Nurses’ perceptions of using tablet computers at the point of care; examining perceptions of whether the use of handheld devices aids and facilitates the performance of nursing care

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A dissertation submitted as partial fulfilment of the requirements for the degree of Master of Health Sciences (Nursing – Clinical)

University of Otago, New Zealand

January 2019
Abstract

Aim: The aim of this research was to study the phenomenon of the use of hand-held devices (HHDs) at the point of care by nurses; specifically, the research was striving to comprehend how nurses experienced the phenomenon in the context of their daily workflow and delivery of care in the acute hospital environment.

Background: Improving patient safety and the further development of the electronic health record have been drivers for change in health in New Zealand. A few New Zealand District Health Boards have implemented projects that have introduced small tablet computers to replace traditional clinical tools such as the medication chart and the vital signs chart. This move is a significant change in the culture and environment for nursing, and the people who care for. There is a paucity of research on how this cultural change will affect the nursing workflow and ultimately the person at the centre of the care, the patient.

Method: A qualitative descriptive inductive approach was used to discover the experiences of the nurse through the thematic analysis of focus group discussion transcribed as text. Eight nurses working on different acute hospital wards made up two focus groups were led through discussions by semi-formal questioning.

Findings: Thematic analysis uncovered six distinct themes that were recognised as important as experienced by the participants: Rage against the machine; With me, not to me, understanding our clinical reality; The humans in the system; The information age; Being prepared, and It’s getting better. Each theme is described separately, though in clinical practice many of the findings were intertwined adding to the complexity of the already complex depiction of the environment.

Discussion: The study showed that problems experienced by nurses using HHDs are multifaceted and reliant upon many interrelated systems and technical
infrastructure that are beyond the influence of the ward nurse. Benefits were experienced as the nurse did not need to find or spend time looking for information but negative aspects were experienced as new work was required when the systems did not work as expected. The study found that the HHDs have the ability to both improve and hinder the care that nurses deliver depending on how well the HHD, and the tools that they contain, perform.
Acknowledgments.

This study has been a confronting and rewarding process which has taught me valuable lessons as a person and also as a nurse. I am passionate about nursing and my wish is that systems can be changed so that nursing can be undertaken with the same professionalism, clinical excellence and compassion that I experience currently. In comparison to other health systems around the world nursing in NZ has the opportunity to make considered change to ensure we can continue nursing into the 21st Century with all the challenges it holds.

I would like to take this opportunity to thank SW for her support, leadership and friendship over the last year of study, JK for the 12 years of sharing the same brain and being an unparalleled friend in deed. BB and PS for their amazing academic support and supervision and finally my family and friends for putting up with me being grumpy.

Ma whero, ma pango, ka oti te mahi
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1. Introduction

Nurses are the frontline staff in New Zealand and most of the health systems in the world. They are essential for delivering safe and effective care. Nursing care, whether it is the task of performing oral cares or a specific assessment of pulmonary function using spirometry, has nursing-specific outcomes for the patient (Cheung, Aiken, Clarke, & Sloane, 2010; Clarke, 2007; Dall, Chen, Seifert, Maddox, & Hogan, 2009; Kane, Shamliyn, Mueller, Duval, & Wilt, 2007). Achieving these outcomes can dramatically alter the overall quality of care delivered.

Nursing is also affected by the culture in which the nurse works (Wikberg & Eriksson, 2008). This culture includes the physical environment as well as the values of the health organization and is seen to have the ability to be an enabler or obstacle to what nurses describe as good care (Rytterstrom, Cedersund, & Arman, 2009).

Improving patient safety and the further development of the electronic health record have been drivers for change for some New Zealand hospitals who are implementing projects that have introduced hand held devices (HHDs, small tablet computers) to replace traditional clinical tools such as the medication chart and the vital signs chart. This move away from the accepted end-of-bed chart however, is a significant change in the culture and environment for nursing and the people who they care for. There is a paucity of research on how this cultural change will affect the nursing workflow and ultimately the person at the centre of the care, the patient. Unlike paper that is a static medium, digital devices are complex, reliant upon a wireless network, local area computer networks and electricity to work.
The author is a Registered Nurse with over twenty years of clinical experience within acute hospitals, their clinical role has involved working alongside digital health projects aimed at nursing. The Author realises that this is a momentous change and requires research into its effect.

The purpose of this research is to investigate nurses’ perceptions of using a HHD at the point of care, particularly to find whether this hinders or enhances their ability to provide nursing care.
2. Background review of the literature

2.1 Introduction.

This chapter has been written to give the reader an understanding of the background to the development of Health Information Technology and how this has led to the use of HHDs at the point of care. Secondly, the chapter considers some of the current research regarding change and some of the issues that are common to nursing at the point of care.

It has only been in the last 20 years that information technology has reached the point of care (Lupton, 2014). Within that time it has only been the last eight years that tablet style computers have been advanced enough and become economically viable to be available for use at the point of care for all clinicians (Ventola, 2014). It needs to be recognised that this is a very new area of health that is, very possibly, not well understood.

This chapter will outline the literature search strategy that was used to inform the background reading and then describe the literature that the author believes is important to understand, prior to examining this research.

2.2 Search strategy.

The PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL) electronic databases were searched using the terms, nursing, point of care, hand held device, hand held computer, tablet computer, personal digital assistant (PDA), health information technology, acute care, nurse patient
relationship, nurse perspectives, and clinical workflow. The search terms were used in different combinations with Boolean and/or searches. The search strategy was very broad as the author was not intending to answer a question but instead gain background information. No publication date was set and there was no limit set on the publication type except that it had to be English language.

The search yielded a large variation of articles that were then exported into a reference manager (Mendeley) where duplicates were removed. The search only yielded one article with where the HHD is used by nursing in an acute hospital setting. The case study by Sergeeva, Aij, Van Den Hooff, & Huysman, (2016) concentrated solely on the operating theatre and included the nurses personal smartphone devices. Other than this there were no articles on the experience of nurse using HHDs at the point of care in an acute hospital setting.

The articles were read, sorted by the author and have been used to provide a background to the digital health environment and health environment and how this relates to today’s acute care setting.

2.3 Information technology and healthcare.

With the advent of computers and the ability to process and store information in a way that was superior to paper, information technology was born. Essentially information technology is the use of technology to develop, use and maintain computers and software to process information (Merriam-Webster, n.d.). Lupton (2014) and Biesdorf and Niedermann (2014) both describe how information technology was applied to healthcare in three broad waves.

1. The 1950s saw the automation of tasks associated with accounting and payroll within a hospital or an organization.
2. The 1970s began the development of data crunching software and informatics to look at how resources are used, coding undertaken and the costs incurred to help streamline the business of health.

3. Lastly, the 2000s saw rapid improvements in technology that brought easy to use technology to the workplace and to the individual. Applying information technology to health care begot its own branch of science labeled as Health Information Technology, or Health IT.

Though the environment of the acute hospital has not changed much since the 19th century, if Florence Nightingale or one of her colleagues were to spend time on today’s wards the changes in the equipment that is used and treatments undertaken would be beyond comprehension (Thimbleby, 2013). Moore’s law, a prediction regarding the number of transistors on a microchip, describes how an exponential rise of these transistors has allowed for the development of computers and technology (Sanders, 2015). As the power of the computer processor has increased exponentially as anticipated by Moore’s Law, the capability of Health IT has increased alongside this.

Today, Health IT is broadly split into systems that store information and systems that allow interaction with information. The system that allows the clinicians to interact with the information has three basic components and is often referred to as the Electronic Health Record (EHR). These components are described as (Menachemi & Collum, 2011; Troshani & Wickramasinghe, 2014):

- Clinical decision support (CDS) – this helps/aids clinicians in their decision making by presenting them information formatted in a specific way or aggregated by algorithms targeted at specific care guidelines, for example, sepsis early warning systems.
- Computerized physician order entry (CPOE) – this allows clinicians to enter orders into a computer rather than doing it on paper, for example, electronic prescribing, ordering lab tests.
Health information exchange (HIE) - the sharing of clinical information between clinicians, teams, health providers, to ensure that a healthcare provider has all of the information about a person.

The components that store information and the components that allow interaction within the system are inextricably linked. Each of the components require the others to be able to function effectively. Conversely, if any of these components fail then the other components do not work effectively and the purpose of the system as a whole cannot be realised.

2.4 Drivers of Health IT.

In 2000 the Institute of Medicine released its’ first report on the quality of healthcare in the United States, Too Err is Human, Building a Safer Health System (Kohn, Corrigan, & Donaldson, 2000). This report focused on how systems and processes affect the quality of patient care and can frequently lead to harm. This seminal report on quality and patient safety led to Health IT systems being used to achieve safer process (Kowalski & Anthony, 2017). Software began to be developed to make information available at the point of care and to standardise care, with the aim of reducing errors that are made in the paper world and making healthcare safer (Rojas & Seckman, 2014; Sommervold & van der Velden, 2017). To achieve a high reliability within an organisation, data is seen to be one of the main keys for monitoring and measuring organisational goals. The presence of data allows the setting of goals and the measurement of these goals to see if they are being achieved. So from a process improvement and quality improvement aspect health IT is invaluable as it can supply the data (Chassin & Loeb, 2013).

Another challenge of today’s healthcare around the world is growth and increased longevity of the population. This is causing an increased demand on limited
healthcare resources. Constraints are the increased costs of advanced treatment, increased complexity of chronic disease, patient expectation, fiscal limits and reduced availability of health care professionals and inpatient beds (Taylor, 2015). Healthcare systems are no longer financially sustainable thus there is a cultural shift to use Health IT. Problems facing health are the lack of and cost of resources required for the increased demand on health (Meskó, Drobní, Bényei, Gergely, & Győrffy, 2017). Health IT is now being primarily designed to convey and manage information so that efficiency as well as safety improves in a health system (Chassin & Loeb, 2013). As collection and reliability of data improves then planning can be undertaken on an organizational scale and resource can be prioritised and focused on where it is required. IT is now seen as the tool to achieve sustainable healthcare with Health IT being developed to meet this need (De Raeve et al., 2017; Serbanati, Ricci, Mercurio, & Vasilateanu, 2011). Iyawa, Herselman, & Botha, (2016, p246) describe Health IT innovation as,

“an improvement in the way healthcare provision is conceived and delivered by healthcare providers though the use of information and communication technologies to monitor and improve the wellbeing and health of patients and to empower patients in the management of their health and that of their families.”

2.5 Benefits and drawbacks of Health IT.

The drivers of Health IT have focused on the benefits that it delivers. The benefit of CPOE over traditional paper notes/orders is the elimination of handwriting errors and need for paper storage. With clinical decision support, clinicians have the ability to track all interventions and follow the individual, the ability to have portable data and timely access to this data (DesRoches, Donelan, Buerhaus, Potter, & Zhonge, 2008; Gunter & Terry, 2005; Hoover, 2017). The patient benefits because the collection of the data enables the clinician to personalize care (Sensmeier, 2017). Evidence does show that the use of a basic EHR can have a
positive effect on quality of care and patient safety, with nurses reporting on outcomes improving, such as medication error, lost information in patient transfer communication and safety of the clinical environment (Lindgren, Elie, Vidal, & Vasserman, 2010; Rojas & Seckman, 2014). Hospitals with a basic EHR had better nurse-assessed outcomes than hospitals without EHR (Kutney-Lee & Kelly, 2012). Using an interrupted time series analysis, over five years in 29 Californian hospitals, looking at the effect of EHRs on falls and pressure injury in hospitals; Dowding, Turley, and Garrido, (2012) found that empirical evidence regarding the benefit of health information technology was mixed. There were potential benefits but the confounding factor was the mix of EHRs across the study hospitals. Though technological innovation in health is seen to be a major contributor to improve healthcare, there is still little evidence to back this up with large systems changes (Greenhalgh et al., 2017).

Greenhalgh et al., (2017) research informed the development of a framework to implement Health IT solutions, entailed a hermeneutic literature review that identified 28 technology implementation frameworks in the literature. The review showed that many implementation processes are about the technology being a solution rather than working out the actual problem that is to be solved. Further to this very few of the frameworks actually assessed whether the technology was worth introducing. Lupton in her editorial in Societies (2014), goes further and challenges the fact that digital technologies are being sold as solutions for problems that do not seem to be clearly identified. Today’s world is one of market forces and market forces drive technology so if there is an actual or presumed need then Health IT will be developed and sold. Unfortunately, the result of the implemented technologies does not always reach the intended expectations.

This revolution in healthcare has been likened to the invention of the Gutenberg press after which the printing press completely changed the flow of information of the world (Topol, 2015) but the rate of change is seen as one of the major drawbacks (Meskó et al., 2017; Westra, 2016; Thimbleby, 2013; Wachter, 2016).
report on technology and nursing (Westra, 2016) showed that in 2008 less than 10% of US hospitals had an EHR and by 2016 97% of private hospitals had an EHR. Where the technology is being implemented the rapid development of new technologies could mean that clinical disciplines have not been able to plan the adoption of the technologies, thus it is questionable as to whether this is having an effect on the culture of health care. Technology can be disruptive to normal working patterns as it does not always fit with traditional working practices. New ways can be time consuming, complicated and require a change of working practice; there is a requirement to understand the human adjustment needed with the adoption of Health Information Technology (Health IT) (De Raeve et al., 2017; Meskó et al., 2017; Thimbleby, 2013).

Various groups within Health IT settings use different technologies in different ways. In everyday practice the clinician has a way of working that is often steeped in history, experience and culture; introducing a new piece of technology into this mix may dramatically change the workflow. This can challenge a deeply embedded way of working (Cresswell, Worth, & Sheikh, 2010). Health and hospital infrastructure is still largely based around an old world view of health (Meskó et al., 2017). Though the view of the clinician holding all the information and the patient agreeing that they will submit to the clinician's authority, is fast becoming an old world paradigm in the age of the hardware and software revolution (Meskó et al., 2017).

The acceptance and move towards technology is often down to a person’s desire to engage with the technology (Heidarizadeh et al., 2017). Many clinicians have not developed strategies with computers yet, so it is hard work and brings unintended consequences (Thimbleby, 2013). Putting data on a computer is very useful and is happening but clinicians have learnt to deal with the frailties of paper and have over 100 years of developing ways to deal with paper. So, internationally the movement to an electronic record has been slow. Despite the
documented advantages paper is still predominant in the majority of countries (Heidarizadeh et al., 2017).

A frequently cited reason for slow adoption of Health IT technologies in healthcare is usability (Chassin & Loeb, 2013; Kossman & Scheidenhelm, 2008; McAlearney, Schweikhart, & Medow, 2004; Snowden & Kolb, 2017; Stevenson, Nilsson, Petersson, & Johansson, 2010). The National Institute of Standards and Technology (cited, Armijo, McDonnell, & Werner, 2009) describe usability as the effectiveness, efficiency and satisfaction which the intended users can achieve tasks in the intended context of the product use. Any systems that are too complex and difficult for the clinician will take up clinician’s time. Potentially, such time is now spent on the technology rather than being spent with the patient. This is counterproductive to the aims of the introduction of Health IT as it can create a decline in productivity and take time away from the person who ought to be at the centre of care. Health IT must be usable to ensure that provider time is not wasted on operating the system. (Gunter & Terry, 2005)

Reasons for wasting clinicians time can be that the systems do not interact well with each other (Chassin & Loeb, 2013), when the system is down then nothing can be done, or users require multiple logons for multiple systems (Stevenson et al., 2010). When clinicians spend time on finding and waiting for computers, this then decreases time with patients because of the time taken at the computer (Kossman & Scheidenhelm, 2008). Workflows need to be altered, increasing time spent documenting, increasing the reliance on technology. (Gephart, Bristol, Dye, Finley, & Carrington, 2016). Concerns have been noted about dependency on the device and the information that it contains: with the question from clinicians being, what if it all breaks? The expectation is that IT is the saviour of health, the information is with you but the computer is reliant on the rest of the system to work (McAlearney et al., 2004). Essentially, the problems are all a mismatch between user needs and the usability of the technology.
Despite the fact that Health IT has been predominantly implemented to improve patient safety, the unintended consequences of Health IT can introduce new and unexpected safety concerns. Unintended consequences being the side effects of introducing a change to a process or system, that often contradict the initial goals of the change and often have a negative effect on users and patients in the context of Health IT (Gephart et al., 2016; Snowden & Kolb, 2017).

These adverse events are often due to the interactions between technical and non-technical aspects of care (Singh & Sittig, 2016). That is, the inability to find a computer, time spent accessing information, connecting to the web means that Health IT can become a third actor at the point of care and has the potential to change this relationship (Rathert, Mittler, Banerjee, & McDaniel, 2017).

Rogers theory on the diffusion of innovation (cited in Gonzalez, Aebersold, & Fenske, 2014; Kaminski, 2014) explains and describes how a new idea, way of doing things or product is adopted by people. Once a system is adopted a successful implementation relies on the advantages perceived by the users. If the system is better than the one that they currently use, there is an advantage to using this system. Unfortunately the complexity in healthcare is that is often unpredictable, has many working parts that do not always work in cohesion (Lipsitz, 2012). Health IT is seen to be behind other industries use of technology, some commentators postulate that this is because of the complexity of the health environment (Troshani & Wickramasinghe, 2014).

Biesdorf & Niedermann (2014) undertook a study to test five Health IT myths. Their survey spanned three countries’ health systems that were using Health IT, with an end sample size of greater than 1000 respondents. Their findings regarding these five myths were explained as:
1. **People don’t want to use digital healthcare.** The reason people don’t want to use digital healthcare is mostly because the digital service doesn’t meet their needs.

2. **Only young people want to use digital services.** There was no evidence to show that much of a difference across the age ranges in engagement. The difference is instead on the platform or channel that is used. Older people like the older digital mediums, younger people are more likely to use the modern mediums.

3. **Mobile health is the game changer.** For some it is but as per myth 2, it depends on the person.

4. **Patients want innovative features and apps.** Patients want integration, information and a human if the system is not working.

5. **Big is better for institutions.** Smaller systems that work well are a better start. Understand what the need is and what people really want.

The use of Health IT is varied across the world, from being nearly ubiquitous in some organizations, to not being present in others. In the areas that use Health IT, success comes from the usability of the system from a clinician’s perspective.

### 2.6 Complexity and actors in healthcare, a wicked problem.

Health is a complex system and can be described as being non-linear, dynamic and unpredictable in nature. A linear system is one that is predictable, where all the parts have a known function that they do not deviate from. The major complexity in healthcare is that it is often unpredictable, has many working parts that do not always work in the same fashion and can produce unintended results (Greenhalgh et al., 2017; Lipsitz, 2012). The volume of information that a clinician is required to access to make decisions is huge and can be unstructured in nature (Marcon Dal Sasso et al., 2013). Clinical decisions are often made by implicit clinical reasoning rather than by explicit methods (Serbanati et al., 2011) and interactions are dictated by, and affected by, the means of communications and
the settings in which communications take place. Within each episode of care, other systems also interact, structures and process create and facilitate frameworks in which the right person ought to be seen at the right time by the right person with the right information (Kannampallil, Schauer, Cohen, & Patel, 2011). The more interrelatedness within a system the more complex it is. So, a complicated task can become complex due to the number of relationships between tasks. Working within a complex system will take up more time and cognitive process due to its complexity. This can also work out as more physically tiring as well (Kannampallil et al., 2011).

As discussed, Health IT has the potential in part to solve a lot of these issues and reduce the complexity of cognitive load of the clinician. The benefits are in presenting the information in a way that the clinician can use it to benefit the care of the patient. Sittig and Singh (2010) state that any health system that uses Health IT should be considered to be a complex adaptive system. The reason for this is that as soon as Health IT is introduced to a complicated system, it acts as another component that can affect the relationship between the clinician and the person. This, they state, will make a complicated system increasingly complex, and unless this system performs flawlessly the users will experience drawbacks.

In actor network theory (ANT) applied to Health IT (Cresswell et al., 2010; Troshani & Wickramasinghe, 2014), an actor is defined as the source of an action regardless of it being human or not. Within this theory, technology is accepted as being a non-human actor as it has the ability to change the process and workflow of a human actor. ANT also assumes that if a new actor is introduced to a system then the system will need to adapt to accept that actor. This is central to the introduction of Health IT as seen by the drawbacks or unintended consequences that it has on the human actors.

Notably there are tensions between the visions of the different actors involved in the creation and use of technology. The developer, the policy maker, the
implementer, the clinician and user (Sommervold & van der Velden, 2017). So what effect is this having on the culture of health care, experienced by the actors within the clinical environment?

In two opinion pieces in the Journal of the American Medical Association, two physicians have recounted how placing technology into their work place has changed their patent interaction (Feldman, 2010; Young, 2012). The introduction of a computer in a clinic room changed the dynamic of the conversation. With the physicians being required to look at the screen rather than the person and manage systems rather than people, technology became a third 'person', another actor. In time, both had to consider the way that the technology was introduced and used and they changed their ways of working so that it did not lead to dehumanizing the therapeutic dynamic of their relationship with patients.

Within a setting of goal setting in social planning Rittel and Webber (1973) described two types of problems, a wicked problem and a tame problem. A mathematical equation is an example of a tame problem. It carries all the information that is required for a solution. When the information is identified a single solution can be made and when it is solved, it is solved. A wicked problem however, does not contain all of the information required for a solution, so there can be multiple solutions. Understanding the problem requires the ability to ask every question for every solution, though this is not always possible as there are often economic and time constraints on solutions. A solution for a wicked problem may also bring in multiple new problems or consequences that then have to be solved. The potential of a wicked problem is that there is no end to the relationships that interact in the open system that are being solved, so the solution is never completely reached. These are the type of problems that are being experienced and anticipated as IT is introduced into health (Cresswell, Worth, & Sheikh, 2010; Feldman, 2010; Singh & Sittig, 2016; Young, 2012).
2.7 A socio-technical model of Health IT.

As Health IT becomes more widespread it becomes part of the health eco system. Such a system that can be defined as

“a network of digital health communities consisting of interconnectedness, interrelated and independent digital health species, including healthcare stakeholders, healthcare institutions and digital healthcare devices situated in a digital health environment, who adopts the best demonstrated practices that have been proven to be successful, and implementation of those practices through the use of information and communication technologies to monitor and improve the wellbeing and health of patients, to empower patients in the management of their health and that of their families” (Iyawa, Herselman, & Botha, 2016 p.249)

This is aspirational thinking and is accepted as the future of Health IT but, as discussed, few if any health systems worldwide have achieved this level of sophistication. Health IT is improving rapidly and many systems are now being introduced and implemented on an organization wide level (Singh & Sittig, 2016). Though the implementation is to improve care, the practice implications are huge if the care process is changed or interrupted by the technology (Rathert et al., 2017). Due to the nature of the interrelatedness of the human care process, the paper information and digital information repositories, to study Health IT in situ a social technical system is required (Greenhalgh et al., 2017).

A social technical system is a system where the social, or human part of the system, is interrelated with the technical, or computer part of the system. Together the whole system is created and to study the effectiveness of the whole system the parts must be studied and also the interactions between the parts must be studied (Cresswell et al., 2010). A pure sociotechnical work system should be free from error, useable, give the ability to intervene prior to an event where harm may occur (Singh & Sittig, 2016). The design of the system should also consider
the interaction between Health IT hardware, software, information content and
the human computer interface. Health IT should be viewed in the context in
which it is used and where the effects of the interventions can be seen (Sittig &
Singh, 2010).

Health IT is a wicked problem, so many of the drawbacks of its use were not
anticipated until the systems were implemented. In this case Sittig and Singh’s
eight-dimensional model to study health information was not published until
2010, so many health systems already had implemented Health IT systems. This
was acknowledged by Sittig and Ash (2011) in an editorial discussing the
importance of studying any Health IT system. The design of the system looks at
the 8 dimensions (Fig 1) and applies them to the dynamics of any system. The
system includes 6 items relating to processes within the environment in which
Health IT is used, the external forces that influence this environment and finally
the outcome of measurement and monitoring, or purpose of the system.

Fig 1. Sittig & Singh’s eight-dimensional model to study health information
(adapted from Menon et al., 2014)
Sittig and Singh (2010) state that cultural change and investment is required because if any part of the system is missing or fails then the whole system starts to fall down.

2.8 Nursing and Health IT.

In the majority of health systems nursing is by far the largest workforce (Buchan, Duffield, & Jordan, 2015). Nurses are described as being independent professionals with expertise that is distinct from and complimentary to that of physicians (Kowalski & Anthony, 2017). Nursing concentrates on the relationship between the nurse and the patient and an essential part of this relationship is that the nurse can demonstrate respect, empathy and compassion in all of their actions. This enables the nurse to see the whole person and to show that they see the person as a whole. Meeting the care needs of a person requires a meaningful exchange for both people: the carer and the person being cared for, and is termed as a therapeutic relationship (Kitson, Muntlin Athlin, & Conroy, 2014). In interviews with 15 registered nurses from a variety of hospital settings, Schmidt (2010) found that the central tenet for nursing was “knowing what’s going on”, considered as the need of the nurse to have all the information so that they could know the patient as a whole person rather than as a segment of care. This tenet involved “being close” to be vigilant and aware of the person by being in close proximity; “watching” as concentrated observing, not just taking observations but looking at the whole person; and finally, not taking anything for granted and being alert for cues from the patient.

Nurses see the therapeutic relationship as one where the nurse is able to “support informed decision making and treatment response assessment; to give the medium through which tailored care, comfort and support is provided; to guide and support patient decision making; to reconcile differing perspective
between patient, family, and professionals; and to act as a patient advocate” (Bridges et al., 2013, p.763)

The ability to maintain the relationship is influenced by the environment in which a nurse works. The ability to provide aspirational care is often at odds with the care that can be provided. The problems and barriers to this aspirational care can be due to pressured communication, low resources, high patient throughput or other patients having higher or more complex needs.

The acute ward environment in which a nurse works is changeable and unpredictable (Bittner, Gravlin, Hansten, & Kalisch, 2011). The factors affecting the nurse are multiple, for instance many patients may have needs at the same time, each one of these needs may not be complicated in itself but the nurse needs to decide on which one is required to be acted on now and by whom. Or one person may have many needs due to the complexity of their illness, trauma for example. Therefore, a nurse is conditioned to act on the needs of the patients and this can change dramatically during the course of one shift (Potter et al., 2009).

Due to these circumstances, omissions are common in the clinical environment and that these can lead to adverse patient outcomes (Bittner et al., 2011). Care omissions are the parts of nursing care left out or not done, that are directly between the nurse and the patient. Such as enabling someone to change position frequently, enabling a person to eat at mealtimes or supporting the person with learning about their illness and discharge, to simple documentation. There is a tension between the nurse-patient relationship and the need to get the job done. Focusing on the parts and ensuring that each step is taken according to the time allowed could be a default setting in a complex environment running at capacity, as the ability to establish a therapeutic relationship requires more investment by the nurse (Kitson et al., 2014).
Unfortunately, this is sometimes seen as an apparent lack of provision of the basic care within acute wards. In a meta-ethnographical review of qualitative studies, 16 papers met the inclusion criteria on acute nurses’ experience of the nurse patient relationship. In a ten-year period from 1999-2009, Bridges et al., (2013) reported that nurses held the perception that modern healthcare is lacking in compassion and individualized care. Notably, the issues that were cited as keeping the nurse from the bedside were the factors that are causing the omissions. Causes had been reported as increased acuity on the shift; one unwell person or an unpredicted increase in the churn of the ward, large numbers of discharge and admissions to an area would cause this. Delegation and communication within the team is also a factor reported that will amplify the busyness that can cause care omissions (Bittner et al., 2011). In the New Zealand Nurses Organisation’s vision for nursing, Clendon (2011) identifies that one of the threats to high quality nursing care is that nursing in acute care is becoming increasingly more complex with shorter lengths of stay, higher churn, complexity of illness or disease, and increasing administrative and workplace responsibilities.

Description of an ongoing research study that used qualitative observation for capturing process in the nurses’ workflow, shows that nurses’ work interruptions and cognitive load can have an effect on omission and error in care (Potter, 2012); that in turn has an effect on the nurses’ satisfaction with their role. RNs leave nursing for a myriad of reasons and this has not changed over time, one of the most influential reasons for nurses to leave is lack of job satisfaction. This can be summed up as having increased complexity within the workplace that is seen to be unmanageable leading to an inability to provide care to the satisfaction and fulfilment of the nurse (Chan, San Tam, K.Y. Lung, Yan Wong, & Wa Chau, 2013). The ongoing issue is that patient outcomes will be affected by lack of nursing resource (Walker, 2017).

Internationally nursing is experiencing a supply and demand issue, fewer nurses and increasing demand on health care. The drivers for this imbalance are
primarily the ageing population, the ageing workforce and the mobility of the nursing workforce (Buchan, Duffield, & Jordan, 2015; Li, Nie, & Li, 2014; Walker, 2017). The baby boomer generation of the developed countries is having the effect of increasing the population of over 65-year-olds but this demographic also includes a vast majority of nurses (Walker, 2017). In New Zealand it is predicted that the population size will increase to over 5 million in NZ by 2035 and the health demand will naturally increase. It is predicted that 50% of the 2010 nursing workforce will retire in by 2035 and that supply and demand issues will rise significantly after 2020 (Nursing Council of New Zealand, 2013).

With the mobility of the nursing workforce some of this shortage can be filled with developed countries being able to pull nurses into their health systems through financial incentives and improved quality of life (Li et al., 2014) and some of the predicted shortage can be replaced by long term measures to train new nursing staff. Though the cost to replace RNs is huge, long term measures involve comprehensive training and may not be an economically viable long term strategy (Walker, 2017).

In their 2015 editorial concerning the nursing shortages Buchan et al. (2015) explain that this is not a coming problem it is instead already here. It is just that developed countries are now starting to feel the shortages. They explain that just growing more nurses is not the best option as this can then lead to surplus as it is projected to do in the United States by 2025 (U.S. Department of Health & Human Services, 2014; cited Buchan et al., 2015). They go on to explain that the current solutions such as traditional policy response as recruitment, retention is looking at nursing being the problem and only focuses on the supply side rather than looking the demand side of the changing healthcare environment. This theme is echoed in the Nursing Council of New Zealand (2013) vision for nursing future where they suggest that nursing needs to look beyond this supply and demand imbalance and develop processes to increase the effectiveness of each nurse rather than increase the numbers of nurses. These processes include use of technology.
Where health IT is used, nursing is the predominant user due to the frontline role that nurses play in hospitals (Kutney-Lee & Kelly, 2012). Adoption and use of Health IT does need to be an iterative process and to transform the culture of nursing there a need to identify what the culture is and what the change is for. Health IT is one of the main tools that can be used to help identify, understand and improve nursing care delivery to improve patient outcomes (Mason & Wesorick, 2011; Harris, Vanderboom, & Hughes, 2009). Honey and Westbrook (2016) in a position paper for Nursing Informatics in New Zealand state that the themes that echo for informatics are, best use of technology and information, fostering and spreading innovation and quality improvement.

Technology will improve patient care and the quality of care, but nursing is a hands-on profession. Therefore, technology needs to be an adjunct to nursing care not a replacement for nursing care (Westra, 2016)

Clendon, (2011) outlines the issues as below,

“The ability to understand and utilize technology in nursing practice is an essential element of nursing care. A lack of interoperable IT systems, inconsistency in the availability of technology, and a lack of recognition of the costs of IT in contractual arrangements are significant problems that are still to be addressed and have substantial ramifications for quality of care” p.21.

Unfortunately, the majority of the literature on clinicians and Health IT is focused on physicians not nursing (Gephart et al., 2016). The role of the nurse is different to the role of the physician or allied health professional, so their needs from an EHR will be different.

Nursing documentation is an accumulation of expertise, prior knowledge and critical thinking on behalf of the nurse working in partnership with the patient to
provide continuous documentation of the nursing process of assessment, planning, intervention and evaluation (Kelley, Brandon, & Docherty, 2011). It is also an essential part of the clinical work, with ethical and legal need for timely and accurate record keeping. Health IT tools are not always appropriate to nursing practice as they do not fit the complexity of nursing care, especially with documenting actions such as psychological support (Stevenson et al., 2010).

The concern about electronic systems in nursing is that they are often designed around specific assessments and systems that can further compartmentalise the care of a person (Stevenson et al., 2010; Kitson et al., 2014). There are mixed reports of Health IT in the context of nursing with some very positive studies showing a reduction in hospital acquired pressure injuries (Dowding et al., 2012), to improvements in nurse reported outcomes such as medication error, lost information in communication of patient transfers and safety of the clinical environment, from a large study of survey results from 4 US States, 316 hospitals and 16,000 nurses (Kutney-Lee & Kelly, 2012).

Seemingly the big problems are with the systems usability. A qualitative study using focus groups with a convenience sample of 46 nurses in acute care who use Health IT at work, describes how early PC based systems for nursing documentation failed to fit within nursing workflows so did not always improve patient outcome or nursing resource time (Kossman & Scheidenhelm, 2008). The nursing staff reported that there was potential to improve workflows, communication and documentation but on average half of the work day was on the computer.

In their comprehensive literature review, Rathert et al. (2017) examined 41 articles and confirmed that the non-verbal communication is vital in the nurse patient interactions as this is the main way that emotions are shared. This non-verbal communication can be interrupted by the need to input data on a screen, so communicating an emotion can be lost in the encounter. Care has to be taken
regarding the use of equipment that takes the “gaze” away from the person in this moment.

Unintended consequence (UC) is the need to work around the system to achieve the result that is required. Unintended consequences are the “side effects” of introducing a change to a process or system, these UCs often contradict the initial goals of the change and often have a negative effect on users and patients in the context of Health IT. Examples of this can be altering workflows, increasing time spent documenting, increasing the reliance on technology. Essentially these are a mismatch between user needs and the usability of the technology. Gephart et al., (2016) found that nurses frequently deal with Health IT systems that require them to either change their workflow or spend more time within their workflow. Threats to patient safety were also reported in this study at a frequency that the authors found concerning.

Clendon (2011) identified that technology is a challenge that is relatively new for nursing. A challenge that has to be met to ensure that nursing is able to continue to achieve improved health outcomes for people. Nursing interventions are known to exist but poorly understood by non-nurses. For nursing to advocate for people so that healthcare meets the individuals needs they must be included in the decision making and design for the tools that they use. Technology is one of the fastest growing areas of health and the health profession is dependent upon technology to achieve its outcomes.

The absolute need of Health IT software is to be user friendly and that means nurse friendly. The purpose of this study is to explore what an implementation of HHDs has meant to nurses and their workflow. Understanding their perceptions of how this has helped or hindered them in their work will help to inform future implementations and further research into an area which has little current literature to inform it.
3. Methodology Chapter

3.1 Introduction

This chapter describes the overall design of the study and importantly why the methodology and methods were chosen. First the methodological paradigm is discussed that then leads into how this paradigm has shaped the data collection, management and analysis. Finally, the chapter closes with consideration of the ethical aspects of the study and discusses the validity of using the approach and tools to provide assurance with the study findings.

3.2 Study Design

The aim of this research is to study the use of HHDs at the point of care by nurses; specifically, the research is striving to comprehend how this group of people experience this use of technology in the context of their daily workflow and delivery of care. As the review of relevant literature has shown there is an understanding that introducing technology to health workers can have an effect, but none of this research has looked at how this affects nurses in the acute hospital environment.

Research is a method of inquiry with the goal of expanding knowledge (Polit & Beck, 2004) and using a research approach that is appropriate to the inquiry is essential to enable successful research (Young Cho, Lee, 2014). The constructivist paradigm asserts that people experience life, and through reflection on this experience construct their own meaning and understanding of the world (Adom, Attah, & Ankrah, 2016). As opposed to a quantitative approach that is based in a positivist paradigm where the subject of research is fixed and known (Polit and
Beck 2004), qualitative research is an approach that is useful to nurses who are wanting to understand the human experience (Magilvy & Thomas, 2009). The view is that the experience belongs to and is lived by the nurse experiencing it, and leads to the need for the nurse to describe this experience. These experiences will provide data that in turn can be analysed to form a greater understanding of the phenomena. Qualitative research is often aligned closely with the naturalistic inquiry where the purpose is to discover how individuals generate reality within their environment or context (Polit & Beck, 2004). Salkind, (2010) describes Naturalistic Inquiry as being an approach to understand the world in which a group undergoes a specific experience. He also explains how this method is not used to generalize the experience but instead to develop insights into the experience and phenomena at hand.

3.2.1 Qualitative Descriptive

Many qualitative approaches are referred to as being complex designs for the researchers, as they require a comprehensive understanding of both the philosophical and disciplinary foundations of each approach (Magilvy & Thomas, 2009). The qualitative descriptive approach allows for a straightforward description of a specific phenomenon or experience (Sandelowski, 2000, Magilvy and Thomas, 2009). This straightforward approach does not intend to apply meaning as to why a phenomenon is experienced. In an exploratory study of a new phenomenon that has not been studied it will help describe specific themes that will require further, more in depth, research and understanding.

3.2.2 Positioning of the researcher.

Currently in New Zealand paper is the accepted norm for clinical documentation, patients in hospital expect to see a nurse with a paper drug chart or a folder containing paper end of bed charts. For Nursing, paper is still predominant even
in hospital that have some electronic medical record systems. Nurses are still trained in environments that use paper. The author in developing the research question has made the assumption that introducing HHDs to the point of care may have an effect of the lived reality of nurses using the HHDs. Positing that the HHD is new, unknown and not 'normal', the device therefore, has the potential to have an effect on an interaction where traditionally paper has been used. From understanding the author’s perspective and the research aim, a qualitative approach and constructivist paradigm is suited to study that is both subjective and descriptive (Jackson, 2013).

Within this study the Author is the researcher. As a researcher within qualitative studies the Author is a novice and is being supported and advised by his research supervisors. Though the Author is a post graduate nursing student within academic institution the Author has worked in a senior clinical nursing role for ten years within the district health board from which the sample group is being recruited. Within the last 4 years the researcher has been involved in the development of the nursing digital clinical record and has been instrumental in the initial development and implementation of a digital vital signs system. The potential conflict of this on the researcher - participant relationship will be discussed throughout this chapter.

3.3 Methods

The qualitative descriptive (QD) approach has been described as a comprehensive summarisation in everyday terms of a specific event as experienced by a group of people (Lambert & Lambert, 2012), describing the data rather than explaining the data. Sandelowski (2000) explains this as being low interference interpretation, being close to the actual data rather than having a subjective interpretation of the data. Though no description is ever likely to be free of bias due to its interpretive nature, Sandelowski (2000) further defines this method of description to be a
description of the facts of events rather than an interpretation of why the event happens. Within this study it is these facts that need to be described as it is an area where there is little research. The study will bring these facts to light through straightforward description, with the description being a summary written in everyday language. Though this should not be taken to say that the method is not interpretive, it is just less interpretive as it concentrates on the surface data. It is still the duty of the Author to interpret and analyse this data and present import, elisions and nuances of their data (Sandelowski, 2010). Colorafi and Evans (2016) affirm this difference as not being one of rigor but instead the amount of cognitive work required for the Author to transition from the data obtained to a conclusion. Sandelowski (2010) cautions the researchers using this method that analysis is always required to move from the data to a conclusion; citing studies that have not transitioned from the raw data but instead presented the raw data without analysis as a conclusion.

3.3.1 Sampling

The sample size for QD studies is often small, a typical sample size may be a few as five ranging up to 20 participants (Magilvy & Thomas, 2009). For this project, the Author was aiming to recruit up at least 8 participants. A small sample group also generates a manageable amount of data (Magilvy & Thomas, 2009). As stated the Author wanted to use this research to generate further research on an emerging use of technology that has not been studied in this specific environment before rather than producing conclusive work.

Sampling has been described by Polit and Beck (2004) as being a way to represent the population that the researcher is interested. In this study the sample needed to be nursing staff who use HHDs at the point of care. A purposive sampling technique is also recommended as complementary to QD and NI methodology (Kim et al., 2017; Neergaard, Olesen, Andersen, & Sondergaard, 2009; Sandelowski, 2000) So, the Author has used a purposeful sampling approach to
ensure that the participants are nurses who use HHDs at the point of care. Using this method of sampling the participants were recruited because they fit the purpose of the research (Holloway & Galvin, 2017). Due to the Author's clinical role within this hospital the sampling technique was advertised on a poster within the wards inviting a response (appendix 1) rather than by direct recruitment.

3.3.2 Setting

The study took place in a 520-bed tertiary hospital in New Zealand. This hospital is a regional teaching hospital and is the referral service for a large geographical area. Within the last 2 years the hospital had introduced HHDs into the adult ward areas, these HHDs were a platform for end of bed clinical tools for clinical staff but primarily for nursing staff. The clinical tools included a vital signs and assessment tool, a medicines management tool and in some areas a task management tool was also being used. The sample was recruited solely from ward areas where the HHDs were used at the point of care by nursing staff. The hospital still has a combination of paper and electronic records but in all acute general adult inpatient areas HHDs are used by nursing at the bedside in some form.

3.3.3 Data collection

The method of data collection was through two focus group interviews. Focus group research allows the participants to say what they feel and think about the subject through semi structured interviews and focused discussion in a comfortable and safe environment (Krueger & Casey, 2015, Polit & Beck, 2004, Nagle & Williams, 2013). Focus group research also enables the participants to express in-depth information and provide personal insight into their experience. Though this can be achieved by individual interviews, the focus group is more economical for the Author. The individuals within the groups may also provide connections to concepts that an individual interview may not, by the addition of interaction, practice comparison and discussion within the group.
The Author has used a five stage approach for focus group planning as suggested by Krueger & Casey (2015) and demonstrated by Nagle and Williams (2013, p1-12).

1. Define your purpose.
As stated, the reason for using a focus group is to find the lived experience of the individuals in the group through questioning and intergroup discussion. The benefits of the focus group over individual interviewing is through group interaction. This interaction stimulating debate and uncovering richer data than individual interviews (Barbour, 2005; Krueger & Casey, 2015; Morgan, 1997; Nagle & Williams, 2013).

2. Methodology.
Nagle and Williams (2013) discuss that the methodology stage is about the conception and logistics of the focus group. Within this stage the leading questions were developed by the Author to follow the questioning route described by Krueger & Casey (2015). The questioning route allows for an opening question that is easy for the whole group to answer with the following questions moving towards key questions that were designed to evoke memories of the experience of using the HHD and to generate conversation within the group. Finally, this method ends with a closing question that allows the participants to sum up their experiences. This questioning route allows for framing of the conversation but does not become the conversation. The questions were:

Q: Could you think back and tell us how you first heard about the use of Hand-held devices at work, and if you can, tell us your memories / thoughts about this?
Q: Thinking about education and the transition to using the HHDs what went particularly well?
Q: Tell me about the negative experiences that you have had with the HHDs?
Q: Tell me about the positive experiences you have had with the HHDs?
Q: thinking back on these experiences how you feel the HDDs influences, good or bad, your ability to provide care?
Q: if you had one minute to sum all of this up in a conversation with our CEO what would you say?
During the focus group prompts and probes (Nagle & Williams, 2013) were used to supplement the questions and to dig deeper in to meanings.

This stage takes into account the time constraints (Krueger & Casey, 2015) to make sure that the Author can complete the focus group within the time allowed. The Author ensured that generous amounts of time was given for room booking to allow for this

3. Facilitation.
The focus groups were moderated by the Author and the note taker. Polit and Beck (2004) explain that due to a nurse’s role and their need to elicit responses from people within their care; nurses have the ability to be good moderators within a focus group. The moderation of the focus group should also be done by a team, a facilitator who has prepared and can ask questions and facilitate the group questioning and also a note taker who can observe and take notes on emerging themes as well as provide feedback at the end of the session and individual member support if necessary (Krueger & Casey, 2015; Morgan, 1997; Nagle & Williams, 2013).

Within this study the Author was the group facilitator, though this was not ideal as the Author was known to all of the group participants and this has the potential to change the dynamic of the group. Every care was taken to ensure that this did not happen and this is discussed later within the ethical considerations. The note taker was selected by the Author due to the fact that they had experience with focus group research. On the request of the Author the note takers role was primarily to support the participants and to keep a note of any unfinished
conversations. No other notes were taken as this study was not looking at the group dynamics or non-verbal communication due to the limits of a dissertational study. Any notes taken were destroyed at the each session. The note taker was asked at the end of each group whether there were any conversations that were not completely finished. The roles of the Author and the note taker were explained to the group at the beginning of the focus group. The note taker was also known to some of the focus group participants as they had also held a clinical position within the district health board so this potential conflict was managed and is discussed in the ethical considerations.

4. Analysis
The method of analysis will be discussed later in this chapter.

5. Reporting
The reporting will be within the discussion and the conclusion to this study, where themes from the data analysis and recommendations will be presented in a coherent fashion. The reader can then understand how and why the themes have emerged and what meaning this has on the phenomenon being studied. Krueger and Casey, 2015) consider this as providing enlightenment for the audience. The reporting stage is also described as a part where the Author decides upon the audience and this is inextricably interwoven with the purpose and aim of the study (Nagle & Williams, 2013).

3.3.5 Recruitment.

In this study the participants were recruited from the wards by an advertisement pined to hospital notice boards. Participants emailed or texted to contact the researcher about their interest in participating. Responders were replied to with a copy of the study information sheet (appendix 2) and asked two questions to satisfy simple inclusion criteria according to the purposive sampling strategy.

1. Are you a Registered Nurse?
2. Do you use a handheld device at the point of care when you are on the wards?

3.3.6 Inclusion Criteria.

The inclusion criteria for participants was that they were all Registered Nurses who use hospital provided HHDs within their everyday clinical work. Each participant was required to sign a consent (appendix 3). Nurses who were not Registered Nurse or who do not use HHDs at the point of care in their everyday work were excluded from the study.

3.3.7 Sample size.

At the end of the recruitment period 15 RNs were recruited into the study but due to personal and work commitments a total of 8 RNs were able to attend the 2 focus groups held.

3.4 Data Analysis

Thematic analysis was used to analyse the data from the audio recordings. Thematic analysis is recognised as a common form of data analysis suited to qualitative studies (Boyatzis, 1998; Braun & Clarke, 2006, Clarke & Braun, 2014, Krueger & Casey, 2015; Sandelowski, 2000). Though it is commonly used, it is not well defined and there is no simple procedure for doing it (Boyatzis, 1998). Braun and Clarke (2006) describe it very simply as a method for “identifying, analysing and reporting patterns within data” p6.

The analysis was driven by the research question and was systematic in nature. The patterns that recognised in the data became the major themes. Boyatzis (1998, p3) instructs his readers that the instance when a pattern emerges is a “codable
moment”. A moment that then requires the researcher to develop a label so that the pattern can then be labelled or coded if it appears again. In this way the data can become more defined or classified and once it is classified it can be analysed and made sense of (Boyatzis, 1998).

In this study a transcript was made of the audio files. Both of the focus groups were asked the same set of questions, moderated by the Author and held in the same setting, due to this the transcripts were treated as one data set rather than as separate groups.

The Author read and reread the transcript to become immersed within the text. From this the Author followed a technique described by Braun and Clarke (Braun & Clarke, 2014; Clarke and Braun, 2013). This strategy is systematic and enables the Author to break down the work into manageable chunks by the application of six sequential steps.

1. Familiarisation of the data.

The transcripts were read in conjunction with the digital recordings and checked for accuracy. An inductive approach was taken, meaning the Author did not start this approach with any framework or suggested categories. The reading and rereading of the data allowed the Author to become cognizant of the whole data. At this point the Author started to make simple margin notes on the transcript to indicate repeated patterns in the data. Simple ideas were also written in a notebook.

2. Generating the initial codes.

The familiarisation process suggested patterns that had interested the Author, but the next stage was more systematic than simply reading and rereading. At this stage the Author began to code the patterns by identifying them, collating them and writing notes about them. Highlighter pens were used to identify each recognised pattern in the data, then each highlighted data extract was matched with other similar data extracts. Multiple copies of the transcript were used to
enable the Author to collate similar patterns and also allow for the fact that some data extracts spanned more than one pattern.

During this phase the coded data extracts were sorted into broader levels, which became the templates for potential themes. Using post it notes the codes were combined into theme groups. At this stage potential themes were identified.

4. Reviewing themes.
This stage involved the Author refining the potential themes into actual themes. Each potential theme was reviewed alongside the data extracts that comprised them. The Author then made the decision of whether there was enough data to support each of the potential themes, or whether the data supported a theme being split into two separate themes. This was an iterative process, involving rereading the data in the context of how it was said. Ensuring that the relationship between the data in each theme was coherent and that the data in different themes were clearly distinct from each other. This can be seen in the table in appendix 4. When the draft of the final themes was completed the Author sought validation from the academic supervisors. The transcript was read and reread in conjunction with the themes until a thematic map was clear.

5. Defining and naming the themes.
Each separate theme was reviewed in this section alongside codes and the data extracts that made up each theme. The Author then wrote an analysis of each theme describing what it was, the circumstance of how it arose and why it was interesting to the Author and consistent with the study aim. Subthemes were also identified and explained at this point. Each theme was then titled with either a single word or short phrase that was able to immediately describe what the theme was about.

6. Producing the report.
Within this stage the elements of QD were used to tell the story of the analysis. Extracts from the data were used to highlight specific points to the reader and also to give validity to the analysis of the data in relationship to the research question.
The thematic analysis was then discussed in relationship to the existing literature to further give meaning and use to the research findings.

3.5 Ethical Considerations

One of the ethical concerns inherent with focus group work is protecting the privacy and integrity of participants who are sharing their thoughts and feelings in a semi-formal setting which is being recorded (Morgan, 1997). Another ethical consideration was recruiting participants from a healthcare provider within the Author’s and note taker's institution. Broyles et al. (2011) identified potential risks for nurse participants in this type of study which included concerns of social sanctioning by peers and/or supervisors due to opinions expressed in the focus group. Within this study the discussion involved examination of workplace culture and norms; this was acknowledged by the Author and the study has been designed (as detailed below) to protect the individual from harm or perceived harm. Access to the research setting was formally requested through the Health Boards research office locality agreement (appendix 5)

Prior to enrolment all potential participants were made aware of the study and its design via an information sheet and the opportunity to ask questions regarding participation was offered. Within each part of the recruitment process it was stated that an individual’s participation in the research would not be disclosed to employers and the research materials, consent processes, audio recordings and final transcripts would not be available to the employers. Informed consent was a requirement of participation. Participants were made aware that transcribers are involved in writing up the audio recording and were also required to sign a confidentiality agreement. The participants were informed that the audio recordings would be destroyed after confirmation of successful transcription.

In addition to the Author and the participants each focus group also included a note taker whose role was to be attentive to the needs of the group as well of the
conversation within the group. If at any point a participant needed to leave the room or became distressed with the conversation within the group, the note taker was on hand to be able to leave with the participant and help debrief and offer support as required.

At the beginning of each focus group the Author and the note taker introduced themselves and again the participants were given the choice not to partake in the focus group. The participants were advised that during the focus group work no clinical areas should be named and patient names must not be used. The group was asked to identify themselves by their first name only and to refer to their area of practice not the actual ward they practice on.

The participants were informed that any material published from this research will be in thematic form and direct quotes would be used to illustrate points but names are not used. They were also informed that they would be contacted and provided an executive summary of the findings.

Ethics approval was sought and gained from the Human Ethics Committee at the University of Otago (appendix 6). To ensure that the research was meeting the requirements of the Treaty of Waitangi, as well as being culturally safe, approval and advice was sought from the Maori Ethics Board (appendix 7).

3.5.1 Confidentiality and safety of data.

The data was digitally recorded and transcribed. The number of people with access to the data was limited to the Author, academic supervisors and the transcription service where confidentiality agreements were used (appendix 8). Particular attention was given to the storage of the information and all data was anonymised. Other than the Author no other person had information as to which focus group supplied which sound file. Transcribers had no access to any
personal details. As previously discussed first names were used on the sound files but during the transcription process these names were de-identified further.

On completion of the research all digital data was deleted and the hardcopies of the data were submitted for storage at the University of Otago Centre for Post Graduate Nursing Studies. Here the data will be stored for seven years as per the University of Otago guidelines for Health research.

3.6 Rigour

Rigor has been assessed by the application of a criteria first suggested by Lincoln & Guba (1986).

3.6.1 Credibility.

During the focus group the note taker was tasked with an increased awareness of the topic of conversation rather than the detail. At the end of each session was asked if, in their opinion, questions had been answered, areas of ambiguity clarified and points raised by the participants had been explored. The participants and note taker were sent a copy of the transcript. They were able to verify the transcript, note any corrections, add additional comments and ask for a comment to be withdrawn. After the initial analysis, the participants and the academic supervisors were provided with a copy of the themes for comment and to ensure that the analysis of the data accurately captured their viewpoints.

3.6.2 Dependability

Systematic steps have been used in the planning of the study, method of sampling and finally the collection and the analysis of the data. With the development of the codes to identify patterns in and themes from the data, at each step
verification was sought from academic supervisors to ensure that there was consensus with the code development.

3.6.3 Confirmability

The participants have had access to the raw transcript as well as the analysis to ensure that this was an accurate version of their focus group experience. The Author is confident that the findings are an accurate reflection of what the participants expressed.

3.6.4 Transferability.

It is important at this point to remember that this study is exploratory and the Author is not ascribing meaning to what has been said but instead reflecting the content and lived experience of the participants. The purposeful sampling technique employed can be repeated but the electronic environment of the hospital in which this study has taken place is in constant flux and is continuously improving. The experience of the similar sample taken at a different time may not provide the same results.

3.7 Summary.

The purpose of this chapter was to describe the methodological reasoning of why a qualitative approach was used to record the lived experience of registered nurses who use hand held devices at the point of care. The chapter also described the collection methods, how confidentiality and protection of the participants was maintained, and finally, described the ethical considerations of the study and how the rigour was maintained throughout the process. Special consideration was given to the participant - author - note taker relationship to ensure that there was no power imbalance that might put the participant at risk or influence the research.
4. Findings.

4.1 Introduction.

This chapter reports the findings of the study which were analysed using the qualitative descriptive approach (Sandelowski, 2000). Braun and Clarke's (Braun & Clarke, 2006; Clarke and Braun, 2013) framework for analysis was followed to produce six distinct themes emerged from the analysis of the focus group data. These were:

- Rage against the machine
- With me, not to me, understanding our clinical reality
- The humans in the system
- The information age
- Being prepared
- It’s getting better

The themes are presented in the order that the author recognised that the participants gave importance to. When each of the questions were asked, the participants’ conversations were observed to form their own pattern that transitioned through each of these themes. While each theme and subtheme are described separately, this is purely for the purpose of ease of reporting. In clinical practice many of the findings are intertwined adding to the complexity of the already complex working environment. This point will be explored in greater depth in the discussion chapter.

Each theme will be presented with a short description of why the content and aspects were important to the focus group participants. This will then be broken down into subthemes illustrated by the comments and opinions of the group.
Main themes were built from patterns within the data that were grouped as subthemes and then aggregated into the main themes. The following illustration is an example of how the patterns within the transcript formed the subthemes which were then grouped by similar characteristics to form the main theme.

Fig. 2: Rage Against the Machine theme development.

4.2 Sample.

The data was supplied by eight participants, all Registered Nurses who work within acute medical or surgical wards. Although not formally collected as data the introductions showed that there was a span of experience, length of practice, and practice areas. All used HHDs at the point of care in their everyday practice and all owned personal HHDs.
4.3 Theme 1: Rage against the machine

This theme was developed from the annoyance and frustration that the participants described from the disruption that transitioning from paper to digital has caused them. This disruption of their normal workflows does show up in other themes, but these particular issues were expressed as being obstacles that prevented them from performing care and annoyed the participants, hence Rage Against the Machine.

So, you’re taking something away that is a paper chart, it’s been there since 1800’s, I think people have been doing paper charting and documenting on paper in the nursing profession and then you put something that an analogous, which is an ipad or an electronic system, but did they foresee or did they understand that humans might react differently on the machine…

The Device

The group described how the HHD itself was a change to practice. Paper end of bed charts were an accepted medium the nurses had to adapt to the HHD. Simple issues such as the size of the device and how the RN handles it at the point of care requires thought.

I don’t know if this is just because I was so new on the ward and stuff but the number of times I’ve had it in my pocket, bent over and almost got impaled by them, it’s very painful, like you bend down to do something and you’re like that’s really painful…

Though the HHD is designed to fit in the pocket it cannot go everywhere the nurse goes as the nurse goes where the patient goes as portrayed in these next comments.

obviously, they can’t go in the shower because of water reasons…
it’s just like if the paperwork got kicked to the floor it’s not broken, but if you put the iPad on the bed it’s like the patient just kicks it?...

The group felt like they had extra worry due to needing to care for the device, explaining that HHD breakages were not only an extra expense on the ward budget but also meant that the area would then be without a required tool.

you know you drop it and that’s $300 to get a screen replaced plus about a week and a half on the ward while you wait for somebody to come and pick it up, take it down to Durham Street and then to bring it all the way back…

This comment led to a discussion about whether the number of HHDs were sufficient for the requirements of the area. The group agreed that the number of devices were reliant upon the amount of people using the devices. In addition, the applications on the devices dictated the needs, the more other clinical groups used the devices, the more devices were required. Participants from the general surgical wards explained that the surgical team were using an app-based tool as the medical clinical record and as a way to highlight tasks and improve communication. Though this was seen to be a positive move by the nurses it put more stress on the pool of devices that the wards used, as the devices would leave the ward.

doctors take them, or everyone, sorry not the doctors, everyone wanders them off the ward and so then you don’t have your full set of ipads ….because they haven’t come back to where they should…

Another frustration with the device was the simple fact that the device required charging. This brought issues where charge would run out during a shift and an RN would need a new HHD. This was put down to either battery life degrading over time or HHDs just not being charged for reasons such as the battery charger
not functioning properly, people forgetting or simply that charging cables can be used for personal devices as well as hospital devices.

Yeah mine first started at 100 percent a day, by the time I finished it was down to 6 which is kind of annoying for the next person coming on, there’s no iPads apart from that aren’t full charged…

So there is a charger now. But people take the cords. They take the cord to go and charge something else and so then you go to charge your iPad and there’s no cords. They unplug the missing iPad and charge their own phones…

Exasperation with the device was mixed with an element of humour as the discussions led to the ability of nursing staff to break devices in more and more unusual ways.

I’ve seen some really amazing injuries to iPads that I didn’t even know you could sustain, we had one the other day that was bent into an arc. Like how do you even bend, like a rainbow shaped iPad? Like how does that even happen?...

Getting it to work

All of the group expressed huge frustration with the fundamental task of getting into the HHD and then into the applications. They described a system that required multiple passwords to log on followed by an application that may then stop working midway through a work process for no apparent reason.

And having to log in and out of two systems multiple times during your shift even if you have the same iPad and secure hub which is on the iPads, I don’t know what it really does to be honest, having to log in and out of secure hub as well, so you know you can log in, you’ve got three apps and you can log in nine times a day and some of the nurses have got smart and they use their finger print (login) but that only works if they keep the same iPad, you know they keep that same iPad all the time, I’ve got one nurse who always looks for iPad 119 because she’s got her fingerprint on it to make it faster to login…
Internet collapsing. Disconnecting all the time, it’s so annoying and then sometimes when it comes back and you’re putting in your details then it’s a bad command and then you have to log out and then re-put in all the obs, it’s so annoying, the bad commands and everything…

The common frustration being that this then increased the time that was required for an action that is then multiplied by the repetition of the action.

But I actually do really like the iPads but it’s just not a quick system for nurses and you’re standing there waiting and like a nurse’s minute is like a lifetime of giving care isn’t it really, it’s like, you don’t want to lose your minutes or your 30 seconds here or there…

The participants described how this would involve using workarounds and needing to learn how to mend the tool. An added frustration in an environment where the expectation is that the tool that you are given to work will actually work.

It’s just like I don’t understand why it does it, because you ask people tricks around the hospital and they say “oh yeah just turn the wifi off, turn it back on, close the app” and you try all that and sometimes it doesn’t work and you end up going through about five iPads until you find one that works…

Workflow disruption

So, there was difficulty in remembering some of the steps and transitioning from paper where you can see from top to bottom what the entire information when you’re putting it in, as well as when you’re reviewing it. So that kind of changed with the interface of the ipad and some things that they used to be able to do like the IVC for example is below the sedation score or something and now you have to go to another page for that…
The participants expected normal disruption associated with change and acknowledged the enormity of the change process. The degree of frustration was specifically regarding the disruption of a normal process due to the workflow changing in new ways. Ways that, to the nurse, did not make sense or again, increasing the time required to complete an action.

*I love how it gives you options like Panadol, and then you get to pick whether it’s on a tablet or whatever so you pick tablet and then it says oral or intravenous?...*

The participants expressed worry at the fact that they can now make new mistakes due to the workflow of the applications that they were informed were to improve safety. An example of this was that there was a perception that the prompts were often contradictory and could allow mistakes to happen.

*then you get the nurses who said “well med chart said the antibiotics were due at eight, so I gave them at eight”. But someone delayed or missed the dose incorrectly and they were actually given at six as well, now you’ve given them an extra dose and so “EMed said so I did it”...*

The final part of the disruption was that digital is not paper and that brings its own set of problems. The ability to edit and strike through was perceived to have been prevented altogether or made much more time consuming and difficult.

*I think the difficulty was when the staff started initially using it and so the bugs started coming up and they realised that there were some things that they were able to do on paper, cross things out...*

The final examples of this theme segue well into the next theme. As the participants believed that a lot of the frustration that they experienced was due to the devices or application not meeting the needs of the clinical environment.
4.4 Theme 2. With me, not to me, understanding our clinical reality

This theme is explained by the perception of the participants that often they were that last to know that the HHDs were arriving. Again, this is a source of frustration, but here the frustration is around ownership of the workflow and how consultation was not perceived to have taken place. The sub themes consist of systems development, training and support, where programme designers/implementers’ knowledge deficits of the work flow has led to inconsistencies and inaccuracies.

*let us train ourselves, let us actually have a really strong voice in selecting what you’re going to use for us because we’re going to tell you how we’re going to use it...*

Systems design.
It was clear from the focus group conversations, highlighted in theme 1, that the design of the individual systems present difficulties in the workflow. This is a source of frustration to the nursing staff. The participants from the surgical wards explained that when they were consulted in the design stages of an application trialled exclusively on the surgical wards this then produced a better outcome that application that they feel was imposed on them.

*Cortex¹, was kind of brought out in amongst the issues that we’re already having with the ipad but it was brought out by a very passionate team local to us and only to our area and it had a lot of support from the nurses on the floor because they were our team and it was their project and we wanted to make it work for them but again they were on the floor supporting the nurses. You didn’t just have to pick up the phone, there was someone there you could talk to and it was quite intuitive and you could just use it and run with it and

¹ Cortex™ is a patient centric multi professional communication platform that was being developed and trialled on the General Surgical wards in conjunction with Sense Medical at the time of this study. It was an application on the iPads and used by all clinical general surgical staff.
the vendors were quite receptive to us making changes to it that we thought would run better…

The converse was explained when a nurse described discussing her issues regarding the differences between paper and digital process with the vendor:

I would start my shift I’d get my MR4 (paper medication chart) and I’d open it up and I’d look at all my drugs and I’d know what time things were due, I’d see what they had in the last, you know like I could see it in one whole and I said “so where’s the screen on med chart that I can bring up everything” and they’re like “Oh no, the pharmacy didn’t want that”, and I’m like “I want that, so where’s the screen” and he was like “oh no, you’ve got the administration history here” and I’m like “yeah I know, I want that but I don’t want to be told what time I’m giving something or when somethings due, I want to see it as a whole”…

A general consensus was reached when one of the participants summed up their experience:

Does our system accommodate human factors in their design? So, we talk about nurses being part of the design system, I don’t think med chart has incorporated nurses when they were designed so the pitfalls that could have been foreseen on the development of that app could have been avoided, I don’t know?...

Another participant expressed a sense of bewilderment as they just did not know how some systems were decided upon:

Did they research it effectively to find out what was effective useful equipment to use? How did they do it? That would be my… the evidence-based practice surrounding it and what the outcome of it was?...
Education

Education was considered an important part of the implementation of any product into the nursing workflow. The participants had had experience of what worked well and what did not work as well. The training of nurses in the environment where they worked was perceived as being the easiest and simplest way for the nurses to gain knowledge of the application.

*we all had time to go to training it was nicely spaced out, people came to your wards, there was lots of sessions, you had that team that stuck around with you for the first kind of three weeks and then even then they came back and you know there was always someone there you could go to…*

The experience of this type of education was that it was much better received when it was taught by nurses to nurses, again the implication was that this enabled the learner to have the trainer understand the question and have the questions answered in real time.

*you had the EMeds and iPad champions on the ward, that was more beneficial, that there was someone there going “well actually this is how you do it”…*

*when they started doing the Cortex training we had one of the vendors and it became really apparent really quickly that he didn’t get what we did and we got our Clinical Nurse Specialist to do the training and instantly the buy in transformed…*

Some of the participants had also experienced classroom style learning where one person would instruct a whole group. The experiences of this were disappointing as it was either not remembered, not delivered at the pace of the learner or delivered by someone who did not have experience of using the product in a clinical environment.
Yeah because obviously you’ve got the computer study day on it, you know you had someone there teaching you through it, that was boring, someone telling X number of people, like 10-15 people, nothing really sunk in because everyone’s really tired…

And then this year when I started my Net-P we got, it felt like hours and hours of training on patients tracking their chart which was really boring, I don’t really understand, because again all they did was put up the data projector and one guy at the front of the room in the most monotone voice ever tried to tell us how to work it all…

Another education method that the group reported that worked really well was having the training system which involved them simulating practice. They acknowledged that some of them grasped the use easily and quickly but those who were more unsure were able to practice in their own time if they wanted to, in mock systems and training sites.

I remember doing all the stuff on ..(a web based inhouse education system) and practicing it because I thought right I need to get this sorted…

I found ..(the web-based system)…more beneficial and that’s because we could practice it at home…

The last thoughts on education was that standardised education methods did not work for the ‘hard to reach’ staff who solely worked nights and weekends or who worked on a very part-time basis.

And in the training of ourselves remember that we work 24/7 and we can’t all get here for a morning training session because we can’t leave the ward for an hour because we have patients…

Support
As described in theme one the participants encountered frustrating problems whilst using HHDs at the point of care. Due to this the group expected that the
support should reflect the importance of the tool that they were using. The current experience of the participants was that the IT support people did not always understand the clinical reality in which the tools were being used.

I mean I locked myself out of med chart and I rung on a Sunday morning and he goes “is this urgent”? I was like “I’d kind of like to be able to administer some medications”, he goes “do you need to be able to do that today”? “Yes” you know and then he finally rings back and the man that rings back is really grumpy because he’s been woken up at 7.15am and “look I’m sorry but I need to give my morphine”…

The group expressed frustration with the fact that the support was not always there after an implementation of a system on the HHDs. The need to document vital signs in real time and to give medications in a timely manner is essential to their workload. However, all the participants acknowledged that this was a resourcing issue.

with the ipads after hours, there is one ISG guy on call, who fields all your calls and then he then goes and rings someone else and then someone else might ring you back in two hours but there’s one guy for an entire hospital after hours…

When asked the question “what would you ask the Chief Executive for?” their responses echoed this.

I’ll start, get me some ISG support people who understand what it is I need to do and what my priorities are…

Mine would be the same. Fix ISG and give them more money, give them more people, give them more something but they don’t understand how this affects us and they must be equally frustrated then if you can make things faster, the better…

and make sure that they’re a little bit more responsive to things as I have spoken about, when things drop out or when things aren’t working it needs to be fixed ASAP…
4.5 Theme 3. The humans in the system.

This theme is derived from the conversations that the groups had where they spoke primarily about how the HHDs affected human processes. The subthemes that led to the development of this theme each convey a distinct process of the human interactions discussed.

HHDs as barriers

The group discussed the idea that the HHD itself was a barrier to care purely by being something that nurse would concentrate on while interacting with the person they are caring for. There was debate in the group regarding this, with some believing that it was a barrier in the therapeutic moment and some not.

*on a surgical ward round where, you’ll be greeted by about 15 people all with iPads, looking at the iPads and sometimes you actually have to remind them to talk to the patient…*

Mostly the participants thought that the perceived lack of contact with the patient was due to the clinicians and especially nurses looking at the screen not the person. Though, as the debate continued an RN prompted the group to think about what the difference was between looking at an HHD or looking at a chart.

*it does seem that you are looking at it a lot but then you sort of think you would be looking at a piece of paper just as much to write things down as you would be looking at an iPad…*

*if you think about it when you have the paperwork in the blue chart, you’re still holding it and you’re still writing it, but admittedly it’s quicker but to me it’s just the same, you’ve still got something blocking you from that patient…*
so the nurse interacting with the patient holding the technology, I do see a lot of nurses, I think we have spoken about this before, nurses becoming completely focused on the iPad and so that interaction with the patient actually is lost and I think probably sometimes patients feel like they’re not as important, like the nurse is just continually looking at this piece of information, at technology without actually the nurse talking to the patient and so I think the patient probably sometimes feels a little bit left out because that communications gone a bit…

Essentially the group decided that it was not the device but instead the way that the device is used that could affect care. Like any tool it should be explained to the person you’re using it with.

I think with explanations that we give the patients I think they understand kind of where we’re heading with technology for sure but I think some of them do and I guess it depends how the nurses actually integrate dealing with as well…

I often turn it around and show them like their obs chart or something say hey look when your blood pressure was low this morning and it’s come up that’s because you’ve been drinking, you know there’s a good visual…

Acknowledging the HHD as being new to the patients and explaining the use of the device was what the participants explained as a thoughtful use of the device. A few of the clinical areas had discussed showing the patient the information and some had purchased stands so that they nurse did not have to hold it all the time and worry about the HHDs. This allowed more of their concentration to be on the person.

We did get some stands for the obs trolleys. They are fantastic. Just for having somewhere to put it while you put your blood pressure cuff on and all that rather than sorting it into your pocket and pulling it out and all that…
HHDs as assurance

Some of the interaction that the nurses were having were reported to be better due to the use of the HHDs. This was seen to be due to the ability of the nurses to assure the person by instantly answering questions regarding care.

I think I am better updated with the care that they’re involved in and I think I’m better at communicating that to patients because generally I can answer their questions. If they said “do you know when my results will come through”? you know you can answer the question at the bedside while you’re talking to them, it’s not “I’m going to go away and come back to you”…

This positive sentiment was also expressed regarding not having to leave the patient to communicate to other members of the clinical team. The nurses shared their concern that when a nurse left a person to do something then they were often distracted or interrupted and did not get back to the person in a timely fashion.

I find that I’m with a patient and they say something like “my bowels haven’t gone in four days” or something on admission it can give them a lot of comfort by me acting on it at the bedside, instead of me “I’ll just go away and page” or “I’ll just go away and call or I’ll wait”, it gives them confidence that I have heard them. Whereas if I go “I’ll just message the doctor right now to say we need some laxatives charted” or whatever it is, I think they like that…

Overall the participants felt that they were better able to empower their patients and advocate for their needs when they were able to produce the information instantly at the bedside to aid discussions.

I know for us a lot of patients are absolutely fascinated by the information that we can actually just boom boom boom, yep there you go I can see that there and that’s clever…
Not a replacement for a human

This subtheme was highlighted by the participants expressing the need to apply clinical judgement to the information that is contained within the HHD. They had already discussed that the HHDs bring new problems into the work environment but also old problems still existed and required clinical decision making. The information was often one piece of the pie.

I guess I’m still not a huge believer on not relying on what I’m being told by the applications, to be completely informed as to the care that I’m going to be giving my patient, so I’ll always look at my patient first and foremost but use the iPads and the applications within the iPads to give me the big picture but not fully solely relying....

This was part of the education that the group felt was important for all new staff.

I do remember conversations when these types of systems were rolled out about not fully relying on, you know about being kind of vigilant and that the systems are not completely fool proof, that clinical judgement and actually being ok to question what the application is telling you is ok...

All of the nurses within the group felt strongly that the HHDs were an assistive tool and the information that the HHDs contained was useful and important to the care process but the delivery of care, for them, was a human process.

And so, there’s a lot to be said about the actual, I mean there’s a certain element of nursing you’ll never replace with robots because the empathy and that clinical/critical thinking that we do...

Alongside this there was a concern that some people will defer to the machines and not think for themselves and that this could be a risk if there is not a process that validates information as being correct. One of the participants commented
on the irony in this, as the systems are being introduced to combat the problems inherent with human based risk factors.

we need to improve the system safety wise, we need to have a lot of forcing functions, you know we need to integrate human factors when we think about this ironing these things, because there’s a lot. Humans are valuable day to day, you cannot expect a vigilant nurse to be hyper vigilant 24/7 of their lives, there is a variation with performance, you know they might have emotional things in the background that we don’t think about, we can’t always say that you need to be vigilant all the time, yes it’s going on in the background but there are things that happen on a person that could affect their performance and they are relying or using a tool that needs to be better designed……you know these are human factors that coupled with a system that doesn’t work perfectly or near perfectly, I think that could create huge potential in the impact on how health care is delivered to patients…

Computer induced stress

Though not acknowledged as being experienced by any of the group, this stress was seen to be a product of the HHDs. The initial change was cited by a nurse as being a major stressor on a few of the people who she worked with. Just the anxiety that the upcoming change was huge as these people did not consider themselves to be computer literate and thought that they would not be able to manage.

She was so stressed she’d go home crying at the prospect of this coming out…

As frustration is experienced by the users this does have the potential to increase the stress of the user. An interesting observation from one of the participants was that this stress has the potential to be passed on.

on the other end of the spectrum too is that it can, this is just an observation, it could create to the end user a sense of stress that they could possibly pass along to the carer. Say for example you prepared 15 tablets and two of them required checks and then on the way
to the patient it turned itself off, so that’s a stress point, you have to go back and you have
to wait for that (iPad to start up) so are we taking into account the stress that the person
has received and then the patient says “I need my morphine, I need my morphine”, you
come to the bedside and you would hear a nurse from time to time snap at a patient saying
“sorry the ipad has turned off” you know it crashes…

4.6 Theme 4. The information age

The focus group participants all acknowledged that the world is moving into an
information age and that this will improve patient safety and their experience of
care. There were obvious patterns in the focus group conversations that produced
the subthemes for this, negative and positive in nature.

I can see clearly now
This was a very strong theme running throughout the focus groups. The nurses
could see what was written. Illegibility of records, notes, medication and
observation charts was in the past, clearly an accepted part of the nurse’s work
experience. Be it their own handwriting or other clinicians. Every single nurse
within the groups made multiple comments regarding the ease of which they
could read and that the information was clear now.

    like everyone else has said, being able to read the charts is amazing…

    it’s actually really good to see because often or not nurses weren’t that wonderful. We
were okay to do that, actually it’s got the numbers on the blood pressures, you can actually
understand it, you can see the trend. So in that sense it’s great…

Among these comments was the underlying thread that this now made life
quicker as time was no longer required to decipher, information and signatures.
I think it comes in two ways so one way it has made things a lot faster for me when I look at the notes, I don’t have to decipher the name of the doctor because you know when you’re dispensing controlled medication and you have to figure out whose given that and you could spend one to five minutes to find, is that an L is that an E, which doctor has got the initials, which name of the doctor, so you don’t do the guessing game with the doctors…

The paper digital divide
The nurses’ description of their work areas and the systems that they used showed that they were in the middle of a transition from paper-based systems to digital systems. So, one of the issues that they faced were due to the fact that information was not only kept in different digital systems but also on paper. So, parts of the clinical story can be missed as it is not looked at. This, the participants agreed, added time to their workload as they had to check to see if information was seen if it was recorded on paper.

at the moment on Cortex doctors put their notes into it and it’s really good and we can see their ward round, that’s awesome. It also pretty much means that doctors don’t pick up the actual patient’s file ever, so from admission to discharge they are only using Cortex and nurses are only using patient notes and even though we will transition and use Cortex as well, I have noticed that sometimes nurses are flagging concerns in their notes but doctors don’t have a clue because they’re not reading ours even though we are reading theirs, so that’s sort of one of the issues I have because it kind of means that we have to work really hard to flag every concern with them…

This concern expressed was seen to be amplified further when specialist departments are still completely paper based.

Definitely for us too, because you incorporate theatre and anaesthetics who don’t use it, so that when they come back you have to then go to another chart and see and ICU also, so you get a patient from ICU, and you can’t actually see what’s been given without going back so it’s definitely a big issue for us isn’t it?...
Interoperability.

you have to put it in four different places, the same piece of information, you weigh them on scales, you write it on a sticker, you stick that in the paper notes and then you write that onto patient track and he enters it into med chart, the pharmacist, and we have all these amazing systems whether they be on an ipad or on a computer but none of them talk to each other…

This simple quote sums up the groups' thoughts about systems sharing information. The expectation was very clear that this should be a high priority in the list of system improvements. The groups expressed an understanding that this comes with the maturity of systems but put huge value on any system that achieved any aspect of interoperability.

Visibility of information

This subtheme of the information age was the visibility of information. The participants' described how, in a paper world, they would need to go looking for information as it was only in one place at one time. It was explained how the HHD allows nurses to be much more vigilant as they can see information across whole cohorts.

When you’re a nurse in charge I think it’s great. You can literally just open up patient track and you know where all the sick patients are in the ward, so there’s no surprises when you’re ready to hand over…

you know if someone rings you questioning something on the drug chart again I can look it up from wherever I am…

The perception was that due to this valuable time was saved. This was also experienced in workflow as multiple people seeing the same piece of information.
More than one person can use a chart at the same time. So the nurse can be putting in her observations and for an unwell patient and I can be ringing my nurse specialist to say we’ve got this unwell patient on the ward and they can look up the observations there and then as well and then the Registrar who’s in a different ward…

Visibility of information also included seeing communication as it was acknowledged by the person receiving the communication. The nurses’ conveyed that this gave them a sense of security in knowing that their requests were being actioned.

once I send a message it says “responsible” it will say my name and it will say delegated or say to who I’ve delegated that too and like after hours it will go to the CTC (clinical team coordinator) first and then you’ll see them take responsibility and delegate to a house officer then you’ll see the house officer take responsibility, like you’ll just track it through and you feel better because again you know that message is getting through makes you feel confident…

This visibility of information was seen to be of great benefit to the patient in a very similar way.

I can check a patient’s blood results at their bedside which is an amazing thing because a patient asks “so what did my bloods from this morning show” and I can go “oh look your Hbs actually gone from 80 to 120”…

Supervision

It also gives students and new nurses more confidence because instead of (the RN) hovering behind and waiting to pick up the chart to see what they’ve written down to see if it was ok, you can check it on the other side of the ward. And you don’t have to go and ask them to do the obs and then go and recheck and be like “oh have you done those obs”?...

The visibility of information as it occurs gives staff vigilance over enrolled nurse and students whose care they are directing and delegating. This was seen as
important to the nurses as it meant that they could achieve effective, indirect supervision and not be seen to be at the person's shoulder examining every aspect of their care. They could make decisions based on the information that they were seeing digitally and act on that.

And you can figure out if you or your student someone whose made a typo error, had a student who like put respirator 2 or something and she’d meant 20 and suddenly it flags up blue and I was like at the other end of the ward, I went straight down to her and I was like so you’re in a blue zone and she was like oh no no. And then she was “oh no, that’s a typo that’s fine…”

Paper is easier

This final subtheme illuminates how despite the best of technology sometimes members of the focus groups found that, oftentimes, paper was easier to deal with at the point of care.

Sometimes it would be nice if you could divide the iPad in half so you could see your EMeds and your Obs at the same time. Because otherwise you have to log out of EMed to get into EObs just to make, you know can I give this tablet, I’d better check that Obs. Whereas if you have the paper system, you just “I’ll just have a quick look” and you’re done and dusted in like less than 30 seconds. But I actually do really like the iPads but it’s just not a quick system for nurses…

it was so much easier on the paper one just to flick down and write…

The patient also experiences the issues with the digital system and may, at times, also want to go back to paper.

I think I agree that the biggest issue is when something goes wrong then the patient finds it frustrating, “why don’t you just have a piece of paper” because you know a piece of paper can’t turn off…
Though the group understood that this is juxtaposed to the good things, it was still seen as a part of the system that slowed people down.

4.7 Theme 5. Being prepared

This penultimate theme is small but resonated very highly with the nursing staff in the focus groups. There were a few simple reasons why a nurse would be more prepared or less prepared than others and it was clear that this does require examining.

The Age gap

Though no-one within the group considered themselves to be old the group did consider that the some of the older nurses and some older patients do not have the interest or experience in using HHDs as the younger nurse / patient mostly do.

some of the older nurses on the floor were quite apprehensive because they weren’t using smart phones and had no idea even less of an idea of how to use an iPad…

There was debate on the group that this was not an age related issue but that younger people were more likely to have been exposed to the technology that is being rolled out. Especially as this is new technology to a work environment that has always been predominantly paper for nursing.

For this reason, it was considered that there is a subsection of the older nurses who may feel threatened by new technology. The participants remarked that consideration of this should be embedded into the implementation so that more attention can be given in supporting this group.
We’ve spoken about people that have been a little bit harder to get on board and probably some of the older generation nurses who are not so tech savvy were probably the hardest...

The group then explained that the younger nurses were at the opposite end of the spectrum.

*I feel like iPads a step in the right direction because I’m young and fairly new, and not bothered about using computer and iPads and stuff…*

Interestingly, the overall thought was that this was no different from personal technology and again the group did assume that this type of technology was attributed to the younger nurse.

*I mean we all carry cell phones in our pockets most of the time so I think for the younger nurses on the floor it wasn’t a big deal…*

One of the newer nurses within the focus group explained that she had only ever known HHDDs throughout her training and her first year as a nurse. Her main concern was not HHDDs but having to go back to paper if they failed.

*Although if you gave me a drug chart and asked me to sign something I wouldn’t really know what to do. I’d have to ask…*

Experience matters

The participants held the opinion that experience of technology outside of work makes using technology easier at work. The members of the group who considered themselves very technology savvy expressed the fact that they took the use of the HHDDs in their stride.

*I’m an android user so I was a little bit “ahh iPads” but I found it completely fine. It was intuitive like I haven’t had a problem with the actual being an iPad device per se and I feel that they’re easily accessible in all the areas, I haven’t had any complaints about that…*
Those who were not as experienced found that the ability to practice on the actual machines increased confidence and they expressed that anyone would increase in confidence overtime.

I found it quite tricky to start with but then after you’d done it for a day and a half it was fine but you’d still sort of come up with things and you’re like “how do I do that, I can’t just write on the chart or put in the time and stuff”, but now it’s just fine. After about the first week it was just second nature and that’s what you did, but I’d still take my pen out to try and sign something…

### 4.7 Theme 6. It’s getting better

The final theme that was recognised within the data is that of optimism from the participants. This was expressed as each time a negative view was given, a positive view of how it could be improved so it would work balanced the negative out. This theme was strong enough as a pattern and subthemes did not emerge, instead it is the thoughts of the two focus groups that crossed all of the other themes, threading through the data.

The majority of the Health IT mobile applications were thought of as being intuitive by the focus group. Due to this using the HHD, and the contained applications, at the point of care became easier and education became shorter.

I just felt like it was easier to just figure it out as I went along so I’m not too bothered about the training…

The user experience was improving through user feedback as this was incorporated into the systems. This was acknowledged as being an iterative
process were the users had some resolution in the issues that they originally experienced and has given a sense of optimism for the future.

*I think that now we’re over the teething issues of the devices and everyone actually knows how to use the apps that we’ve not got, now we’re at the point where it is starting to make nursing faster. Initially we were a bit slow, we had the teething issues, but now it is there for you to use and it is quite quick…*

going from paper charts to all of a sudden being electronic and the problems that may come with it and problems that we’re having encountered obviously which have slowly been ironed out which is awesome…

Finally, the group all wanted more functionality and improved interoperability. Not one person in the groups said that they wanted to go back to paper or that using HHDs at the point of care prevented them from carrying out their roles.

*I don’t think the patients realise but with our assessment units where our patients are coming straight from the GP and often all you’ve got from the doctor is Mrs X is coming in with abdo pains and it’s not necessarily with our hand held devices but it would be amazing if it could be, but if you’ve got the computer there with an electronic health system you can look up the past discharge summary and you can figure out their eight co-morbidities and that they’re going to need a side room and you can have that ready before they get there which then speeds up that patient’s journey which previously we haven’t been able to do so the patient may not realise that aspect of things but I think from that point of view it can make things faster…*

4.8 Summary

The group remained positive about the use of HHDs at the point of care due to the improvements that they could see happening but there were obvious frustrations that could be either avoided or improved through implementation and system or
infrastructure design. The importance of this will be discussed further in the next chapter.
5. Discussion

5.1 Introduction.

This chapter will interpret and discuss the themes from the findings alongside what is known in the literature and what is known from the author’s own clinical experience. The discussion will focus on examining the author’s research question “Nurses’ perception of using handheld devices at the point of care; examining perceptions of whether the use of handheld devices aids and facilitates the performance of nursing care”. This chapter has been divided up into sections, the first examining the perceptions on the effect on workflow complexity, the second on how usability of the HHD in clinical practice is perceived and finally the third section will explain the perceived utility or beneficial aspect of the using the HHDs at the point of care. Again it should be noted by the reader that though the headings imply division, all of the threads are intertwined.

5.2 Workflow Complexity.

The need to improve the quality of healthcare through reducing unwarranted variations of care and eliminating human error in care processes is unequivocal. The challenge in doing this is what many health organisation are struggling with. In New Zealand and internationally health strategies to improve quality and safety in healthcare are firmly embedded in using digital technologies, with the pinnacle being a comprehensive electronic health record that follows the person through all their health encounters from birth to death. Kowalski and Anthony (2017) in their article exploring the nurses’ role in promoting safety discuss the implications of the Institute of Medicines (IOM) 1999 report To Err Is Human: Building a Safer Health system. Their content analysis of over 100 years of published articles in the American Journal of Nursing suggests that safety has
always been at the forefront of nursing yet the complexity of nursing has increased and due to this, they conclude, solutions are needed for the known systemic errors that the IOM report initially identified and those arising since. Rojas and Seckman (2014) acknowledged this drive for safety and how Health IT is being used at the point of care to improve care and how this is being driven by government policies. In their article it was specifically the Health Information Technology for Economic and Clinical Health Act in America. In New Zealand the Nursing Council of New Zealand is promoting the same use of Health IT to improve the effectiveness of nursing care (NCNZ, 2013).

In their respective clinical areas, the focus group participants described their experience of the results of these drivers at the coal face with the implementation and use of HHDs. The HHDs were described, by the participants, as a replacement for the traditional “end of bed” folder that contained applications which the nurse could use to input and view clinical information. The value of the HHDs was that they are mobile and could become part of the nursing workflow. The medications chart and the vital signs chart of the focus groups’ organisation were specifically targeted, to become electronic to improve specific and measurable quality and safety issues. It is well known that electronic systems are able to reduce the complexity of certain tasks by eliminating common problems. Difficulties with handwriting are eliminated: as eliminating handwriting solves issues with deciphering drugs names and doses; with charts being available on any networked device; users no longer have to spend time looking for charts and can also see them when they are not at the end of the bed. So the intentions of saving nursing time, improving patient safety and improving efficiency of nursing workflows as suggested by many proponents of Health IT and nursing (Harris, Vanderboom, & Hughes, 2009; Honey & Westbrooke, 2016; Mason & Wesorick, 2011), should be being met with an 'anywhere/anytime' function.
In the author's experience as a registered nurse with over twenty years of acute hospital practice, medication management and vital signs assessment are the most commonly used paper forms in the nursing workflow. Both of the traditional paper forms are used on all patients within the acute hospital. The use of these charts is common place and a major part of multiple nursing workflows, so reducing the complexity inherent in these workflow activities would clearly benefit nursing. However, it was clear from the focus groups that the HHDs are not the same as paper as the HHDs have different frailties. So this was not a like for like change. It was seen in the focus groups’ replies that significant complexity had been added to each process that involved using the HHDs. These were multifactorial in nature and did not seem to be anticipated or expected in the training and implementation of the HHDs. Interestingly, the problems experienced by the nurses in this study are known and attributed to the fact that Health IT is a sum of its parts and reliant on those parts (Sittig & Singh, 2010). For example, the process of logging on to a device is required to preserve data security and privacy reasons, a device should not be left to be accessed by anyone. Paper did not require a logon, so the time spent logging on is extra time spent in an activity (unless of course the time spent in other parts of the activity is less than the previous paper-based workflow). Unfortunately, this was often not the case for the nursing staff due to problems with HHD connectivity, or the need to log onto multiple different platforms within the HHD. An example would be to administer a medication that affects a patient blood pressure requires the nurse to login to the HHD, secondly, login to the medications platform to prepare the drug, then thirdly, login to the vital sign observations platform to check the current blood pressure and then move back to the medications platform to administer the medication.

Gephart et al. (2015) performed a systematic review to present evidence of these unintended consequences and found similarly that the need to adapt the workflow adds work to the nursing workflow. Importantly they describe this work as new work, work that in this study did not previously exist in a paper-
based environment. The study participants conclusively agreed that there was a change to their normal workflow that could be directly attributed to the introduction of HHDs at the point of care. These changes were either positive or described as improving the current work process; or as negative, where the work process was described as either disaggregated or prevented.

It was described how the visibility of information was greater than with the paper system with the use of the HHDs due to the fact that digital information can be seen in multiple areas at a time. This allowed for expansive viewing of clinical information to take place away from the patient bedside. The benefits of being able to do this were seen, by the study group, to allow vigilance over the sick patient, be aware of upcoming tasks and assessments and have oversight of students who they were mentoring. This ability to have information at their fingertips enabled them to be more responsive to the needs of their patients. The current nursing environment in the study area is complex and busy; at times the nurses feel that they are working at the limit of their capacity. To be able to have this greater visibility of their work, the needs of their patient load and to be able to support peers is beneficial in enabling them to plan, discuss and communicate care without having to spend time searching for the right information or person. The fact that with the HHD handwriting is now obsolete within the medication management and the vital signs chart was described by the participants as time saved that can be used more meaningfully. This also included the ability to discuss information with colleagues over the telephone (and virtually) while both parties view the same information. The accepted task of contacting and then waiting for an appropriate doctor to come and prescribe simple analgesia or mild aperients was also welcomed as being defunct.

Standardisation of the forms within the tools was described by the participants using the HHDs as a benefit to their workflow, with the nurse not needing to search for the right tool but instead being given the right tool at the right time. This benefit to workflow was described as meaning that the assessment was more
complete as the HHD forced the RN to document the whole assessment, thus creating a more complete record. They noted that the downstream effect of this was that the next nurse made better decisions as they had more information to make decisions with and would use the same tool as a measure. This was examined in a study of nurse sensitive patient outcomes associated with the implementation of an EHR. Dowding, Turley, and Garrido (2012) used an interrupted time series analysis over six years in 29 hospitals in California that included outcome measures of complete risk assessments for hospital acquired pressure injuries and patient falls. The increased standardised and visible documentation of the pressure injury risk was associated with a decrease in pressure injuries across all hospitals. It is acceptable to assume that this improvement was due to the use of standardised assessments and visibility of information could be applied in the study environment.

Conversely the HHDs were seen as a barrier to the nursing workflow by the study group. This was due to the HHD not working as per their expectations which then increased the complexity of their work. Complexity in health care and nursing is known and well-studied and has a direct effect on the clinician and patient health outcomes (Cresswell et al., 2010; Donley, 2005; Greenhalgh et al., 2017; Kannampallil, Schauer, Cohen, & Patel, 2011; Lipsitz, 2012; Troshani & Wickramasinghe, 2014). The more complex a task the more likelihood that a problem can occur or a mistake be made. Therefore, it is pertinent to conclude that adding complexity to an already complex task will increase the risk of adverse outcomes.

Of most concern to the nurses in the study were the problems caused by the automatic prompts on the HHDs. If, as this study intimated, there are issues where the nurse is given an instruction that leads to an incorrect action then this may lead to harm. This type of unintended consequence was termed as ‘e-iatrogenesis’ by Weiner, Kfuri, Chan, and Fowles (2007) in a comment to an article that was describing the types of unintended consequence in Computerized
Provider Order Entry systems. Of particular note, this, of all the disruptions to workflow should be of concern due to the potential for direct harm. This is completely contrary to the reason for the introduction of the system in the first place. Again, the affect that this has on the nurses’ workflow was reported as being frustrating and time consuming. For them it was expressed in their concern for the patient where a simple task of administering analgesia would be delayed, extending the time that the patient is in pain, and has the unintended consequence of creating professional distress for the nurses.

5.3 HDD Usability

The usability of the HHDs was seen by the study participants to be multivariate. This study underlined that the implementation of the HHDs was an important factor of how well the technology was accepted and used in clinical practice. The actual HHDs themselves were seen to be common place in society due to the fact that the majority of nursing staff had smart phones and the HHDs are viewed as just bigger versions of these. It was apparent that the concerns were more down to the clinical applications, or the tools within the toolbox.

The experience of the implementation of the applications was mixed and this clearly affected the user experience and the usability of the application that they were accessing. Participants expressed more satisfaction when they perceived that the design and implementation of an application involved nurses and the nursing profession as key stakeholders. Conversely the more that they perceived that the implementation was being done 'to them' rather than 'with them' then the less satisfied they were. This was highlighted in this study with the nature of the introduction of the medication management system and Cortex. The former was a hospital wide implementation of a standardised application that the nursing staff had very little involvement in, and the latter, an application that was developed alongside the general surgical nursing team and specialised to their
area of work. The participants experience with both of these tools showed that where nursing had the most input their workflow needs were met and that the team who implemented the tool were seen to have had a greater understanding of the nursing workflow and needs. This echoes the findings of Nguyen, Bellucci, & Nguyen's (2014) comprehensive literature review examining the impact of EHR implementations across hospitals. Their study documented that the more successful implementations were contingent on individuals who were known and able to exert interpersonal influences in the design phase. This included clinicians implementing projects where they clearly understood the system and the value that the system brought to the clinical environment.

Education and support was seen as vital to the implementation and use of the applications and HHDs by the nurses in the study. Overall the experience was positive and showed that the way that the education was delivered had the ability to shape the implementation, ongoing experience and use of applications and the HHDs. Having educators and support staff who were cognisant of the nursing workflow and the ward environment in which the HHDs were used was seen as a must have, with the most positive experiences being when education and support was delivered by nurses to nurses. This emphasises that understanding the complex environment of the workplace is a vital factor in understanding the strength and weakness of the how HHD will be used in the nursing workflow and from this understanding a successful implementation can be planned. Studies of the implementation of Health IT projects in hospitals show that successful implementations ensure that the individual users are able to see value in the project (De Raeve et al., 2017; Greenhalgh et al., 2017; Meskó, Drobní, Bényei, Gergely, & Győrffy, 2017). Value from the point of view of this study’s participants was the understanding of their environment, the workflow and the disruption that can occur as well as the value of the HHDs within the nursing workflow.
Surprisingly, the literature does not expand on support services except by saying that they are required (McAlearney, Schweikhart, & Medow, 2004; Sittig & Singh, 2010). The National Advisory group on Health IT in England (Wachter, 2016) suggested that to make IT work, a workforce of clinicians trained in informatics is required at a hospital level and is essential to support the implementation. Similarly, Rojas and Seckman (2014) agree that due to the fact that with nursing the major frontline health worker and therefore the major user of Health IT at the point of care, there is a need to invest in nursing roles to manage how the implementation of technology will affect nurses and the nursing workflow. It could be surmised from this that part of that role would be direct user support and training of those people who give direct user support.

In this study the nurses perceived that there was a difference in the use of the HHDs that was due to the age of the nurse using the device. Though the study participants did not class themselves as encountering these problems, some did make the assumption that the older nurse had more difficulty in using HHDs than the younger nurse due to their experiences with work colleagues. Biesdorf and Niedermann (2014) described this assumption in an international patient survey with over 1,000 respondents, conducted in Germany, the United Kingdom and Singapore. They stated that it was a myth that only the younger generation would use digital services. Instead the survey showed that it was the platform that separated generations. The older generation were more comfortable with Personal computer and laptops and the younger generation more comfortable with using HHDs. However, the survey suggested that both generations were equally able to use either platforms. In this current study the participants did recognise that once education had occurred and nurses had become familiar with the HHD there were no apparent problems but alongside this it was acknowledged that extra training and support had to be given to certain groups of nursing staff who may have had smart phones in their pocket but would not use full functionality of these phones. When such support was apparent apprehension was lessened and nurses became happier at using the HHDs.
Solely concentrating on the handling of the HHD itself, the study shows that this presented difficulties in the workflow of a highly active and mobile clinician. Considering that nursing spans the whole spectrum of care activities in the acute hospital, there was a need to be able to rest the HHD whilst performing care, essentially wanting a safe place to put the HHD down. Paper can get wet and be dried, paper can be dropped and not break, HHDs cannot. Usability is reduced if the nurse is needing to worry about the consequences of placing and breaking the HHD. It is no use having the HHD if the nurse is too wary of its frailty to actually take it to the point of care. The areas that the participants worked in had different approaches to managing this risk with the use of holders and stands, but there did not seem to a best practice model recommended by the study site. The negative effect of this is by not carrying the HHDs on the nurses’ person the benefits of using HHDs at the point of care will not be realised or significantly lessened.

The most common usability problems that were experienced in the study area were defined as problems with technical environment that led to the HHD cutting out in the middle of a workflow causing the nurse to redo work and the lack of interoperability of the systems, where the user had to log off one system and then logon to another system to find the information required to complete an assessment or intervention. As much as they acknowledged the benefits of the HHDs the nurses within this study were despondent due to the unintended consequences that they were experiencing and did not think that the whole system was being looked at. They describe a quasi EHR, where parts of the record are digital and do not share information across systems as part is still on paper.

The premise is that Health IT is an interrelated system with no separate parts. Sittig and Singh (2010) describe a model where equal importance is given to all aspects of the Health IT system, a sociotechnical model that includes all the traditionally unrelated systems, the technical infrastructure as well as the clinical systems. A true sociotechnical model must address all parts of the system so that users of the system have seamless interaction with it (Sittig & Singh, 2010).
Usability within a complex clinical environment where all aspects of information are required to make decisions would seem to be directly related to the reliability and interoperability of the HHDs and the systems within them. The reported issues within this study became a long list including data retrieval, wireless connectivity, session stability, charging stations, battery life, and malfunctioned hardware. Every problem encountered requires new work strategy to solve it.

5.4 Perceived Utility

Due the author's experience as a registered nurse and as a clinician working within digital health projects; one of the suppositions prior to the research project was that the use of a device at the point of care could potentially be disruptive, especially to the therapeutic relationship of the nurse and the patient. A qualitative descriptive study of nurses using digital vital signs monitors at the point of care showed that the introduction of technology can have an effect on decision making as the computer will tell you what to do (Ansell, Meyer, & Thompson, 2015). Two reflective practice articles by clinicians who use computers within their clinics, thought that without careful use then the computer can dehumanise the interaction with the patient (Feldman, 2010; Young, 2012). This study however, did not show that the use of the devices at the point of care hindered the nurses' ability to maintain a therapeutic relationship with the patient. The nurses' observations were that a nurse new to the system would spend time looking at the HHD, but familiarity with the system enabled them to treat it as any other clinical tool, but they described how it was quickly understood that the system was inherently no different from a clipboard or folder. When asked whether they thought that the patients minded that the nurses using a device the group agreed that occasionally they needed to explain why they no longer had paper but they soon understood that the patient population seemed to expect them to have this technology as it was everywhere else.
The very simple time saving measure of not having to go away to find information to answer questions allows the nurse to support the patient in the moment as a question is asked. Sensmeier (2017) explains how digital tools lead to an enhanced ability to make decisions based on the fact that the clinician has better insight due to the information that they can access in real time, in the therapeutic moment. Gomes et al, (2016) compared a 3-day period prior to an implementation of an EHR with a 3-day period 6 months after the implementation in 4 different hospital in 2 U.S. states. They specifically examined the caring component with a pre and post questionnaire. Forty RNs completed both questionnaires. One of their significant findings was that by having the information readily available and having less time spent looking for the right information the nurses felt that they could spend more time in meaningful patient centred activities. This study showed that the use of HHDs enabled the nurse to answers questions when they were asked. Though not stated directly, the participants described a more informative interaction at the point of care. Diagnostic results were asked for, looked up and discussed, questions that could not be answered by the nurse could be directed to doctors in real-time and the patient and nurses could see that the doctor has acknowledged the question and then be informed as to when the doctor would have time or be present to answer the question.

Though the focus groups conversations would often start with the negative aspects of using the HHD at the point of care. Human nature quite possibly dictates that the thought at the forefront of our mind may be the most pressing and at the time of the focus groups the disruption that the implementation caused would still have been fresh in the minds of the majority of the participants. Interestingly, after the negative comments were aired in conversation the benefits of using the HHDs always emerged. The mind-set of the study group was one of optimism rather than despondency. Since the implementation of the HHDs and applications there had been significant improvements experienced. Systems were becoming more accessible, more stable and more interoperable and expectations
were being met. Snowden & Kolb (2017) depicted a similar journey in their exploration of the introduction of an EHR in a hospice in Scotland. They explained the journey to be consistent with organisational change theory as the disruptions are overcome by cultural change and systems improvement.

Technology was seen to be a solution to many nursing workflow problems but the problems were often ill defined or symptoms of a stressed environment. The study group were explicit in stating that technology is the way forward for nursing and that the use of technology is the only way that they will be able to manage their workflows into the future. Unlike Ansell, Meyer, & Thompson (2015) who proposed that the reliance that nurses have on technology could make clinical reasoning defunct; the suggestion is that well designed and purposeful technology is able to support clinical decision making. Though the suggestion that there is a need to incorporate new technology into all nursing learning environments so that positive and negative attributes can be simulated and discussed, was confirmed by the study participants view of a future where all the new graduate nurses will already be equipped with the technical skills as the HHDs will become the paper of the future.

5.6 Significance of the study findings.

The use of HHDs at the point of care for nursing is beneficial but is a challenging process. Due to this implementation, education and support of the HHD requires specialist input so the dynamic workflow of the nurse and how information is used in their clinical decision-making process can be understood. For nursing, the use of HHDs at the point of care is complex and requires a cultural shift from the paradigm of the paper-based record. Despite the limitations of the paper record, paper is known, predictable and not reliant upon other systems to enable it to work. Whereas the digital record contained within the HHD is complex in nature, reliant upon other systems and requires substantial support both technical and
clinical. The adoption of Health IT solutions is seen as the part of the future of nursing as more information is required by the nurse in decision making, workflow is faster and the burden on health providers is greater. So, it is important that the technology nurses use allow them to focus on the patient and their workflow rather focusing on the needs of the technology.

This study shows that the nurses' perceptions of using HHDs at the point of care is paradoxical and this is due to the infrastructure that supports them. The benefits are noted by nursing staff as HHDs allow them to have the mobility that their role requires and be supported by the tools and information that the digital environment bring. The use of HHDs enables them to provide more informed and efficient care, at the point of care. Which in turn, the nurses perceive, benefits the person who they are caring for. The contradiction is that the poor design and weak infrastructure is a barrier to use. This is experienced as new work that increases complexity in an already complex and pressured environment.

5.7 Further research

The experiences of the nurses within the study showed that some human error was reduced but new potential for errors was introduced by the introduction of these applications on the HHDs. Unintended consequences as a result of the introduction of change is well researched but there is little literature that specifically relates to unintended consequences and the use of HHDs and nursing in the acute environment, this study suggests that further research on these aspects would benefit nursing.

Further study would be beneficial regarding Health IT systems that have been developed and or implemented by nurses for nurses, and whether this has improved the experience of the nurses and the usability of the technology.
This research will be published so that it can inform future research and Health IT implementations. The author will be submitting abstracts to local New Zealand conferences such as Health Informatics New Zealand, to ensure that other groups are able to access and learn from this study.

5.8 Study limitations.

The main limitation of this study is the pace at which Health IT is changing and improving as all IT follows the exponential curve of Moore’s Law. Due to this the experience of the nurse using Health IT on a HHD is changing and as this study suggests improving. This study is informative and applicable to anyone developing and implementing HHDs into nursing workflow in the acute hospital environment but the context of this study’s environment and technology has to be considered. This is clearly demonstrated in that since the beginning of this study the software updates for HHD operating systems has meant that some of the HHDs being used are no longer supported will require HHD replacement.

5.9 Conclusion.

This research study has described the experiences of nurse using HHDs at the point of care in an acute hospital environment and how the nurse perceives that HHDs affect the performance of their care. It is clear that this is an under researched area as currently there is a paucity of advice within the literature as to how to solve the human factors of using an HHD in this workflow.

Key learnings from this study can be used as recommendations for future and continuing Health IT implementation projects as well as the basis for future research.
• The problems experienced by nurses using HHDs are multifaceted and interrelated, to understand this considerable work is needed to understand the nursing workflow and environment prior.
• Change from a paper to a digital documentation system is not a like for like change, continuous iteration will be required to manage the unintended consequences of this change.
• Nursing is time sensitive and therefore, time is highly valued. Any process that is perceived to waste nursing time will not be accepted. Processes that improve time management are welcomed.
• Many of the interrelated systems and their technical infrastructures are beyond the influence of the ward nurse, support need to be in place to manage this.
• The use of the HHD is easily learnt and mobility it provides the nurse is valued and seen to benefit the ability to provide patient centred care.
• Health IT is in a dynamic state as the hardware and software are improving; but nursing needs to lead the development of any tools that will be used by nursing to ensure they meet the workflow needs and the professional paradigm and status of the nurse.
References.


Appendices.
Appendix 1 Recruitment poster

WANTED

Registered Nurses

To help with my dissertation research.

I am conducting some focus group research to examine the effect that using hand held tablet computers have on registered nurses’ workflow and interactions with patients at the point of care.

If this sounds interesting and you would like to give me 2hrs of your life then please contact me for more in depth information.

John.Hewitt@cdhb.health.nz
Appendix 2. Study information sheet.

Reference Number: 17/186

Nurses’ perceptions of using tablet computers at the point of care; examining perceptions of whether the use of handheld devices aids and facilitates the performance of nursing care

INFORMATION SHEET FOR PARTICIPANTS

Thank you for showing an interest in this project. Please read this information sheet carefully before deciding whether or not to participate. If you decide to participate we thank you. If you decide not to take part there will be no disadvantage to you and we thank you for considering our request.

This project is part of a dissertation study for a Masters of Science in Nursing.

What is the Aim of the Project?

HEALTH IT has developed rapidly in the last 10 years as it has the capacity to improve workload and patient safety. New Zealand has acknowledged the benefits of smart systems, He atamai te whakaraupapa, to ensure that our health systems continues to improve and innovate to the benefit of our people. This has driven the South Island district health boards and Canterbury district health board, in particular, to strive towards the use of health information technology and digital solutions.

Nurses are the frontline staff in New Zealand and most of the health systems in the world. They are essential for delivering safe and effective care. Nursing care, whether it is the task of performing oral cares or a specific assessment of pulmonary function using spirometry, has nursing specific outcomes for the patient and also for the satisfaction of the nurse.

This has been acknowledged by HEALTH IT and is driving the use of hand held mobile devices (HHDS) to enable unobtrusive documentation and recording at the point of care. This is a big change for nursing and the people who they care for, a move away from the accepted end of bed chart. New Zealand hospitals are
implementing projects that are introducing HHDs for example iPads to replace traditional nursing tools, though there is a paucity of research on how this will affect the nurse and the person at the centre of the care, the patient.

The aim of this research is to investigate the nurses’ perception of using a handheld device and whether the use of hand held devices at the point of care has a perceived effect on the nurses’ performance of nursing care.

What Type of Participants are being sought?

We wish to recruit nursing staff who

- Work in adult wards at Christchurch hospital
- Use Hand held tablets/computers at the point of care in their daily practice

What will Participants be asked to Do?

Should you agree to take part in this project, you will be asked to take part in a focus group with your peers. The focus group will consist of 8-15 RNs and will take 1 1/2 to 2 hrs. The group will use a predefined set of questions to guide a conversation. The purpose of the focus groups will be to gather the views and opinions of the people who use this technology in their everyday work life.

The precise nature of the questions which will be asked have not been determined in advance, but will depend on the way in which the discussion develops. Consequently, although the University of Otago Human Ethics Committee is aware of the general areas to be explored in the interview, the Committee has not been able to review the precise questions to be used.

Within this study the discussion are likely to involve examination of workplace culture and norms. Participation in the research will not be disclosed to employers. The research materials, consent processes, audio recordings and final transcripts will not be available to the employers.

In the event that the line of questioning does develop in such a way that you feel hesitant or uncomfortable you are reminded of your right to decline to answer any particular question(s) and also that you may withdraw from the group at any stage without any disadvantage to yourself of any kind.

What data or information will be collected and what use will be made of it?

Focus group research allows the participants to say what they feel and think about the subject through focused discussion in a comfortable and safe environment. The conversations will be recorded and then this audio information will transcribed onto paper for analysis. This analysis will provides themes and
indications for further research and lessons for further health technology implementations.

During the focus group we will attempt not to use any real names or identifiable areas. All participants will be given the opportunity to use pseudonyms if they wish.

During the transcription process all personal identifying information will be replaced in the data. Transcribers will operate under a confidentiality agreement.

The only personal identifiable information that will be collected and stored will be the written consent.

The data collected will be securely stored in such a way that only the researchers mentioned below will be able to gain access to it. Data obtained as a result of the research will be retained for at least 5 years in secure storage. Any personal information held on the participants for example consent forms may be destroyed at the completion of the research even though the data derived from the research will, in most cases, be kept for much longer or possibly indefinitely.

No participant will be identified in published work.

The results of the project may be published and will be available in the University of Otago Library (Dunedin, New Zealand) and no personal identifiable material will be published.

Can Participants Change their Mind and Withdraw from the Project?

You may withdraw from participation in the project at any time prior to the anonymisation of audio data without any disadvantage to yourself of any kind. After this point any data will be unidentifiable.

What if Participants have any Questions?

If you have any questions about our project, either now or in the future, please feel free to contact either:-

John Hewitt Canterbury District Health Board john.hewitt@cdhb.health.nz

or

Dr Beverly Burrell Centre for Post Graduate Nursing studies beverly.burrell@otago.ac.nz
This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph +643 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
Appendix 3. Participant consent form

[Reference Number: 17/186]

Nurses' perception of using handheld devices at the point of care; examining perceptions of whether the use of handheld devices aids and facilitates the performance of nursing care.

CONSENT FORM FOR PARTICIPANTS

I have read the Information Sheet concerning this project and understand what it is about. All my questions have been answered to my satisfaction. I understand that I am free to request further information at any stage. I know that:

1. My participation in the project is entirely voluntary;

2. I am free to withdraw from the project before its completion.

3. Personal identifying information may be destroyed at the conclusion of the project but any raw data on which the results of the project depend will be retained in secure storage for at least five years;

4. This project involves an open-questioning technique in alignment to the title of the research and as explained in the information sheet. The precise nature of the questions which will be asked have not been determined in advance but will depend on the way in which the focus group develops. In the event that the line of questioning develops in such a way that I feel hesitant or uncomfortable I may decline to answer any particular question(s) and/or may withdraw from the project without any disadvantage of any kind.

5. Every attempt will be made to preserve my anonymity; authorised persons who will access the data during moderating of the focus group or data analysis will be bound by a confidentiality agreement.

6. The research findings will be available to me should I wish to see them.
I would like to be informed of the research findings

I agree to take part in this project.

............................................................................

(Signature of participant)                      (Date)

............................................................................

(Printed Name)

............................................................................

Name of person taking consent

This study has been approved by the University of Otago Human Ethics Committee. If you have any concerns about the ethical conduct of the research you may contact the Committee through the Human Ethics Committee Administrator (ph +64 3 479 8256 or email gary.witte@otago.ac.nz). Any issues you raise will be treated in confidence and investigated and you will be informed of the outcome.
## Appendix 4 Theme development

<table>
<thead>
<tr>
<th>Codes</th>
<th>Subthemes</th>
<th>Major themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apologising for the machine</td>
<td>The Device</td>
<td>Rage against the machine</td>
</tr>
<tr>
<td>App switching</td>
<td>Getting it to work</td>
<td></td>
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<tr>
<td>Battery life</td>
<td>Workflow disruption</td>
<td></td>
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<tr>
<td>Chargers</td>
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<tr>
<td>Complex tasks more difficult</td>
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<tr>
<td>Connectivity</td>
<td></td>
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<tr>
<td>Creates new problems</td>
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<tr>
<td>Device breakages</td>
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<tr>
<td>Device ownership</td>
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<tr>
<td>Device size</td>
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<tr>
<td>Devices enough of them</td>
<td></td>
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<tr>
<td>Does not match clinical workflow</td>
<td></td>
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<tr>
<td>Duplication</td>
<td></td>
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<tr>
<td>Frustration</td>
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<tr>
<td>Hardware failure</td>
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<td>Log issues</td>
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<tr>
<td>New errors</td>
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<tr>
<td>Passwords</td>
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<tr>
<td>Breakage</td>
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<tr>
<td>Can’t see paper</td>
<td></td>
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<tr>
<td>Digital and paper environment</td>
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<tr>
<td>Disaggregation of information</td>
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<tr>
<td>The Device</td>
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<tr>
<td>Getting it to work</td>
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<tr>
<td>Workflow disruption</td>
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<tr>
<td>Fit for purpose</td>
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<td>Infection prevention control issues</td>
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<tr>
<td>Login issues</td>
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<td>New errors</td>
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<td>Repeating work</td>
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<tr>
<td>After hours support</td>
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<tr>
<td>Classroom teaching bad</td>
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<tr>
<td>Needs immediate support</td>
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<tr>
<td>Understanding clinical reality</td>
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<tr>
<td>Don’t need to learn what the information is just how to use it.</td>
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<tr>
<td>Education at right time</td>
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<tr>
<td>Heard to reach people</td>
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<tr>
<td>Involving us in the device selection</td>
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<tr>
<td>Learning peer support</td>
<td></td>
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<tr>
<td>Systems design</td>
<td></td>
<td>With me not to me</td>
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<tr>
<td>Education</td>
<td></td>
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<tr>
<td>Support</td>
<td></td>
<td></td>
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<tr>
<td>With me not to me</td>
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103
<table>
<thead>
<tr>
<th>Continuing support on wards</th>
<th>Alarm fatigue</th>
<th>HHDs as barriers</th>
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<tbody>
<tr>
<td>Not knowing about education</td>
<td>Anxiety at digital affects care</td>
<td>HHDs as assurance</td>
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<td>Nurses teaching and implementing technology</td>
<td>Creates new problems</td>
<td>Not a replacement for a human</td>
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<tr>
<td>Online learning good</td>
<td>New errors</td>
<td>Computer induced stress</td>
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<td>Supported in person in clinical environment</td>
<td>Passwords</td>
<td>The humans in the system</td>
</tr>
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<td>Teacher alongside learner</td>
<td>Where do you put the device?</td>
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<tr>
<td>Understanding the clinical environment</td>
<td>Breakages</td>
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<tr>
<td>Training in normal environment</td>
<td>Hard to reach people</td>
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<tr>
<td>User interface</td>
<td>User interface</td>
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<tr>
<td>With us not to us</td>
<td>Assurance</td>
<td></td>
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<tr>
<td>Intuitive</td>
<td>Barrier to care</td>
<td></td>
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<tr>
<td>Tell us truths not lies</td>
<td>Barrier to eye contact</td>
<td></td>
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<td>Disaggregation of information</td>
<td>Challenging old habits</td>
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<tr>
<td>Not a complete system</td>
<td>Clinical decision-making support</td>
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<tr>
<td>Expectation of nurses to teach Drs</td>
<td>Clinical judgement required</td>
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<td></td>
<td>The machine is the focus not the person</td>
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<td></td>
<td>Communication reducing anxiety</td>
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<td></td>
<td>Empowering patients at point of care</td>
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<td>Feeling rude when using device</td>
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<td>Not trusting the machine</td>
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<td></td>
<td>Values and beliefs</td>
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<td>Not a replacement for a human</td>
<td>I can see clearly now</td>
<td>The information age</td>
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<td>Digital harder</td>
<td>The paper digital divide</td>
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</tr>
<tr>
<td>Disaggregation of information</td>
<td>Interoperability</td>
<td></td>
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<tr>
<td>Information at fingertips</td>
<td>Visibility of information</td>
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<tr>
<td>Instant access to information</td>
<td>Supervision</td>
<td></td>
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<tr>
<td>Not a complete system</td>
<td>Paper is easier</td>
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<td>Paper more convenient</td>
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<td>Seeing information</td>
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<td>Expense</td>
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<td>New errors</td>
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<td>Disaggregation of information</td>
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<td>Clinical decision-making support</td>
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<td>Empowering patients at point of care</td>
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<tr>
<td>Technology makes things easier</td>
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<tr>
<td>Not a replacement for a human</td>
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<tr>
<td>Better than paper</td>
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<tr>
<td>Business as usual</td>
<td></td>
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<tr>
<td>Digital safer</td>
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<tr>
<td>Instant messaging</td>
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<tr>
<td>Instant access to information</td>
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<td>Interoperability</td>
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<td>Legibility</td>
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<td>Seeing information</td>
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<td>Seeing the sick patient</td>
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<td>Visibility</td>
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<tr>
<td>vigilance</td>
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<tr>
<td>Experience of technology makes it easier</td>
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<tr>
<td>Learning to fit device to situations</td>
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<td>More use increase confidence</td>
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<td>Previous exposure to technology</td>
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<td>Thoughtful use of device in interactions.</td>
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<td>Anxiety of change</td>
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<td>Digital not a worry</td>
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<tr>
<td>The age gap</td>
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<tr>
<td>Experience matters</td>
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<tr>
<td>Being prepared</td>
<td></td>
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<tr>
<td>Older people not good at computers</td>
<td>Younger people good at computers</td>
<td>Only known paper</td>
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<tr>
<td>Only known digital</td>
<td>Preconception</td>
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</table>

<table>
<thead>
<tr>
<th>Intuitive</th>
<th>Seeing benefits</th>
<th>Communication reducing anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical decision-making support</td>
<td>Empowering patients at point of care</td>
<td>Technology making things easier</td>
</tr>
<tr>
<td>Trusting the machine</td>
<td>Better than paper</td>
<td>Business as usual</td>
</tr>
<tr>
<td></td>
<td>Experiencing benefit</td>
<td>Finding information</td>
</tr>
<tr>
<td></td>
<td>Information at bedside</td>
<td>Information at fingertips</td>
</tr>
<tr>
<td></td>
<td>Instant access to information</td>
<td>Instant messaging</td>
</tr>
<tr>
<td></td>
<td>Legibility</td>
<td>Improving</td>
</tr>
<tr>
<td>Modern is good</td>
<td>Getting better</td>
<td>Less paper</td>
</tr>
<tr>
<td>Wanting more than there is</td>
<td></td>
<td>More apps / functionality</td>
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<tr>
<td></td>
<td></td>
<td>Wanting more than there is</td>
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<tr>
<td></td>
<td></td>
<td>Excitement at change</td>
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</tbody>
</table>
Appendix 5. Locality approval.

2017 Request for Locality Authorisation Form
(Non-commercial/Non-government/Government Research Projects)

Instructions:

1. Complete the form. ***Only typed applications will be accepted. Please provide detailed answers as the CLHB Locality Authorisation will ONLY be provided for that outlined in this application.

2. Print the form and obtain approval from the Clinical Director and Service Manager of the Host department where the research project will be conducted.

NEW

3. If using the services of Canterbury Health Laboratories and/or Pharmacy for services outside of standard of care please note that signatures are now required or a copy of the quote.

4. The following MUST accompany your Locality Authorisation Form:
   a. IRCCS Approval Letter
   b. CLHB Online Locality Authorisation Request (clhb.researchoffice@otago.ac.nz) where applicable
   c. CLHB Te ‘tahi Waikata: Māori Consultation Letter
   d. Source of funding – eg. contracts, email confirmation, proof of funding document
   e. Please note any additional documentation or evidence may be requested by the Research Office to assist in the processing your application

5. Send the completed locality form along with the required documentation to Research Office, Level 5, University of Otago, Christchurch or send via email to clhb.researchoffice@otago.ac.nz.

6. The Research Office will endeavor to process your locality within 5 working days WHEN ALL THE REQUIRED DOCUMENTATION HAS BEEN RECEIVED.

7. STUDENT RESEARCH. If you are a student, please complete your emails in the “Other parties involved” box. Please ask your supervisor to validate the “Coordinating Investigator (CI)” box and request that they sign the form as CI.

Locality Authorisation Form, March 2017

Research Office (canterbury) 1171 Bealey Avenue, Christchurch 8013, New Zealand 03 375 5000. Otago Mail Centre, Christchurch 3110, New Zealand. Tel: 03 479 7000. Fax: 03 479 7010. www.otago.ac.nz/christchurch/research
2. Project Details

   Project

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   ry  ject  copy  from  question

   development,  ity  p  proj

www.orage.gr.na/christchurch/research
1. **CDHB Principal Investigator (PI)**: John Hewitt  
   **Email**: John.hewitt@cdhb.health.nz

2. **CDHB Contact Person**: John Hewitt  
   **Email**: John.hewitt@cdhb.health.nz

3. **Coordinating Investigator (CI) and Organisation**: Dr Beverly Burrell, Centre for Postgraduate Nursing Studies (CPGNS), University of Otago, Christchurch Campus  
   **Email**: beverley.burrell@otago.ac.nz

4. **Contact Person**:  
   **Email**: 

5. **Other parties involved (e.g. Sponsors, Collaborators, other Sites)**:

2.1 **Research Office ID**: RO# 17253

2.2 **Project Title/Protocol Number**: 
   Nurses’ perceptions of using tablet computers at the point of care; examining perceptions of whether the use of handheld devices aids and facilitates the performance of nursing care

2.3 **Project timeline** *(If applicable, project start and end dates should be consistent with HDEC answer a.1.4)*
   - **Project start date**: January 2018
   - **Recruitment start**: March 2018
   - **Recruitment end**: April 2018
   - **Project end**: 

2.4 **Brief Summary of the Overall Project** *(If applicable, a.1.5 in the box below)*
   The aim of this research is to investigate the nurses’ perception of using handheld devices (iPad type tablet computers) and whether the use of handheld devices at the point of care has a perceived effect on the nurses’ performance of nursing care.

   This study population will be nurses from general wards in a tertiary hospital. Inclusion will be RNs who use mobile devices at the point of care for documentation.

   Focus groups will be used as a method of obtaining narratives from 2 groups, one of expert nurses and one of beginner nurses. The questions will be informed from a sociotechnical model of examining health IT systems. The narratives will be examined using Qualitative research methodology, specifically using the qualitative descriptive approach described by Sandelowski.
The themes of the narrative will then be examined and presented to further increase the nursing knowledge concerned with the effects.
2.5 Describe the methods/ procedures that will occur within CDHR (tests that local guidelines will likely cover)

Relevant Nurses will be recruited to join from groups that will be carried out on CDHR premises.

2.6 Outline which of those procedures in 2.4 above fall within standard of care.

N/A

2.7 Outline which of those procedures in 2.4 above fall outside standard of care. (If applicable, copy answer from Q2C question 11)

N/A

2.8 Are you using the services of Canterbury Health Laboratories (including within standard of care)?

NO

If YES, please:
1. Attach a copy of the quote for services,
   OR
2. Obtain the signature of Kirsten Heynen, General Manager of CHL (Table 5).

2.9 Are you using the services of Pharmacy outside of standard of care?

NO

If YES, please:
1. Attach a copy of the quote for services,
   OR
2. Obtain the signature of Paul Barnett, Pharmacy Manager (Table 5).
3. CDHB Resources Used

3.1 CDHB Participants - Please outline the recruitment process and number of participants required from below.

The study will be identified through the existing direct health encounters, and indirect through social media. Information will be gathered to determine the recruitment, and the selected methods. The tasks on the page will provide specific instructions on participant information sheet, consent form, and an email address for further information as required. An online recruitment source will be used. The project for Internet site and further research individual's primary patient participants will be invited to contact the researcher via email.

3.2 Access to CDHB Patient Data - Please specify data source (e.g., HealthOne, HealthConnect, HealthOne Patient registry, Tissue Bank, samples, data warehouse, imaging, Clinical records)

N/A

3.3 CDHB Staff - Please outline key CDHB staff, and their specific tasks for this project

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
<th>Role in the Project</th>
<th>Key Tasks</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

3.4 CDHB Facilities (list specific location/s and department/s where the project will be conducted e.g., Burnwood Orthopaedic Dept.)

<table>
<thead>
<tr>
<th>Location / Department</th>
<th>Methods / Procedures at this Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christchurch campus Med/Surg, Tissue Bank</td>
<td>Recruitment of nursing staff only.</td>
</tr>
<tr>
<td>1</td>
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3.5 Other Resources Required - please specify

Last edited Australian firms, March 2018
4. Evidence Required – The following should be sent along with the completed locality authorisation form:

4.1 Ethical Approval or “Out of Scope” Letter

a. If the project is “outside ethics review,” then CI/PI should sign and date.

b. If the project has been approved by HDEC, please ensure to request locally on line via the HDEC website. You will need to type in our email address cdbh.researchoffice@otago.ac.nz

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<tr>
<th>Reference Number</th>
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<td>HDEC</td>
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<td>HDEC – Out of scope</td>
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<td>Institutional approval</td>
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<td>Not required:</td>
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4.2 Local Māori Consultation from Te Kāmātai Whakareo:

- Date of letter received: 24/03/2018

4.3 Funding: If any procedures have been outlined in Question 2.7, please detail how costs will be covered (attach proof of funding document e.g., contract, confirmation letter/email).

N/A – study is part of a postgraduate research for a Master degree.

4.4 Proof of Indemnity for CI or PI

Is your role in this project within your CDB and UGC employment capacity? Yes

If NO, please attach proof of professional indemnity insurance from your Institution/Organization.
5. Approval From All Areas Where Resources are Access

Approval: I hereby authorise this application to undertake the research within this CDHB Department and guarantee the availability of adequate facilities, equipment, staff and any special support which may be required as detailed in the application. I confirm that it is in accordance with current CDHB policy.

Department name: 1.  2.  3.

Executive Director of Nursing: [Signature]

Date: [Signature]

Director of Nursing: [Signature]

Date: [Signature]

Other Approving Manager: [Name]

Title: [Signature]

Date: [Signature]

RESEARCH OFFICE TO FACILITATE APPROVAL FROM CDHB GENERAL MANAGER/S

General Manager sign-off:

This research will take place in your hospital, do you approve it?

Pauline Clark
General Manager

Hospital 1
Name: Pauline Clarke
Signature: [Signature]
Date: [Signature]

Hospital 2
Name: [Signature]
Signature: [Signature]
Date: [Signature]
03 October 2017

John Hewitt
129A Mayland Street
Sumner
Christchurch

Dear John

Research Proposal: Master of Health Sciences (Nursing - Clinical)

Thank you for submitting your research proposal. The Research Proposal Review Panel is pleased to approve your research proposal and supervisory arrangements as follows:

Title: "Nurses' perception of using handheld devices at the point of care"
Supervisors:  Primary Supervisor: Dr Beverley Burrell
Second Supervisor: Dr Philippa Seaton

The reviewers thank you for addressing the points raised – you have made the required amendments and present an effective research proposal. The reviewers wish you well with the development of this project.

Memorandum of Understanding for Supervision

We strongly encourage you to develop a formal Memorandum of Understanding with your supervisors outlining the supervisory relationship and responsibilities so that expectations are clear and documented for all parties. A template Memorandum is enclosed for your use. Please feel free to modify it to suit your individual situation.

Ethical approval

You are reminded that your research cannot begin until ethical approval, where appropriate, has been granted. Once granted, a copy of the Ethics Approval must be sent to your Programme Administrator, to be filed along with your research proposal.

I wish you all the best with your studies.

Yours sincerely,

Amanda Clifford
Postgraduate Administrator

cc Beverley Burrell, Philippa Seaton, Ruth Hefins, Linda Munro-Ianes
24th January 2018

John Hewitt
Corporate: Quality and Patient Safety
Level 1; 32 Oxford Tce
Christchurch

RE: Nurses’ perceptions of using tablet computers at the point of care; examining perceptions of whether the use of handheld devices aids and facilitates the performance of nursing care

Tēna koe John,

Ka nui te mihi tēnei ki a koe me tou roopo o nga Kairapūkōrero ki te hapai o te kaupapa whakahirahira mou, moku mo tātou kataua. Ko Rapunga Korero te mea nui. No reira tēna koe me te roopo o nga Kairangahau, tēna koutou kataua.

Thank you for submitting the above research proposal to Te Komiti Whakarite, the Canterbury DHB Māori Health Research committee for Māori consultation.

We have read your proposal, which you are undertaking as a research paper for your Master’s, through the University of Otago.

We note that you are not collecting ethnicity data. Ethnicity data is a key variable for understanding the health experiences and priorities of different population groups that can lead to the development of more effective policies and programmes.

Ultimately this type of research has the potential to reduce the health disparities between Māori and non-Māori.

We are happy to offer our support regarding any further culturally responsive practice and guidance you may seek advice on.

We wish you every success in your research and the Komiti would appreciate a summary of your findings on completion of the current project.

I hope this letter will suffice in terms of the application. Please contact me should you need any other information that may not have been included in the letter relevant to your research.

Heoi ano

Eru Waiti
Chairperson
Te Komiti Whakarite
Appendix 8. Transcription confidentiality form.

Transcription Typist Confidentiality Agreement

Project Title:
Researcher/s:
Contact Person:
Address:

Phone Number:  Email:

I__________________________ of ____________________________ agree to transcribe *ad verbatim* research data from audiotapes from the above named research project. I agree to maintain complete confidentiality in regard to anything I may hear or read in connection with this research.

All tapes, digital files, and paper copy of this information will be kept in a secure place while in my possession for the purposes of transcription. All the aforementioned material will be returned to the researcher on completion of each transcription and any information on the computer hard drive will be erased.

I understand this confidentiality agreement is binding both now and in the future.

Signed ______________________________ (Typist)

Date ________________________________

Signed ______________________________ (Researcher)

Date ________________________________