see Table 4.10). Cross-tabulation between the education level of participants and whether or not participants would support the idea of a universal EHR was conducted to find potential differences between these two education level groups.

The results indicated that 57 participants (90% or 57 of 63) with an education level of a Bachelor's Degree or below and 63 participants (93% or 63 of 68) with an education level of a Postgraduate Certificate or above support the idea of a universal EHR that will be used and accessed by healthcare providers from all of New Zealand (see Figure 4.12). No participants with an education level of a Postgraduate Certificate or above disapproved the idea of a universal EHR compared to two participants (3%) with an education level of a Bachelor's Degree or below.

An overall chi-square test was performed to test the hypothesis of no association between the education level of participants and whether or not participants support the idea of a universal EHR that will be used and accessed by healthcare providers from all of New Zealand. A higher proportion of participants (93%) with an education level of a Postgraduate Certificate or above supported the idea of a universal EHR, that will be used and accessed by healthcare providers from all of New Zealand, compared to participants with an education level of a Bachelor's Degree or below (90%), although this difference did not reach statistical significance, χ^2 (2, N = 131) = 2.22, p = 0.329.

The results are consistent with not being able to reject the null hypothesis at the α = 0.05 level and therefore there is no statistically significant relationship between the education

level of participants and whether or not participants support the idea of a universal EHR that will be used and accessed by healthcare providers from all of New Zealand. The results do not support the research hypothesis that a participant with a Postgraduate Certificate qualification or above will support the implementation and use of a universal EHR more so than those with a Bachelor's Degree or below.

Table 4.10: The education levels of participants separated into two groups

Education Level	Frequency	Percent
Bachelor's Degree or below	64	48.5
Postgraduate Certificate or above	68	51.5
Total	132	100

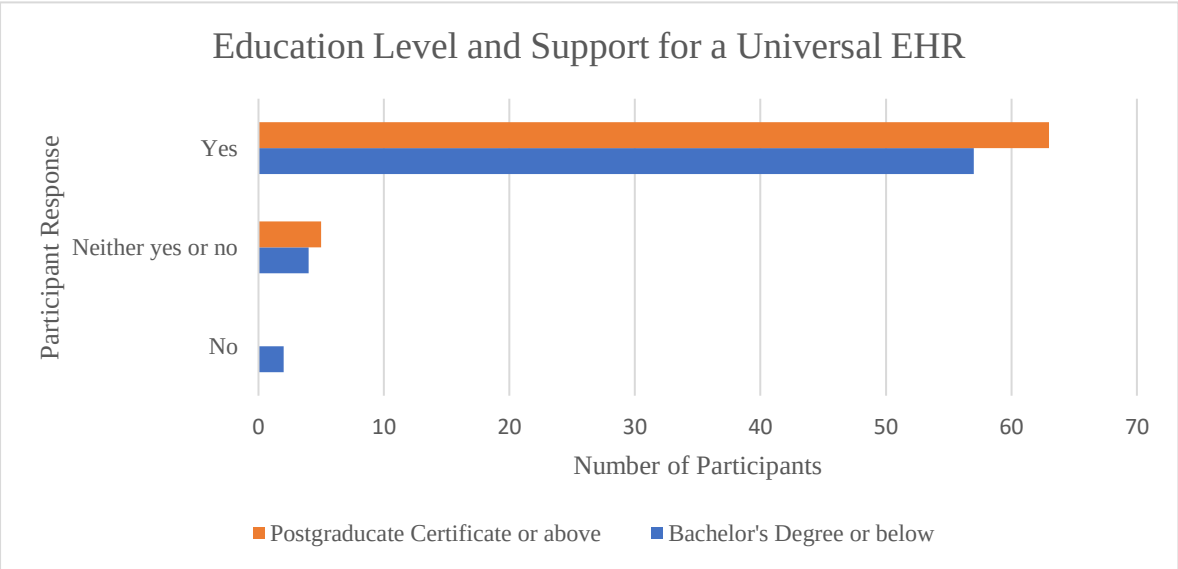


Figure 4.12: The education level of participants and their perspectives on supporting a universal EHR

The Perspectives among NZRPs who use Computers more frequently in their Work Environment compared to those who do not

The fourth supplementary research question asks, "Will there be different perspectives among NZRP participants who use computers more frequently in their work environment?" The results show that 129 participants (99%) use a computer for work while two participants (1%) do not use computers for work on a daily basis (see Figure 4.13). As illustrated in Table 4.11, a total of 131 participants provided insight about the amount of time that they spend using computers for work each day. A mean time of 3.24 hours (194 minutes), a median time of 3 hours (180 minutes), and a mode time of 3 hours (180 minutes) were reported being spent on using computers for work each day. From these results, the time of 3 hours was used as an indicator to determine frequent or infrequent use of computers among the sample participants. Participants who report using a computer for more than 3 hours at work were defined as higher than average users while participants who report using a computer for 3 hours or less were defined as below average users. Table 4.12 illustrates that 78 participants (60%) use computers at work for 3 hours or less each day and 53 participants (40%) use computers at work for more than 3 hours each day. The results above provide support for the research hypothesis which states that, "almost all of the participants would be using a computer for work each day for more than two hours on average."

Table 4.11: The amount of time NZRP participants spend using a computer for work each day

N		131 participants
Mean		3.24 hours
Median		3 hours
Mode		3 hours
Percentile	25	1.5 hours
	50	3 hours
	75	4.5 hours

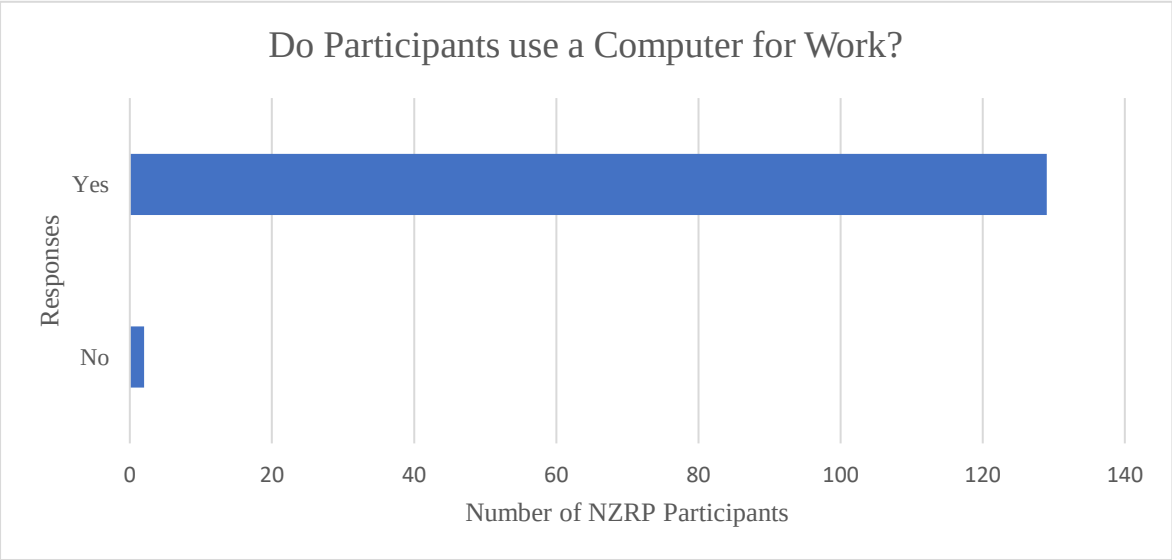


Figure 4.13: Whether or not NZRP participants use a computer for work

Table 4.12: The participants' computer usage at work on a daily basis

Computer usage	Frequency	Percent
3 hours or less	78	59.5
More than 3 hours	53	40.5
Total	131	100

Cross-tabulation between how much time NZRP participants spend using computers for work each day and whether or not participants support the idea of a universal EHR to be used and accessed by healthcare providers from all of New Zealand was conducted to explore an association between these variables. Table 4.13 shows that 69 of 78 participants (89%), who use the computer for 3 hours or less at work, and 50 of 52 participants (96%), who use the computer for more than 3 hours at work would support the idea of a universal EHR. Only two participants (3%) from the "3 hours or less" computer usage group responded with not wanting to support the idea of a universal EHR.

A chi-square test was performed to test the hypothesis of no association between the amount of computer usage among participants and whether or not participants support the idea of a universal EHR that will be used and accessed by healthcare providers from all of New Zealand. A higher proportion of participants who use the computer at work for more than 3 hours per day supported the idea of a universal EHR, that will be used and accessed by healthcare providers from all of New Zealand, compared with participants who use the computer at work for 3 hours or less, but this difference failed to reach statistical significance, χ^2 (2, N = 130) = 2.72, p = 0.257. The results are consistent in not being able to reject the null hypothesis at the $\alpha = 0.05$ level and thus there is no significant relationship between computer usage among participants and whether or not participants support the idea of a universal EHR

that will be used and accessed by healthcare providers from all of New Zealand.

Table 4.13: The amount of computer usage among participants and whether or not they would support the idea of a universal EHR that will be used and accessed by healthcare providers from all of New Zealand

	Computer Usage	Would Participants Support A Universal EHR?			
		Yes	No	Neither yes or no	Total
	3 hours or less	69	2	7	78
	More than 3 hours	50	0	2	52
Total		119	2	9	130

What do NZRP Participants Perceive as Advantages and Disadvantages of using EHRs?

The fifth supplementary research question explores the advantages and disadvantages of using EHRs according to the NZRP participants. Ninety-nine percent (131) of the total 132 participants responded to Question 5 of the survey (see Appendix B) when asked what they thought were advantages of using EHRs. Table 4.14 and Figure 4.14 shows the results of these responses where “integration” (95%), “timely” (95%), and “communication” (94%) were seen as the top advantages of EHRs whereas “evaluation” (41%), “multiple copies” (37%), and “calculation” (34%) were less agreed upon as advantages of EHRs. The results showed that the 10 listed advantages of EHRs were selected 884 times (68%) out of a possible 1310 times by the 131 participants who responded to this survey question. The

results partially support the research hypothesis that participants would see “integration”, “communication”, and “accessibility” as the main advantages of EHRs.

The ages of the participants were taken into account when analysing the results. Age was not a major determinant because there was little variation between different age groups and their perception of the advantages of using EHRs. For instance, the advantage “integration” was determined by 39 participants (33%) aged 23 – 34 years, 41 participants (34%) aged 35 – 49 years, and 39 participants (33%) aged 50 – 75 years and the advantage “timely” was determined by 39 participants (33%) aged 23 – 34 years, 39 participants (33%) aged 35 – 49 years, and 40 participants (34%) aged 50 – 75 years. Similar results were found when taking into account the amount of years in which participants have been registered as NZRPs and the amount of years since participants graduated with a physiotherapy qualification.

Table 4.14: What NZRP participants perceive as advantages of using EHRs

		Agree		Disagree	
		n	Percentage	n	Percentage
Advantages	Integration	125	95.4%	6	4.6%
	Timely	124	94.7%	7	5.3%
	Communication	123	93.9%	8	6.1%
	Accessibility	119	90.8%	12	9.2%
	Clear Reading	89	67.9%	42	32.1%
	Security	79	60.3%	52	39.7%
	Electronic Footprint	78	59.5%	53	40.5%
	Evaluation	54	41.2%	77	58.8%
	Multiple Copies	48	36.6%	83	63.4%
	Calculation	45	34.4%	86	65.6%
	Total	884		426	

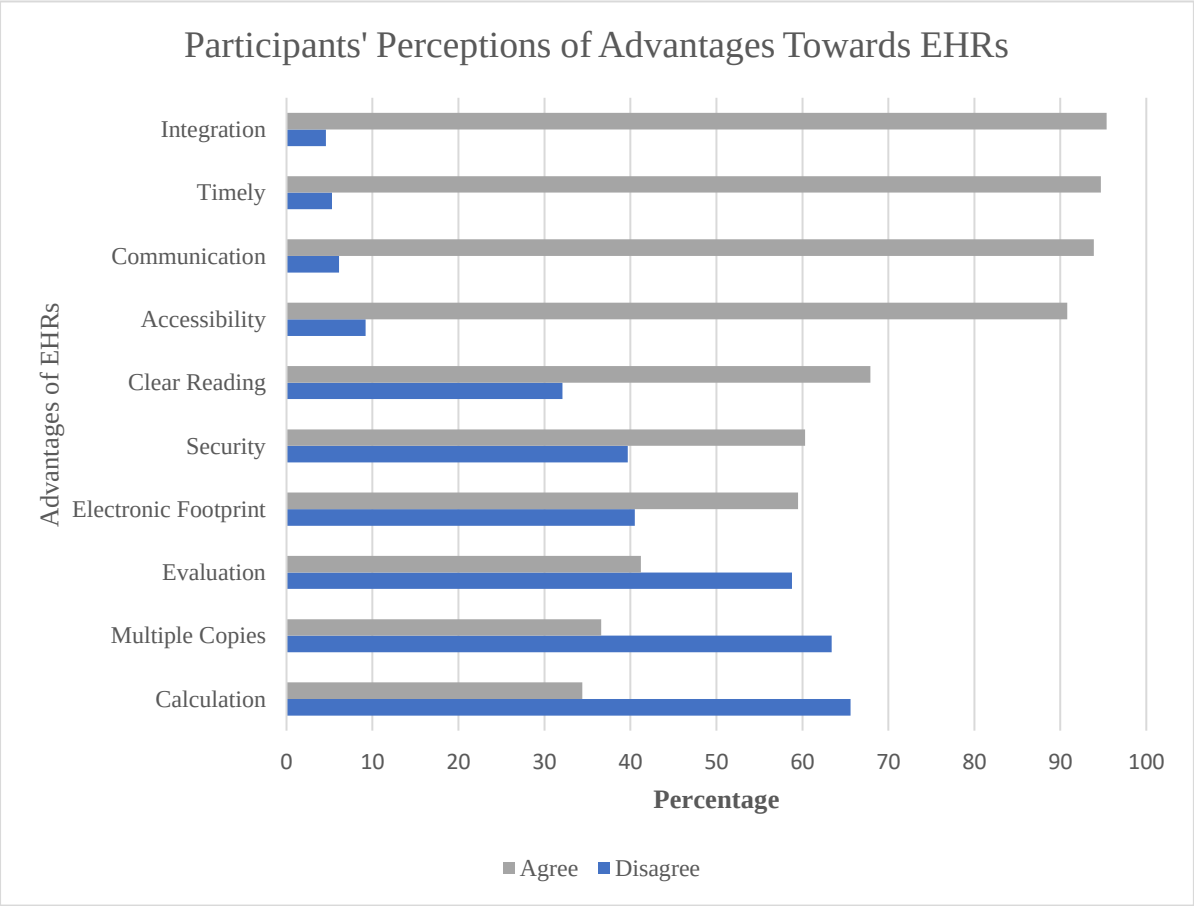


Figure 4.14: What NZRP participants across the cohort perceive as advantages of using EHRs

Ninety-eight percent (129) of the total 132 participants responded to the survey when asked what they thought were disadvantages of using EHRs. Table 4.15 and Figure 4.15 show the results of these responses where “insecurity” (82%), “incorrect recording” (57%), and “inflexibility” (53%) were seen as the main disadvantages of EHRs whereas “ongoing cost” (40%), “vendor access” (34%), and “extra cost” (33%) were less agreed upon as disadvantages of EHRs. The eight listed disadvantages of EHRs were selected 516 times (50%) out of a possible 1032 times by the 129 participants who responded to this survey question. The results partially support the research hypothesis that participants would see “insecurity”, “inflexibility”, and “unjustified access” as the main disadvantages of EHRs.

Table 4.15: What NZRP participants across the cohort perceive as disadvantages of using EHRs

		Agree		Disagree	
		n	percentage	n	percentage
Disadvantages	Insecurity	106	82.2%	23	17.8%
	Incorrect Recording	74	57.4%	55	42.6%
	Inflexibility	68	52.7%	61	47.3%
	Unjustified Access	68	52.7%	61	47.3%
	Non-acceptance	62	48.1%	67	51.9%
	Ongoing Cost	52	40.3%	77	59.7%
	Vendor Access	44	34.1%	85	65.9%
	Extra Cost	42	32.6%	87	67.4%
	Total	516		516	

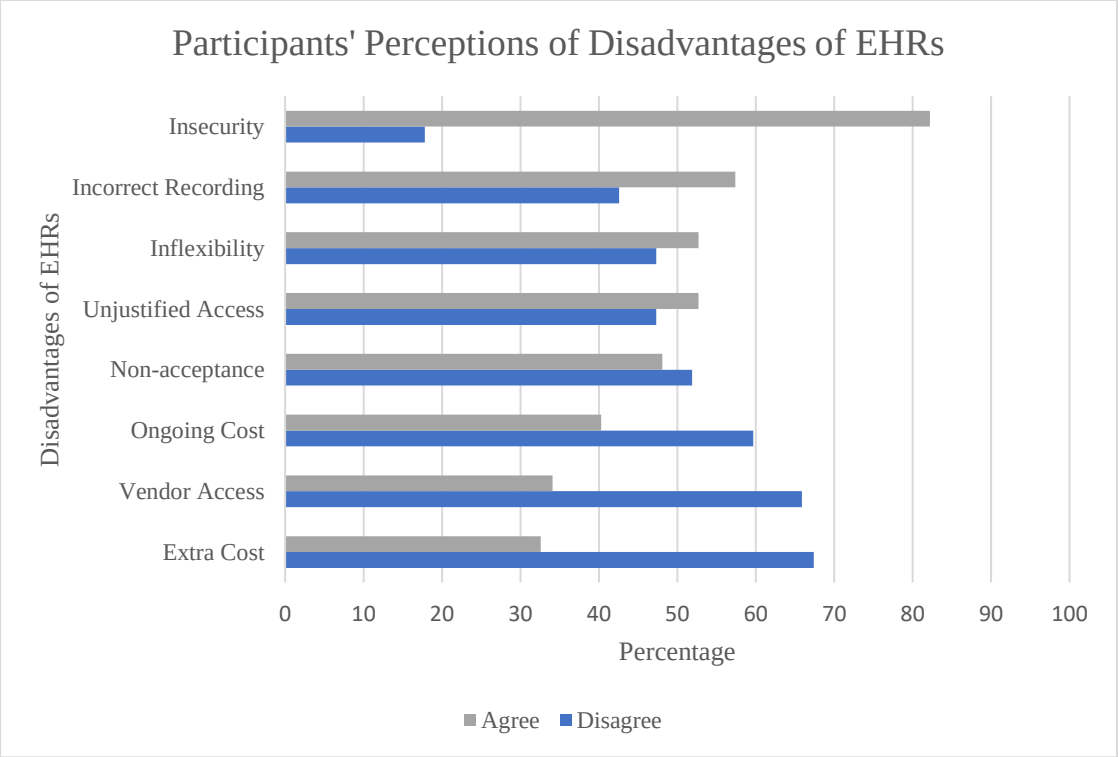


Figure 4.15: What NZRP participants across the cohort perceive as disadvantages of using EHRs

The ages of the participants were taken into account when examining the reported disadvantages of using EHRs (see Table 4.16). Age accounted for some variations in participant perceptions towards the disadvantages of using EHRs. For instance, the disadvantage “insecurity” was reported by 29 participants (29%) aged 23 to 34 years, 33 participants (33%) aged 35 to 49 years, and 39 (39%) participants aged 50 to 75 years and the disadvantage “incorrect recording” was reported by 21 participants (30%) aged 23 to 34 years, 23 (32%) participants aged 35 to 49 years, and 27 (38%) participants aged 50 to 75 years old. In particular, there was the big difference between participants aged 23 to 34 years and participants aged 50 to 75 years reporting the disadvantage “extra cost” where less than a quarter (23%) of participants from the younger aged group perceived “extra cost” as a disadvantage while over half (51%) of the participants from the older aged group reported “extra cost” to be a disadvantage when using EHRs. Similar results were found when taking into account the amount of years in which participants have been registered as NZRPs and the amount of years since participants graduated with a physiotherapy qualification.

An overall chi-square test was performed to test the hypothesis of no association between which age group (23 to 34 years, 35 to 49 years, or 50 to 75 years) the participants belong to and whether or not participants agreed with the eight listed disadvantages of EHRs. A higher proportion of participants in the age group of 50 to 75 years agree with the listed

disadvantages of EHRs compared with the participants in the age group of 35 to 49 years followed by the participants in the age group of 23 to 34 years, but this difference between groups failed to reach statistical significance, χ^2 (16, N = 124) = 24.2, p = 0.086. The individual chi-square test between which age group (23 to 34 years, 35 to 49 years, or 50 to 75 years) the participants belonged to and whether or not participants agreed with each one of the eight listed disadvantages of EHRs are also reported in Table 4.17. The size of these statistics and accompanying p-values indicate the relative contribution of each disadvantage to the overall chi-square statistics. It can be seen from the table that "extra cost" was the disadvantage that provided the largest difference between participants in the three different age groups.

The results are consistent in not being able to reject the null hypothesis at the $\alpha = 0.05$ level and thus there is no statistically significant relationship between the age group the participants belonged in and whether or not participants agreed with the eight listed disadvantages of EHRs

Table 4.16: The age distribution of participants and their perspectives on the disadvantages of using EHRs

		Age of Participants in Years						
		23 - 34		35 - 49		50 - 75		
		n	Percentage	n	Percentage	n	Percentage	Total
Disadvantages	Insecurity	29	28.7%	33	32.7%	39	38.6%	101
	Incorrect Recording	21	29.6%	23	32.4%	27	38.0%	71
	Inflexibility	20	30.3%	19	28.8%	27	40.9%	66
	Unjustified Access	21	32.3%	22	33.8%	22	33.8%	65
	Non-acceptance	23	38.3%	16	26.7%	21	35.0%	60
	Ongoing Cost	11	22.9%	18	37.5%	19	39.6%	48
	Vendor Access	12	28.6%	11	26.2%	19	45.2%	42
	Extra Cost	9	23.1%	10	25.6%	20	51.3%	39

Table 4.17: The statistical values of the disadvantages of EHRs and which age group (23 to 34 years, 35 to 49 years, or 50 to 75 years) the participants belong in

	Chi Square Value	df	p-value
Extra Cost	6.710	2	0.035*
Non-acceptance	2.396	2	0.302
Ongoing Cost	3.276	2	0.194
Inflexibility	2.236	2	0.327
Insecurity	4.282	2	0.118
Incorrect Recording	0.889	2	0.641
Unjustified Access	0.117	2	0.943
Vendor Access	3.006	2	0.222

* denotes the p-value is statistically significant at the $\alpha = 0.05$ level

The Type of Information Recording System that the NZRP Participants are currently using in their Work Environment

The sixth supplementary research question of this study asks, “What type of information record systems are NZRP participants currently using in their work environment?” The results show that 127 (96%) of the sample participants provided responses and data in regards to the computer software that are used in their day to day practice as a physiotherapist. The mean reported number of computer software programs used by participants in their day to day practice as a NZRP was just over two (2.03). The total reported number of brands and types of computer software used by NZRP participants was

41. This means one physiotherapy practice may have three computer software in use, while another physiotherapy practice may have two computer software in use that are different to that of the first physiotherapy practice resulting in a total of five types and brands of computer software across the two physiotherapy practices. There were 41 different types and brands of computer software used across the physiotherapy practices that the NZRP participants work in. *Gensolve* (n = 60 or 47%), a practice management software, was the most commonly used software, followed by *Health Connect South* (n = 38 or 30%), another practice management software, and then *Christchurch Radiology Group (CRG) Inteleviewer* (n = 36 or 28%), a patient investigative imagery viewing software, as seen on Figure 4.16. The results support the research hypothesis that participants would be using multiple software programs in their day to day practice as NZRPs.

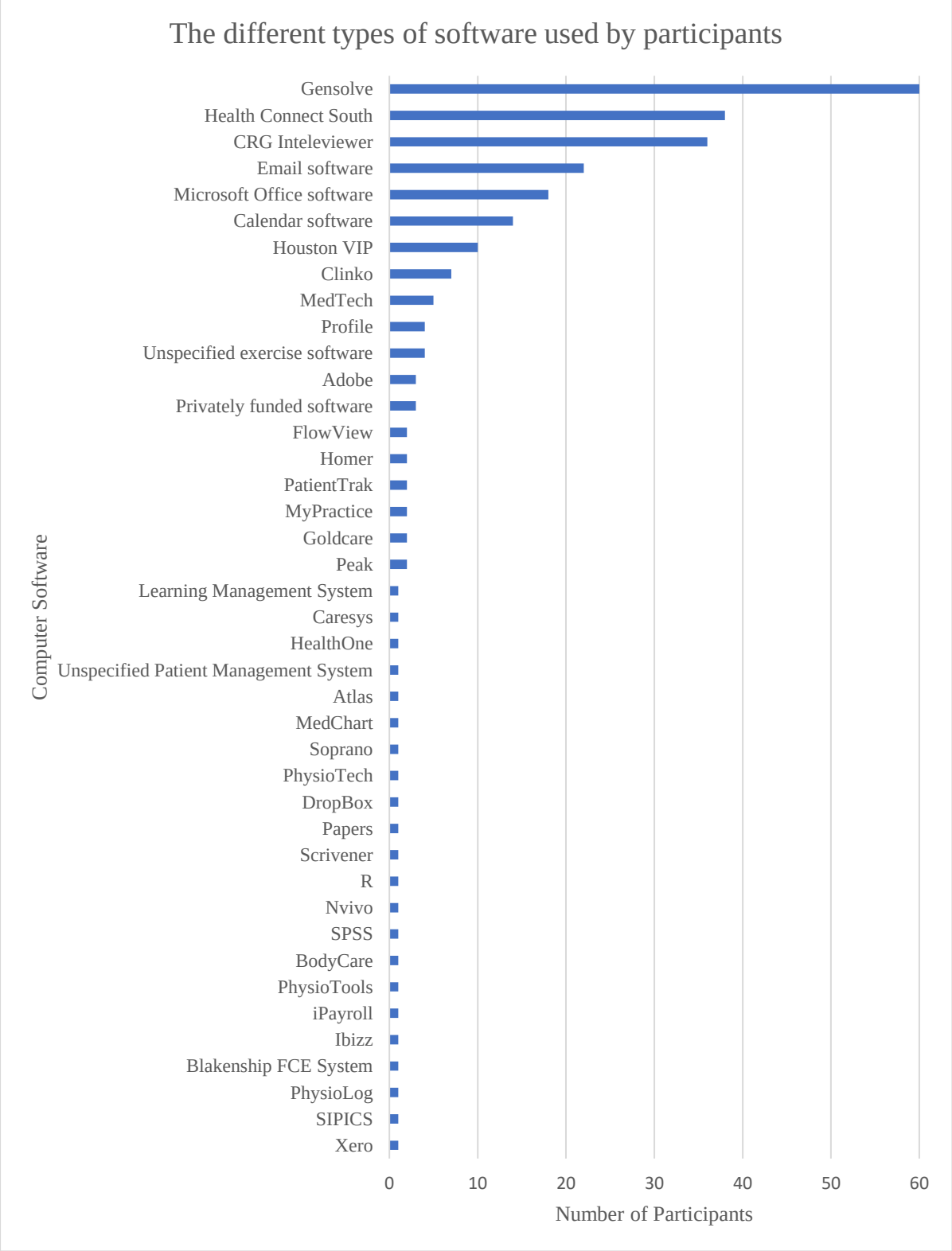


Figure 4.16: The different types of computer software used in the day to day practice of NZRP participants

Of the 132 sample participants, 78 (59%) had formal training on operating EHRs and other computer software used in their physiotherapy practice, while 54 of 132 sample participants (41%) had not (see Figure 4.17). Of the 78 participants who had formal training on operating EHRs and other computer software used in their physiotherapy practice, 39 (50%) of these participants provided details on the types of computer software involved within these training sessions. Question 7 of the survey (see Appendix B) originally intended to collect information on whether the participants have received formal training on operating EHRs, but because the participants also reported formal training on other computer software, they were also included within the results as well. Figure 4.18 details the types and brands of computer software involved within the participant's formal training where Gensolve (n = 16 or 41%) was the most often mentioned computer software, followed by Health Connect South (n = 14 or 36%), and then general unspecified training (n = 9 or 23%) which may involve EHR computer software and other types of computer software. The results support the research hypothesis that the majority of participants are likely to have received formal training on operating EHRs and other types of computer software used in their physiotherapy practices.

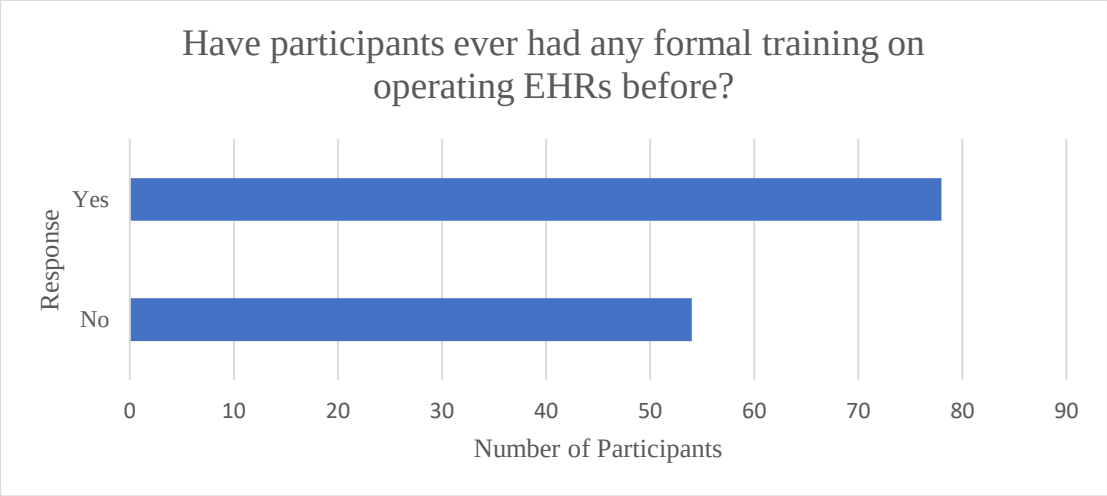


Figure 4.17: Whether or not participants have received formal training on operating EHRs before

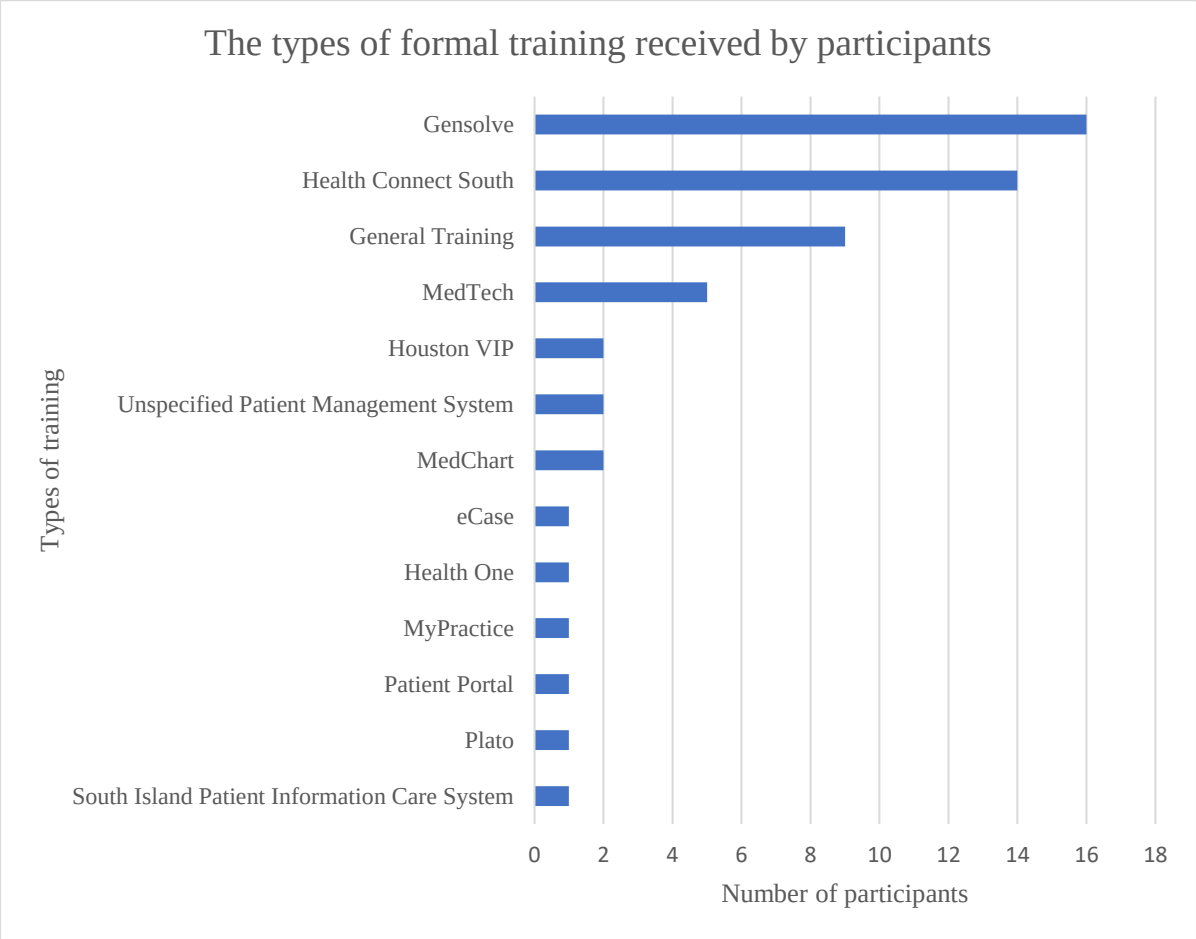


Figure 4.18: The different formal trainings of EHRs received by participants

The Attitudes that NZRP Participants have towards EHRs and Health Information Technology

The seventh and last supplementary research question explores what attitudes NZRP participants had towards EHRs and health IT. This question provided qualitative information rather than quantitative information from the sample participants. This was achieved by giving the participants the opportunity to record any general remarks or opinions on the research topic at the end of the survey in order to gain further insight on their attitudes towards EHRs and health IT as a whole. Of the 132 participants, 25 participants answered this open-ended question, of which 19 responses were relevant to the research topic. Content analysis was completed in order to organise the qualitative data into groups of similar words, themes and topics as portrayed in Table 4.18. Five different themes emerged and were defined accordingly with summary words suited for each theme which were individually labelled as supportive remarks, resource concerns, complex nature, side effects, and potential misuse.

Table 4.18: Content analysis of the participants' attitude towards EHRs and health IT

Summary Words of Theme	Theme Definition	Frequency
Supportive Remarks	Participants express their support towards the Government's strategic plan for a universal EHR	8
Resource Concerns	Participants express their concerns about the additional resources required to keep EHRs operating efficiently and safely	5
Complex Nature	Participants express their concerns about the complex nature of producing a universal EHR suitable for all key stakeholders with different interests in mind	4
Side Effects	Participants express their concerns about the side effects of operating EHRs through computers which may create chronic work-related injuries or health issues	1
Potential Misuse	Participants express their concerns about the potential misuse of the conveniently accessible EHR data by key stakeholders	1

Summary

A large proportion of the Canterbury based sample participants (92%) support the idea of a universal EHR that can be used and accessed by healthcare providers throughout New Zealand; however, the Government and its formal support, training, and funding behind this idea is a major factor for NZRP participants. Ninety-five percent of participants report being committed to the idea of a universal EHR, when there is formal support, compared to 9% support of a universal EHR if there were to be no formal support.

There is a strong association ($p < 0.05$) between whether the sample participants work

in the public or private sector and their satisfaction with the current health record system used in their day to day practice as NZRPs. A higher proportion of participants working in the private sector (61%, which is 54 of 88) were more satisfied with their current health record information system compared to participants working in the public sector (14%, which is 4 of 28). This shows a statistically significant difference in perspectives among the sample participants towards EHRs depending on where they work in the healthcare industry.

One of the supplementary research questions sought to identify the awareness of NZRP participants about the Government's current health IT strategic plan known as Digital Health 2020. The results indicated that only 37 participants (29%) have heard of Digital Health 2020, eight participants (6%) cannot remember if they heard of the strategic plan, and 84 participants (65%) report never hearing about Digital Health 2020. This supported the research hypothesis that the majority of NZRP participants would not have heard of the Government's Digital Health 2020 strategic plan.

There is a strong association ($p = 0.033$) between whether the sample participants work in the public or private sector and whether or not participants agree with the 10 advantages of EHRs that were listed in the survey. "Communication" was the only advantage with statistical significance when individual chi-square tests were performed for each

advantage. The overall chi-square test between where the sample participants work (public sector or private sector) and whether or not participants agree with the eight disadvantages of EHRs that were listed in the survey did not reach statistical significance ($p > 0.05$). "Inflexibility" was the disadvantage that provided the largest difference between public and private participants.

Forty-nine percent of the NZRP participants have an education level of Bachelor's Degree or below while 51% of the NZRP participants have an education level of Postgraduate Certificate or above. A higher proportion of participants (93%) with an education level of a Postgraduate Certificate or above support the idea of a universal EHR, that will be used and accessed by healthcare providers from all of New Zealand, compared to participants with an education level of a Bachelor's Degree or below (90%), but this difference did not reach statistical significance ($p > 0.05$). There is, therefore, a weak association between the educational backgrounds of sample participants and their support for a universal EHR.

Almost all of the NZRP participants (99%) use computers for work on a daily basis. Sixty percent of NZRP participants use computers at work for three hours or less each day and 53 participants (40%) use computers at work for more than three hours each day. There is

a weak association ($p = 0.257$) between the amount of computer usage among sample participants and whether or not participants support the idea of a universal EHR that will be used and accessed by healthcare providers from all of New Zealand. The means the chi-square test between these two variables did not reach statistical significance ($p > 0.05$).

The NZRP participants perceive “integration” (95%), “timely” (95%), and “communication” (94%) as the top advantages of using EHRs but did not see “evaluation” (41%), “multiple copies” (37%), or “calculation” (34%) as advantages of using EHRs. Age was not a major determinant as there was little variation between the different age groups of sample participants and their perception of the advantages of using EHRs. The 10 listed advantages of using EHRs were selected 884 times (68%) out of a possible 1310 times by the 131 NZRP participants who responded to the survey question.

The NZRP participants perceive “insecurity” (82%), “incorrect recording” (57%), and “inflexibility” (53%) as the main disadvantages of using EHRs whereas “ongoing cost” (40%), “vendor access” (34%), and “extra cost” (33%) were less agreed upon as disadvantages of using EHRs. Although age accounted for some variation in participant perceptions about the disadvantages of using EHRs, an overall chi-square test between the age group (23 to 34 years, 35 to 49 years, or 50 to 75 years) the participants belong to and

whether or not participants agreed with the eight listed disadvantages of EHR use indicated a lack of statistical significance between the two variables (p = 0.086). The individual chi-square test between the three age groups and the disadvantage “extra cost” did yield a statistically significant p-value of 0.035.

NZRP participants reported a mean of over two (2.03) different computer software and a total of 41 different types and brands of computer software used in their day to day physiotherapy practice. Gensolve was the most commonly used software (n = 60) reported by the sample participants which is then followed by Health Connect South (n = 38) and CRG Inteleviewer (n = 36). Seventy-eight of 132 sample participants (59%) had formal training on operating EHRs used in their physiotherapy practice and 54 participants (41%) had no formal training. The most common computer software that NZRP participants received formal training on was Gensolve (n = 16) which is then followed by Health Connect South (n = 14) and then general unspecified training (n = 9).

Lastly, five different themes emerged through content analysis on the attitudes that the sample participants report having towards EHRs and health IT. These five themes were created through examining 19 relevant responses provided by participants who answered the open-ended question on this topic. In the order of the most often mentioned theme to the

least, the themes were:

- Support remarks,
- Resource concerns,
- Complex nature,
- Side Effects,
- Potential Misuse

The results chapter has provided detailed results and information produced through the analysis of data collected from the sample participants in the study. These results address the primary research question and the seven supplementary research questions which were formed through the aims of the research study. In the next chapter, the results are discussed in conjunction with existing literature and the aims of the research study.

Chapter Five: Discussion and Conclusion

Introduction

The core of this research study is that health professionals and their perspectives on EHRs are vital components, which will contribute to the overall success of introducing and implementing EHR systems in New Zealand healthcare settings. The involvement of health professionals, such as physiotherapists, during the implementation process is essential because they will ultimately be one of the primary end-users who use the EHR system. Despite this, the literature discussed in this thesis demonstrated a lack of existing literature on physiotherapists and their perspectives about EHRs. Furthermore, there appears to be limited existing literature that details the involvement of physiotherapists or the rest of the allied health workforce on the implementation of a universal EHR. Here, the key findings are presented with appropriate comments drawn from the literature, participants' responses, and the extrapolated data.

The main aim and research hypothesis of the study are:

Aim: To examine the perspectives of Canterbury-based physiotherapists on the use of EHRs and identify potential relationships between their perspectives and sociodemographic characteristics.

Hypothesis: The participant's age, computer usage, highest education attained, and the sector of healthcare they are working in will influence their perspectives and attitudes on the use of EHRs.

The Sociodemographic Profile of the NZRP Participants

The sample consisted of a larger proportion of female participants (77%) than male participants but this gender distribution was almost identical to the New Zealand physiotherapy employment statistics published by Stokes et al. (2014), which found that of 3,150 NZRPs in employment in 2013, 738 NZRPs (23%) were male and 2,412 NZRPs (77%) were female. This trend is common among Commonwealth countries where the physiotherapy workforce is primarily female (Stokes et al., 2014). From a global perspective, the World Health Organization (2008) reports how women working within health sectors around the world often make up 75% or more of the health workforce population. This is seen in countries such as the United States of America, the United Kingdom, Switzerland, Russia, the Netherlands, Hungary, Germany, Denmark, Canada, and Austria (World Health Organization, 2008). The finding of the gender distribution among the sample participants was expected and is supported by the New Zealand physiotherapy workforce report and the World Health Organization's health workforce report (Stokes et al., 2014; World Health Organization, 2008) and, therefore, the study sample gender profile reflects the NZRPs as

well as the healthcare workforce in many medium-high income countries around the world.

The mean age of the NZRP participants was found to be 43 years and the age distribution was largely even across the age groups of 23 to 34 years (33%), 35 to 49 years (33%), and 50 to 75 years (34%). The sample age distribution encompasses the reported NZRP mean age of 35 years (sample age range 23 – 75 years), even though the mean age of the sample participants is 43 years with a standard deviation of 12.9 years, which was eight years more than the reported national NZRP mean age of 35 years by Stokes et al. (2014). While there is no published literature available on the sociodemographic profiles of NZRPs based in the Canterbury region, the sample age distribution is likely due to an even age representation spread of the Canterbury-based NZRP participants across all ages compared to all of the New Zealand physiotherapists. Furthermore, since the publication of the physiotherapy workforce survey by the Physiotherapy Board of New Zealand in 2014, the New Zealand Ministry of Health (2016b) observed significant ageing patterns among the country's healthcare workforce including its medical, nursing, midwifery, and allied health workforce. The ageing of the health sector workforce is a trend observed internationally affecting multiple countries around the world (New Zealand Ministry of Health, 2016b; Segal & Bolton, 2016). For this reason, the high mean age of sample participants may be attributed by multiple factors including the even age distribution spread observed in the sample and the

general ageing trend of healthcare professionals observed around the world but this ageing workforce trend may be more evident in Canterbury compared to the rest of New Zealand (Dall et al., 2013).

The majority of participants identified their primary ethnicity as New Zealand European (81%), followed by Asian (4%), Maori (2%), Pacific Islander (1%) and all others (13%) which was an expected result. The Physiotherapy Board of New Zealand workforce survey reported that most of the country's NZRPs identify their primary ethnicity as New Zealand European or European (85%), followed by Asian (6%), Maori (5%), and all others (4%) (Stokes et al., 2014). The ethnicity profile of the study's participants is similar to the workforce survey's respondents except the study survey specifically requested participants to distinguish their primary ethnicity between New Zealand European and other European ethnicities whereas the workforce survey categorised these ethnicities together. This difference is likely the reason why the sample participant's all other (13%) identified primary ethnicities is more than the workforce survey's all other (4%) identified primary ethnicities because the sample participants who have European ethnicities, other than New Zealand European, were categorised into the all other ethnicities group but the workforce survey included European ethnicities together with New Zealand European ethnicity. Regardless of this methodological difference between these surveys, the primary ethnic distribution of the

sample participants reflects the primary ethnic distribution of all other NZRPs in the country.

The sample participants have a reported mean age of 23 years at graduation with a physiotherapy qualification and a reported mean age of 25 years when they first registered as a NZRP. This difference is due to a delay in which participants choose to apply for registration even though all of them would have met the requirements for registration upon graduation. Potentially, the time required by the Physiotherapy Board of New Zealand to review individual applications and approve registration of applicants, combined with the personal preferences for participants to seek certain physiotherapy careers, or to take time off following studies, will contribute to this time delay.

Almost all of the sample participants (99%) reported they were practising physiotherapy. This result was expected because the sample participants were recruited from public hospitals and private clinics where NZRPs are employed to deliver physiotherapy and provide their services. The other area that the sample participants were recruited from was Physiotherapy New Zealand, a professional body of NZRPs where membership to join the society is optional but provides physiotherapists with a variety of resources and support such as Professional Liability Insurance (Physiotherapy New Zealand, 2017a). As such, Physiotherapy New Zealand membership consists of a higher proportion of NZRPs who are

practising physiotherapy compared to those who are not members due to the benefits Physiotherapy New Zealand provides for practising physiotherapists. The Physiotherapy Board of New Zealand reported in their workforce survey that 4,040 out of 5,388 physiotherapists (75%) on the register were NZRPs issued with Annual Practising Certificates who can legally practice physiotherapy in New Zealand (Stokes et al., 2014). For these reasons, the sample participants are more likely to over represent the perspectives of practising physiotherapists than non-practising physiotherapists on a regional and national level.

Half of Canterbury-based NZRP participants (51%) have furthered their education level after attaining their physiotherapy qualifications and reported having achieved a Postgraduate Certificate or above qualifications. In the latest annual report published by the Physiotherapy Board of New Zealand (2017), 43% of NZRPs have an education level of Postgraduate Certificate or above. All of the sample participants would have attained a minimum of either a Diploma in Physiotherapy (pre-1991) or a Bachelor of Physiotherapy (1991 and onwards) because a recognised physiotherapy qualifications is a prerequisite to being a NZRP in New Zealand (Physiotherapy New Zealand, 2017). In the 2013 New Zealand population census report, less than 10% of the country's population have an education level of Postgraduate Certificate or above (Statistics New Zealand, 2013). The high

percentage of NZRP participants with postgraduate qualifications compared to the New Zealand population is likely facilitated by access to Health Workforce New Zealand's work programme with its annual budget of NZ$173,000,000 to fund postgraduate training and education programmes for health professions including allied health, which includes physiotherapists (New Zealand Ministry of Health, 2017d). Furthermore, the Physiotherapy Board of New Zealand requires NZRPs to have Continuing Professional Development which includes Formal Education Continuing Professional Development that can be met through postgraduate study (Physiotherapy Board of New Zealand, 2012). The education levels of the sample participants were expected in the findings and only slightly over represent the education levels of NZRPs around the country but greatly over represent the education levels of the general population in New Zealand.

Almost all of the sample participants (95%) reported using computers for personal purposes and spend on average 1.37 hours (82 minutes) each day doing so. This finding was expected because although there is currently no existing literature or reports on computer usage by NZRPs, Crothers, Smith, Urale, and Bell (2015) from the Auckland University of Technology reported in the World Internet Project, that over two-thirds (70%) of the New Zealand population spend 2 hours or more on the Internet through mobile devices and computers. Nine out of ten New Zealanders who are 45 years old or younger rate the Internet

and computer use as important and a vital source of information (Crothers et al., 2015). Apart from entertainment, New Zealanders use the computer and the Internet for social networking, payment of bills, fines, taxes, or licences to the Government, online product purchasing, and financial activities such as banking, money transfers, or stock investments (Crothers, Smith, Urale, & Bell, 2016). It is, therefore, not surprising to find that almost all of the sample participants use computers for personal purposes outside of working hours. The difference in the mean time spent on personal purpose computer use between the sample participants and the majority of the New Zealand population is likely attributed to the World Internet Project combining New Zealand's mobile phone usage, tablet usage, and computer usage together and this research study only specifically looked into computer usage. Thus, the personal purpose computer usage by the sample participants is likely to represent the computer usage by the rest of the New Zealand population.

The NZRP participants consisted of more NZRPs who work in the private sector (69%) than the public sector (22%), while a small portion of participants (9%) reported working in both sectors of healthcare. This finding was expected because the latest annual report from the Physiotherapy Board of New Zealand (2017) found that there are more NZRPs working in private practices, private hospitals, and private rest homes (2853 NZRPs) compared to NZRPs working in public hospital and health services, education and research,

and industry or government settings (1571 NZRPs). Furthermore, in the comprehensive physiotherapy workforce survey analysed by Stokes et al. (2014), more NZRPs reported working in the private sector (54%) than in the public sector (31%). The proportion of New Zealand's NZRPs who practice physiotherapy in the private sector (60%) and NZRPs who practice physiotherapy in the public sector (33%) are similar to the proportions in the study although the sample participants are likely to over represent NZRPs working in the private sector (69%) and under represent NZRPs working in the public sector (22%) compared to all of New Zealand's NZRPs. This difference is likely attributed by how the NZRPs were recruited in the study in that two of the three recruitment groups were likely to be more private sector dominated.

Over half (56%) of the NZRP participants who are practising physiotherapists use EHRs in their workplace while only 12% use paper-based health records and 32% use both EHRs and PHRs on a daily clinical basis. These findings were expected as the Government is currently trying to create paperless work environments in their healthcare facilities through Digital Health 2020 and the Canterbury DHB is currently leading the country in EMRAM metric scores used to assess the creation of completely digitally enabled hospitals. This positively influences the region's health professionals to be more aware of EHRs and primes them for future EHR adoption plans more so than other regions in New Zealand with lower

EMRAM scores (Ministry of Health, 2017). Furthermore, the Canterbury DHB is in the process of introducing an EHR system called HealthOne for the sharing of patient health data between selected primary and secondary health sector health professionals (HealthOne, 2016). As a consequence, it is not surprising to see the Canterbury-based NZRP participants predominantly using EHRs or using both paper-based health records and EHRs while the Canterbury health system undergoes its digital transformation. Currently, there is no available literature on the types of health records used by non-sample NZRPs nor is there any information reported in the physiotherapy workforce survey or the Physiotherapy Board of New Zealand's current annual report on this matter. As mentioned previously in the literature review, NZRPs are allowed to use any type of health records to record patient information and are not required to be computer literate nor are they required to operate electronic devices in their physiotherapy practices according to the Physiotherapy Competencies set out by the Physiotherapy Board of New Zealand (2009). This is a significant contrast to the Competencies for New Zealand registered nurses set out by the Nursing Council of New Zealand where Competency 2.3 states that nurses must demonstrate "literacy and computer skills necessary to record, enter, store, retrieve and organise data essential for care delivery" (Nursing Council of New Zealand, 2009, p. 16). A similar competency should be added to the Physiotherapy Competencies to ensure that future NZRPs are well prepared to operate EHR systems. The findings in this thesis provides an insight on the current situation of the types of

health records used by NZRPs around the country and this information may be used in the future to gauge how physiotherapy health record keeping has changed following the completion of Digital Health 2020 strategy.

The NZRP Participants and their Perspectives on the Implementation of a Universal EHR

Canterbury-based NZRP participants have predominantly positive perspectives on the implementation and use of EHRs. Almost all (92%) of the sample participants support the idea of a universal EHR that can be used and accessed by healthcare providers throughout New Zealand, 7% are indifferent, and only 2% reject the idea (see Figure 4.4). These findings were expected because the literature has reported the usefulness and effectiveness of EHRs in healthcare settings and health professionals largely welcome its introduction into their workplace environments (Barry et al., 2006; Buyl & Nyssen, 2009; Chaudhry et al., 2006; Hailey et al., 2014).

Allied health professionals working in practices located by Sydney, Australia, and their respective clinical managers were frustrated with their mixed paper and electronic-based health record systems and were supportive for the Australian Government's plan to introduce a universal certified Australian e-health standard compliant EHR system (Hailey et al., 2014).

Levine (2012), an American physiotherapist and EHR development consultant, believes that EHR systems would improve the overall quality of care for physiotherapy patients and strongly supports the implementation of and use of EHRs in healthcare settings. A research study conducted by Rieckmann et al. (2016), looking into the perspectives of EHR use found that a high percentage of German physiotherapist respondents (79%) could imagine the use of EHR systems in their daily clinical practice and believed the advantages of EHRs would outweigh the potential disadvantages.

In order to further explore the effects of formal Government support, training, or funding on EHR perspectives, the sample participants were asked if they would still be supportive of a universal EHR should the Government not provide any formal support, training, or funding during the implementation of an EHR. The findings show that NZRP participants view formal Government support, training, or funding as vital to their willingness to support a universal EHR throughout New Zealand. Eighty-one percent of the sample participants would not support a universal EHR if the Government introduces the new system but does not provide formal support, training, or funding for its implementation and use. In contrast, 92% of the NZRP participants would support a universal EHR if the Government provided formal support, training, or funding for the new system's implementation and use. Ninety-eight participants (75%) who responded to the questions on both the no funding

scenario and the funding scenario altered their responses from “No” to “Yes” towards committing to a universal EHR were the Government to provide formal support, training, or funding. Although this difference did not reach statistical significance, these findings were expected and supported the research hypothesis that more participants would be committed to using a universal EHR introduced by the Government if there was formal support, training, and funding compared to without such enablers.

In their study, Greenhalgh et al. (2008) argued that in Britain the successful implementation of an EHR requires adequate educational, monetary, and time support for end-users of the system. This includes health professionals from the nursing, medicine, and allied health professions. Formal support in the form of promoting and then educating about EHR systems to the general public and cooperating with educational institutions that train physiotherapists is an important aspect for future physiotherapists to develop a commitment towards EHR system adoption (Buyl & Nyssen, 2009). In the critical literature review conducted by Vreeman et al. (2006), a lack of formal training, a lack of time to modify workflow behaviour, and a lack of funds to purchase software or hardware ultimately hindered physiotherapists from implementing EHRs into their daily practices.

As hypothesised, just over half of the NZRP participants (52%) report not being

satisfied (or neither satisfied nor unsatisfied) with their current health record patient management system in their daily physiotherapy practice. Several factors from the results section in this study provide insight into these findings. Firstly, participants who currently practice physiotherapy use different types of health records with just over half (56%) using EHRs and 12% using PHRs while 32% use a mix of both types. There are currently no statistics available on the types of health record systems used by New Zealand physiotherapists since the start of the Government's Digital Health 2020 strategic plan which began in 2016 (Ministry of Health, 2016). It is, however, widely known that similar strategic plans which promote the implementation of EHRs, such as the American HITECH Act, will cause a major shift in healthcare settings to abandon old PHR systems and adopt new EHR systems (DesRoches et al., 2013). Thus, conclusions can be reached from these findings where many NZRP participants are using EHRs, or work in physiotherapy practices where an EHR has been implemented. Some participants, however, are still in the process of transition from a PHR to an EHR despite the release of the Digital Health 2020 strategic plan almost two years ago. When new EHR systems are in the process of being implemented or in the infant stages of its use, end-user health professionals have to readjust their workflow behaviour to accompany the new system and this often causes dissatisfaction and concerns about the new health record system that they have recently adopted (Haland, 2012). Like the participants in Haland's (2012) study, this process may also cause the NZRP participants to

be dissatisfied with their current health record system. Secondly, study findings indicate that the NZRP participants are using an average of just over two (2.03) different types or brands of computer software with a total of 41 different kinds of computer software being used across the different physiotherapy practices. This demonstrates the lack of a universal EHR system that can provide the needs of NZRP participants in their clinical practices where they have to resort to multiple computer software to suffice their work requirements. Hailey et al. (2014) found allied health professionals to be highly dissatisfied with the labour intensive process involved with gathering and tracking information scattered across separate software packages. Two of the allied health clinics who participated in Hailey et al.'s (2014) study had to use up to four different software systems to meet their demands to operate their clinic and deliver quality healthcare for their patients in an effective manner. Again, a similar situation may cause the NZRP participants to be dissatisfied with their current health record system. Lastly, the findings show a statistically significant relationship ($p < 0.001$) between which sector the participants are working in and whether or not participants are satisfied with their current health information system that they are using in their day to day practice. The low satisfaction rates (14%) of participants working in the public sector on their current health record information system will ultimately lower the overall satisfaction rates of all the participants in the sample. The possibility where the business-driven private sector of healthcare who adopt, and are satisfied with, EHRs to maximise operating efficiency and cost

calculation, compared to the complex nature of the public sector and its less efficient traditional workflow structure, may have contributed to the differing satisfaction rates of both sectors.

Overall, the findings discussed above reveal several key perspectives that the Canterbury-based NZRP participants have towards EHR implementation and use that potentially represent the perspectives of a large majority of the country's NZRPs, based on the sociodemographic similarities between both population groups. It appears that NZRPs are quite accepting of EHR implementation and use, that is, they believe that EHR systems would be the more superior system to use in healthcare and support its implementation and use should the Government develop a universal EHR that can be accessed by health professionals across the country. In order to maintain this positive outlook, the Government must provide formal and adequate support, training and funding for NZRPs during the early stages of the implementation of an EHR as well as the latter stages when the EHR is in use. A failure to do so may cause setbacks in their technological investment as NZRPs will not be as willing to adopt the EHR system without accompanying support and reassurance from the Government. Lastly, more attention should be given to the NZRPs working in the public sector because they showed less satisfaction than did those in the private sector of their current health record information system. Further research is required to understand why this

phenomenon is observed especially among NZRPs who work in the public sector. Failure to do so will increase the risk of significant discrepancies in EHR adoption rates for NZRPs who work in the private sector and NZRPs who work in the public sector. Successful EHR adoption relies on maintaining the positive perspectives of NZRPs through adequate Government support and in-depth research on public sector NZRPs.

The NZRP Participants and the New Zealand Government's Digital Health 2020 Strategic Plan

In response to the New Zealand Health Strategy 2016, the Digital Health 2020 strategic plan was developed and established as the primary strategic guide to progress core digital technologies and investments that are expected to come to fruition in New Zealand's health and disability sector across a five-year span from 2016 to 2020 (Ministry of Health, 2016). The findings in this research indicate that the majority (65%) of Canterbury-based NZRP participants have never heard of the Digital Health 2020 strategic plan compared to 29% of participants who have heard of it and 6% who cannot remember (see Figure 4.8). This means there is an alarmingly large number of NZRP participants, who are one of the many key stakeholders of the strategic plan that never knew of the strategic plan's existence prior to participating in this research.

This finding was expected and was hypothesised prior to data collection and analysis that the majority of participants would not have heard of the Government's Digital Health 2020 strategic plan. It is understood that although Digital Health 2020 had carefully detailed the Government's plan to invest digital technologies in healthcare, at no point did the Government formally raise Digital Health 2020's awareness to end-user healthcare workers nor was there any statement made that they wanted healthcare professionals to be thoroughly involved throughout the process (Ministry of Health, 2016). In the Government's strategic assessment for establishing New Zealand's universal EHR, the end-user healthcare professionals were not included as one of the key stakeholders (Ministry of Health, 2016d). Rather, Digital Health 2020 and the Government's strategic assessment of establishing New Zealand's universal EHR focuses more on the meso-level (organisational antecedents, readiness, and operational aspects of implementation) and the macro-level (institutional and socio-political forces) (Greenhalgh et al., 2008; Ministry of Health, 2016d). Despite the Government's effort to involve healthcare consumers and the general public in discussion workshops on the implementation of an EHR across the country, the lack of budget set aside for promotion and advertisement will have contributed to the overall lack of participation, engagement, and awareness (Ministry of Health, 2016). In the EHR design workshop facilitated by the Government held in March 2016, in Auckland, New Zealand, only one medical doctor specialist from Christchurch was formally asked to present his perspectives on

the EHR and represent himself as a healthcare professional (Ministry of Health, 2016a). Ultimately, there was a lack of involvement from NZRPs and other health professionals from the allied health sector. Nevertheless, the New Zealand Government and the Ministry of Health are still making vast gains in the forefront of health IT implementation into the country's health and disability sector.

As reported by the Ministry of Health (2016d), New Zealand remains in a prime position to succeed in implementing a universal EHR throughout the entire country due to effective initiatives and regional solutions carried out by the Government and the 20 district health boards. Since 2013, alliances have been formed between neighbouring district health boards around New Zealand to create the Northern Regional Alliance, the Midland Regional Alliance, the Central Regional Alliance, and the South Island Alliance with aims to achieve better health outcomes and targets for their respective populations by working together with their neighbouring counterparts (Ministry of Health, 2017i). As a result, regional centralised patient clinical records such as Health Connect South, strategies for regional clinical records that encompasses primary, secondary, and tertiary care such as the Central Region Information Systems Plan, and plans to explore the feasibility of regional EHRs such as the Northern Electronic Health Record Implementation Planning Study have provided the foundation and building blocks for a universal EHR across the country (Central Region

Alliance, 2016; HealthOne, 2016; Ministry of Health, 2016d; Northern Regional Alliance, 2016). The key for a smooth transition and effective implementation of a universal EHR will be ensuring that the Government's current progress is accompanied by the awareness and involvement of healthcare professionals in the country's health sector.

Walker and Clendon (2016) found that New Zealand Registered Nurses who participated in their qualitative study, fully appreciate the benefits of EHR systems and realised the need of a singular standardised EHR which can be provided by the Government. However, these participants desired more involvement throughout the implementation process and wanted to be made aware of potential plans for the implementation of the EHR so as to feel more connected throughout the entire process (Walker & Clendon, 2016). Such findings from participants who belonged to the New Zealand nursing profession suggests that their current perception and awareness of the entire EHR implementation process is likely inadequate as there is a desire for more awareness and involvement.

New Zealand and its key stakeholders for EHRs can learn from the knowledge gained through studying England's implementation of their centrally stored and shared electronic patient record, known as the *summary care record* (Greenhalgh et al., 2008). Constant involvement and awareness of the implementation of an EHR must be achieved on all three

levels including the micro-level (the individuals involved and their readiness), the meso-level (the healthcare organisations involved and their readiness), and the macro-level (the governing bodies involved and their socio-political forces) (Greenhalgh et al., 2008). The lack of awareness, involvement, and support on the micro-level ultimately resulted in multiple difficulties when the British government attempted to implement their version of a universal EHR throughout England (Greenhalgh et al., 2008).

These findings support the claim that many NZRP participants and likely many NZRPs across their profession in New Zealand are not aware of Digital Health 2020 and its five core components to improve digital capabilities in healthcare. Greater awareness and subsequent involvement by NZRP in the strategic plan will increase the likelihood of a smoother transition into the digital transformation of healthcare. This can be achieved through setting aside budget to support NZRPs and raise incentives for them to be involved in the process. Further research into this hypothesis is desirable for the future implementation of EHRs and will benefit the New Zealand physiotherapy profession as a whole.

The Perspectives among NZRP Participants Who Work in the Public Sector compared with NZRP Participants Who Work in the Private Sector on EHRs

In the study, a statistically significant higher proportion of NZRP participants working in the private sector agreed with the 10 listed advantages of EHRs compared with the participants working in the public sector. A complete table of the 10 listed advantages and their summary words were detailed in Table 4.4. This finding was unexpected because there previously was no available literature or reports on comparing NZRPs who work in different sectors of healthcare and what they perceived as the advantages of EHRs. Therefore, the relationship between these two variables (which sector the NZRP participants work in and the perceived advantages of EHRs) were unknown and their possible associations were undetermined prior to this study but have since been identified.

In contrast, a higher proportion of NZRP participants working in the private sector agreed with the eight listed disadvantages of EHRs compared with the NZRP participants working in the public sector. Even though this relationship and difference did not reach statistical significance, it is still important to discuss this finding because of its relevancy to the perceptions that NZRP participants have on the use of EHRs. This finding was also unexpected as there previously was no available literature or reports on comparing NZRPs who work in different sectors of healthcare and what they perceived as the disadvantages of

EHRs. What is profound from these findings is that both the listed advantages and disadvantages of EHRs were agreed upon by more NZRP participants working in the private sector compared to NZRP participants working in the public sector. This means although the private sector NZRP participants see the benefits and advantages of EHRs, they also understand the difficulties and disadvantages of EHRs instead of disregarding these potential challenges.

Based on the observation of these findings, a general hypothesis is made that Canterbury-based NZRPs who work in the private sector are likely more knowledgeable and experienced with EHRs compared to their public sector counterparts. This is because the sample participants who work in the private sector appeared to be in more agreement with the listed advantages and disadvantages of EHRs in the survey of this study which were formulated through literature that discussed in-depth the advantages and disadvantages of EHRs. Future research into the knowledge and experience of NZRPs on the topic of EHRs compared to which sector of healthcare they practice physiotherapy in may help produce valuable information on resource allocation during EHR implementation.

Another broader hypothesis for the observed findings above is that EHR systems provide more advantages to the private healthcare sector and its health professionals

compared to that of the public healthcare sector in the Canterbury region. At the same time, EHR systems bring about just as many disadvantages to the private healthcare sector and its health professionals compared to that of the public healthcare sector in the Canterbury region. This may be attributed to the different nature and structure that underpins the operation of the two different health sectors.

After introducing a number of acts and policies that evolved and reformed the health system from the 1800s through to the early 2000s, New Zealand currently uses the socialised medicine Beveridge model where healthcare is provided and financed by the government with the vast majority of health professionals being employed by them in the public sector (Gauld, 2001; Reid, 2008). In 2001, the New Zealand Primary Health Care Strategy was developed to move away from an individualised fee-for-service model and towards a more community centred health approach (Crooks & Andrew, 2009). This resulted in many primary care providers, such as general practitioners and NZRPs, becoming less dominant in making sensitive decisions, such as setting healthcare service fees in their private operated community practices (Crooks & Andrews, 2009). With this approach and the Government's increase in resources to support primary care, it had begun to limit the freedom of these privately operated primary care providers to set fee levels as well as losing their clinical and economic autonomy by having to focus on national priority initiatives through clinical

indicators rather than sustaining their privately owned healthcare business (Cooks & Andrews, 2009).

In New Zealand, the private health sector complements that of the public sector. Private healthcare involves specialist services, primary care, private hospitals and clinics which "provide non-urgent and elective treatments that complements the public health service's focus on urgent and essential treatments" (Medical Council of New Zealand, 2011). Many medical clinics in the private sector operate outside of the usual working hours of health professionals in the public sector to provide treatment for accidental injuries and emergencies (Medical Council of New Zealand, 2011).

The need for NZRPs, who work in the private sector to provide their unique services, which differs to their public sector counterparts, coupled with the burden to privately fund and operate their health clinics, will contribute to their tendency to adopt and become more knowledgeable of the more superior EHR system over the traditional PHR system. An EHR system allows a healthcare provider to better facilitate the order management, communication, and cost calculation of their treatment services which all appear to benefit the private sector more so than the public sector of healthcare in New Zealand (Gardner et al., 2003; Latha et al., 2012). Therefore, it is likely that because of the nature of the services they provide which results in more time and subsequent knowledge on EHR systems compared to

their public health sector counterparts the NZRP participants, who work in the private health sector agree with the listed advantages and disadvantages of EHRs more so than the sample participants who work in the public health sector.

Among the 10 listed advantages of EHRs, NZRP participants who work in the private health sector view “communication” (allow healthcare providers of different professions to communicate with each other), “integration” (provide integrated healthcare across different healthcare locations), and “timely” (save time on locating and retrieving health information and patient charts) as the top three advantages of EHRs. It is likely that “communication” (97%) and “integration” (92%) were highly agreed upon advantages due to the work environment and patient treatment approach of the private health sector NZRP participants. Commonly, NZRPs work in private practice physiotherapy clinics or privately owned clinics that provide predominantly physiotherapy services. This means they will be physically isolated from other health professions who are treating the same patient but working in other specialised clinics at different locations. This creates an essential need for good “communication” and “integration” among private sector working NZRP participants to ensure that healthcare providers who see the same patients are doing so in a multidisciplinary team approach and not hindered by different physical isolations. New Zealand’s Accident Compensation Corporation partially funds, or provides partial payments to private health

sector working NZRPs for each physiotherapy consultation they provide for patients with accidental injuries (Accident Compensation Corporation, 2017). The more patients that an NZRP sees in private practice the more payments they will receive which results in "timely" being an important EHR advantage for privately owned healthcare clinics who aim to operate their businesses effectively and maximise profits.

Similar to the perceptions of the NZRP participants who work in the private health sector, the NZRP participants who work in the public health sector view "integration" (100%) and "timely" (96%) as two of the top three advantages of EHRs. Instead of "communication", "accessibility" (be accessed anytime and anywhere by healthcare professionals involved in the direct care of patients) was the third most popular advantage (89%) chosen by public health sector working NZRP participants. "Communication" may be seen as a less important advantage of EHRs because of the generally closer physical proximities that different health professions and their respective departments have to each other in public sector hospital settings. Multidisciplinary teams in public hospitals involve multiple healthcare disciplines approaching a patient case with their own professional perspective through separate consultations (Jessup, 2007). The close proximities that different health professional departments have to each other and the presence of different health professionals in hospital wards allow for easier and more frequent multidisciplinary team case conference discussions

and subsequent communication with each other in their work settings. It is likely that the NZRP participants who work in the public health sector do not have to rely on the EHRs as heavily to achieve effective communication with other health professions compared to the NZRP participants who work in the private health sector. In contrast, the "accessibility" advantage of EHRs would be more important as NZRPs working in public hospital settings who are less isolated than NZRPs working in private practices and are required to be at different hospital locations and conferences where accessibility to patient health records at anytime and anywhere is more desirable. The different workplace environments of private and public health sector NZRPs may also be the reason that "multiple copies" (provide more than one copy of the same patient information at any given time) was the EHR advantage that had the greatest difference in agreement between private sector working NZRP participants (31%) and public health sector working NZRP participants (50%). Private sector NZRPs working in more physically isolated workplace settings would have less competition to the access of patient health records as opposed to public sector NZRPs working in less physically isolated workplace settings where clinicians from different health professions would wish to simultaneously access the patient health records for patients that are under their direct care. Further research into this area which looks into the effects of different workplace settings between different sectors of healthcare on the perspectives of NZRPs in New Zealand will provide further insight to this topic.

Latha et al., (2012, p. 6) write that EHRs have been found to "help individual practitioners and healthcare provider institutions manage and evaluate the quality and costs of care" so that resources can be better distributed and utilized. Despite this, two of the less popular advantages from the 10 listed advantages of EHRs were "evaluation" (effectively evaluate the quality of the care provided) and "calculation" (effectively calculate the cost of the care provided) regardless of which sector the NZRP participants work in (see Table 4.4). It is possible that NZRP participants are not fully aware of these particular advantages of EHRs as many providers are not well informed about the benefits of using EHRs and their capabilities beyond simply storing patient health information (Nguyen et al., 2014). This observation is further supported by the findings described earlier in this discussion section where a majority (65%) of the Canterbury-based NZRP participants have never heard of Digital Health 2020. This further implies a lack of engagement and a lack of understanding that the NZRP participants have towards using EHRs and its implementation as both come hand in hand. The lack of understanding and awareness of how EHRs can benefit NZRPs in their clinical practice will result in a lack of engagement from the physiotherapy profession as a whole which will ultimately hinder the Government's plan to establish a universal EHR system throughout the entire country. Therefore, a potential method to target this situation is through comprehensive explanations and descriptions of the advantages of EHRs by the Government to NZRPs, health professionals, and all other end-users to ensure a full

understanding of the system that the Government is trying to implement into the health system.

Among the eight listed disadvantages of EHRs, NZRP participants who work in the private sector view “insecurity” (potential threat of security breaches by hackers or malicious software that can access sensitive healthcare information from anywhere), “inflexibility” (lack of autonomy and inflexibility for healthcare professional to record health records the way they want to rather than the set rigid structured format of the EHR), and “incorrect recording” (possibility of recording wrong healthcare information due to operating the electronic system incorrectly) as the top three disadvantages of EHRs. Compared with the NZRP participants who work in the public sector, “insecurity, “incorrect recording”, and both “unjustified access” (healthcare providers can access healthcare information of patients who are not in their direct care) and “non-acceptance” (lack of acceptance by healthcare professionals who choose not to use EHRs) are the most agreed upon disadvantages of EHRs. In both working sectors, “insecurity” and “incorrect recording” were perceived by NZRP participants as two of the top disadvantages of EHRs.

The security of web-based EHR systems as opposed to the traditional PHR systems has been frequently discussed because EHR systems can be breached and hacked into without

the offender being physically in front of the medical record (Chhanabhai & Holt, 2007). This is due to how medical records are stored electronically in EHR systems, and not physically like traditional PHR systems, which may cause the system to appear to be less secure because of its ease of access (Chhanabhai & Holt, 2007). During the recruitment process for potential participants to take the study's survey, the media continuously reported one of the largest known EHR security breaches. Hackers who broke into the English National Health System's information storage system and held sensitive patient information hostage in exchange for a monetary ransom (Griffin, 2017). This, coupled with the lack of familiarity about new EHR systems compared with traditional paper-based health record systems as described by Anderson (2007), could have resulted in the NZRP participants being concerned with "incorrect recording" and operating the system incorrectly. It is likely that reassurance and education by the Government on the security of their universal EHR will be key in convincing NZRPs that a universal EHR system is the future of healthcare in New Zealand.

NZRP participants who work in the private sector may view "inflexibility" as one of the top three disadvantages of EHRs because their work consists of providing community-based primary care which involves health services such as "diagnosis and treatment, health education, counselling, disease prevention and screening" (Ministry of Health, 2017h). As one of the first points of consultation for patients who make contact with New Zealand's

health system, private health sector NZRP participants would likely require a health record system that is flexible to document unforeseen or unexpected patient presentations as opposed to public health sector NZRP participants who largely work in secondary and tertiary hospital care where inpatients have previously received primary or secondary care and are accompanied with existing health records. For this reason, there is a need to ensure the autonomy of NZRPs when recording health records will be the key to gaining their acceptance of an incoming universal EHR in New Zealand. This is reinforced by literature that describes how, in many situations, health professionals will have negative experiences with an EHR system when they lose "the autonomy in making patient decisions because an EHR blocks the ordering of certain tests or medications" and the system allows little space for practitioners to exercise their professional autonomy in situations where flexibility is desired (Khangura et al., 2010; Menachemi & Collum, 2011).

The Canterbury-based NZRP participants who work in the public health sector view "unjustified access" (43%) and "non-acceptance" (43%) as the third and fourth respectively most agreed upon disadvantages of EHRs. The publicly funded Canterbury DHB delivers healthcare services to an estimated 543,820 people in the Canterbury region (Ministry of Health, 2016d). As such, vast amounts of sensitive patient health records of the region's population are recorded and stored and the risk of unjustified access by healthcare providers

into records of patients not in their direct care is a concern for the public health sector working NZRP participants who have access to these records. Furthermore, the finding of "non-acceptance" by health professionals in hospital settings from existing literature has also been identified by public health sector working NZRP participants in this study (Greenhalgh et al., 2008). A potential solution to these two disadvantages of EHRs may be the need to create multiple champions of EHRs, who are educated, trained and knowledgeable about EHRs in multiple public healthcare settings to promote acceptance within the end-user population and reinforce the need for justified access to patient health records when using an EHR system (Greenhalgh et al., 2008).

Lastly, NZRP participants from both private and public health sectors do not view "ongoing cost" (ongoing cost to maintain the required software and hardware to keep the electronic system up to date), "extra cost" (extra cost of additional resources such as money and time to train healthcare professionals to use EHRs), and "vendor access" (non-healthcare providers who produce, maintain, and service the EHR system will have access to sensitive health information when working on the system) as disadvantages of EHRs. These findings were unexpected and profound as previous results in the study (see Table 4.2) demonstrates how important Government supporting, training, and funding are to the NZRP participants regardless of which sector they work in yet they do not view the ongoing maintenance costs

of EHR systems or the extra costs to support healthcare professionals during the implementation of an EHR as one of the top disadvantages of EHRs. Furthermore, reports on the effectiveness of the American Government's HITECH Act have been well documented and how its positive financial incentives to adopt EHR systems and its negative financial dis-incentives for not adopting EHR systems have helped overcome the disadvantages of "ongoing cost" and "extra cost" (DesRoches et al., 2013; Sheikh, Jha, Cresswell, Greaves, & Bates, 2014; Thurston, 2014). Perhaps the NZRP participants may perceive that the Government has provided the majority of the costs to develop the universal EHR system with partnering vendors and that the Regional IT Foundations component of Digital 2020 will provide adequate support in the delivery of New Zealand's future universal EHR. Therefore, this leads to the perspective where "ongoing cost" and "extra cost" are not the main concerns for EHR adoption and neither is "vendor access" as the NZRP participants trusts in the Government's decision to select reputable vendors.

When interpreting the findings of this study and its relevance to Canterbury-based NZRPs as well as NZRPs based throughout the country, it should be noted that the NZRP participants in the study consist of a higher than average percentage who work in the private health sector and a lower than average percentage who work in the public health sector. This means there is a greater chance where the associations found in this section may over

represent the private health sector NZRPs and under represent public health sector NZRPs. However, all the other sociodemographic characteristics of the NZRP participants were largely similar to the sociodemographic characteristics of all NZRPs in the country as discussed earlier. Therefore, the findings discussed in this section will likely hold its relevance to not just the NZRPs who participated in the study, but also to all other NZRPs located in the different regions of New Zealand.

The Educational Backgrounds of NZRP Participants and their Support towards an Universal EHR

NZRP participants who have been awarded a postgraduate certificate or above qualification are more supportive of a universal EHR than NZRP participants who only have a bachelor's degree or below, but this difference failed to reach statistical significance because a large majority (92%) of NZRP participants, regardless of their educational backgrounds, are already supportive of the idea of a universal EHR. This finding was expected because literature has reported the approval of health professionals for the effectiveness of EHR systems as well as the importance of education and knowledge leading to a greater understanding and resulting acceptance of EHRs (Barry et al., 2006; Buyl & Nyssen, 2009; Chaudhry et al., 2006; Hailey et al., 2014; Liddell & Cross, 2011; Safdari et al., 2015). It is, therefore, likely that NZRP participants with postgraduate qualifications will

generally have had more opportunity to be exposed to further subject specific knowledge on health IT and EHRs compared to NZRP participants with a bachelor's degree or below. However, given that the New Zealand physiotherapy profession and its population is a well-educated one (virtually all NZRPs have tertiary education backgrounds), it is unsurprising that the majority of NZRP participants would support the idea and implementation of a universal EHR system that can be accessed by all healthcare providers across New Zealand.

The Healthcare Information and Management Systems Society (2010), abbreviated as HIMSS, describes the top 10 EHR factors for success in the implementation of an EHR for practices with between one and five physicians (small-sized medical practice) as well as practices with between six to 10 physicians (medium-sized medical practice). These factors are also likely to apply to small and medium-sized physiotherapy practices run by NZRPs in New Zealand because NZRPs are also primary care providers in the community along with medical physicians. Education along with training and system testing were two of the 10 listed factors for success in both reports that catered for differently sized practices (HIMSS, 2010). Having further education either formally through education providers or informally through contact with EHR vendors to increase the knowledge that a health professional has on EHR systems and its implementation is instrumental to the successful implementation of an EHR in healthcare practices (HIMSS, 2010). Training, and ensuring that health

professionals in medical practices have adequate computer skills prior to the implementation of an EHR system through additional training or education courses, are both important to ensure staff support throughout the implementation process of an EHR system in their practices (HIMSS, 2010). Currently, there is no literature reporting on the size of physiotherapy practices in New Zealand and their experience in the implementation process of an EHR system. Future research looking into these factors will help solidify and reinforce the factors that will lead to a successful implementation of an EHR as identified by HIMSS for medical practices.

Other than the medical and nursing professions within healthcare, there has been a lack of research on EHR perspectives for the physiotherapy profession and the rest of the allied health professions as found in the literature review for this study. In fact, a systematic review of literature by Nguyen, Bellucci, and Nguyen (2014) found a surprising lack of evidence-based studies on the benefits of EHR systems despite the well documented increase in adoption and growth of EHR markets. Many healthcare providers who are considering EHR adoption into their practices are not well informed on EHR systems, despite having positive attitudes towards them (Nguyen et al., 2014). Ninety-eight papers were identified in their systematic review with two-thirds of them focusing on the United States, four papers each on Denmark, England, and Norway, five papers on Canada, but nothing on Oceanic

countries and their experiences with the implementation of EHRs (Nguyen et al., 2014). This lack of scientific insight into the implementation of EHRs and EHR systems in general is a concern for health professionals because this lack of knowledge about EHRs, especially in the Oceanic region, will cause a lack of education for health professionals due to insufficient understanding which may jeopardise the positive outlook that health professionals in Australia and New Zealand, such as the NZRP participants, have on EHRs. A greater understanding on EHRs in New Zealand through research will aid in providing further knowledge on the subject which can then be used to educate the health sector's workforce to ensure ongoing support for the Government's plan to implement a universal EHR system across the country.

Apart from education and training, studies from a variety of countries outside of New Zealand have also noted other factors involved in the successful implementation of EHR systems in healthcare settings. In the United States of America, the main issue hindering the implementation of an EHR in 2007 was the lack of financial incentives, such as quality-based reimbursement programmes where the Administration "reward practices for specific quality improvement actions or use of specific IT applications" (Anderson, 2007, p. 482). However, after the HITECH Act and its Medicare and Medicaid financial incentive programmes were authorised by the United States of America Administration in 2009, EHR adoption in medical

facilities and practices quickly occurred throughout the country (DesRoches et al., 2013; Menachemi & Collum, 2011). This resulted in the United States of America having nearly three times as many acute care hospitals with EHR systems in 2012 than the country did in 2010, just after the introduction of the HITECH Act (DesRoches et al., 2013).

After the establishment of England's National Programme for Information Technology (NPfIT) in 2002, literature has described the failure of this large-scale IT project and the subsequent lessons acquired through the programme, which cost the British Government GBP6.2 billion (Crompton, 2007; Greenhalgh et al., 2008; Sheikh et al., 2014). The programme was a failure because a top-down implementation strategy was initiated where the British Government signed substantial contracts with a handful of EHR vendors which led to feelings of disconnection and lack of involvement from their health professionals (Greenhalgh et al., 2008; Sheikh et al., 2014). In contrast, the United States of America pursued a bottom-up strategy in which health professionals and hospitals were given the choice of which EHR system to implement with subsequent incentives rewarded through their own decisions (Greenhalgh et al., 2008; Sheikh et al., 2014). This shows the importance of providing not just funding, but also involvement and communication to healthcare providers and healthcare consumers as key factors to successful EHR implementation.

Within New Zealand, despite being regarded as a leader in merging health information with IT, the majority of healthcare records still exist as paper records (Chhanabhai et al., 2006). Healthcare providers at different locations are using different EHR systems from different vendors which results in a lack of a standardised or uniform system that can be connected to communicate with other health professionals in the health system (Chhanabhai et al., 2006; Menachemi & Collum, 2011). Digital Health 2020 and the Government's plan for a universal EHR must acknowledge the lessons learnt from other countries to ensure successful implementation strategies are provided. This includes factors such as education, training, funding, involvement, and communication with healthcare providers to ensure the successful implementation of a universal EHR in New Zealand.

The Perspectives among NZRP Participants who use Computers More Frequently in their Work Environment Compared to those who do not

NZRPs who use computers more frequently in their work environment are more supportive of a universal EHR system that can be used and accessed by healthcare providers from all of New Zealand. NZRP participants who use the computer at work for more than three hours per day are more supportive of a universal EHR than NZRP participants who use the computer at work for three hours or less although this difference failed to reach statistical significance. This is because a large majority (92%) of NZRP participants, regardless of their

computer usage at work, are already supportive of the idea of a universal EHR. Almost every NZRP participant in the sample (99%) report using computers for work on a daily basis (see Figure 4.13) and spend on average three hours (mean = 3.24 hours, median = 3 hours, and mode = 3 hours) each day doing so. For this reason, the value of three hours was used in the results and analysis of the NZRP participants as an indicator of more than frequent use (more than three hours) and less than frequent use (three hours or less) of computer in their work environment.

These findings were expected because it was anticipated that almost all of the NZRP participants would be using computers at work for more than two hours each day and that those who use the computer more frequently at work would support computer-operated EHR systems in their work environment due to their familiarity and confidence with operating computers. Although there is no available literature on computer use by NZRPs in the Canterbury region or New Zealand, it is known that seven in 10 Internet users in New Zealand population spend two hours or more each day on the Internet for a variety of purposes including work (Crothers et al., 2015). Research at a Swiss teaching hospital reported that their house officer physicians spent on average 5.2 hours each shift using computers of which approximately 2 hours were for operating EHR systems and writing discharge summaries (Phillips, 2017). In another study, Alromaihi et al. (2011) reported that

house officer physicians spent on average 4.8 hours each day working by their workstations which involved operating EHR systems 68% of the time (3.26 hours). This means that NZRP participants are likely to spend less time using computers at work than house officer physicians, since NZRP participants reported an average of 3.24 hours of computer use at work. This takes into account the varied reported amount of time that different house officer physician spends on operating EHR systems through using computers as seen in Alromaihi et al.'s (2011) and Phillips's (2017) studies.

As mentioned earlier, sufficient amounts of training, education, and system testing for healthcare providers on EHRs are keys factors that contribute to the success of the implementation of an EHR and this also implies the importance of allocating a sufficient amount of time for health professionals to use computers for these purposes. It is also, however, important to note that overspending a high proportion of working time on computer and EHR use detrimentally affects the amount of time that house officer physicians have for face-to-face patient interactions as well as inducing negative perspectives on EHR systems (Alromaihi et al., 2011; Phillips, 2017). While the roles of medical doctors and physiotherapists in healthcare is different, the requirement for both professions to know how to operate EHR systems and be computer literate remains similar in the New Zealand health system. The findings in this study indicate that frequent computer use at work by NZRP

participants is likely associated with supportive and positive perspectives towards the implementation of an EHR system, but the effects of overusing computers at work or operating EHR systems that require large proportions of time is poorly understood. Further research to classify what NZRPs view as infrequent, frequent, and overuse of computers in their work environment as well as the effects that time efficient and inefficient EHR systems have on NZRPs will provide further insight into the factor of computer use and NZRP perspectives on the implementation of an EHR system.

What do NZRP Participants Perceive as Advantages and Disadvantages of using EHRs?

Almost all of the NZRP participants perceive “integration” (95%), “timely” (95%), “communication” (94%), and “accessibility” (91%) as the top advantages of using EHRs while the majority perceive “clear reading” (68%), “security” (61%), and “electronic footprint” (60%) as advantages of EHRs, whereas “evaluation” (41%), “multiple copies” (37%), and “calculation” (34%) were perceived as advantages of using EHRs by less than half of the NZRP participants (see Table 4.14). These findings were partially expected because although literature has consistently described “integration”, “timely”, and “communication” as advantages of using EHRs, they also described “evaluation”, “multiple copies”, and “calculation” as advantages of using EHRs, which the NZRP participants did not perceive as advantages of using EHRs (Chhanabhai & Holt, 2007; Khangura et al., 2010;

Latha et al., 2012; Menachemi & Collum, 2011; Zandieh et al., 2008). Differing perceptions of the advantages of EHRs by the sample participants was expected but having more than half of the sample not perceive some of the listed advantages as advantages of using EHRs was unexpected because the listed advantages in the survey were formulated from the literature reviewed for this project. The conclusion might be drawn that the NZRP participants are familiar with some of the advantages of using EHRs as discussed in the literature but not all of it.

Although there was no available literature that detailed the perceptions that NZRPs have on using EHRs, the literature has described the distinct and unique features that EHR systems have over traditional PHR systems that allows the implementation of an EHR to be seen as advantageous in healthcare settings. The Institute of Medicine of the National Academies in the United States of America identified eight core care delivery functions that EHR systems have to improve healthcare quality, safety, and efficiency. They are:

1. record health information and data,
2. facilitate results,
3. facilitate order management,
4. provide clinical decision support,
5. allow electronic communication and connectivity,

6. provide patient support,

7. allow administrative processing and reporting, and

8. aid in the reporting population health statistics (Gardener et al., 2003).

The high-level integration of healthcare achieved through EHR systems that provides effective communication between healthcare providers, convenient accessibility of health records anytime and anywhere, and time-efficient health information retrieval have been well documented in the literature (Chhanabhai & Holt, 2007; Gardener et al., 2003; Khangura et al., 2010; Latha et al., 2012; Menachemi & Collum, 2011; Rieckmann et al., 2016; Zandieh et al., 2008). Thus, it is unsurprising that these functions and features which define EHR systems and its proven success in healthcare settings would be perceived as advantages by NZRP participants who deliver healthcare in these settings.

An online survey targeting German physiotherapists found that the majority (79%) of the respondents perceived the use of EHR systems in their clinical practice in a positive light and believed that the advantages outweigh the potential disadvantages (Rieckmann et al., 2016). The German physiotherapist respondents believe that implementing EHRs in their clinical practice will:

1. Save time,

2. Simplify data back-up,

3. Simplify maintenance and archiving,

4. Realise interoperability,

5. Increase intra- and inter-professional communication,

6. Improve professional image, and

7. Prove the objectives and outcomes of physiotherapy (Rieckmann et al., 2016)

Similar advantages such as “timely”, “security”, “integration”, “communication”, and “accessibility” were identified in the current study by NZRP participants that also closely resembled what the German physiotherapist respondents in Rickmann et al.’s (2016) study perceived as advantages of using EHRs.

EHRs nullify the difficulties that health professionals may have on reading each other’s handwriting which can often be unintelligible when written in a rush or in situations with time constraints (Latha et al., 2012; Zandieh et al., 2008). Importantly, properly maintained EHR systems provide strong security for sensitive patient health information through password authentication processes that can only be accessed by the health professionals who are involved in the direct care of patients (Anderson, 2007; Menachemi & Collum, 2011). Furthermore, the potential exists for health IT vendors to program in EHR systems electronic footprints to track who altered, or viewed, which specific patient health record file, and at what point of time, to create undeniable electronic evidence that protects

both the health professional and the patient involved in a healthcare scenario. Nullifying the difficulties of reading other colleague's handwritings, enforcing a password authentication process, and programming electronic footprints into EHR systems are the three traits of EHRs were viewed as advantages by NZRP participants where the majority saw "clear reading", "security", and an "electronic footprint" as advantageous features of using EHRs.

EHRs can "help individual practitioners and healthcare provider institutions manage and evaluate the quality and costs of care" so that resources can be better distributed and utilised (Latha et al., 2012, p. 6). In addition, EHRs help reduce the cost of healthcare by granting multiple access points to one patient's medical record thereby decreasing the time spent by health professionals on locating and retrieving patient medical records which otherwise may involve waiting in line with other colleagues to gain access to the one physical copy that cannot be easily shared (Lath et al., 2012). Despite the acknowledgement that these EHR advantages have received in the literature, less than half of the NZRP participants perceive "evaluation" (41%), "multiple copies" (37%), and "calculation" (34%) as advantages of using EHR systems in their clinical practice (Gardner et al., 2003; Latha et al., 2012; Menachemi & Collum, 2011).

A plausible hypothesis to this finding is that the NZRP participants, whom almost all

are practising physiotherapy (99%), view EHRs as tools to aid their clinical work for their patients and not tools to evaluate their performance as therapists or tools to calculate the cost of the therapy they are delivering to their patients. The primary focus and role of practising physiotherapists would be to deliver physiotherapy to healthcare consumers instead of evaluating the quality of their physiotherapy or whether they are generating sufficient income for healthcare facilities (Physiotherapy Board of New Zealand, 2009; Physiotherapy Board of New Zealand, 2012a; World Confederation for Physical Therapy, 2016). NZRP participants are likely to view "evaluation" and "calculation" as work that should be performed by private practice owners, clinical managers, or business accountants. The projected continual growth of the physiotherapy profession in New Zealand along with the increasing need and subsequent job vacancies for physiotherapists may also contribute to the NZRP participants feeling secure with their careers and not placing additional emphasis on "evaluation" and "calculation" as advantages of using EHRs (Stokes et al., 2014).

Lastly, "multiple copies" was not seen as an advantage of using EHRs by NZRP participants as they may view this EHR characteristic as one that may contribute to the inappropriate distribution of sensitive patient health information due to the ability of EHRs to allow multiple copies of information to be displayed at any given time, thereby increasing the opportunities of personnel not related to a case intentionally gaining access to the

information. Instances, such as famous athletes being hospitalised and having their EHRs inappropriately accessed by health professionals, have been reported by media across different regions in New Zealand, including Canterbury (Leaman, 2017; Torrie & King, 2013). This is reinforced through what NZRP participants perceive as the primary or main disadvantage of using EHRs.

NZRP participants perceive “insecurity” (82%) as the main disadvantage of using EHRs while the majority perceive “incorrect recording” (57%), “inflexibility” (53%), and “unjustified access” (53%) as disadvantages of EHRs, whereas “non-acceptance” (48%), “ongoing cost” (40%), “vendor access” (34%) and “extra cost” (33%) were not perceived as disadvantages of using EHRs with less than half of the NZRP participants viewing these EHR traits as disadvantages (see Table 4.15 and Figure 4.15). These findings were partially expected because although a body of literature has consistently described “insecurity, “incorrect recording”, “inflexibility” and “unjustified access” as disadvantages of using EHRs, they also described “non-acceptance”, “ongoing cost”, “vendor access” as well as “extra cost” as disadvantages of using EHRs which the NZRP participants did not perceive as disadvantages of using EHRs (Anderson, 2007; Chhanabhai & Holt, 2007; Greenhalgh et al., 2008; Khangura et al., 2010; Menachemi & Collum, 2011; Zandieh et al., 2008). Differing perceptions of different disadvantages by the sample participants were expected but having

more than half of them not perceive some of the listed disadvantages as disadvantages of using EHRs was unexpected because the listed disadvantages in the survey were formulated from the literature reviewed for this project.

Although there was no available literature that detailed the perceptions that NZRPs have on using EHRs, the literature has described the potential drawbacks and shortcomings that EHR systems can have over traditional PHR systems that allows the implementation of EHRs to be potentially disadvantageous in healthcare settings if the process is poorly managed. Privacy and confidentiality concerns as to whether many web-based EHR systems will be secure, and not breached by hackers or malicious software, has always been a heated topic of discussion because medical records can be illegally accessed through the Internet without needing offenders to physically be near healthcare facilities for the offence to occur (Anderson, 2007; Chhanabhai & Holt, 2007; Griffin, 2017; Ministry of Health, 2005). Together, the Government's strategies to ensure the security of patient health data and the literature that describes the potential threats from hackers on EHR systems, combined with media reports of breaches of EHR systems by malicious software are likely to contribute to the perception by NZRP participants that "insecurity" is the biggest disadvantage of using EHRs in their clinical practices (Anderson, 2007; Chhanabhai & Holt, 2007; Griffin, 2017; Leaman, 2017; Ministry of Health, 2005; Torrie & King, 2013).

A lack of knowledge on how to run an EHR system and the consequences when health professionals incorrectly record and submit patient health records is a known disadvantage (Anderson, 2007). The rigid and inflexible nature of EHR systems created through software programming by health IT vendors to establish order and structure in patient health records were also seen as a major disadvantage by health professionals who felt a loss of their professional autonomy to freely alter and adapt patient health records to different clinical settings and situations where malleable formatting of records is desirable (Khangura et al., 2010; Menachemi & Collum, 2011). Thus, even though many healthcare practices had the ability to generate medical prescriptions electronically stored in EHRs, the majority of health professionals continued to handwrite prescriptions to maintain their autonomy which exposes the "inflexibility" of EHRs (Zandieh et al., 2008). Furthermore, the majority of NZRP participants perceived "unjustified access" as a disadvantage of using EHRs which is linked to their perception that "multiple copies" is not an advantage of using EHRs as discussed earlier due to the ability of EHR systems to make health records highly accessible to health professionals in healthcare facilities. It is, therefore, unsurprising that "incorrect recording", "inflexibility", and "unjustified access" would be seen as disadvantages of using EHR systems by the majority of NZRP participants.

Less than half of the NZRP participants perceived "non-acceptance", "ongoing cost",

"vendor access", and "extra cost" as disadvantages of using EHRs. These findings were not expected as the literature has shown the lack of EHR adoption by healthcare organizations due to "physician resistance, financial costs, concerns about privacy, lack of uniform standards, and providing little information about best practices for implementation" (Zandieh et al., 2008, p. 756). Many hospitals and health professionals looking to adopt EHR systems into their practices frequently mention funding issues, the high cost of initial implementation, and ongoing maintenance fees for computer software and hardware updates as disadvantages of implementing and using EHR systems (Anderson, 2007; Khangura et al., 2010; Menachemi & Collum, 2011; Zandieh et al., 2008). Estimates show that education sessions and maintenance fees for EHRs in healthcare facilities in the United States of America cost an average of US$8,412 dollars per clinician during initial implementation stages of EHR systems (Menachemi & Collumn, 2011). Furthermore, NZRP participants in the study voiced their change of perspective and support towards the implementation of an EHR system when the factor of Governmental funding was added into the scenario (see Figure 4.5 and Figure 4.6). The high-level involvement of vendors, who not only produce and maintain EHR systems for health professionals, but who also educate and support health professionals on how to use the EHR systems, was often mentioned in literature because vendors have unobstructed access to sensitive patient health information when they work on EHR systems and can abuse this right of access to the system (Anderson, 2007; Khangura et al., 2010;

Menachemi & Collum, 2011). Because of this, it was not expected that the majority of NZRP participants would not view “non-acceptance”, “ongoing cost”, “vendor access”, and “extra cost as disadvantages of using EHRs.

A likely explanation for these findings among the NZRP participants that is different from what was noted in the literature is the trust and rapport that they have in the New Zealand Government. Ultimately, the Government and its initiative to develop a universal EHR throughout the country, with Digital Health 2020 as their strategic plan and guide have an important role in the implementation of an EHR system in New Zealand (Ministry of Health, 2016). In addition, trusting in the Government’s judgement to find a legitimate vendor so that the disadvantage of “vendor access” and its potential risk is minimised along with the Government taking up the responsibility to shoulder the cost of developing and maintaining the universal EHR system, which partially offsets the “extra cost” and “ongoing cost” required for EHR implementation, are likely reasons why the NZRP participants do not view “ongoing cost”, “vendor access”, or “extra cost” as disadvantages of using EHRs. If the Government centrally controls the developmental process of the EHR system and its associated costs then this appears to resolve these disadvantages of EHRs as noted in the perspectives of the NZRP participants. Lastly, it appears that the “non-acceptance” of EHR systems is not an issue within the allied health and nursing sectors of Australia and New

Zealand because allied health professionals and nursing professionals in these two countries are eager to implement EHR systems into their practices with positive attitudes towards the adoption of an EHR system (Hailey et al., 2014; Walker & Clendon, 2016). For these reasons, the majority of NZRP participants would be unlikely to view these four disadvantages of using EHRs as disadvantages that will cause them to not adopt EHR systems in their daily clinical practices as physiotherapists.

The age of the NZRP participants was not a major determinant of how the participants perceived the different listed advantages of using EHRs in the study. For instance, there was little variation among the NZRP participants across the three different age groups in regard to the advantage "integration" where similar percentages of NZRP participants in all age groups perceive "integration" as an advantage of using EHRs (23 – 34 years, 35 – 49 years, and 50 – 75 years). The same was found in the other listed advantages of using EHRs such as "timely", which was perceived as an advantage by all participants. The NZRP participants perceived the 10 listed advantages of using EHRs uniformly regardless of their age and which age group they fitted into in the study. This finding was expected because almost all (92%) of the NZRP participants agreed with, and positively support, the idea of a universal EHR, and so that they are just as likely to have almost identical or similar perceptions on the advantages that can be provided by using EHRs.

In contrast, age accounted for some differences in NZRP participant perceptions in relation to the disadvantages of using EHRs. Even though this difference between the three age groups did not reach statistical significance, the age of the NZRP participants and their perceptions in relation to the disadvantages of using EHRs should be compared to their perceptions in relation to the advantages of using EHRs as discussed in the previous paragraph. For instance, the disadvantage "insecurity" was reported by 29 participants (29%) aged 23 to 34 years, 33 participants (33%) aged 35 to 49 years, and 39 participants (39%) aged 50 to 75 years. In particular, the biggest difference between NZRP participants aged 23 to 34 years and NZRP participants aged 50 to 75 years was the disadvantage "extra cost" where less than a quarter (23%) of the participants from the younger group perceived "extra cost" as a disadvantage but over half (51%) of the participants from the older group perceived it as a disadvantage of using EHRs. "Extra cost" was the only listed disadvantage to have a statistically significant association with the different age groups that the NZRP participants were allocated to because it is likely that the older group are more careful and aware of money management than their younger group counterpart. This finding was expected because Crothers et al. (2015) and their World Internet Project New Zealand report described the trend of younger New Zealanders spending more time on the Internet and the computer than older New Zealanders which ultimately affects their perception and attitudes of spending money and investing resources on such technologies due to the difference in familiarity and

attachment on using the Internet through computers. Similarly, it is likely that the variations in perception of what are the disadvantages of using EHRs will likely be present among NZRP participants who are younger compared to those who are older due to their different computer usage amounts for personal purposes outside of work. Further research into this finding will provide more insight to gain additional knowledge on NZRP ages and the NZRP's perception of what the disadvantages are of using EHRs.

NZRP participants view the use of EHRs as more advantageous than disadvantageous in their day to day clinical practices as physiotherapists in New Zealand's health system. This finding was expected because EHRs have been accepted as a superior patient health information recording system as reported in the literature (Barry et al., 2006; Buyl & Nyssen, 2009; Gardner et al., 2003; Latha et al., 2012; Rieckmann et al., 2016). There exists the possibility that the NZRP participants were limited in their choices of advantages and disadvantages because they were provided with the two lists. It is, however, unlikely that this has affected the results, because multiple options were provided for both the advantages and disadvantages of EHRs, and these options were formulated from the literature review conducted as part of this project.

The Type of Information Recording System that the NZRP Participants are currently using in their Work Environment

NZRPs throughout the Canterbury region and the rest of New Zealand are highly likely to use multiple computer software programs to meet the daily demands of recording patient health information, communication with other health professionals, reviewing patient injury investigations and many other physiotherapist tasks. The NZRP participants reported that they are currently using an average of just over two (2.03) computer software programs in their day to day practice as physiotherapists. A total of 41 different types and brands of computer software were reported used by the NZRP participants (see Figure 4.16). The different computer software programs reportedly used by the NZRP participants provides them with a variety of benefits and functions such as:

- structured management of invoices and bill payments (Ibizz and iPayroll),
- detailed patient current health statuses (FlowView and Profile),
- comprehensive EHR systems (Gensolve, Health Connect South, Houston VIP, and SIPICS),
- organised time schedule and communication systems (Email software, Microsoft Office software, and Calendar software),
- specialist data and imagery programs (CRG Inteleviewer and MedChart),
- structured continuing professional development and research education tools

(PhysioLog, PhysioTools, R, Nvivo, and SPSS), and many more.

These findings were expected because not only does New Zealand not have a universal EHR system at present, but there is also no single EHR system that is tailored for NZRPs that would meet their daily clinical physiotherapy practice requirements.

It is apparent that there is currently no single information recording system that can perform all the tasks required by NZRPs in their day to day practices. This observation is not only noted in the study, but has also been described in the literature. First, allied health professionals in Australia have reported in their work that they have to use three to four different software systems simultaneously to record patient health information, manage patient appointments, manage patient billing, and communicate with other health professionals because there is no one system that could provide all of the above requirements (Hailey et al., 2014). Second, when Buyl and Nyssen (2009) developed a physiotherapy centred EHR system in Belgium, they sought to ensure that their proposed software program met all the legal requirements set out by the Belgium Ministry of Health for the physiotherapists because they had previously seen the lack of a single system which could cover all the bases needed by physiotherapists which had resulted in frustration and poor interest in EHR adoption. Third, Levine (2012) believes the key to raise the level of physiotherapy care for patients is a complete and comprehensive EHR system that can

provide physiotherapists with what they need in their clinical practices. That is to say, an EHR system which can provide multiple functions that will record patient health information, keep track of patient payment of treatment sessions, document the therapeutic interventions provided, and alert physiotherapists of potential human errors through clinical decision support systems (Levine, 2012). From these findings, it is evident that there is a need of a universal EHR system that is powerful enough to provide features which meet the demands of NZRPs and other health professionals across New Zealand and that the Government's universal EHR system must be able to achieve this to ensure successful implementation.

More than half (59%) of the NZRP participants have received formal training on operating the EHR systems used in their physiotherapy practices. A likely explanation for a number of NZRP participants reporting general unspecified training (23%), such as NZRP participants reporting the use of multiple computer programs but not naming any of them, may be due to the multiple systems and computer programs used in their physiotherapy practices resulting in the lack of uniform or specific training on a particular EHR system. Although it was expected that the majority of the NZRP participants would have received formal training on operating EHRs, there was still a large proportion of NZRP participants (41%) who received no formal training on how to operate the EHR systems they use in their physiotherapy practices. This is one of many important findings in the study that shows there

is a lack of knowledge by the NZRP participants on how to operate the EHR systems which they use to aid in their treatment of patients. There is, therefore, an increased risk of incorrect operation, resulting in a lower quality of healthcare services and a negative perception of the value of an EHR because of a lack of training. Formal training on operating EHRs would facilitate a more efficient and effective use of EHRs by healthcare professionals, as well as ensuring a smooth transition from traditional PHRs to EHRs (Anderson, 2007; Greenhalgh et al., 2008; Menachemi & Collum, 2011).

Although the literature stresses the importance of allocating extra resources such as time, money, and education for health professionals to adapt to EHR systems during the initial implementation stages, there has been a lack of literature on the types of training or the duration of training required during the implementation stages of EHR systems (Anderson, 2007; Greenhalgh et al., 2008; Menachemi & Collum, 2011). The obvious type of training that should be included for healthcare facilities looking to adopt EHRs is training to use the EHR system itself; however, the different age and generational differences of health professionals who did, or did not, grow up with regular computer use must also be taken into account and different levels of EHR training may be required (Greenhalgh et al., 2008). Group training on operating EHR systems is vital for all health professionals involved, but training that is individually tailored to ensure fundamental computer literacy on an individual

basis is also important (Barry et al., 2006; Greenhalgh et al., 2008). This provides a solution for senior clinicians with higher positions or greater roles in healthcare organisations to be more willing to adapt to unfamiliar EHR systems through private one-one-one training sessions rather than group training sessions where they may feel uneasy or uncomfortable by potentially being less competent in computer literacy than their junior staff despite having more clinical experience. Having informal training, encouragement, and support from clinical champions who are well versed in both computer use and EHRs will also be important to sustain positive perceptions and use of EHRs by health professionals in clinical environments. It is, therefore, important for the Government to continue to invest in formal training and support for EHRs and health IT not just regionally through Digital Health 2020's regional IT foundations, but also individually to ensure a higher proportion of NZRPs, and other health professionals, across New Zealand are well equipped for the single EHR system that the Government plans to introduce in the near future. Future research into the type and the duration of training for NZRPs during the implementation of an EHR and its use will provide further insight on the resources and investments required to ensure that more NZRPs will have received formal training on operating EHR systems and computers.

The Attitudes that NZRP Participants have towards EHRs and Health Information Technology

A total of five themes emerged from the qualitative content analysis of NZRP participants which was performed to gain further insight into their attitudes on EHRs and health IT. The five themes were "supportive remarks" (n = 8), "resource concerns" (n = 5), "complex nature" (n = 4), "side effects" (n = 1), and "potential misuse" (n = 1) with each theme's full definition described in Table 4.18. The most popular theme among NZRP participants who provided the study with their qualitative responses was "supportive remarks" (participants express their support of the Government's strategic plan for a universal EHR). This was an expected finding, given the vast amount of literature describing the positive attitudes that health professionals have towards the use of EHRs in their clinical practices (Barry et al., 2006; Buyl & Nyssen, 2009; Hailey et al., 2014; Latha et al., 2012; Levine, 2012; Menachemi & Collum, 2011; Vreeman et al., 2006; Walker & Clendon, 2016). In the study, a participant said:

> *I place a very high value on EHRs and see them as being a key way to ensure improved service delivery across the continuum of care – particularly between primary, secondary, and tertiary care settings. Fragmentation of services impact on health outcomes significantly and EHRs help address some of these issues. In other words, EHRs ensure more person-centred service delivery while also helping*

healthcare professional's access timely data and improve their services. Of course, the system will have issues and healthcare professionals will encounter challenges; however, this is to be expected. Training and support will be important to help manage this transition and optimise the system's chance to improve health pathways. (Participant 73, female, works in both health sectors)

Here, the NZRP participant clearly advocates the use of EHRs and is supportive of EHR systems despite being aware of the potential drawbacks and challenges that may be encountered with its use. The acknowledgement that this particular NZRP participant has of some of the advantages and disadvantages of using EHRs yet still supporting its use demonstrates the positive attitude that NZRP participants generally have towards EHR systems. It seems, therefore, the NZRP participants in the study appear to have similar positive attitudes compared to that of other participants in other literature and the Government should take advantage of their positive mindset by providing adequate training and support to ensure a smooth transition of their universal EHR through Digital 2020.

The second most popular theme among NZRP participants open ended question responses was "resource concerns" (participants expressed their concerns about the additional resources required to keep EHRs operating efficiently and safely). This theme and attitude aligns well with the literature which describes the concerns voiced by health professionals

and other key stakeholders in health in regard to the additional resources required such as time, money, support, and technicians to effectively implement and run an EHR system (Anderson, 2007; Khangura et al., 2010; Menachemi & Collum, 2011; Zandieh et al., 2008). In the study, a participant said:

> *I work part-time clinically [and am] self-employed. I would like to use an EHR system but the cost of subscribing [and maintaining one] is too much for my physiotherapy practice. If it was mandatory, I would want a subsidised electronic system or I would have to retire from clinical practice altogether.*
>
> (Participant 65, female, works in both health sectors)

This comment reiterates the voices of the NZRP participants who stress the need for formal training, support, and funding, as discussed earlier in this section. The requirement of additional resources to adopt an EHR system may cause smaller scale physiotherapy practices based in Canterbury and the rest of New Zealand to struggle if the Government does not provide incentives, subsidies, and other forms of support to NZRPs. Contingency factors would require healthcare facilities to spend additional funds on items such as backup electrical generators in the event of a power outage to prevent the failure of electricity-dependent EHR systems (Nguyen et al., 2014). This finding was expected because the extra and ongoing costs to operate EHR systems have been discussed in literature as disadvantages of using EHRs and the participant comments are in line with the literature.

The third most popular theme among NZRP participants was "complex nature" (participants expressed their concerns about the complex nature of producing a universal EHR suitable for all key stakeholders with different interests in mind). The genesis of the theme was expected as similar themes have often been the topics of discussion among the literature looking for a potential solution to successfully implement EHR systems into the greater health system with different countries (Anderson, 2007; Buyl & Nyssen, 2009; Chhanabhai & Holt, 2007; Greenhalgh et al., 2008; Hailey et al., 2014). In the study, a participant said:

> *I think documenting every treatment session [on EHRs] for health professionals [who provide] frequent ongoing input over a period of time can just "clog it up" with very discipline-specific information that is not of much use to anyone else.*
>
> (Participant 31, female, works in the public health sector)

Here, the NZRP participant commented on her perspective on a micro-level and mentioned the potential complexity of a singular EHR system containing patient information from all disciplines of health that may cause cluttering and complications to operate the system efficiently without the software program displaying too much information that is not needed by different health professions. This, along with the concerns of other health professionals on a micro-level, and combined with other factors on the meso-level and macro-level will ultimately result in a complex system that requires careful management to

provide solutions for all the key stakeholders involved in the implementation of an EHR and its operation. Because of this, the finding suggests that NZRP participants are in tune with the issues of "complex nature" as described in the literature and reassurance from the Government that they will address the issue would benefit the implementation of an EHR on a micro-level.

The "side effects" (participants expressed their concerns about the side effects of operating EHRs through computers which may create chronic work-related injuries or health issues) theme was an unexpected finding that was identified by one NZRP participant. Although the literature frequently describes the system aspect of EHRs and its advantageous features, not much is known about the potential physical burdens EHR systems will have on health professionals as opposed to operating traditional paper-based health record systems. It is likely that the professional niche of the NZRP participants along with their awareness and experience on chronic work-related injuries or health issues would have contributed to this concern of "side effects". In the study, a participant said:

> *More time spent [sitting in front of] a computer potentially leads to musculoskeletal issues (like neck or back pain) and vision issues.*
>
> (Participant 21, female, works in the public health sector)

This remark demonstrates the awareness that the NZRP participant has on the use of EHRs through computers and the potential side effects of its usage. The literature has described the prevalence of neck pain and its association with computer use in populations around the world, especially in work environments where sustained computer use is important to work productivity (Hoy, Protani, De, & Buchbinder, 2010; Smith, Louw, Crous, & Grimmer-Somers, 2009; Szeto, Straker, & O'Sullivan, 2009). Although the implementation of an EHR is vital to improve the quality of healthcare, it is important to consider the potential side effects it may have on NZRPs to ensure successful adoption of the system. Further research into this topic is required to understand the association between EHR systems and the potential musculoskeletal injuries it may cause to NZRPs and other health professionals who operate EHR systems.

The last theme found through the content analysis of the NZRP participants open ended question responses was "potential misuse" (participants express their concerns about the potential misuse of the conveniently accessible EHR data by key stakeholders). This finding was expected because the risks of "potential misuse" in healthcare settings have been well discussed, not just earlier in this section but also in other literature, as a disadvantage of using EHRs (Anderson, 2007; Chhanabhai & Holt, 2007; Griffin, 2017). What the finding further contributes to this discussion is the potential for other non-health professional key

stakeholders, or someone who is not a key stakeholder, to take advantage and abuse the data-filled EHR system. In the study, a participant said:

> *[We should] consider the real possibility of digital records being abused by organisations [involved with healthcare] like ACC. [They may] manipulate patient data for their own benefit. [For example, they can] force NZRPs [and claimants who are receiving treatment] to sign over access to client records then use them to look through key words to decline claims.*
>
> (Participant 22, male, works in the private health sector)

Here, the NZRP participant describes a scenario for the potential misuse of patient health information by a key stakeholder which can be conveniently accessed through EHR systems. Although there is currently no literature on key stakeholders or organisations in New Zealand and their non-clinical use, or misuse, of patient health information stored in EHR systems, it is likely that building trust and transparency between all key stakeholders is an essential solution to this issue. Further research into this topic will allow greater insight as to whether this is a common concern among NZRPs across the country and what potential solutions are available to prevent the misuse of patient health information.

Implications for Policy Makers, Health Professionals, and Physiotherapists

From the results and findings of this study, several implications are evident for policy makers, health professionals, and physiotherapists in terms of the implementation and use of an EHR.

Policy Makers

For policy makers in the Government and champions of the Digital Health 2020 strategic plan, ensuring the involvement of physiotherapists and other health professionals is vital for the successful implementation and use of an EHR – one that is accepted by end-user health professionals and adopted in healthcare facilities in the near future. First, policy makers should strive to take an adequate course of action and raise more awareness of their health IT plans, such as the Digital Health 2020 strategic plan, to the main beneficiaries they are intended for. This will involve campaigns, emails, announcements, and other forms of awareness-raising activities to let physiotherapists and other health professionals in New Zealand know of the Government's project to implement a universal EHR system across the country. Second, once the majority of physiotherapists, health professionals, and the greater health workforce are aware of the Government's plan to improve the digital capabilities of the health sector and introduce a universal EHR, policy makers should involve each of those groups in the planning, designing, and implementation stages of the EHR system. This means

identifying the needs and perspectives of the EHR system's end-users through research, surveys, and meetings before bringing their overall findings to the vendors, so that a user-friendly EHR system is created. Last but not least, following the implementation and initial use of the universal EHR system, the Government and policy makers should provide formal support, training, and funding as incentives to adopt the new system into healthcare facilities. This means education sessions and courses on how to use the EHR system, financial incentives and reimbursements for spending resources to adopt the system, and frequent communication with end-users. With these implications in mind, policy makers and their involvement of physiotherapists and other health professionals will help contribute to the overall success and implementation of a universal EHR system across New Zealand.

Health Professionals

For health professionals, and the governing bodies of their professions in the New Zealand health system, several implications can be made from the study results. First, there is a need to identify the different perspectives that health professionals from different health professions will have towards the implementation and use of EHRs. Health professionals, DHBs, and governing bodies of health professions, as well as societies and associations of different health professions must be proactive in determining and presenting their different views on EHRs so that the Government and EHR vendors can be made aware of their

different perspectives and needs during the crucial stages of the EHR design and also to ensure that the universal EHR system will be accepted by all health professions regardless of which profession they belong to. Second, health professionals must ensure they are prepared and have adequate computer literacy skills to be comfortable with operating the universal EHR system once it is implemented and adopted in healthcare settings. This could be achieved on an individual level where health professionals seek out private courses to improve their computer literacy or on a group level where healthcare facilities and health professional associations organise courses to ensure their health professionals meet the requirement of knowing how to operate EHRs. Last, health professionals and their governing bodies should work together to create a professional standard for operating EHRs for inclusion in their scope of practice and competencies so that their professions will keep up with the Government's plans to progress health IT in the wider health sector. Such a standard in a profession's list of required competencies will further serve as a reference for colleges and schools to ensure they have the correct curriculum for future health professionals who must know how to operate EHRs. With these implications in mind, health professionals and their associated boards and societies, will maximise their chances to successfully adopt and adapt to the Government's plan to implement a universal EHR system as well as other health IT while the health sector continues to evolve in the digital age.

Physiotherapists

For NZRPs, the Physiotherapy Board of New Zealand, and Physiotherapy New Zealand, several implications can be made based on the study results. First, NZRPs should continue to remain supportive of the idea for a universal EHR system throughout New Zealand and be prepared for the challenges ahead of its implementation and use as healthcare settings begin to adopt the system. This means NZRPs must be actively involved with the EHR system by continuously voicing their perspectives to give collective feedback to the Government and the EHR vendors to ensure there is good communication between themselves and the other key stakeholders so that the universal EHR can be refined and improved, which will ultimately raise the quality of healthcare they provide to their patients. Second, the Physiotherapy Board of New Zealand must be in tune with the Government's Digital Health 2020 strategic plan and reflect their understanding of New Zealand's advancing health IT through the list of physiotherapist competencies by including specific computer literacy skills required to use the universal EHR system. This will ensure that all registered physiotherapists with Annual Practising Certificates are equipped to use the EHR effectively. This means the Physiotherapy Board of New Zealand should be actively involved with the design of the universal EHR system and be knowledgeable about the functions and features of the EHR in order to create a physiotherapist competency requirement that reflects the demands of the EHR. Finally, Physiotherapy New Zealand as a societal organisation for

physiotherapists should work to advocate, educate, and provide informative services on the Government's incoming universal EHR system as well as health IT in general to raise the level of awareness and knowledge that physiotherapists have towards EHRs. This means promotion of the Government's Digital 2020 strategic plan through member emails, newsletters, and events, providing information on EHRs through their organisational website, and creating channels of communication between physiotherapists and other key stakeholders to promote the participation and involvement of physiotherapists towards EHRs. With these implications in mind, NZRPs, the Physiotherapy Board of New Zealand, and Physiotherapy New Zealand will have greater involvement with the incoming universal EHR system and will ensure the physiotherapy profession successfully adjusts to the imminent introduction of future health IT innovations.

Study Limitations

After the completion of this research, some limitations that related to the research aims and objectives were identified. First, the study sought to determine a participant's length of computer use and its association to other variables in the study's survey. These other variables include a participant's support for a universal EHR system, as well as a basis to quantify how often they use electronic devices to operate EHR systems at work, or for personal purposes at home. The specificity of the study to solely distinguish computers from

other electronic devices was because computers were, and still are, the primary electronic device widely used in most healthcare facilities and settings by healthcare providers. Vendors create software programs in health IT primarily for computers before determining potential compatibilities of their products with other electronic devices. Because of the scale of the study and its objectives, which examine more than just electronic device usage but also many other factors that may potentially be influential factors to an NZRP's perspective, the survey selected computer use as the source of information for whether a participant uses electronic devices in work or during personal situations. This means the data collected would purely be for computers and not for other electronic devices such as smartphones or tablets, which are also used in healthcare but to a lesser extent. Therefore, the study did not seek to record further information on the usage of electronic devices other than computers which may potentially be additional influential factors that might have affected the NZRP's perspective on EHRs and health IT in general. This limitation, however, is not likely to have had a significant impact on the overall findings and conclusions of this research because computer use, especially in current healthcare settings, would have most likely correlated to the use of other electronic devices. Future research into the use of all of the available electronic devices used for clinical and personal purposes would address this limitation and provide further insight into this topic.

Second, because of time constraints, this cross-sectional study was only able to observe and analyse data collected from Canterbury-based NZRP participants across a three-month time period from 11 May 2017 to 11 August 2017. This means the study did not have the ability to collect data from NZRP participants who were Canterbury-based outside this data collection window and that the findings detailed throughout the study were based on this three-month time frame. The limited time allowed for the duration of this study resulted in the recruitment of participants to be confined to the Canterbury region and was not extended to other regions around New Zealand, or to all of New Zealand. The perspectives, however, that NZRP participants have about the use of EHRs would likely not have changed in or outside of the study's three-month data collection period and the potential participants interested with the study would have had three months to participate in the study's survey which takes only an estimated fifteen minutes to complete. Furthermore, similarities in sociodemographic characteristics were noted between the NZRP participants in the study compared to NZRPs around the country and because of this the study's time constraint limitation and its Canterbury regional base are likely to had minimal impact on the overall findings and conclusions of the study. Further research in the future using a qualitative research design by interviewing NZRPs across New Zealand, using the key themes of this research as a basis for its interview schedule, would benefit the topic at hand.

Third, due to funding constraints, the amount of Canterbury-based NZRPs who chose to become participants of the study were limited, which negatively affected the number of Canterbury-based NZRPs and sample size in the study compared to the number of all the Canterbury-based NZRPs in the region. A sample size of at least 236 Canterbury-based NZRPs out of the 606 NZRPs in the Canterbury region, as reported by Stokes et al. (2014), would have provided better representation of the views of all the Canterbury-based NZRPs with a lower margin of error (5%) at a 95% confidence level. The lack of sponsorship or funding from external sources resulted in this privately-funded study to be unable to provide additional incentives or rewards to attract potential NZRP candidates to be study participants. This means a bias could likely exist where NZRPs who were interested in expressing their perspectives, or who were knowledgeable in regard to EHRs, would be more inclined to be a participant in the study. Another potential effect of this funding limitation was that NZRPs who had more available free time or NZRPs who had less workload responsibilities during the three-month data collection time period would have a higher likelihood of becoming participants of the study. This means a potential bias where some of the Canterbury-based NZRP population who have more time or less workload would over represent other individuals who have less time or more workload and thus misrepresent the Canterbury-based NZRP population as a whole. Funding limitations could have a significant impact on participant numbers and sample size in the study with the potential to impact the overall

findings and conclusions of the study. Future research with more funding and incentives to increase the sample size and sampling frame to all of New Zealand would help gain better understanding for the perspectives that NZRPs have towards the use of EHRs by increasing the number of participants to validate research objectives.

Lastly, the study's data collection method of the NZRP participants through the use of a survey allows for potential recall bias or response bias which affects the validity and accuracy of the self-reported data and its results thereby limiting the findings of the study. First, selective memory (where participants remember, or not remember, their experiences and events related to EHR use in the past) can affect the data produced through the survey such as whether they have had training on certain computer software programs or if participants have heard of Digital Health 2020 in the past. Second, there is the potential for telescoping to occur when participants are answering survey questions whereby they may recall certain events that occurred at one time as if they occurred multiple times or at another point of time. Third, attribution can occur where participants attribute positive experiences and favourable outcomes to themselves but negative experiences and undesirable outcomes to external sources such as seeing the security capabilities of EHRs as a favourable advantage due to past experiences but see the same capabilities as a disadvantage when the security is breached by other individuals. Fourth, exaggeration may occur for participants expressing

their attitudes and perspectives to emphasise their point of view, such as agreeing with all of the advantages but disagreeing with all of the disadvantages of using EHRs, thereby affecting the data collected from the survey. Recall bias could have a significant impact in the overall findings and conclusions of the study because the data used for analysis and subsequent interpretations were all self-reported by the participants. Future research involving a different data collection approach, such as observing how participants interact with EHRs in their work environments, could eliminate the need for participants to recall certain events, or have participants take multiple surveys with similar questions to ensure consistent responses. These approaches would help improve the validity of study findings and decrease the effect of recall bias.

Study Strengths

At the completion of this research, a number of strengths of the study were identified. First, the study is the first New Zealand study to identify and determine the perspectives that physiotherapists have about the implementation and use of EHRs. These perspectives are important to the progression of the New Zealand health system and its journey towards a universal EHR system because physiotherapists will ultimately be one of the main health professions to operate the system. In New Zealand, the health system consists of three major professional groups: the medical profession, the nursing profession and the allied health

professions. While much deserved attention and focus have been given towards the medical and nursing professions on their perspectives of EHRs, the allied health professions have received little or limited attention from governing bodies or researchers of this topic. This study addresses the topic and issue with physiotherapists, one of the allied health professions, and provides much needed insight as the Government carries out the Digital Health 2020 strategic plan to implement the universal EHR system. Once the awareness of this situation is raised through the study, where the allied health profession and their perspectives on EHRs has potentially been neglected, more research and focus on other professions in the allied health professions in New Zealand could likely result, causing a ripple effect that addresses the different perspectives on EHRs and this could contribute to the EHR design and subsequent success of the system.

Second, the study gathered both quantitative and qualitative data that allowed for better understanding of the NZRP participants' perspectives about the implementation and use of an EHR. The quantitative data collected through the study's survey closed-ended questions permitted analysis using statistical methods to identify any potential relationships which will contributes to explaining the overall findings of the study from the NZRP participants that are likely to be representative of all the Canterbury-based NZRP population. The qualitative data collected through the open-ended question in the survey allowed for

further insight by providing more detailed and individualised information about the NZRP's perspectives on EHRs and this complements the quantitative data findings. Combined together, the findings produced through both the qualitative and quantitative data collected in the study provides better insight about the perspectives that the NZRP participants have on EHRs and allows for better understanding of their views through different approaches.

Third, the cross-sectional survey design allowed for NZRP participants' perspectives on the implementation and use of EHRs to be effectively and efficiently identified in the same period of time that the Government is carrying out its Digital Health 2020 strategic plan to implement a universal EHR system that can be used and accessed by health professionals from across the country. In this way, the study's findings are relevant, current, and contributes to the Government's agenda to upgrade the digital capabilities and IT in its health and disability sector. Through its use of the cross-sectional survey design, the study was able to capture multiple variables that may potentially influence NZRP participants' perspectives about EHRs all at once which can then be used to create multiple outcomes and results of different associations between variables of interest. For this reason, the descriptive analysis and its subsequent findings from the study can generate plausible hypotheses which can then be used as primary focus points for future studies as have been suggested throughout the discussion section. These objectives were achieved in this study in a time and cost-effective

manner that allowed for minimal time latencies between its findings and the current situation that the Government is facing towards the goals of their Digital Health 2020 strategic plan.

Last, the study distinguished between the differing nature of the public and private health sectors where NZRP participants work and identified their different perspectives about EHRs based on their experiences from working in the two different health sectors. Acknowledging the differences between both health sectors of the New Zealand health system creates a better understanding of why certain EHR features are more attractive to one health sector as opposed to the other health sector. This allows the key stakeholders to be more aware of what the public and private health sectors value more in their EHR systems due to working in different levels of care (primary, secondary, and tertiary), and ensures their concerns are addressed so that there is minimal rejection by NZRPs in either health sectors when the Government implements the universal EHR system. The study, therefore, provides not just a singular view of NZRP participants in the health system, but two differing views from both public and private sectors of the health system: this is not something that is commonly addressed for EHR systems (Chhanabhai et al., 2006; DesRoches et al., 2013; Gardner et al., 2003; Goldzweig et al., 2015; Greenhalgh et al., 2008).

Conclusions

In conclusion, the Canterbury-based NZRP participants, who have similar sociodemographic profiles compared to NZRPs throughout New Zealand, are supportive of EHR systems with positive perspectives on the implementation and use of an EHR in their clinical working environment. Age, computer usage, and education levels among NZRP participants do not appear to have any statistically significant effects or impact on their perspectives on the implementation or use of EHRs. Although the majority of NZRP participants from both public and private sectors of healthcare are supportive to the idea of a universal EHR system, the NZRP participants who work in the private sector of healthcare perceive EHRs more positively than do the NZRP participants who work in the public sector. A statistically significant higher proportion of private sector NZRP participants believe in the advantages of EHRs more than the public sector NZRP participants. This implies that the privately-driven sector of healthcare appears to be more in-tune and supportive of EHR use and that the Government should pay more attention to NZRPs and other health professionals in the public sector when implementing their universal EHR system to ensure they are just as supportive of the advantages of EHRs as their private sector counterparts. Future research focusing on public sector NZRPs and other health professionals will help identify the cause of the differences and what needs to be addressed by the Government in order for them to have an equally positive perception on the advantages of EHRs as their private sector

counterparts. Several other factors have been identified as important for maintaining positive perspectives on EHRs which will be vital to the success of EHR implementation by the Government through Digital Health 2020.

This study confirms and supports the argument from the literature that formal support, training, and funding from the Government must be provided for end-users of the universal EHR system that the Government is planning to implement. While NZRP participants remain supportive of a universal EHR, they require external support to adapt to the new system and be compensated for the potential workflow disruptions, education courses, and additional costs especially during the initial stages of the implementation of the EHR. Failure to do so would largely jeopardise the success of its implementation in physiotherapy settings, as well as other healthcare settings, around New Zealand.

This study further confirms the lack of communication that governing bodies frequently have with physiotherapists and health professionals in general when implementing health IT strategies such as Digital Health 2020 in New Zealand. A high number of NZRP participants had never heard of the Digital Health 2020 strategic plan and its core components which was established by the Government with the intentions of progressing digital technologies in the health sector in New Zealand. This is an issue that needs to be addressed

because ultimately it will be the NZRPs and members of the other health professions that will operate and benefit from these new digital technologies, yet they are often not involved in the decision process of designing or implementing these technologies. If not addressed, this miscommunication can affect the relationship between the Government and health professions in New Zealand, resulting in less than optimal unification of healthcare providers under a universal EHR system but rather multiple, separate silo EHR systems that different healthcare providers would adapt to independently. Increasing the involvement of NZRPs while the Government is planning the universal EHR system with vendors and increasing the awareness of NZRPs of what the Government plans to implement in the health sector will improve the chances of successful new digital technological implementations by the Government and improve their rapport with the physiotherapy profession as a whole.

This study provides insight to the lack of perspectives in the literature of physiotherapists on the implementation and use of EHRs, especially in a New Zealand context, and more specifically within the Canterbury region. Noteworthy advantages of EHRs as perceived by the Canterbury-based NZRP participants were “integration”, “timely”, “communication”, and “accessibility” which were all agreed upon by over 90% of those in the study. In contrast, “insecurity”, “incorrect recording”, “inflexibility”, and “unjustified access” were disadvantages of EHRs that were perceived by the majority of the Canterbury-

based NZRP participants. This provides knowledge of what Canterbury-based NZRPs and to a certain extent, NZRPs around the country, may perceive as advantages and disadvantages of EHRs and this in turn provides a framework of focus for the upcoming universal EHR system that the Government plans to implement for the health system. The Government and vendors of the EHR system should take into account these findings and work together with the physiotherapy profession to ensure these advantages are amplified in their design and the disadvantages are addressed accordingly. This means the universal EHR system must strive to provide integration for different health professions across different healthcare locations, be user friendly, and time efficient when operated, include communication features that allow healthcare providers to communicate with each other, and be easily accessed by healthcare professionals who are involved in the direct care of their patients. Furthermore, key stakeholders involved in the design of the universal EHR system must ensure that the system has adequate security features, simple and clear instructions for patient information documentation, the ability to be malleable for different health professionals in different healthcare scenarios, and measures to prevent unjustified access by healthcare providers or others who are not in the direct care of patients. Through these considerations, a universal EHR system created with the end user's perspectives in mind would allow a higher likelihood for its implementation to be successful. Therefore, the study provides significant information on how NZRPs perceive EHRs which can then be used by the Government and vendors to

create an EHR system that is suitable and supported for NZRP use.

In addition, this study provided much needed insight on what types of information recording systems are used by Canterbury-based NZRPs in their current work environment and this was not identifiable from the literature. NZRP participants reported an average of just over two computer software programs used in their daily clinical practices and this consists of software that manages or records information for patient health records, patient investigations, email messaging, salary distribution, financial accounts and invoices, continuing professional development, clinical research purposes, and time schedule recording. This demonstrates how dynamic Digital Health 2020's universal EHR system must be in order to have a singular system which can provide features that cater for the full scope of NZRPs because at present they require different software systems to meet their clinical needs. Furthermore, this insight allows key stakeholders to be made aware of what functions NZRPs are looking for in EHR systems and this can be used to ensure these features will amplify the advantages of using EHRs as well as addressing potential disadvantages of using EHRs. A failure to provide and refine the many types of information recording systems reported by the NZRP participants will risk the success of the Government's universal EHR system.

Overall, Canterbury-based NZRPs appear to be supportive for the implementation and use of a universal EHR system. They are aware of its general advantages and disadvantages which have been described in the literature. The Government will need to involve NZRPs in the planning of the universal EHR system as well as improve their communication with NZRPs to ensure both key stakeholders are aware of each other's intentions and perspectives. Ultimately, formal support, funding, and training after the release of the Government's universal EHR system will be the key to maintaining the positive perspectives that NZRPs have towards the use of EHRs.

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Appendices

Appendix A: Research Approval Letter from the Human Ethics Committee

HUMAN ETHICS COMMITTEE
Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Ref: HEC 2017/16/LR

5 May 2017

Cheng-Wei Chen
School of Health Sciences
UNIVERISTY OF CANTERBURY

Dear Cheng-Wei

Thank you for submitting your low risk application to the Human Ethics Committee for the research proposal titled *"The Perspectives of Physiotherapists in Canterbury on the use of Electronic Health Records"*

I am pleased to advise that this application has been reviewed and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 28 April 2017.

With best wishes for your project.

Yours sincerely

pp. R. Robinson

Associate Professor Jane Maidment
Chair, Human Ethics Committee

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand.
www.canterbury.ac.nz

Appendix B: Survey for the Perspectives of Physiotherapists in Canterbury on the use of Electronic Health Records (Paper Version)

SECTION 1 OF 4: THE ELECTRONIC HEALTH RECORD (EHR)

The Healthcare Information and Management Systems Society (HIMSS) define an Electronic Health Record as "**a longitudinal electronic record of patient health information produced by encounters in one or more care settings. The health information includes patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports**" (HIMSS, 2013, p. 259).

Reference:

HIMSS. (2013). *Dictionary of Healthcare Information Technology Terms, Acronyms and Organizations* (Third ed., pp. 259-262). Chicago, IL: The Healthcare Information and Management Society.

1. **Would you support the idea of a universal electronic health record that will be used and accessed by healthcare providers from all of New Zealand?**
   Please circle one answer.

   - Yes
   - No
   - Neither yes or no

2. **Have you heard about the government's Digital 2020 strategic plan where they aim to introduce a universal electronic health record that can be used and accessed by healthcare providers from all of New Zealand?**
   Please circle one answer.

   - Yes
   - No
   - Cannot remember

3. **Would you be committed to using a universal electronic health record introduced by the government if there was NO formal support, training or funding?**
   Please circle one answer.

   - Yes
   - No
   - Neither yes or no

4. **Would you be committed to using a universal electronic health record introduced by the government if formal support, training, and funding ARE provided to you?**
   Please circle one answer.

   - Yes
   - No
   - Neither yes or no

5. **What do you think are the ADVANTAGES of using electronic health records?**
   You may circle multiple answers.
   It's ability to:

- Provide integrated healthcare across different healthcare locations.
- Be accessed anytime and anywhere by healthcare professionals involved in the direct care of patients.
- Effectively evaluate the quality of the care provided.
- Efficiently calculate the cost of the care provided.
- Allow healthcare providers of different professions to communicate with each other.
- Save time on locating and retrieving health information and patient charts.
- Provide more than one copy of the same patient information at any given time.
- Nullify the difficulties that health professionals may have on reading each other's unique handwritings that may often be unintelligible.
- Determine who had access (an "electronic footprint") to which patient health information by requiring each user to be registered to the electronic health record.
- Provide security to sensitive health information through password authentication processes.
- Other advantages, please state below:

  _____

  _____

  _____

  _____

6. **What do you think are the DISADVATANGES of using electronic health records?**
   You may choose multiple answers.

   - Extra cost of additional resources such as money and time to train healthcare professionals to use electronic health records.
   - Lack of acceptance by healthcare professionals to use electronic health records.
   - Ongoing cost to maintain the required software and hardware to keep the electronic health record system up to date.
   - Lack of autonomy and flexibility for healthcare professionals to record health records the way they want to rather than the set rigid structured format of the electronic health record.
   - Potential threat of security breaches by hackers or malicious software that can access sensitive healthcare information from anywhere.
   - Possibility of recording wrong health information due to operating the electronic system incorrectly.
   - Healthcare providers can access healthcare information of patients who are not in their direct care.
   - Non-healthcare providers who produce, maintain, and service the electronic health record system will have access to sensitive health information when working on the system.
   - Other disadvantages, please state below:

     _____
     _____
     _____
     _____

7. **Have you ever had any formal training on operating electronic health records before?**
   Please circle one answer.

   - Yes, please state what was this training _____
   - No

SECTION 2 OF 4: COMPUTER USAGE INFORMATION

8. **Do you use a computer for work?**
   Please circle one answer.

   - Yes
   - No

9. **On average, how much time do you spend using a computer for <u>work</u> each day?**
   Please write below and round your answer to the nearest half hour.

   - _____ hours.

10. **Do you use a computer for personal purposes?**
    Please circle one answer.

    - Yes
    - No

11. **On average, how much time do you spend using a computer for <u>personal purposes</u> each day?**
    Please write below and round your answer to the nearest half hour.

    - _____ hours.

12. **What computer software are used in your day to day practice as a physiotherapist? For example: Gensolve Practice Manager, MedTech, Health Connect South, CRG Inteleviewer, Microsoft Calendar…etc.**
    Please write below all those you use.

    - _____
      _____
      _____
      _____
      _____

SECTION 3 OF 4: CURRENT PRACTICING INFORMATION

13. As a New Zealand Registered Physiotherapist are you currently:
Please circle one answer.

- Practicing as a physiotherapist
- Not practicing as a physiotherapist (If so, **please do not answer Questions 14 – 16** and proceed to Question 17 in the next section, thank you)

14. If you are currently practicing as a physiotherapist, what type of work setting do you practice in?
Please circle one answer.

- Private sector
- Public sector
- Both sectors

15. If you are currently practicing as a physiotherapist, when recording patient notes, does your workplace use:
Please circle one answer.

- Electronic Health Records
- Paper-based Records
- A mix of both types

16. If you are currently working as a New Zealand registered physiotherapist, are you satisfied with the current health record information system that you are using in your day to day practice?
Please circle one answer.

- Yes
- No
- Neither yes or no

SECTION 4 OF 4: PHYSIOTHERAPIST SOCIODEMOGRAPHIC INFORMATION

17. What was the year that you first registered as a physiotherapist in New Zealand?
Please write your answer on the line below.

- _____

18. What was the year that you graduated with a physiotherapy qualification?
Please write your answer on the line below.

- _____

19. What is your highest education qualification?
Please circle one answer.

- Diploma
- Bachelor Degree
- Postgraduate Certificate
- Postgraduate Diploma
- Masters
- PhD
- Other, please state: _____

20. How many total years have you worked as a physiotherapist? This means to exclude the times where you did not practice physiotherapy but have a physiotherapy qualification.
Please write your answer on the line below.

- _____

21. What is your gender?
Please circle one answer.

- Male
- Female
- Other, please specify _____

22. What year were you born?

Please write your answer on the line below.

- _____

23. What is your ethnicity?

Please circle all that apply to you.

- New Zealand European
- Maori
- Asian
- Pacific Islander
- Other, please state _____

24. If you have any comments regarding the questions within this survey, please feel free to make any comments in the space provided below:

_____
_____
_____
_____
_____

This is the end of the survey. Thank you for your participation.

If you wish to have a summary of the survey findings sent to you electronically, please provide me with your email address in the given space below.

Email: _____