THE PROCESS OF NURSES' ADOPTION OF THE ELECTRONIC HEALTH RECORD

by

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Abstract

The electronic health record (EHR) is being introduced on some nursing units. The process of nurses’ adoption of the EHR into practice is not well understood. The purpose of this grounded theory study was to gain further understanding of this adoption process, to identify the factors that influenced the adoption process, and the factors that influenced the learning experience.

Semi-structured audio taped interviews were conducted with six nurses representing some variation in their level of technology adoption and the level of technology of the unit where they worked. Using the constant comparative method of data analysis, data was collected and analyzed simultaneously. Memos were used to assist in the development of the stages and phases identified in the analysis process.

Findings revealed a three-staged process that involved “getting started”, “getting comfortable with the computer system”, and “establishing a pattern”. “Getting started” included the nurses’ receiving EHR training. “Getting comfortable with the computer system” involved learning how to access and use the EHR. “Establishing a pattern” involved choosing how they would access patient information.

Individual, technical, and organizational factors seemed to influence the adoption process. Individual factors included the nurses’ age and role, their educational preparedness, and their motivation to use the EHR; technical factors included the nurse’s computer skill level, their use of the pre-existing computer system, and the availability of the EHR program; and organization factors included the nursing units’ general response to change, the availability of time to practice, the availability and nature of support, and the organization’s method of communication and implementation of the EHR appeared to influence the adoption process. Training geared to the learner’s level, their computer skill level, their level of fear and anxiety, their sense of information overload, and the make-up of the training class related to computer skill mix influenced the learning experience.

Although there are limitations in the study because more depth and variation in sampling is needed, the findings can add to our understanding of the adoption process of the EHR and factors that influenced that process. These findings suggest implications for education, practice, administration and research.
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CHAPTER ONE: INTRODUCTION

Background and Problem

Although computers have been utilized for many years within the healthcare setting in ancillary departments such as finance, laboratory, and radiology, information technology (IT) is only now being introduced in the clinical departments. As the introduction of computers and IT continues in the clinical settings, nurses face the challenge of adopting and accepting these technologies into clinical practice. Nursing information management systems, staff scheduling applications, and electronic health record applications are currently being deployed in nursing units across the country (Hannah, Ball & Edwards, 1999; Staggers, Thompson & Snyder-Halpern, 2001).

Ancillary hospital departments have adopted and integrated IT into departmental practices. Financial departments have integrated computer technology into the business practices. Financial information is collected from a variety of sources, collated into a common financial database, and sent to other external financial systems (Hannah et al., 1999). Radiology departments have also integrated IT into practice. Radiological images are now viewed, interpreted, reported, and stored digitally through the utilization of IT. This IT adoption and use have transformed the business process of these departments (Ball, Hannah & Douglas, 2000).

Based on a master patient indexing system, the electronic health record (EHR) facilitates the storage and retrieval of patient-specific data across a patient's episodes of care, and integrates the information into one virtual patient record (Hannah et al., 1999; Staggers et al., 2001). The EHR is a structured means for entering patient information. This structured information is part of the field of nursing informatics (NI). NI's focus has moved away from mere computer use, and is concerned with information, information management, and the nursing profession in general (Hannah et al., 1999). NI is a nursing specialty that "integrates nursing science, computer science, and information science to manage and communicate data, information, and knowledge in nursing practice" in order to support nurses in their decision-making process through the use of information structures, processes and technology, thus supporting patient care (Staggers & Thompson, 2002, p. 260). With the implementation of an EHR, nurses are being introduced to IT, as well as NI. The ability of nurses to adopt the EHR into practice requires nurses to adopt IT, thereby adopting one aspect of NI.
Addressing change management has been cited as a method to facilitate nurses' adoption of IT. MacDonald and Muir (1996) identify that addressing change management issues associated with IT implementation enhances nurses' adoption of IT. Doyle and Kowba (1997) equate the implementation of IT to nurses on a nursing unit to personal loss and grief. Acknowledgement of the grieving process enhances a successful implementation of IT and subsequent adoption of the IT by nurses.

Charles (2000) discusses the dissemination of technological innovations as part of Rogers' Diffusion of Innovation Theory (Rogers, 1983) and identifies that dissemination of technological innovations must be situated within the larger framework of the innovation diffusion model in order to achieve success. Barr (2002) suggests that the success of EHR implementation can be maximized if the innovation and diffusion model (Rogers) is used.

Research has revealed that factors such as age, knowledge, skill, attitude, and motivation influence nurses' acceptance, utilization, and adoption of IT in general (Hillan, McGuire & Cooper, 1998; Hobbs, 2002; Jayasuriya & Caputi, 1996; Kim & Kim, 1996; MacDonald & Muir, 1996; McBride & Nagle, 1996; Romano, 1995; Russell & Alpay, 2000; Saranto, 1998; Saranto, Leino-Kilpi & Isoaho, 1997; Simpson & Kenrick, 1997). Nurses in highly technical clinical settings indicate that the mastery of IT is just one aspect of critical care nursing practice (Little, 1997). Knowledge, attitude, and computer skills influence the use of an EHR (Liu, Pothiban, Lu & Khamphonsiri, 2000; Marasovic, Kenney, Elliott & Sindhuseke, 1997; Miller & Jeffcote, 1997; Royle et al., 2000).

Innovative training strategies have been proposed to maximize the potential for nurses to adopt IT into practice. Yee (2002) identifies that inexperienced nurses would benefit from general IT education and training, while experienced nurses would benefit from work-related IT application training. A four-tiered training method has been developed and utilized in the training of nurses in IT (McGuire & Stoddart, 1996; Royle et al., 2000; Slaney & Hitchins, 1993). This training method addresses cultural changes, basic computer awareness, change management issues, and application training for end-users, but has not been evaluated.

The Vancouver Island Health Authority (VIHA) embarked on the implementation of an enterprise-wide hospital information system replacing departmental stand-alone patient databases with several applications that utilize a common relational database.
The VYSTA Project was formed to implement this system. The VYSTA Project is a multi-phase, multi-year project, which began in 2000 and is planned to continue to the middle of 2006. The centrality of the patient within IT is the underlying vision of the project. The vision of the project is a portrait of the patient as a whole – the vista of the patient, but since the name “VISTA” is an acronym for the Victoria Innovative Senior’s Treatment Approach, the project name became known as “VYSTA”. VYSTA is not an acronym, but a play-on-words that represents the vista of the patient.

The enterprise-wide hospital information system being introduced at VIHA is composed of the following applications: patient management, pharmacy, patient scheduling, radiology, transcription, laboratory, emergency tracking and triage, and clinical representing the foundation of the EHR. The suite of products operates from a master patient indexing system and stores patient data in a large relational database, permitting multiple access points with minimal duplication. The pharmacy application was the first application to be deployed in 2001. The introduction of the clinical application began in the fall of 2001 and continues today. The EHR, known as PowerChart® (PowerChart is a registered trademark of the Cerner Corporation, 2004) is currently a view-only tool to view laboratory results, radiology results, transcribed documents, patient encounters, radiology and outpatient clinic orders, and the electronic emergency triage. All current encounter and clinical information such as lab results, and the triage record that are viewable in PowerChart are also available in the patient’s paper chart. To date, the patient’s officially recognized health record is the paper chart.

Prior to the implementation of PowerChart, all unit clerks and some nurses utilized the pre-existing nursing information system to obtain laboratory results and radiology reports for patients. This information system is known as the Nursing On-line Results and Messenger (NORM). NORM is a Disk Operational System computer application (rather than a Windows based application) that was available to most nursing units in VIHA. Although most nurses were initially trained to use NORM, many did not remember their passwords and relied on other healthcare providers for the retrieval of clinical information related to a patient (VYSTA, 2001).

A problem facing the VIHA clinical application team was the training of healthcare providers in a Windows-based application with a method that minimizes impact to staffing, and maximizes training resources and computer usage. This was accomplished through sequential computer application deployment to individual nursing
units throughout the VIHA healthcare facilities, which included two community hospitals, four long-term care facilities, a large mental health facility, two acute care facilities, and the community (see Appendix A for information on training and implementation). Although a four-tiered training method has been developed, the use of this training model was not possible due to the financial constraints of the VYSTA project. As such, EHR computer application training was accomplished through a four-hour paid training session for nurses. This method of training was chosen as nursing units could replace two staff members for training with one casual nursing staff, thus lessening the impact of training on nursing units.

The VYSTA clinical implementation team members identified varied usage and adoption of the EHR by nurses throughout VIHA. As the clinical application support individual on the VYSTA clinical implementation team, the investigator can confirm these findings. There were nurses who rely mostly on the EHR for viewing patient information, there were nurses who use both the EHR and the paper chart to view patient information, and there were nurses who have not utilized the EHR for patient information, relying solely on the paper chart. This was how the investigator’s interest in the topic of the adoption of the EHR by nurses began.

The successes and barriers of IT and EHR implementation have been documented for nurses, including educational plans to capitalize on a successful implementation. Despite this current knowledge regarding the nursing profession and the impact of training and implementations of the EHR and IT, little has been documented about the process that nurses use when adopting the EHR into their nursing practice.

The effect of IT implementation and EHR adoption in nursing practice can be deduced from the literature. Critical care nurses identify that the mastery of technology is an essential aspect of becoming a competent critical care nurse, and that technology competency is just one aspect of nursing practice within the critical care environment (Little, 1997). Characteristics of individual nurses can be used as predictors of adoption of new technology. Romano (1995) identifies that perception, namely the perception that individual nurses view the technology as advantageous, is just one indicator affecting the adoption of technology by nurses. Romano examines twelve indicators grouped into the three categories of individual predictors, organizational predictors, and technology predictors. All twelve indicators in the three predictor groupings are
significant facilitators of nurses' adoption of a technology (Romano). Kim and Kim (1996) identify that self-efficacy is an indicator of technology adoption. Miller and Jeffcote (1997) identify that despite individuals' believing that they are inadequately prepared for computer technology, they possess a positive attitude towards computer technology.

As there is little documented on the actual process of how nurses adopt the EHR into practice and factors that influence that, there is a need to gain further knowledge related to this phenomenon.

Purpose of the Study

The purpose of this study was to gain further understanding about how nurses adopt information technology into practice, particularly the technology aspect of the EHR. Furthermore, the goal was to describe the challenges they face and the factors that facilitated and hindered their adoption of the EHR into their practice.

Research Questions

The research questions addressed in this study included the following.

1. What is the process that nurses move through to adopt the EHR into their nursing practice?
2. What specific factors influence the process of the adoption of the EHR into nursing practice?
3. What aspects of the learning experience do nurses identify as being helpful in adopting the EHR?
4. What aspects of the learning experience are hindrances?

Significance of the Study

Healthcare departments have been using IT in their practice for decades and have revolutionized their practice because of the availability and power of IT. Nurses are facing the introduction of the EHR and other computer technologies (Hannah et al., 1999; Staggers et al., 2001). Today, VIHA nurses are facing the introduction of a Windows-based EHR in their practice. Although the VYSTA clinical application team has trained a majority of nurses in the Southern Island area, nurses' adoption of the
EHR has been varied.

The findings from this study could provide a better foundation of knowledge to assist in the possible redevelopment of EHR computer training programs for the further deployment of the EHR within VIHA. The findings of this study could assist in the identification of gaps in EHR training to date and could assist nurse educators, nurse managers, and information system departments in gaining further insight into the adoption of the EHR by nurses. Knowledge and insight into the adoption process of the EHR into practice will increase the success of the introduction of the EHR within VIHA.

Outline of the Thesis

This thesis is a report of the research focusing on how nurses adopt technology into practice. Chapter One introduced and detailed the research problem, as well as the purpose of this research. Chapter One concluded with identification of the research questions that have guided the research and the significance of the study. Chapter Two will include a review of the pertinent literature in an attempt to understand the current knowledge base in relation to nurses and IT, specifically the EHR.

In Chapter Three, the research method will be outlined. The documentation of the methods of participant sampling, data collection, data analysis, rigor, and ethical aspects of the research will be included in this chapter. Chapter Four will present the findings according to the data analysis. Chapter Five will include a discussion of the findings. Chapter Six will include a summary of the research, limitations, conclusions, and implications of the research related to nursing education, practice, and research.
Current knowledge of nursing informatics (NI), computer information technology (IT), and the electronic health record (EHR) integration by nurses is important in order to identify the gaps in knowledge, determine the appropriate research methodology, and provide a foundation to guide the research. The history of computers in healthcare and the evolution of the EHR will be explored in this literature review, followed by the field of NI. This will be followed by information about the electronic health record. A review of the information regarding nurses' attitudes towards computers will be presented. Finally, information relating to change theory and technology integration will be presented.

History of Computers in Healthcare

Although the introduction of computers and IT has been fairly new to nursing practice, the healthcare industry has been using IT in their business processes for years (Staggers et al., 2001). In an attempt to identify patterns, strengths, and issues related to the introduction of the EHR into nursing practice, a review of the history of computers in healthcare will be presented in this section.

The business industry began using computers in the 1950's. As computer technology and IT developed further, industry and business readily integrated computers and IT into their processes. The computer capability and applicability of the first few generations of computer technology were not well suited for the complex needs of the hospitals, and few hospitals had the punch card technology required to operate them. In the 1950's, a few hospitals installed computers and began to develop software applications. A feasibility study conducted in the late 1950's, reported that hospital-wide computer applications were required for financial, business, and medical applications with terminals disseminated throughout nursing units and departments. These hospital-wide computer applications were termed hospital information systems (HIS) (Hannah et al., 1999).

Healthcare providers began to investigate the use of computer technologies to address patient care needs during the 1960's and 1970's as a result of the lower cost of these technologies. The focus of the computer technology was on the development of HIS and decision support tools (Staggers et al., 2001).
Some larger hospitals implemented accounting information systems to manage the increasing demands of the regulatory agencies as a result of the passage of Medicare and Medicaid legislation in the 1960's. Shared accounting data-processing centres began to surface to meet the data-processing needs of smaller hospitals, as it was difficult to justify, train, and maintain the highly skilled individuals to maintain in-house systems. In that same era, attempts were made to develop applications that would meet the clinical needs. However, many of these attempts failed due to the unreliability and expense of the equipment needed for clinical applications in the clinical areas (Hannah et al., 1999).

In the 1970’s, the hospitals that were successful in implementing in-house accounting systems began to use the shared data-processing centres due to inflation problems. The shared data-processing centres gained expertise in meeting the accounting needs of the hospitals and increased their service to meet the clinical and communication requirements of the hospital. As the microcomputer increased in popularity, these service companies developed on-site networking systems to meet the non-financial needs of the hospitals (Hannah et al., 1999).

Although computers and information technologies have been in use in the business industry since the 1950’s, the healthcare industry was slower to integrate IT into their processes. Accounting functionality was the initial focus of the use of computers in healthcare, but the need to integrate patient care information with accounting information was identified. The early computer technology was not reliable enough for the development of clinical applications, and the expertise to maintain the financial systems moved to data-processing centers (Hannah et al., 1999). Since the use of computers in healthcare has lagged behind other industries, the use and adoption of computers and IT by nurses may not be well established as in other areas. Thus the need to gain further understanding of the impact of IT on nurses is required.

**Nursing Informatics**

To gain a deeper understanding of how nurses adopt the EHR into practice, a review of the literature related to NI was undertaken. A definition of NI, as well as the relationship between data, the EHR, and nurses will be presented in this section.

With the increasing introduction of information technologies that affects nursing, the field of NI emerged. NI encompassed any information technology used by nursing
in the delivery of patient care, administration, or education (Ball et al., 2000). By 1992, the American Nurses Association recognized NI as a new specialty field in nursing (Meadows, 2002). During the evolution of this new specialty, many definitions of NI have been developed and used as a method to shape and define the specialty. Staggers and Thompson (2002) defined NI as "a specialty that integrates nursing science, computer science, and information science to manage and communicate data, information, and knowledge in nursing practice. Nursing informatics facilitates the integration of data, information, and knowledge to support patients, nurses, and other providers in their decision-making in all roles and settings. This support is accomplished through the use of information structures, information processes, and information technology" (p. 260).

The core of NI was nursing information, knowledge, and nursing data (Lange, 1997). Without standard methods for collecting and reporting data, valued nursing information could be lost (Ball et al., 2000). Data in the IT environment can be collated, stored, and used for analysis if the data were standardized. One goal of NI with regards to data standardization, or data sets, was to establish national nursing data sets and standards, thus enabling nurses across Canada to collect, record, and report on nursing care provided to clients (Ball et al.). Establishing common language within a healthcare facility would enable nurses and other healthcare providers to understand the nursing care provided to patients. These data sets were supported with the EHR. Data can be collected and presented to clinicians through IT and the EHR. The EHR was then the conduit for the storage of patient information and the IT was the mode of collection and transmission. Nurses' relationship with the patient, the data, and the computer technology was paramount to the adoption of an EHR.

The Electronic Health Record

To understand the process of the adoption of the EHR into practice, an understanding of the EHR is required. In this section, the evolution of the EHR will be presented, followed by information regarding the EHR.

_Evolution of the Electronic Health Record_

Some hospitals were successful in developing forms of clinical information systems used in the laboratory, but few attempts were made to integrate the accounting computer systems with these stand-alone departmental systems (Hannah et al., 1999).
The development of computer applications for clinical nursing areas began in the 1960's. With Lockheed Missiles and Space Company as a partner, the El Camino Hospital in California started the development of the Medical Information System. This HIS was implemented in a patient care area in 1971. Other hospitals were developing individual versions of HIS during the late 1960's. These hospitals were Massachusetts General Hospital; Latter-day Saints Hospital in Salt Lake City, UT; Duke University Hospital in Durham, NC, and the National Institutes of Health Clinical Center in Bethesda, MD (Staggers et al., 2001).

In the 1980's, Canadian hospitals began to develop and implement computer applications for patient care. York Central Hospital in Ontario was successful in the development and implementation of a patient care computerized system. Calgary General Hospital was also successful in implementing an HIS that included an electronic patient care portion. These projects included representation from nursing in the development, coding, implementation, and management of these computerized patient care systems (Hannah et al., 1999).

In the late 1980's, HIS with the inclusion of nursing documentation, care planning, and other functions beneficial to nurses were being developed and marketed. Despite the success of these early HIS, fiscal restraints limited the development and support for use in clinical settings. Institutional support for applications useful to nurses was not consistent. The focus of many executives during that era was financial reimbursement. Billing computer applications were implemented prior to clinical computer applications, as care computer applications were not viewed as a priority. There were several HIS with no nursing modules (Staggers et al., 2001). However, by the 1990's, hospitals were moving from departmental data to patient-focused, integrated data as a result of the increased availability of powerful, affordable personal computers and the advancement of information management tools (Hannah et al., 1999).

Understanding the Electronic Health Record

An understanding of the health record was required to begin to understand the EHR. A health record was described as a collection of patient-specific data. It was an archive of information composed of diagnostic discoveries, care provided, and observations. The health record was described as a collection of discrete data elements stored in a uniform manner that could be retrieved (Hovenga, 2001). The origins of the health record dated back to the 1800's, when the healthcare industry was
a charitable cause that cared for the sick. During that time, healthcare providers documented care provided in a health record of patients. There was no need to share patient information among different providers or healthcare settings. Although Medicare and Medicaid legislation revolutionized healthcare reimbursement for services provided, the health record remained paper-based and provider-centred (Stagger et al., 2001).

The newly organized managed healthcare networks required an EHR for the delivery of cost-effective, comprehensive care. The EHR was a recommendation of the Institute of Medicine in an attempt to support the change in delivery of healthcare (Dick & Steen, 1991). The Institute of Medicine recommended that the EHR be a longitudinal patient record spanning the life of a patient that captured all patient data from any healthcare encounter throughout the managed care network. The EHR would manage and integrate patient-focused data across the continuum of care. This vision of managed clinical data focused on patient-centred care, and addressed the needs of the increasingly important interdisciplinary approach to healthcare delivery (Harsanyi et al., 2000; Staggers et al., 2001).

There were three different types of computerized information systems used in the healthcare environment. The first type of information system was a stand-alone system with a specific purpose and function, which addressed a single aspect of care. Nursing workload measurement systems, dedicated laboratory systems, and public health immunization systems were examples of stand-alone systems. The second type of information system was a hospital information system, generally composed of a financial component, a clinical component, and a communication network. The third type of information system was an enterprise hospital information system, which captured and stored patient information across the life of the patient. The data could be stored centrally or locally in an electronic format and could be assembled and presented in different formats to meet care requirements. The goal of the hospital information system was to maintain the operational requirements of the healthcare facility. The enterprise hospital information system was patient-focused, comprehensive, and integrated (Hannah et al., 1999).

The EHR was not just the computerization of a paper health record. A replica of the paper health record would also replicate the problems and limitations associated with the paper-based system (Stephens & Mason, 1999). In creating a solution to a paper-based method of recording, a hospital in Southern California developed an
electronic system based on the three components of the delivery of care; the care provider, data integration, and data organization. The caregiver collected and entered data into the system. The integrated nature of the system permitted the collation of data and processes into a whole, such as associating billing with data collection, and enabled the system to utilize one piece of data in multiple areas to meet the documentation needs of various healthcare providers. Integration also permitted the collation of both the data and the processes from multiple sources and the presentation of the data in an organized manner to the different clinicians. The associated smart system suggested diagnosis and planning for abnormal findings. That type of system reduced duplicate data entry, provided concise care planning, and increased efficiency with regards to meeting the medico-legal aspects of care. A comprehensive patient database was created with the integration of clinical data and financial data (Stephens & Mason). Dehn (2002) described the EHR as being capable of collating data from multiple sources, which reflected Stephens and Mason’s view.

In Britain, the National Health Service (NHS) referred to the EHR as a record of a patient’s healthcare history from birth to death (Griew & Currell, 2000). The vision of the NHS Information Strategy for the EHR was a central computerized record composed of periodic patient care from four electronic patient records databases. The databases included the Mental Health Services Electronic Patient Record (EPR), the Hospital-based EPR, the Community Services EPR, and the Social Care Records. Griew and Currell questioned the exclusion of episodic care provided by General Practitioners, as the information from that group represented a component of patient care. In order to determine the structure and content of any EHR, the intended functions needed to be explicit. The biases and opinions of all intended users needed to be considered in determining the structure and content of the EHR (Griew & Currell).

Paper forms and care plans could be difficult to read, making collation of data into various formats difficult. Documentation of care provided usually occurred at the end of the shift, which increased the reliance on the healthcare providers' memory of data. The EHR attempted to address these issues. Since the information was electronic, legibility was improved, and the mobility of computer devices aided data accuracy by facilitating point of care documentation. With the EHR, users could be presented with previously charted data, which would also increase the accuracy of data as trends and changes in the patient's status could be easily viewed (Triplett, 2002).
Lack of patient information was a major source of frustration for providers of care. Information necessary to provide safe and appropriate care may not have always been readily available with the current paper-based health record. The paper chart was usually not available at the point of care, or may have been in use by another healthcare provider. With the EHR, past information was easily accessible by healthcare providers at the point of care. The EHR also provided the opportunity for decision support guides, evidence-based clinical information, and consensus-driven care guidelines to be available at the point of care. The EHR was available for clinicians in various care settings in order to have the appropriate information available to make informed clinical decisions (Wallace, 2001). The EHR was not just an electronic chart, but also a powerful data management database, was capable of processing, storing, retrieving, and analyzing patient data, provided decision support, permitted the generation of reports, and supported research (McCartney, 2000).

The patient-focused EHR was based on the foundation of a master patient indexing system. The system assigned a unique standard number and other standardizing data elements for each patient, which facilitated data retrieval and access across all care episodes (Staggers et al., 2001). The requirements of a patient-centered EHR included the ability to have all patient-related information accessible at various locations, as well as the ability to have patient information available at all times. Although the data may have been stored in various locations, the data was integrated into one virtual patient record (Hannah et al., 1999). Thiru, de Lusignan, and Hague (1999) stated that an EHR could be composed of both medical and non-medical information including decision support applications, which increased clinicians' diagnostic capabilities, interventional choices, and decisions. Transmission of electronic data was accomplished through the ability of the EHR to store digital images, unlike paper-based patient records (Bowles, 1997; Thiru et al.).

The review of the literature in relation to the EHR demonstrated that the development of the EHR was a slow and fairly recent process. Due to limited resources, clinical aspects of the EHR were not well developed or supported. The benefits of the EHR indicated that patient care could be improved and streamlined with the EHR, by the increased availability of patient information at the point of care. Although it has been recognized that patient care can be improved with the increased availability of information at the point of care, further understanding about the impact of
the EHR on nursing practice is required. The need to understand the process of adopting the EHR by nurses is important now, more than ever.

Factors that Influence Nurses' Adoption of Technology

Factors that have been identified as influencing nurses' adoption of technology will be described including the nurses' level of nursing competencies, their age and maturity, and other predictors of adopting an innovation.

*Nursing Competencies and Technology*

An exploration of the current knowledge regarding nurses and computers in general is required to better understand some of the factors that relate to computer technology adoption by nurses. Nurses' computer competencies include their knowledge, attitudes, and beliefs about the technology and its application. These factors have been found to influence the acceptance and subsequent computer integration in nursing practice (Registered Nurses Association of British Columbia, 2003).

In a phenomenological study that examined students' views related to post-basic critical care education, participants indicated that acquiring competency in managing the technological aspect of a critical care environment was part of becoming proficient in caring for critically ill patients (Little, 1997). An essential theme was the importance of nurses' mastery of technological competencies in order to make sense of their nursing world. Through familiarization and repeat exposures, nurses' anxiety decreased as their confidence increased. The nurses' comfort level with technology was transformed after repeated exposure to technology. In highly technical areas such as critical care units, technological competence was identified as just one component that comprised competent nursing practice. However, nurses identified that technological competence was a major component of becoming competent as a critical care nurse (Little).

Attitude was described as being composed of the constructs of satisfaction, beliefs, and motivation (Marasovic et al., 1997). Nurses with greater satisfaction towards the use of technology also had a greater belief in and motivation for using a clinical information system. Although there was a positive correlation among knowledge, belief, satisfaction, and motivation towards the use of an EHR, the correlation was not statistically significant. Knowledge did not directly influence nurses' attitudes towards a clinical information system (Marasovic et al.), yet Stricklin, Bierer,
and Struk (2003) found that knowledge had a negative affect on nurses' attitudes towards the EHR.

Surprisingly, Murphy, Maynard and Morgan (1994) found that nurses had a greater positive attitude before the implementation of the patient care information system than measured after the implementation, which indicated that the computer system did not meet the nurses' expectations of the system explained that the new computer system required nurses' to spend more time on the computer, taking time away from patient care. They also explained that the lack of interdisciplinary cooperation with the new system caused an increase workload for nurses in that they had to complete more data entry when other disciplines refused to enter the data. This also took time away from patient care. This finding supported the findings of Scarpa, Smeltzer, and Jasion (1992). However, nurses had a positive attitude towards the EHR (Simpson & Kendrick, 1997; Stricklin, et al., 2003).

There did not appear to be any agreement in nurses' attitudes towards computers and the EHR, and may be explained by the tools used to measure attitudes. The Nurses' Attitudes Toward Computerization questionnaire was developed and validated in the mid 1980's (Stronge & Brodt, 1985). Since then, this measurement tool has been used, validated, and modified in other studies (Hobbs, 2002; Jayasuriya & Caputi, 1996; McBride & Nagle, 1996; Scarpa et al., 1992; Simpson & Kenrick, 1997; Thomas, 1990). McBride and Nagle (1996) identified inconsistencies with results using the measurement tool, questioned the ability of the tool to measure the attitudes of nurses towards computers, and suggested that further understanding of nurses' attitudes towards computers was needed. Other measurement tools have been developed and utilized to measure nurses' attitudes towards computers, again without consistent results (Hillan et al., 1998; Marini, 2000; Murphy et al., 1994; Webster et al., 2003).

Nurses were having difficulty keeping up with technological changes in healthcare. These difficulties were related to limited time for formal information technology training and nurses' apprehension towards computers. The outcome of one study identified two groups of nurses in need of targeted knowledge acquisition related to information technology. The experienced nurses required formalized information technology training, while the inexperienced nurses required work-related computer systems training (Yee, 2002).
The introduction and subsequent integration of computer technologies into healthcare practice began with nurses' computer competency. The training of nurses to use and operate a computer was described as one of the largest challenges when implementing an EHR (Miranda, Fields & Lund, 2001). Although nurses identified that time was a factor in minimal computer use, limited computer skills and nursing attitudes were identified as true barriers to computer use among nurses (Royle et al., 2000). Learning new computer skills was equivalent to learning a new competency. For the competent nurse, being a novice in one area of practice was a competency-destroying change that evoked anxiety, stress, and decreased acceptance of the new technology (Anderson & Stafford, 2002).

A factor in achieving computer competency in nursing involved the dedicated time required for training. In the current nursing shortage climate, it was difficult to take nurses away from direct patient care to attend training sessions (Anderson & Stafford, 2002; Bowles, 1997). The workload on the nursing units also prevented nurses from practicing newly learned computer skills. The healthcare facilities shift to cost containment and patient outcomes was beneficial with the implementation of an EHR. As pressure from senior management to meet the goals of cost containment for the healthcare facilities continued, the support of nurses' computer training, and subsequent use of the EHR was a justified cost saving measure in the long term. There are also the pressures of efficiency, effectiveness, and positive patient outcomes that were motivators of nurses gaining computer competencies in preparation for an EHR (Bowles).

The type, quantity, availability, and quality of information technology training also impacted the computer competency of nurses (Russell & Alpay, 2000). Although nurses received basic computer and application training, many found that they lacked the confidence to utilize the computer application. Access to adequate training also limited nurses' ability to use the computer application, relying instead on colleagues for computer training. Lack of financial support and lack of time were two reasons for not attaining computer training. Many nurses received basic nursing education prior to the influx of technology. Russell and Alpay also identified that nurses access to and use of computers was highly dependent on their attitudes towards computers.

In an attempt to identify the predictors of the adoption of an innovation by nurses, Romano (1995) examined the individual, technological, and organizational variables in
relation to nurses' adoption of computer technology. The technological and organizational variables did not significantly contribute to the nurses' adoption of technology. Individual variables were predictors of the adoption of computer technology into nursing practice. Specifically, individual variables such as the perceived advantages of the technology, including the perceived need; the values held by nursing peers; and use of computer technology as a mechanism for communication were significant predictors for nurses to adopt technology. The significance of these findings illustrated that by focusing on these factors, the successful adoption of a computer application could be maximized.

Age and Maturity

Nurses' attitudes, knowledge, and beliefs towards technology have been documented in the recent past, with varied and opposite outcomes. In some studies, younger and inexperienced nurses were shown to have a more positive attitude towards technology (Hillan et al., 1998; Liu et al., 2000; Saranto et al., 1997; Simpson & Kenrick, 1997). Other studies have reported that nurses' attitudes towards technology were not influenced by age, experience, or training (Miller & Jeffcote, 1997; Saranto, 1998).

Age and maturity were identified as factors in nurses' acceptance of computer technology. Finnish nursing students reflected that age-related aspect of acceptance. Younger students rated their knowledge of computers higher than mature students, however, mature students demonstrated greater motivation to obtain technology training in their future careers (Saranto, 1998). In another study of Finnish nursing students, all students possessed a positive attitude towards information technology in nursing practice, regardless of age. The lack of clinical nursing experience and limited exposure to in-house hospital information systems were contributing factors influencing attitudes towards technology (Saranto et al., 1997).

In comparing nursing experience with computer-related attitudes, younger nurses with shorter nursing experience had a more positive attitude towards computer technology than those nurses with longer nursing experience (Hillan et al., 1998; Liu et al., 2000; Simpson & Kenrick, 1997). Liu et al. explained that this difference was a result of the measurement tool; Simpson and Kenrick gave the rationale that older nurses were concerned with the impact on practice and patient care, while Hillan et al. offered no explanation. Regardless of age, experience, or training, nurses had an overwhelming positive attitude towards computer technology (Miller & Jeffcote, 1997).
Nurses with a longer length of service had a more positive attitude towards computers than nurses with a shorter length of service. Nurses who worked in a facility for an extended period of time generally had a loyalty to that institution and had a positive attitude towards changes introduced by the institution (Simpson & Kenrick, 1997).

Organizational Factors

Kim and Kim (1996) examined the variables of willingness to adopt an innovation, efficacy, and cooperativeness at both the individual level and at the nursing unit level. Efficacy at both the unit level and at the individual level had a positive effect on nurses and on the willingness of nursing units to adopt an innovation. Kim and Kim found that nurses working on similar units had similar self-efficacy levels. From this finding, individual self-efficacy in relation to innovation adoption was an indicator of the willingness of the nursing unit to adopt an innovation. Individualistic cooperation had a positive influence on an individual's willingness to adopt an innovation. However, unlike self-efficacy, cooperation at a unit level had a negative effect on the willingness to adopt an innovation at the unit level. The findings of this study indicated that nurse managers must take into account both individual and unit characteristics as indicators of willingness to adopt an innovation (Kim & Kim).

In an attempt to identify other factors that influences the acceptance of a new innovation, MacDonald and Muir (1996) identified factors that influenced nurses' acceptance of new technologies and innovations. These factors included:

1. Identifying the advantages of the innovation to the people involved.
2. Involving the members in planning, decision-making, and evaluation.
3. Needing careful planning to ensure the first clinical experience is a positive one.
4. Providing twenty-four hour personal support.
5. Implementing the new technology one unit at a time, using the early innovators as resources for later units.
6. Providing varied sources of information and multiple in-services.
7. Providing concise clinical guidelines.
8. Providing opportunity for hands-on practice.
9. Ensuring educational and clinical experience occur in an appropriate time frame.

In order for technological innovation to be successfully adopted by nurses, clinical, administrative, and educational support were essential throughout the introduction and ongoing change process (MacDonald & Muir).
In this section, the factors that influence nurses' adoption of technology were presented. Some studies suggested that age and maturity influenced the nurses' attitudes towards technology, while others found that their attitudes were not influenced by age and maturity. Various individual and nursing unit characteristics were reported as predictors of a successful adoption of technology by nurses or influenced their adoption of technology. Factors such as individual cooperation, perceived need and value of the technology, and values held by peers require attention in order to succeed in the introduction of a new technology to nurses.

The current knowledge regarding nurses' competencies and technology was also presented. Several studies have been undertaken to understand the effect nurses' competencies had on technology. Although several measurement tools were developed, the validity of the measurement tools was questioned. There did not appear to be a consensus related to how competencies affect technological advances. Although training was identified as a factor in nurses achieving computer competence, lack of time and resources limited the availability of adequate training, thereby decreasing the computer use by nurses. There were also conflicting results related to age and maturity, indicating that there is need to further explore and understand the impact age and maturity have on the acceptance of computers by nurses. It is therefore important to develop a deeper understanding of the impact of training and computer usage, which is one of the aims of this study.

Change Theory

Lewin's theory of change had the premise that change could only occur if the driving forces supporting change were stronger than the restraining forces (Lewin, 1951). The process of change involved the components of unfreezing, moving and freezing. During the "unfreezing" stage, identification of the current problem or need was identified, and both driving forces and restraining forces were identified. The "moving" stage was characterized by the actual implementation of the change once the driving forces overcame and/or equalized the restraining forces. The final stage of freezing or "refreezing" involved the stabilization of the change within the organization (Lewin).

Bozak (2003) applied Lewin's theory of change as a framework for the implementation of a nursing information system and discussed how nurse informaticists
could utilize the framework during the implementation of a nursing information system. During the unfreezing stage, the nurse informaticist identified groups and individuals affected by the change and identified the driving forces and the restraining forces. The nurse informaticist devised strategies to strengthen the driving forces and minimize the restraining forces. In the moving stage, the nurse informaticist continued to concentrate on communication and acceptance of the nursing information system, and continued to be aware of residual restraining forces. During the refreezing stage, continued support and assistance to nurses was vital (Bozak).

In an attempt to understand the factors related to the implementation of an innovation, Maxwell (1995) found that the adoption of an innovation involved a process that was similar to Lewin’s (1951) change theory. Maxwell identified five stages in the process of adopting a technical innovation and stated that the stages reflected the stages of change identified by Lewin. She identified the stages of “not knowing anything” and “working toward transition” were similar to Lewin’s “unfreezing” stage, the stages of “becoming accustom to it” and “problem solving” paralleled Lewin’s “moving” stage, and the stage of “being an expert” paralleled Lewin’s “refreezing” stage. From Maxwell’s findings, it appears that the process of adopting an innovated technology is a change process that parallels other change theories.

In this section, the importance of identifying the driving and resisting forces was shown to assist in a successful change process. According to Lewin’s theory of change, change could only occur if the driving forces could overcome or equalize the resisting forces (Lewin, 1951). Bozak (2003) identified that a successful implementation of a nursing information system could occur by using Lewin’s change theory. Lewin’s theory of change serves as part of the theoretical framework for this study.

Technology Integration

In an attempt to gain further understanding of the integration process, a review of the current information regarding technology integration was conducted. What follows is the presentation of the literature review related to integrating technology, including the process of integration and some approaches to be used for successful integration.

The Process of Integrating Technology

Keeping current with technological change was described as both a reality and a burden for nurses in today’s information-laden world. Computer literacy was a basic
skill for today's nurse. In describing clinical issues, Buus-Frank (1999) offered eight guidelines to accurately assess the impact of emerging technologies. They included that:

1. Technology systems must be patient-centered.
2. Technology must be thoughtfully applied.
3. Technology should be seamless.
4. Technology should be carefully integrated.
5. Nurses must not over-rely on technology.
6. Technology must be evaluated as a team.
7. Sometimes less technology is the best.
8. Technology cannot replace humanity.

In order to become comfortable with any new healthcare technology, all healthcare providers moved through three stages of "classic diffusion steps in the adoption of computing and information technology." (Ball et al., 2000, p. 8). The first stage was identified as substitution, where the new technology replaced the old methods, without utilizing the technology's full capability. An example of substitution was the replacement of a typewriter with a computer in a nursing unit and the replication of the typewriter function with the computer. Innovation was the second stage, where the computer began to diffuse into the healthcare system and healthcare providers accomplished tasks and functions that were not possible with the manual system. An example of innovation was in the diffusion of computers and computer systems into departments such as the pharmacy and the laboratory through the use of networks. The third and final stage was transformation, where the entire business process of healthcare delivery was revamped and reinvented because of the computer systems in place. An example of transformation was seen in the Radiology department, where filmless libraries and CT scans revolutionized how medical images were interpreted (Ball et al.).

The impact of the implementation of technology on nurses has also been equated to a sense of personal loss, and as such, nurses move through a grieving process prior to full integration of the new technology into practice. Any change to the status quo within the nursing culture instilled feelings of personal loss and nurses began the grieving process. Doyle and Kowba (1997) described a model of grief that included the stages of equilibrium, denial, anger, bargaining, chaos, depression, resignation,
openness, readiness, and re-emergence. They contended that the understanding of the grieving process assisted in the implementation and integration of technology into nurses' practice.

Rogers' Diffusion of Innovation Theory (Rogers, 1983) has been applied to the introduction of the EHR and other information technology's in today's healthcare environment. Diffusion was described as a form of social change involving the communication of a specific new idea. The Diffusion of Innovation Theory consisted of four elements, namely the innovation, communication channels, time, and the social system (Rogers). As this theory was concerned with the diffusion of new innovations through social channels, the application of this theory was appropriate in understanding how the introduction of the EHR can be successful within the nursing culture. By understanding the stages of innovation and diffusion, the change agent could manage and influence the successful diffusion of technology by capitalizing on the strengths of the groups, and by identifying and managing the negative forces that may impede diffusion (Barr, 2002).

Charles (2000) discussed the importance of the dissemination of information technologies utilizing Rogers' Innovation-diffusion model (Roger, 1983). Innovation adoption or rejection involved the five steps of knowledge, persuasion, decision, implementation, and confirmation. Charles suggested that further research on the individual innovative characteristics of nurses in various practice areas and care settings was required in order to document effective dissemination approaches for nurses. Dissemination was important, as it is one aspect of diffusion. Dissemination was of no value without the larger scheme of innovation and diffusion (Charles).

**Effectiveness of Integration of Technology Approaches**

The introduction of new technology within a healthcare setting required an understanding of the impact of the change on the current nursing culture, an assessment of the knowledge, skills, and attitudes of the nurses, and a plan to address the challenges of implementation and integration of the new technology in order to have a successful implementation and subsequent integration of the technology into practice. Failure to recognize and acknowledge the magnitude of change to the nursing culture would be detrimental to a successful technology implementation and subsequent technology integration into nursing practice (Parker, 2002). Some information technology departments failed to realize that the introduction of technology for nurses
was akin to culture shock. By acknowledging and addressing the change associated with culture shock, the introduction of technology to nurses could be successful. The ultimate measurement of a successful implementation of technology with nurses occurred when the nursing culture associates the new technology as current cultural practice (Slaney & Hitchins, 1993).

To facilitate the adoption of the EHR by nurses, a four-tiered training approach was used with reported success. The first tier addressed cultural changes associated with the implementation of an EHR. An introduction to basic computer awareness was the second tier. The third tier was education for nurse managers to address change management issues. The final tier was the actual teaching of the application to nurses (McGuire & Stoddart, 1996; Royle et al., 2000; Slaney & Hitchins, 1993). Another approach to instilling computer competence in nurses prior to the introduction of new technology was through the use of “super-users”. These super-users were usually computer-savvy nurses who receive additional computer application training in order to assist other nurses with the new computer application (Anderson & Stafford, 2002).

In this final section, the processes of integration and approaches used for successful integration were presented. The purpose of this discussion was in an attempt to understand the current knowledge base regarding the process of integrating technology by nurses. Ball et al. (2000) indicated there were three stages of technology adoption, namely substitution, integration, and transformation. Rogers’ Diffusion of Innovation theory (Rogers, 1983) was also used as a theoretical foundation in an attempt to explain how the introduction of new technology can be successful in the nursing culture (Barr, 2002). Although these theories have been used to explain the introduction of technology into nursing, further knowledge is required to fully understand the exact process that nurses utilize to adopt the EHR into practice.

Investigator’s Reflections on Computer Technology

In this section, the thoughts of the investigator in relation to computer technology will be presented in an attempt to identify potential biases in data collection and analysis. This investigator was introduced to his first personal computer in the early 1990's at the age of 27. His clinical experience with computers is varied. In his first nursing job in the mid 1980's, he was introduced to the Hospital for Sick Children’s “computer system” in Toronto, Ontario. The nursing portion of this system was used to
generate computerized requisitions and labels for laboratory tests through the use of a touch-screen monitor. In the late 1980's, he began working in the Critical Care Unit and was immersed with technology in the form of patient monitoring devices and a prototype of the EHR that electronically downloaded information from the bedside monitors into a flowsheet.

The investigator has not encountered another EHR in any other clinical area where he has worked. He did witness nurses using a computer to replicate the functions of a typewriter to document nurses' schedules for the unit. He also assisted teaching nurses to use a patient information database, during which time there were many nurses who did not have basic keyboard or computer skills. The investigator then became involved in the implementation of a computerized staff scheduling application for Children's and Women's Hospital of British Columbia. During this implementation, all the nurses had basic computer skills and understood the function of the scheduling application. An issue that did arise was related to the additional workload that was being placed on staff nurses with the implementation of the scheduling application. As a result, staff scheduling was centralized in a staff scheduling office.

Since 2001, the investigator has been working on the VIHA VYSTA Project as a Clinical Application Analyst. He is responsible for configuring the EHR to reflect the current practice of the nurses and other healthcare clinicians, validating the EHR to ensure that the EHR will meet the needs of the clinicians, and supporting the EHR. Initially, all EHR users were supplied with an application support pager for questions regarding the functionality of the clinical application. In his position, he did carry the support pager and assisted nurses with questions regarding the functionality of the clinical application. However, many of these support calls dealt with basic computer usage such as password expiration, network-access issues, and general system performance issues rather than the actual technological component of the EHR. As a result, the support pager is no longer in existence, and EHR users contact the Help Desk for any issues or questions.

The investigator has also personally experienced the same issues surrounding passwords and networks when he began working on the VYSTA Project, but now feels comfortable with most aspects of the computerized work environment. He believes that all nurses can acquire new nursing-related competencies after their initial nursing education. He believes that these competencies can, and should be adopted into their
practice. He also believes that individuals may not be able to identify that they have adopted and integrated new competencies into practice. He believes that individuals may still consider themselves as inexperienced or a novice with new competencies when in fact, they have mastered the competencies and have adopted and integrated the competencies into practice.

Summary

The literature was reviewed to examine the current knowledge of NI, computer IT, and EHR integration by nurses to identify gaps in the knowledge. The review also was used to provide a foundation for this research. The review of the literature revealed that computer use within healthcare facilities has been slower compared to the business and industry communities for numerous reasons. Until recently, nurses have not been exposed to IT within their practice. As a result of the emerging technologies, the field of NI developed as a nursing specialty focused on nursing science, computer science, and information science in order to support patient care and nurses. The EHR was the conduit that connects the nurse, the patient, and the data.

The literature review revealed that the use of IT by nurses was fraught with challenges. Factors affecting the use of IT and the EHR by nurses were identified and include age, computer skills, attitudes, competencies, experience, perception, and efficacy. The research demonstrated an attempt to understand these factors. The outcomes of these studies were not consistent due to various factors including the validity of the measurement tools.

Change theories were utilized as a theoretical foundation in studies examining the introduction of IT and the EHR to nurses. Strategies were developed to overcome and improve the adoption of IT and the EHR by nurses based upon existing research. Although these theories were successful in describing the change process associated with the introduction of IT and the EHR, there was no indication that the change theories explained the process that nurses undertook to adopt the IT or the EHR into practice.

Although factors were identified as affecting the use of IT and the EHR by nurses, the process of how nurses adopt the IT and EHR into practice was not fully explained in the literature. Despite the knowledge of change theories and IT implementation on nurses, little, if any studies have been undertaken to examine the adoption process of IT and EHR by nurses. Despite the knowledge of the factors
influencing nurses' adoption of the EHR, there was limited information and knowledge in relation to the process of how nurses adopt the EHR into practice. The current research study began to develop an understanding of the stages of EHR adoption by nurses.
CHAPTER THREE: METHODS

In this chapter, information about the study's research method will be presented. The first section will describe and provide rationale for the selected research method. The subsequent sections will present the sampling method, data collection and data analysis procedures, evidence of rigor, and ethical considerations for this study.

Grounded Theory: Description and Rationale

As the process of adopting information technology in the form of the EHR into nursing practice was not well documented, and in an attempt to describe this phenomenon as a whole, an appropriate method of inquiry was through the use of qualitative research. Qualitative methods are a means to explore and explain the depth and breadth of a phenomenon as a whole. The general purpose of qualitative research is to gain a new perspective of a given situation, to discover the problems that exist in a social setting, and to identify the process the participants use to handle the problem (Burns & Grove, 1997).

Grounded theory research is used to answer research questions that relate to process and action, which was the essence of the research questions in this study (Strauss & Corbin, 1990). Glaser and Strauss first introduced the grounded theory method in 1967 (Baker, Norton, Young & Ward, 1998; Hutchinson, 1993; Simms, 1981; Strauss, 1987; Strauss & Corbin). This method of research is based on the philosophical foundation of pragmatism and symbolic interactionism.

Pragmatism is a school of philosophy that is concerned with defining “truths” (Charon, 1979). In order for truths and our reality to be defined, the pragmatism philosophy employs four principles. The first principle indicates that truths are only possible through human interpretation. The second principle states that knowledge for individuals is based on usefulness. Objects are defined by their usefulness is the third principle. The final principle states that the understanding of a person is only possible through the inference of what he or she does. Symbolic interactionism is rooted in the pragmatism philosophy. Symbolic interactionism focuses on the interaction between individuals in a social situation and the dynamic nature of the interaction (Charon).

From these philosophical underpinnings, there are two significant principles that
are pervasive in the research method. The first principle is related to change. A phenomenon is not static and theories related to a phenomenon must be flexible enough to reflect the fluidity of the phenomenon. The second principle is the stance on determinism. In grounded theory research, the participants in a given social situation have the means of controlling their environment and situation through their responses to that situation. Grounded theory research attempts to uncover the conditions of a phenomenon, as well as to determine how the participants respond to a phenomenon (Baker et al., 1998; Corbin & Strauss, 1990). The outcome, or product of grounded theory research is a theory that is grounded in the data collected and explains the phenomenon that is being studied (Burns & Grove, 1997; Glaser, 1978).

One criticism of grounded theory research rests in the method of coding and the emergence of categories. Kendall (1999) stated that the method of coding utilizing the process of axial coding does not represent the true emergence of the categories. The emergence of the codes and categories fit the data, and not the data fitting the code and categories that occurs during the axial coding process (Kendall).

Through the techniques of participant observation, participant interview, and other data collection techniques, variations and conceptualizations can be confirmed and explored (Dey, 1999; Strauss & Corbin, 1990). The data collection and analysis occur simultaneously, revisiting old data while analyzing current data. This concurrency is known as the constant comparative analysis technique, which permits the emergence, identification, and saturation of concepts within the data (Corbin & Strauss, 1990). This also permits and guides the researcher to select other sources of data to validate the emerging concepts and to identify other new concepts (Corbin & Strauss; Simms, 1981). The resulting theory is truly dependent on the data collected, and ensures the flexibility needed in an exploratory study through the processes embedded in the grounded theory method (Simms). This method of research does not begin with a theory, but rather begins with a phenomenon and the relevant pieces of information that emerge.

The goal of grounded theory research is to develop a substantive theory that explains and assists in the understanding of the social/structural processes utilized by individuals or social groups in response to a specific problem (Kearney, 1998). To meet this end, grounded theory research begins with questions that are orientated towards processes and actions (Strauss & Corbin, 1990). Grounded theory research has been
used as a research method in areas of study where little is known or in familiar study areas where a new viewpoint is required (Hutchinson, 1993).

Artinian (1988) identified four modes of inquiry in grounded theory as applied to nursing research. These included the descriptive mode, the discovery mode, the emergent mode, and the interventional mode. The descriptive mode, the first mode of inquiry in grounded theory research, details the rich information, attempts to answer preliminary questions about the phenomenon, including what the steps are in the process, and provides an understanding of the participants’ perspective in a given situation. This mode is observational and inductive in nature (Artinian).

Artinian (1988) explained that the second mode of grounded theory research is the discovery mode. In this mode, the patterns of a social experience are identified and the interrelationships of those patterns are explored. The discovery mode of grounded theory research produces a theory of social process that explains the social world. A core category or basic social process is the product of the discovery mode. This social process is also known as a substantive theory (Burns & Grove, 1997). The third mode of grounded theory research is the emergent mode, where sections of the substantive theory are expanded or refined. It is during this mode that previous work is built upon and research programs are developed around social processes (Artinian). The final mode is the interventional mode where relationships of a substantive theory are tested (Burns & Grove).

The descriptive mode of grounded theory research focuses on the production of a rich explanation of a situation and on explaining the process involved in a situation. In social settings, this mode of grounded theory research is concerned with group life, group process, group meanings, and the methods of communicating those processes (Burns & Grove, 1997). Since this research was aimed at attempting to understand the process of nurses’ adoption of the EHR, the descriptive mode of grounded theory research was an appropriate level for this study. It was also ideal for the beginning researcher, as the investigator was a beginning researcher (Burns & Grove). As the descriptive mode of grounded theory research was used for this study, the identification of emergent themes was the only outcome; theory and saturation were not achieved.

Sample Selection and Criteria

In this section, the sample selection and criteria used will be presented. A
description of the sample will be presented in Chapter Four.

Using a purposive sampling method to maximize variation, participants were sought to represent levels of end-user EHR adoption; namely those who solely use the EHR to obtain patient information (high-adopters of technology), those who use both the EHR and the paper record to obtain patient information (medium-adopters of technology), and those who solely use the paper chart to obtain patient information (low-adopters of technology). Participants were also sought based on the type of nursing unit where they practiced. The types of nursing units were based on the general level of technology within the unit. Participants were sought to represent high-technology units such as critical care areas, or moderate to low-technology units such as rehabilitation units or medical-surgical units. The small sample size in this study included some variation related to the identified nursing units and level of adoption of the EHR. The sample included a high-adopter of technology, a medium-adopter of technology, and a low-adopter of technology from high-technology units, as well as from low-technology units.

Participants were registered nurses (RN's) employed in VIHA, between the ages of 25 and 55, who received training in the EHR implemented by the VYSTA Project and worked in one of the two acute care facilities within VIHA. Although the training consisted of a basic Windows class if the nurse identified knowledge gaps in computer skills, none of the participants attended the Windows class prior to the EHR application training. Application training involved attending a four-hour training session provided by the VYSTA Project application specialists (see Appendix A for training and implementation details). All participants had received training in the EHR application within the past year.

Age range included from 25 to 55 because younger nurses may be have been establishing their nursing practice and the introduction of the EHR may have been influenced by other changes to their practice. The exclusion of those older than 55 decreased the potential for including nurses who were retiring. The end of a nursing career may not have been conducive to the introduction of change. Nurses who received training and/or used a form of the EHR in either their current clinical setting or in previous clinical settings were also excluded from this study as their previous exposure to a form of the EHR may have influence their usage of the current EHR.

The current study was discussed with the Clinical Informatics Leader (CIL). The
CIL identified appropriate nursing units as well as nurses within those units who may have been interested in participating in this study. The CIL discussed this research with potential participants. Interested participants were given the investigator's contact information by the CIL and were encouraged to make contact with the investigator if they were interested in participating in this research. When a potential participant contacted the investigator, they were asked to identify the nursing setting in which they practiced and to describe their current use of the EHR in order to identify the type of technology unit and technology adopter they represented. The study was also discussed in more detail. Six nurses participated in this study, representing variation in both nursing unit types and stages of adoption of the EHR.

Data Collection Procedures

A description of how the data were collected and the process of data collection and sources of data will be described. Once a participant agreed to be part of the study, a meeting was arranged at a time and location that was convenient for the participant to conduct the interview. The interview was one-on-one and lasted 30 to 45 minutes. The interview consisted of a discussion on the topic of the participant's thoughts, feelings, and experiences about their adoption of the EHR into practice, as well as the collection of some demographic information such as age, education, and previous computer skills. Trigger questions were used to assist in the discussion (see Appendix B for sample trigger questions). During each interview, a portable tape recorder was used to record the discussion. Immediately after each interview, the investigator documented his impressions and thoughts related to the interview. This information was also used as part of the data analysis.

A follow-up interview with each participant was conducted after the initial data analysis was completed. Further questions were developed based on the initial analysis to obtain further insight into emergent themes (see Appendix C for follow-up interview questions). During the follow-up interview, the preliminary findings of the initial data analysis were presented to each participant for validation. This follow-up interview was also used to obtain clarification of questions raised during data analysis. The follow-up interview was arranged at a time and location that was convenient to the participant, lasted no longer than 30 minutes, and was recorded with a portable tape recorder. The tapes from the follow-up interviews were also transcribed and used in the data analysis.
Data Analysis Procedures

The description of data analysis will be described. In keeping with grounded theory research, the constant comparative method of data collection and analysis was utilized. Glaser and Strauss (1966) described the data collection, data analysis, and data coding as a continuum with no beginning, ending, or delineation between the three functions.

Strauss and Corbin (1990) described the steps of data analysis. Data analysis begins with open coding. The aim of open coding is the discovery and naming of categories in the data through conceptualizing the data. The conceptualization of the data can be accomplished through coding of the data, either at the line-by-line level, sentence level, paragraph level, or the entire document (Strauss & Corbin). The discovery and naming of categories follows the conceptualization of the data. This is accomplished through the questioning of the data, and by making comparisons with other aspects of data that are collected. These categories are developed based upon properties and dimensions that are found within the data. Through the use of the different types of memos, the development and documentation of these categories are achieved.

Strauss and Corbin (1990) described the use of three types of memos within the grounded theory research methodology. These memos are code memos, theoretical memos, and operational memos. The code memos document the results of coding such as conceptual labels, concept features, and indications of process. Theoretical memos are written to capture the theoretical thinking surrounding a concept, including the depth, dimension and properties of a concept. Operational memos are written to give direction for future sampling, questions, and possible comparisons within the data.

After the first interview was completed, the taped interview was transcribed verbatim. The investigator compared the transcripts to the audiotape and ensured the accuracy of the transcripts. After the initial reading of the transcript from the interview, the investigator documented a summary of the participant. This summary was also used as data for analysis.

Data analysis began with a line-by-line open coding of the data. The aim of the initial line-by-line data coding was to give conceptual labels to words, phrases, and sentences. During the analysis, the transcribed interviews were read and reread. A word, a phrase, or a sentence containing a single idea was highlighted and given a
descriptor that was written on the transcription. Operational memos were created to document questions raised during the data analysis.

To show movement or process, data can be viewed in steps, phases, or stages (Strauss & Corbin, 1990). After the initial coding, time periods applicable to the adoption of the EHR emerged. Through the use of theoretical memos, the scope and dimensions of the time periods were defined. In keeping with the grounded theory principle of data analysis to show movement over time, the data were reorganized with data applicable to each time period assigned to the time period. This was accomplished by physically cutting the transcripts with the associated coding and placing the cuttings into folders labeled with the associated time period. The purpose of reorganizing the data was to facilitate the identification of themes within each time period.

As subsequent interviews were conducted, the taped data were transcribed verbatim, summaries of the participants were created, line-by-line coding was completed, and the data were reorganized into the defined time periods. The new data were then compared to previously collected data within each time period, comparing like incidents and labels. Existing data within each time period were also compared to the new data. This process of creating a summary, coding the data, and reorganizing the data into time lines was repeated for each subsequent interview.

After the second interviews, the data were reread and reviewed to group conceptually similar labels together within each time period, supported by the use of coding memos. After reviewing the groupings, additional operational and theoretical memos were written consisting of questions and comments about the groupings. The data were then reviewed in an attempt to answer these questions and verify the comments. The data were reviewed for further validation of the groupings. As new data became available, the data were compared to the groupings and the groupings were compared to the new data for further explanation and development of the groupings.

The data were again reviewed, as were the memos. The groupings of data were compared with other groupings. There existed groupings that appeared to be closely related to other groupings. The combining of like groupings facilitated the creation of sub themes within each time period. The dimensions and definitions of these sub themes were documented in the form of theoretical memos. The time periods and sub themes were relabeled to capture the essence of the theme. For example, open coding
produced labels such as "remembering passwords", "forgetting passwords", "changing passwords", and "password confusion" in one time period, and were grouped together. During memoing, questions were recorded, such as What is common amongst the different "password" codes?, Do any of the other participants mention passwords?, and Does this speak to accessing the EHR? With further data collection and analysis, other data related to passwords surfaced. These data were questioned, and compared to other groupings of data. Data from this "password" grouping were compared to data from the "computer access" grouping. Through memoing, a distinction between these two groupings was made. The "computer access" grouping dealt more with hardware and availability, while the "password" grouping dealt with the individuals' ability to manage passwords. This process was a continued until all the codes within each time period were grouped and defined.

Evidence of Rigor

In an attempt to further strengthen this study, a discussion about the rigor associated with this study will be presented. Rigor in qualitative research will be presented, as well as the rigor associated with this study.

Sandelowski (1986) identified the concepts of credibility, fittingness, auditability, and confirmability were required in order to achieve rigor in qualitative research. Credibility in qualitative research is equivalent to internal validity in quantitative research and relates to the truth value of the research. Credibility is evident in qualitative research when the description of the phenomena is presented in such a manner that a reader who shares the same experience will immediately recognize the investigator's interpretation. Chiovitti and Piran (2003) described four steps in enhancing the credibility of grounded theory research. These steps included allowing the participants to guide the research inquiry process, confirming that the theoretical findings matched the participants' meaning of the phenomenon by using their words and articulating the researcher's personal views and insights into the phenomenon.

Fittingness is equivalent to external validity and generalizability in quantitative research (Sandelowski, 1986). Fittingness is evident in qualitative research when the outcomes of the study are context-free and can be applied and recognized in similar situations. Fittingness is enhanced by describing the characteristics of the context in which the study occurred as well as by describing the literature associated with each
emergent category (Chiovitti & Piran, 2003).

In order to increase and support the credibility and fittingness in this study, a description of the unit, the nurses, and the technology present on the unit will be included in Chapter Four. The literature will be used to support the emergent themes, and be presented in Chapter Five. Credibility and fittingness were also increased with the modification of the trigger questions between the first and second round of interviews, based upon the initial data analysis findings. The process of data analysis was described in relation to reviewing the findings against the data to ensure the findings were representative of all the data collected.

All of the identified patterns within the data were incorporated into the emergent themes. As part of the documentation of this research study, examples from the data including the participants' actual words will be used to support the identified themes, and will be presented in Chapter Four. During the follow-up interviews, the initial findings from the data analysis were described to the participants and they confirmed that the description of the identified themes captured their experience of the adoption of the EHR into practice. The investigator's thoughts and views about the adoption of the EHR into practice were presented in Chapter One, in order to document personal views and separate personal views from the data analysis process.

Sandelowski (1986) described auditability as being equivalent to reliability in quantitative research in order to achieve consistency. Auditability is achieved when another researcher is able to follow the decision trail of the first researcher and come to a similar outcome, not a contradictory outcome. Outlining criteria to be used when analyzing the data, and outlining how and why participants were chosen for the study enhances auditability (Chiovitti & Piran, 2003). To achieve auditability, the investigator has described how he became interested in the subject matter, his views of computer technology integration, how the data were collected, how the data were reduced and interpreted, and how the themes were representative of the data. Chiovitti and Piran suggested addressing the data with the following questions in focus; a) What is happening in the data? b) What does the action in the data represent? c) Is the emergent theme part of the participant's vocabulary? d) In what context is the action or theme used? These questions were asked during the data analysis. The rationale for participant select was also described in the documentation of this research study.
Ethical Considerations

Ethics approval was obtained from the Behavioural Research Ethics Board of the University of British Columbia, as well as from the Vancouver Island Health Authority Research Review and Ethical Approval Committee (RRC). Once ethics approval from both facilities were obtained, the recruitment of prospective participants began. Assurances that participant confidentiality would be protected and maintained during all aspects of the research were explained to the prospective participants. The consent form was reviewed with prospective participants and time was allotted for the participant to review and sign the consent form (see Appendix D for the consent form). As part of obtaining consent, the investigator answered all questions raised by the participants, ensured that the participants understood the purpose of the study, the protection of privacy, the time commitment involved with the two interviews, and that the participants had the right to withdraw from the study at any time without any recourse.

Measures were taken to protect the confidentiality of the participants. All participants were assigned pseudonyms. All consent forms and data collected remained in a locked environment, and electronic security was maintained on the investigator's private laptop computer through the use of passwords.

Summary

Grounded theory research, a qualitative research method, was used as the research method in this study in an attempt to understand the process involved in the adoption of the EHR by nurses. The background and description of grounded theory research were explored and presented. Using purposive sampling, participants were selected based on their perspective and their ability to contribute to the research question. They represented nurses from one of the three technology user groupings, namely low-adopters of technology, moderate-adopters of technology and high-adopters of technology. They also represented one of the two types of nursing units, namely a low to moderate technology nursing unit and a high technology nursing unit.

Data analysis began after the collection of the first pieces of data and continued concurrently with further data collection. The investigator recorded his thoughts and these field notes were used to assist in the data analysis. A summary of each transcript was written and used as a contextual foundation for the data. Data were read and reread and open coding was conducted, and conceptual labels were assigned to data
segments. The data were reorganized into like time periods. Memos were written to organize and record the investigator's impressions of the data and to record questions of the data. Similar codes were grouped together to form sub themes. The time periods were relabeled to capture the essence of each period.

Rigor was evidenced through the presentation techniques, as well as through addressing the principles of fittingness, auditability, and credibility. The ethical considerations were also presented in this chapter. Consent was obtained from each participant, and confidentiality was maintained through the use of pseudonyms, and by securing all forms of data.
CHAPTER FOUR: FINDINGS

In this study, the process of information technology (IT) adoption into practice by nurses, in particular the adoption of the electronic health record (EHR) was explored. The factors that influenced the adoption process, as well as the factors that facilitated and hindered the learning experience were also explored. The EHR replaced the pre-existing computerized method of obtaining patient information on the nursing units known as NORM (Nursing On-Line Results and Messaging). Initially a description of the nurses who participated will be described followed by a description of their EHR usage. This will be followed by descriptions of the stages of adoption, the factors that seemed to affect the adoption process and the factors that seemed to influence the learning experience.

Description of the Sample

Six nurses participated in this study representing some diversity in their EHR usage and the degree that technology was used in their unit (see Table 1). They were from high-technology nursing units where various types of electronic and computerized technological equipment are frequently used (e.g. critical care and short stay) and low-technology nursing units, where technological equipment is used infrequently (e.g. medical-surgical units). Three worked in high-technology nursing units and three worked in low-technology units. The nurses also represented one of the three levels of technology adopters: high users, medium users and low users. Level of technology adoption at the time of the first interview was used to describe their EHR usage. In terms of their initial computer skill, three described theirs as good while two described theirs as moderate and the other indicated she had no computer skills.

The nurses ranged in age from 40 to 55 years. They were all female Caucasians, and worked in one of the two acute care facilities within VIHA. Two of the nurses were bedside nurses, while the others were in nursing leadership roles. Four of the nurses had a BSN with the other two having a diploma.

Nurses’ Electronic Health Record Usage Patterns

In examining the EHR usage, some tentative patterns could be identified by
Table 1

Description of the Nurses

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Age</th>
<th>Education</th>
<th>Nursing Position</th>
<th>Type of technology adoption</th>
<th>Type of nursing unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL</td>
<td>Early 50's</td>
<td>Diploma then Degree</td>
<td>Nurse Educator</td>
<td>Low-adopter</td>
<td>Low-technology</td>
</tr>
<tr>
<td>NH</td>
<td>Early 40's</td>
<td>Diploma then Degree</td>
<td>Clinical Nurse Leader</td>
<td>Low-adopter</td>
<td>High-technology</td>
</tr>
<tr>
<td>ML</td>
<td>Early 40's</td>
<td>Degree</td>
<td>Clinical Nurse Leader</td>
<td>Moderate-adopter</td>
<td>Low-technology</td>
</tr>
<tr>
<td>MH</td>
<td>Early 40's</td>
<td>Degree</td>
<td>Clinical Nurse Leader</td>
<td>Moderate-adopter</td>
<td>High-technology</td>
</tr>
<tr>
<td>HL</td>
<td>Mid 50's</td>
<td>Diploma</td>
<td>Bedside</td>
<td>High-adopter</td>
<td>Low-technology</td>
</tr>
<tr>
<td>HH</td>
<td>Early 40's</td>
<td>Diploma</td>
<td>Bedside</td>
<td>High-adopter</td>
<td>High-technology</td>
</tr>
</tbody>
</table>
those who seemed to be using EHR consistently compared with those who were infrequent or low users of EHR.

High-adopters of Technology

The two nurses who were high-adopters of technology used the EHR almost exclusively to obtain patient information. They both generally used the EHR before resorting to the other sources of patient information available to them, such as the paper chart or paper printouts. They were diploma-prepared bedside nurses who differed in age, one in her mid 50’s and the other in her mid 40’s. They saw the benefits of computerization to the nursing profession and the importance of computers in the future. Interestingly, they varied in their proficiency with computers but regardless, they were proficient with the NORM system and accessed it routinely to obtain patient information.

Prior to the EHR training, they had different expectations about the training. The younger nurse who was proficient with computers expected the training to be boring and in fact, found it fairly slow and boring, while the older nurse who was not as proficient with computers expected to learn what she needed to know to use the EHR. For her, the training was overwhelming. Regardless of their background computer skill level, they appeared to take the time to practice their new computer skills. After the introduction of the EHR to the units, the younger computer-sawy continued to use NORM while the older nurse with minimal computer skills immediately used the EHR.

Both nurses were from units being affected by change and each appeared to be taking change in stride. They were from units where the staff appeared to be committed to making things work by either keeping up with change, or by making change work.

Low-adopters of Technology

Two of the nurses used the EHR, little if at all. Unlike the high-adopters who clearly saw the need for computers in nursing, the low-adopters were more concerned with their own needs regarding the future use of computers. They saw that there would come a time when they would have to use the computer, and envisioned how they would need extra training to be able to use the computer. On further exploration, these nurses, with some hesitancy, did eventually see the benefit of the EHR for nursing practice. Both of these low-adopters were in some form of leadership position and indicated that they did not see themselves as needing to demonstrate support or act as resources to other nurses in using the EHR. They provided indirect support for others.
with the EHR, such as providing resources to assist the other nurses.

One of these nurses was in her mid 40's while the other was in her early 50's. Both had completed their nursing degree after having been diploma-prepared. They described their computer skills as low to moderate and emphasized that they needed to practice to maintain their skill levels. Although they knew how to use NORM when they needed to obtain patient information, they obtained the required information from the paper chart.

When it came to what they expected from the EHR training, their expectations differed; one identified no expectations while the other said she would need assistance to manage adequately. They both found the training itself to be adequate but indicated that they would need additional training when the time came that they had no other choice but to use the EHR, i.e. when the EHR was the only source of patient information.

Access and opportunity to practice their new skills was problematic for both of these low-adopters. The EHR application was not conveniently located for them to use. Having time to practice appeared to assist one of them, while the other did not need to use the EHR in her practice, could not remember her password, and did not access the EHR. While the high-adopters of technology were from units that were supportive of computers and seemed quite involved in change, the low-adopters were from units where the nurses were resistant to change in some form. While they themselves might have been supportive, accepting, and facilitative of change, their colleagues were generally not as supportive.

**Moderate-adopters of Technology**

Between the high- and the low-adopters were two nurses who used both the EHR and the paper chart equally to obtain patient information. They were degree-prepared, held leadership positions, and were positive in their views of the benefits of computers and the use of computers in the future. They were both in their early 40's. They rated their computer skills at a moderate level. While one of them was a high user of NORM, the other did not use it.

They differed in what they expected in the EHR training with one thinking it was going to be at too high a level and the other too low. The high NORM user expected training to be geared to those with low computer skills, while the other feared that the training would be 'over her head'. After the training, the one who feared that the level of
training would be too high came away excited about the EHR, while the other expressed no major impression of the training. Interestingly, the excitement carried on, particularly for one who had not been a high NORM user. That nurse accessed the EHR when it was introduced while the other, who was proficient with NORM continued to use NORM even when EHR was introduced.

In terms of the opportunities they had for practicing their new skills, they overcame problems with device access and also issues related to technological problems. They varied in the time they had to practice. While the one who was comfortable with NORM did not have time to practice, the other did practice and started accessing and using the EHR on a regular basis. Interestingly, they both worked in units that were somewhat resistant to change but they each attempted to influence positive change and to support their fellow workers in using the EHR.

The Adoption Process

The nurses appeared to have undertaken a three-stage process in adopting the EHR into their practice. The three stages were; "Getting Started", "Getting Comfortable with the Computer System", and "Establishing a Pattern" with each stage including phases (Table 2). In the first stage, the phases of "Being Aware of Their Own Computer Skill Level" and "Managing the Training" were identified. The second stage included "Managing Passwords", "Being and Feeling Supported", "Supporting Others", and "Making Sense of the Computer Information" as phases. In the final stage, the phases of "Hanging On or Letting Go of Old Ways" and "Envisioning a Future of the Electronic Health Record" were identified.

Getting Started

"Getting Started" began with introductory information about learning the EHR and information regarding the place of EHR in the organization, and continued through to the end of the EHR application training. During this stage, the nurses were presented with information that was used as the foundation for learning the EHR. The phases identified during this stage were "Being Aware of Their Own Computer Skill Level" and "Managing the Training".

Being aware of their own computer skill level

"Being Aware of Their Own Computer Skill Level" involved the self-examination of computer skills by the nurses. The nurses began to prepare themselves
for the eventualty of computers and the EHR on their units by self-assessing their computer skills. Most said they were not adequately prepared to keep up with the computer application training because they lacked the necessary computer skills. Some felt their computer skill level was poor or below average despite using other Window-based computer applications. When NL, a low technology adopter from a low-technology unit who used email for correspondence was asked about her computer competency prior to the EHR training, she said, "I would do a little computer course and then I would be on the computer. I couldn't practice what I learned so I have really pretty rudimentary skills on the computer." ML, a moderate-adopter from a low-technology unit, described her computer skills as "moderate" yet she used a computer at home, had implemented a computer system for nurses, and talked about computer networks and servers.

Table 2

<table>
<thead>
<tr>
<th>Stages and Phases of Nurses' Adoption of the Electronic Health Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting Started</td>
</tr>
<tr>
<td>• Being Aware of Their Own Computer Skill Level</td>
</tr>
<tr>
<td>• Managing the Training</td>
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</tbody>
</table>

*Managing the training*

"Managing the Training" reflected the ability to manage the EHR training. Training consisted of one four-hour training session in which the nurses were presented with a large quantity of information (see Appendix A for information on training). The training was conducted by application specialists and involved hands-on learning. During the training, the nurses were able to explore the content of the EHR with instructions from the trainers. They were also given the opportunity to practice at the conclusion of the training period, with support of the application specialists.

There were different reactions to the training session and in the ability to get
through the session. Some nurses said they experienced no difficulty with the training, were able to keep up in the training session and ‘sailed through’, while others experienced some difficulties with the training and required assistance during the class. Still others struggled through the training and talked about being overwhelmed with it.

The nurses who easily managed the session and ‘sailed through’ were able to keep up during the session, finished the training within the designated time, and understood the information. They assimilated the information quickly and overcame any fears about the training. ML, a moderate-adopter of technology from a low-technology unit, reflected someone who ‘sailed through.’ When asked about her expectations of training, she said, “I could probably have done what we did in four hours in one hour.” She described her computer skills as moderate and expected that training would be geared towards nurses who had minimal computer skills.

Other nurses expected the EHR training to be more difficult that it actually was. MH, a moderate-adopter of technology from a high-technology unit, described herself as not being comfortable with the computer, but was able to use other Window-based applications, expected that the training was going to be more difficult than it actually was. When asked what the training was like for her, she said, “So as soon as I realized it (training) was very basic, I realized I felt quite comfortable and didn’t have any fears about it.”

On the other end of the spectrum were nurses who experienced great difficulty during training. They were barely able to keep up during the session and said they were unable to readily understand the information. These nurses struggled. When asked what the training was like, HL, high-adopter of technology from a low-technology unit who described herself as having no computer skills said, “It (training) was overwhelming because I took the PowerChart first. I had never taken Windows. It was a lot of information there and my hardest part was to click the mouse twice fast enough.”

There were still other who did not struggle. They felt the information was appropriate and sufficient. They were able to understand the information and they kept up. They did not experience difficulties with the training but they did not sail through either. NL, a low-adopter of technology from a low technology unit, reflected someone who managed the session quite well. She described her computer skills as low prior to training. When asked to describe what she thought she would be learning about in the EHR class, she said, “They just give you enough. I knew enough about the computer
Getting Comfortable with the Computer System

"Getting Comfortable with the Computer System" was the period that extended from the completion of the EHR training to the removal of NORM. This stage entailed the nurses accessing the EHR and learning about the information in the computer. The presentation of patient information was different between the NORM system, the paper chart and the EHR. Learning the differences between the two systems was key to this stage. Four phases were identified: "Managing Passwords", "Being and Feeling Supported", "Supporting Others", and "Making Sense of the Computer Information".

Managing passwords

In order to access the EHR, the nurses were faced with remembering their unique user names and passwords for both the computer network and the EHR. During the training session, they were given their training user names and passwords and were given the opportunity to practice changing their passwords. At the end of the training session, they were then given their actual user names and passwords to use when they returned to their nursing units.

The first time the nurses used the system on their nursing unit, they were prompted to change their passwords. After they changed their computer network password, they could then access the EHR and the first time they used the EHR, they were prompted to change this password. Both their network and EHR passwords expired every 90 days and the dates were not synchronized so that if they changed their EHR password, their network password did not automatically change and may have in fact expired on a different day. To successfully manage passwords, they had to be able to change their passwords for both the computer network and the EHR when prompted and to remember their passwords.

The nurses varied in their ability to manage their user names and passwords. Some managed successfully although not without challenge and still others had major problems associated with their passwords. HH, a high-adopter of technology from a high-technology unit, initially said she did not have any problems with passwords. She later explained that she had problems, but was able to manage. When asked if she had any issues with passwords or getting into the system, she said, "Initially I had made
mine something that I thought would be something I could use all the time. And then when I changed it, I juxtaposed it.”

For some of the nurses, the issue of passwords was almost insurmountable. Despite an attempt to develop a method to manage their passwords, they had such extreme difficulties that they were unable to access the EHR. When responding to a question regarding current use of the EHR, NL, a low-adopter of technology from a low-technology unit, described her experience as such:

I can’t remember what my password is and I have no clue. Because I thought that when we changed it, like after I forgot it the first time, we changed it, I thought we had the same password as I had on the rest of my computer stuff.

Being able to manage their user names and passwords was such a major challenge for some nurses that it influenced whether and how they proceeded to use the EHR.

*Being and feeling supported*

“*Being and Feeling Supported*” reflected the degree that the nurses felt reassured in their process of getting comfortable with the computer. If they did not feel supported, they sought the support needed. The EHR application training covered the basics of the EHR, how to access the information, where the information was located, and how to interpret it. After the training, the nurses were then faced with utilizing the information they learned. There was a lot to learn, to remember, and then to apply when needed. Many of these nurses needed support to do this. The support available was in the form of the EHR pamphlets distributed during the training session. The pamphlets contained information on how to access and use the EHR. The computer Help Desk and the application specialists who conducted the training were also available to assist them. Both the Help Desk and the application specialists were only available during regular business hours. All of the training information was also available on the hospital's Intranet, which was readily available on all nursing units and from within the EHR.

Some of these nurses became comfortable and confident with the EHR with the knowledge that others were supporting them. HL, a high-adopter of technology from a low-technology unit, who had a low level of computer skill and struggled with the training, felt supported when she used the EHR on her nursing unit. She said, “But I remember that there was [sic] people I worked with who were quite computer literate and they (application specialists) were a lot of help. So, in that way, I knew that I had
someone to help me through it." MH, a moderate-adopter of technology from a high-technology unit, described the experience of her co-workers with the application specialists. When asked about the application specialists who came to the unit to provide support, MH said, “She (application specialist) was able to answer those questions that they didn’t get right away as soon as you are doing it on your own and it just made them feel more comfortable with it.”

Seeking out support was fairly easy for most of the nurses. They knew whom to turn in order to receive the support and assistance they needed. HL, a high-technology adopter from a low-technology unit, said she learned best from someone with the right level of computer skill. She did not find it helpful if they had too high a level of computer skills because she felt that the supporter overpowered and overtook her. When asked about what helped her to get comfortable with a computer, she said, “And the people I work with, not people who are tremendously computer knowledgeable because they always do it too quickly. The people who have computers and use them and just kind of sit with you.”

**Supporting others**

Some of the nurses assisted and supported other nurses who were struggling with the EHR. The act of supporting others appeared to be common among the nurses who were in a leadership role, but was not limited to these nurses. Supporting was the act of answering questions about the EHR, assisting others with the EHR, and problem-solving the EHR including accessing the EHR. ML, a moderate-adopter of technology from a low-technology unit, said:

People come to me. “It is not on.” “Did you turn the little Thin Client on?” “Oh, I didn’t know.” They don’t know that basic stuff: where to you turn the computer or the monitor or the screen, you know? I have been under desks fiddling with connections.

Part of the role of a nurse leader is to assist other nurses with issues and questions. In order to offer support, these nurses felt they needed to be proficient with the EHR. Some of the nurse leaders actively maintained their EHR skills. When asked how she became comfortable with the EHR, MH, a moderate-adopter of technology from a high-technology unit, said, “Even though I don’t use it very often, people are always, because I am the Nurse Leader, they are asking me questions. So I feel like I needed to be fairly proficient in it.”

Some of the other nurse leaders were unable to assist or support others, even
when directly approached to give support. Despite knowing that assisting others was part of their role, some of nurse leaders did not have the EHR skills required to assist and support others, and were struggling with the EHR themselves. When describing if the EHR training met her expectations, NL, a low-adopter of technology nurse leader from a low-technology unit, was unable to use the EHR. She said, "I don't really know what I am doing so when they say, 'Do you know how to do that?' 'Where is your card?' 'Get your little cheat card out.' So, I can't help them."

NH, a low-adopter of technology nurse leader from a low-technology unit, could not help other nurses when approached with questions, but was able to support them in other manners. In response to a question regarding supporting others with the EHR as being part of her role, she said, "I don't feel qualified enough to help somebody simply because I am struggling with it myself. But I certainly allow them support in that I would give them time to learn it or tell them resources they could use." One of the bedside nurses believed she could be a support for other nurses. When asked if she could teach her coworkers the ins and outs and nuances of the EHR, HH, a high-adopter of technology from a high-technology unit, said, "I could do (teach and support others with the EHR)."

The nursing role held by the nurse appeared to influence how much and how they assisted others. Nurses in leadership roles felt they should support other nurses and were more apt to do so, while the bedside nurses were more apt to receive the support versus actually supporting others with the EHR. Nurse leaders who did not use the EHR could not directly assist others when asked about the EHR, although they could indirectly support them.

Making sense of the computer information

"Making Sense of the Computer Information" described the process of learning about the information contained in the EHR, the meaning of the information displayed in the EHR, and what information was not in the EHR. This phase included how these nurses learned about what was in the EHR and how to use the EHR. This phase was not possible without the nurses successfully managing their passwords or obtaining the support to resolve issues and questions.

Although the EHR contained the same information that was in the paper chart or in NORM, it was displayed differently. This phase reflected the ability of the nurses to make sense of and give meaning to the information displayed in the EHR. By giving
meaning to the information, they were then able to understand the information and were able to make comparisons to the information contained in the paper chart and in NORM.

The ability to make sense of the computer information varied among the nurses. Some were in the beginning stages of understanding the information in that they could locate the information, but could not make sense or give meaning to the information presented to them in the EHR. When asked how she decided where to access the patient information, HL, a high-adopter of technology from a low-technology unit, said, “Sometimes it is confusing when we look things up because it will say, ‘In Progress.’” Through the assistance from other nurses, and from trial and error exploration of the EHR, she was able to make sense of the confusing patient information. When asked about how she made sense of the computer information, she explained, “I eventually learned how to find out if it (an X-Ray or CT Scan) was even done. That took some time... I knew it was in there somewhere. So, I just kind of played around and found it.”

Some of the nurses were more skilled at being able to find and use the information in the EHR. These nurses were able to find the information and use it for patient care. ML, a moderate-adopter of technology from a low-technology unit, was able to make sense of the computer information, described her experience with the EHR and the benefits of the information contained in the EHR. In response to a question regarding her use of the EHR, and what she used the EHR for, she said, “So I went through the past consultations and past visits and diagnoses and stuff so we had a bit of a picture of what they were about.”

Some nurses said they learned through trial and error method. By attempting to find information, or learning a new function in the EHR, they learned by experimentation. In response to a question regarding the reason why she first used the EHR, MH, a moderate-adopter of technology from a high-technology unit, said, “I was just playing... I wanted to print his bloodwork from today and I screwed up. I didn’t highlight it and I got the whole gamut of bloodwork for paper and papers, so that was a good lesson.”

Establishing a Pattern

"Establishing a Pattern" was the final stage in adopting the EHR into practice. “Hanging On or Letting Go of Old Ways”, and “Envisioning a Future of the Electronic Health Record” were the phases in this stage.
Hanging on or letting go of old ways

"Hanging On or Letting Go of Old Ways" represented the actions of how the nurses incorporated the new EHR into their process of obtaining patient information. Letting Go of Old Ways described the ability to use the EHR to obtain patient information whereas Hanging On to Old Ways described their resistance or their practice of continuing to use the paper chart to obtain patient information, and not the EHR to obtain the information.

The nurses demonstrated varying degrees of letting go or hanging on of the old ways. The high-adopters of technology demonstrated letting go of old ways, while low-adopters continued to hang on to old ways. Between these two extremes were the moderate-adopters. When asked where she finds patient lab or x-ray results, NH, a low-adopter of technology from a high-technology unit, responded, "I would actually tend to look in the paper chart before I looked on PowerChart." When asked where she would go to access patient information when it was busy, MH, a moderate-adopter of technology from a high-technology unit, said, "I think we, actually, automatically, we check the paper check to see if it is there, already been printed, someone has got the result. If it is not there, we go to PowerChart." When asked about her current EHR usage and if she used the paper chart, HH, a high-adopter of technology from a high-technology unit, said, "I go to PowerChart basically to get any information."

Envisioning a future of the electronic health record

Having a view of the future use and function of the EHR was common, as was valuing computers and technology. Although the nurses may not have actively or consciously developed a view of the future of technology and the place of computers or thought about the value of technology, questioning revealed different views. Part of this entailed being aware of the downfalls or possible barriers to the use of the EHR. Some nurses envisioned the future with computers to be beneficial for nurses, but also voiced concerns about some of the possible barriers to a future with the EHR. When asked where she saw herself in the future with the EHR, ML, a moderate-adopter of technology from a low-technology unit, responded:

I love for doctors' orders to be on it and I can't wait for that. I hope it will make a difference. One challenge I think is going to be access to computers and time to check a document because it already congested around here. Space...On nights it will be great. On days, it is going to be a nightmare. That part I am not looking forward to. I am hoping it will improve documentation.
The other view of the future entailed seeing even greater functionality of the EHR and the positive aspects of computers. Nurses saw the increased use, functionality, and the eventuality of the EHR. When asked where she would like to be with the EHR application in the future, MH, a moderated-adopter of technology from a high-technology unit, responded, “But the computer is rarely ever down. So, I think that is where we should be looking in the future, is computer charting.”

This view of increased functionality included the use of hand-held devices, electronic documentation, and the eventual removal of the paper chart. Despite the current limited functionality of the EHR, some nurses were anxiously waiting for increased EHR function. ML, a moderate-adopter of technology from a low-technology unit, described some coworkers’ reaction to the EHR. She said, “I think, that people are waiting now for the next step. ‘Why can’t we get…? Why can’t we have…?’”

In summary, the adoption process was reflected in three stages and each stage had several phases within it; “Getting Started”, “Getting Comfortable with the Computer System”, and “Establishing a Pattern”. The first stage was composed of “Being Aware of Their Own Computer Skill Level” and “Managing the Training”. The second stage contained the phases of “Managing Passwords”, “Being and Feeling Supported”, “Supporting Others”, and “Making Sense of the Computer Information”. The final stage was composed of “Hanging On or Letting Go of Old Ways” and “Envisioning a Future with the Electronic Health Record”.

Factors that Seemed to Influence the Adoption Process

There were several factors that appeared to influence how nurses adopted the EHR into practice. These factors could be grouped in terms of individual, technical and organizational factors and they seemed to influence the nurses at different stages of the process. The findings presented below are tentative due to the relatively small and non-representative sample.

**Individual Factors**

The individual factors included the nurse’s age, the nursing role they held, their educational preparation, their motivation to use the EHR, and value they held for the EHR.

*Age*

Age was described as a possible factor in how computer literate the nurse was
and subsequently that influenced their anxiety and fear about computers and the EHR. Those who were younger were more likely to have had opportunity during their nursing program and during their earlier schooling to work with computers. When asked about pre-conceived fears of learning about the computer and not being able to use the computer at work, HL, a high-adopter of technology from a low-technology unit, said, “Well, it was foreign to me. It was new. You know, people of my age, people are not just computer easy like younger people are. It was new.” She was one of the older nurses. Other nurses have seen the affect that age on the fears of coworkers. In describing the general attitudes of nurses towards the EHR, MH, a moderate-adopter of technology from a high-technology unit, said, “They were the old nurses who, everything is changing and they weren’t happy and this was just another thing. And it was those real people that had no computer experience and they were really frightened.”

Age appeared to influence the level of computer skills for some of the nurses. The nurses rated their computer skills lower compared to the computer skills of younger nurses. The perceived computer skill level difference between younger and older nurses may have been an assumption on the part of these nurses. NL, a low-adopter of technology from a low-technology unit, echoed this assumption when she said, “So, you know, maybe thinking that younger people are more literate or more comfortable is an assumption that we make just based on, ‘Well, they probably got the knowledge.’” But for other nurses, age did not impact their computer skills assessment. When asked if age influenced her experience with the EHR, ML, a moderate-adopter of technology from a low-technology unit, said, “I don’t think it (age) has made a difference actually because I think it was more of a comfort level I had developed in a previous job computer skills.”

Age also appeared to impact the mind-set of some of the nurses in regards to change. The older nurses were used to performing tasks in a particular manner, and seemed to had a hard time of letting go of old ways. One nurse spoke directly to age and the change process. In describing the nursing culture on her unit, ML, a moderate-adopter of technology from a low-technology unit, said:

...and they (older nurses) hang on to doing things because they were taught in a way that says “This is what you do. It has to be done right.” And you follow the route. You follow some strict routines and you have strict expectations of yourself and of your coworkers.
Type of nursing role

The nurses worked in one of two distinct nursing positions. Two nurses were bedside nurses, while the other nurses held nursing leadership positions. The two bedside nurses were the high-adopters of technology while the nurses in leadership roles were either moderate- or low-adopters of technology. One possible explanation for this difference was in the purpose the EHR was used in order to obtain patient information in a timely and convenient manner. The bedside nurses required all the patient information to be readily available, especially for other care providers. Those nurses in leadership positions accessed patient information for different reasons. When asked about her EHR usage, ML, a moderate-adopter of technology from a low-technology unit in a leadership position said, “How I generally use it (PowerChart) is because I am involved in bed utilization kind of stuff.”

The information contained in the EHR may have been a factor affecting the EHR use by both the nurse leaders and the bedside nurses. The EHR only contained diagnostic results and did not contain electronic documentation, while the paper chart contained additional information. Nurse leaders required an overall picture of a patient, and thus utilized the paper chart, while bedside nurses wanted to know the latest information about the patient, and thus utilized the EHR.

The roles of the nurses did not appear to impact the ability to support others. Nurses from both nursing positions were able to support fellow nurses. Bedside nurses did not view providing support as part of their role, but more of the make up of their person. When asked about providing support, HH, a high-adopter of technology from a high-technology unit and a bedside nurse, said, “Not part of my role, it is just who I am.” The nurses did not feel that providing support was limited to specific nursing roles. Although nursing leaders felt that providing support was part of their role, bedside nurses also provided support.

Level of education

Another possible difference between the nurses who were high-adopters of technology and the nurses who were moderate- and low-adopters of technology appeared to be their level of education. Both high-adopters of technology were diploma-prepared nurses. The other nurses who were moderate and low-adopters of technology were degree-prepared nurses. Despite differences in educational preparedness, this did not appear to fully explain the differences in EHR use among
these nurses. Their educational preparedness was just one commonality between the high-adopters of technology compared to those who were moderate- and low-adopters of technology. Nurses attributed current EHR usage to computer skills, age, and nursing position, rather than to educational preparedness. When asked about the differences related to educational preparedness, MH, a moderate-adopter of technology from a high-technology unit, said, "So, maybe, I think maybe those diploma people are totally younger nurses than the degree nurses. We could all be older people that have done our degree." She continued her exploration and said, "... and I think that they are maybe more recent and had a little bit more experience with computers." HH, a high-adopter of technology from a high-technology unit, did not relate educational preparedness with the use of the EHR. When asked if educational preparedness related to the use of the EHR, she said, "I don't think...."

**Level of motivation to use the computer system**

Motivation to learn the EHR appeared to affect EHR usage. HL, a high-adopter of technology from a low-technology unit, was personally motivated to excel in her use of the EHR. She wanted to buy a home computer for her personal use. This personal motivation appeared to be a driving force for her to use the EHR as fluently and frequently as she did. Compared to HH, the other nurse who was a high-adopter of technology from a high-technology unit, motivation appeared to explain the differences in their computer skills, time to practice, age, and other factors.

MH, a moderate-adopter of technology from a high-technology unit, appeared to be professionally motivated to learn the computer in order to be able to assist other nurses. She was also motivated to use the EHR as a replacement to the NORM system. In describing her motivation to use the EHR, MH said, "I just hated that system so much that anything was going to be better. I was totally motivated when I found out what PowerChart was all about." She is not as fluent or consistent in her EHR use as the personally motivated user.

NL, a low-adopter of technology from a low-technology unit, could not remember her password, thus limiting her ability to explore the EHR. She said that she was not motivated enough to overcome her password issue. When asked about having time to practice, she explained her rationale for not using the EHR, "I haven't really been motivated to get my old password and activate it because I don't need it in my job."

Another nurse described her motivation in relationship to competency. She felt
that it was her responsibility to stay current and to be able to adjust to changes. In response to a question regarding motivation, HH, a high-adopter of technology from a high-technology unit, said, “And, if being able to access information on the patient that you are looking after or the unit that you are involve in lends itself to basically being competent, I think that is motivation. Competency.” Motivation appeared to be both a personal and a professional motivator in the use of the EHR.

Personal value of the electronic health record

The more valuable the EHR was to an individual, the more the individual appeared to use the EHR. If the EHR did not meet the individuals' needs, the less the individual appeared to use the EHR. NL, a low-adopter of technology from a low-technology unit, did not routinely access patient information as part of her role. The information contained in the EHR was of no value to her, and she did not use the EHR. When asked about her current EHR use, she said, “If I was interested in looking up their bloodwork... I could probably go into PowerChart and find out the stuff I want.... I don't. I go and I look at their charts.” The paper chart seems to meet her needs.

For some nurses, the EHR did not contain all the information that they required. For these nurses, the EHR was of limited value and would use the paper chart to obtain the information that they required, and then the EHR to supplement this information. ML, a moderate-adopter of technology from a low-technology unit, used the paper chart to get a full picture of the patient, and then used the EHR for updated information.

Technical Factors

The technical factors of the nurses' level of initial computer skills, their fluency with using NORM, and the availability of the EHR program seemed to influence the use of the EHR and will be presented in the following section.

Level of initial computer skills

Having computer skills and being able to manage the training information did not appear to be predictors of the nurses' current EHR usage. There were some nurses with computer skills and who were able to manage the training information were low-adopters of technology, as they were unable to manage their passwords, or obtain sufficient support to resolve their issues. On the other hand, the one nurse who struggled with her training due to the lack of computer skills became a high-adopter of technology in the end. She attributed this to her personal motivation. When asked if she used the EHR more frequently than NORM, HL, a high-adopter of technology from
a low-technology unit, responded, "And I also had an ulterior motive. I wanted to get used to it so I could buy one."

Having computer skills appeared to assist in the ability of nurses to make sense of the computer information. HH, a high-adopter of technology from a high-technology unit, attributed her computer skills as having a positive influence on her ability to make sense of the computer information. In response to a question related to making sense of the computer information, she said, "Having a computer at home, I think, really, that I use, makes a difference, you know."

Computer skills also appeared to affect the need for the nurses to practice the EHR. Nurses rationalized that other nurses with computer skills did not require time to practice to be able to use the EHR. When asked about the ability of some nurses to use the EHR without having the time to practice, NL, a low-adopter of technology from a low-technology unit, said, "If people are saying they didn't have time to practice but they are still not having problems, then my guess would be that they are fairly computer literate and so they don't need to practice."

*Fluency with using NORM*

Previous use of NORM appeared to impact how the nurses utilized the EHR. Those nurses, who were fluent in NORM, used the EHR in varying degrees. One was a low-adopter of technology; one was a moderate-adopter of technology, while the other two were high-adopters of technology. Although NORM usage did not explain the current EHR usage, insights into the transition to the EHR can be made.

During the transition period, while both NORM and the EHR were available to obtain patient information, all the nurses who used NORM continued to use NORM, except for one, HL, a high-adopter of technology from a low-technology unit. She was older and personally motivated to use the EHR. She said that the increased convenience of the EHR was a factor in her using the EHR over NORM. When NORM was removed from the nursing units, one of the nurses reverted to the paper chart, while the other nurses used the EHR. The sole paper chart user said that she did not have the EHR application conveniently located for her to learn.

*Availability of the electronic health record program*

Access to the EHR program appeared to influence the use of the EHR. Without the convenient and consistent access, nurses did not use it on a consistent basis and some were so stymied by computer access issues that they did not use the EHR. The
two nurses who were low-adopters of technology said that they did not have a computer conveniently located for them to access. Although NL, a low-adopter of technology from a low-technology unit, had access to the EHR program on her computer in her office, she did not find that accessing the EHR from her office was beneficial to her. She preferred to be seen by other nurses in the nursing unit. If she needed to access patient information, she opted to use the paper chart because she could be visible to the staff. On the other hand, HL, a high-adopter of technology from a low-technology unit, said, "No, we probably use this a little bit more because it is sitting right on the desk there whereas NORM wasn't right where you sat." She stated this when asked if she used the EHR as frequently as NORM.

One of the nurses voiced her frustration with computer device access. She had to troubleshoot the technology to identify computers that were not functioning, and therefore could not be used to access the EHR. Not having the EHR program accessible prevented users from using the EHR immediately after training. MH, a moderate-adopter of technology from a high-technology unit, returned from training to find that there was no EHR access for the nursing unit.

Organizational Factors

The organizational factors included the value and general response to change on the nursing units, having the time to practice, the level and nature of available support, and VIHA's communication about and method of implementing the EHR seemed to influence the nurses' adoption of the EHR into practice.

Response of the nursing units to changes in practice

Nurses talked about the level of resistance to change on their nursing units. Some nurses resisted change until they were shown that the change had individual meaning. NH, a low-adopter of technology from a high-technology unit, reflected this when asked about how nurses on her unit deal with change. She said, "Well, I think people tend to resist it until change is shown to be beneficial and not just change for change. If it makes our life easier."

One nursing unit was described as not being resistant to change. On this unit, the nurses were described as personally and professionally responsible to keep up with the change. When asked how her unit has dealt with change in the past, HH, a high-adopter of technology from a high-technology unit, said, "And everybody pretty well is accountable for, you know, their own learning. And I think everybody wants, you know,
they don’t want to be behind.”

The nurses who worked in these environments attempted to overcome the resistance by change in order to facilitate the change in general. Some realized that change was inevitable and made the personal choice to change. Going along with the change was mirrored in NL’s, a low-adopter of technology from a low-technology unit, statement when asked about change. She said, “Probably, at this stage of my life, I mean there have been so many changes, I just kind of go, ‘Another change. Okay. Okay. Will do it.’” HH, a high-adopter of technology from a high-technology unit, attributed her ability to adjust to change to her personality. In her response to how she overcame the general nursing units’ response to change, she said, “I think change can be a positive thing as well as a negative thing. So, I think it is probably a bit of my personality, that I adopt.”

*Availability of time to practice*

The nurses appeared to use the time to practice to understand the process of obtaining patient information. HL, a high-adopter of technology from a low-technology unit, practiced to understand the process to improve her computer skills, while MH, a moderate-adopter of technology from a high-technology unit, practiced to keep her skills up in order to support others. When asked how she became comfortable with the EHR, MH, a moderate-adopter of technology from a high-technology unit, responded, “Initially, that playing day and then every once in a while, I would just click on and see what I remembered and try and change something or do something.”

The length of time a nurse practiced appeared to vary among nurses, and seemed influenced by the level of their computer skills. Having established computer skills appeared to shorten the length of time needed to practice for some of the nurses. HL, a high-adopter of technology from a low-technology unit, did not have computer skills. She began to practice using practice scenarios and then with patient data. HH, a high-adopter of technology from a high-technology unit, had moderate computer skills prior to the introduction of the EHR and only needed to practice immediately after training in order to make sense of the computer information. She attributed her current use of the EHR to her computer skills. In response to a question regarding what things helped her in using the EHR, she responded, “Probably my base of computer and that I use it at home, so I am not intimidated by it, I would say, and I do use it and I am getting better at using it. So that kind of helps.”
For the nurses with computer skills, having the time to practice did not appear to impact their EHR use compared to the nurses with poor computer skills. These nurses appeared to be able to transfer their previous computer skills to the EHR without the need to practice. When asked if having the time to practice affected her EHR usage today, ML, a moderate-adopter of technology from a low-technology unit, responded, “I think I don’t practice unless I needed to.”

Nature and availability of support

The timing of the application specialists’ supportive visits seemed to influence the ability of some nurses to utilize the support. Some of them that had the time to learn from the clinical application-training specialists were able to use the information and the support. In describing her first time using the EHR, MH, a moderate-adopter of technology from a high-technology unit, had the time to learn. She commented on her use of the application specialists, “That first day was really good because everybody had a chance to come back and once... The woman (application specialist) came over and actually set it up properly for us and it worked, we were all on separate computers looking up stuff.” Not having the time to receive support meant that some nurses could not be supported. When asked about the helpfulness of the application specialists, ML, a moderate-adopter of technology from a low-technology unit, said, “I wouldn’t recommend they come around any more in the morning. If they are going to come around, come around at times that work for the nurses.”

Printed pamphlets were also used by some of the nurses. While some did not need to use this information, others frequently referred to them for information as well as for support. When asked about what kind of support helped, MH, a moderate-adopter of technology from a high-technology unit, said, “The number one thing I still say is that brochure... That was my number one support, I would say.”

Some nurses had issues with using the Help Desk. They found that the response time and availability of the Help Desk were barriers to using the Help Desk. When asked if she had ever used the Help Desk, HL, a high-adopter of technology from a low-technology unit, said, “Sometimes it takes too long to get through to or to get back. I did once.” Another nurse voiced her concerns with the Help Desk in regards to their hours of operation. When asked about the EHR support, ML, a moderate-adopter of technology from a low-technology unit, said, “I have tried to change my password and it always ends up that the only time I have time to phone is at night when the Help
How the organization communicated and implemented the electronic health record

How the organization communicated and implemented the EHR appeared to help nurses adopt the EHR. The nurses responded positively to the manner in which the EHR was communicated and implemented. ML, a moderate-adopter of technology from a low-technology unit, attributed the organization’s approach as having a positive influence on her ability to manage the change associated to the EHR. She said:

It has been a thoughtful process... There was a lot of lead-time, telling us it was coming, but it was done incrementally. So, I think that has been good. We were a pilot site, and I was happy about that. Happy because I was able to support it and happy because I think we had a chance to even phase in our changes.

Factors that Seemed to Influence the Electronic Health Record Training

Several aspects of the EHR training appeared to facilitate or hinder the nurses’ learning. These factors included; whether the training was geared to the learner’s level; whether there was time to apply the learning during the training session; the initial level of the learner in terms of computer skill; the level of fear about the training; whether there was a sense of information overload; and the make-up of the class in terms of computer skill mix.

Gearing the training to the learner’s level appeared to assist in the learning for some of the nurses with computer skills. Teaching the precise method of how to use the EHR appeared to benefit the nurses with computer skills. ML, a moderate-adopter of technology from a low-technology unit sailed through the training. When asked about the positive aspects of training, she said, “It gave me an overview of the system. It showed me what it could do. It gave me the ‘need to know.’ But I did spend time waiting while other people got to the next section.”

During the training session, nurses also had the opportunity to practice using the EHR. This was found to be very helpful as it gave them time to apply the learning. In response to a question regarding what helped during the training session, MH, a moderate-adopter of technology from a high-technology unit, said, “…you know, it is better to actually do while you are learning than to just hear it and then to go back. So, I thought that was really good, having the computers right there at hand.”

The nurses’ pre-existing computer skills appeared to influence their ability to
manage the training information. HL, a high-adopter of technology from a low-technology unit, who described herself as not having any computers skills, struggled greatly with the training. In her description of her training experience, she said, “Because I knew nothing to start with. It was so new to me. That is why I was so overwhelmed.” Those nurses who described their computer skills as moderate either sailed through the training, or kept up with the training. When responding to a question regarding her expectations of her EHR training, ML, a moderate-adopter of technology from a low-technology unit, sailed through the training and described her computer skills as moderate. She said, “...for me, I could probably have done what we did in four hours in one hour.” Still other nurses, who described their computer skills as moderate, were able to keep up with the training. HH, a high-adopter of technology from a high-technology unit, described her computer skills as moderate when asked if she was able to keep up with training or if her computer skills were higher than what the class was taught at. She said, “No, I think it was probably, I mean, I was able to keep up. It was probably at the right level for me. You know, it was slow, yup.”

Some nurses verbalized fears about their ability to keep up with training. They felt their computer skills were not as well developed as they could be and that the EHR training would be a challenge for them. In response to questions related to expectations of training, NL, a low-adopter of technology from a low-technology unit, said, “I guess if you were going kind of nervous that you weren’t going to be able to keep up with the class, that would affect your learning.”

Nurses did not want to look foolish in front of other nurses during the EHR training. Keeping face was important to these nurses. When asked about having fears about learning the EHR, NL, a low-adopter of technology from a low-technology unit, responded that she did not have any fears, except that she did not want “to be a bonehead when you are in the class and do something really stupid.” One nurse feared that she would not be able to learn the EHR enough to be able to use it at work. Other nurses in this study observed the fears of the older nurses on their units.

Overcoming fears of the EHR training occurred with the realization that training was not too detailed or technical, and that the nurses possessed enough computer skills to keep up. These nurses were then able to absorb the training information. In response to a question regarding expectations of training, NL, a low-adopter of technology from a low-technology unit, said, “If you actually had some basic computer
skills, then you would be, other than this is new information, once you got into the class and realized this isn't too scary...you would be able to learn it quite easily.”

The “need to know” information provided during training may have been an obstacle for some nurses. HL, a high-adopter of technology from a low-technology unit, found that the information given during the EHR training included information about the EHR function that she did not use. When asked to describe her EHR training, she said, “Some of it (function) we never, ever use, it was just a little bit, the graphing and all of that, we never use that. So it almost made it a little more overwhelming, learning that.”

Unfortunately, the EHR training session was taught in the same manner regardless of the nurse’s level of computer skill. The classes were scheduled based on the nurses’ availability and not on their computer skill level. Pre-existing computer skills appeared to influence these nurses' perception of the EHR training class. The nurses with lower computer skills found the class to be just right, and were able to manage the training but did not sail through the training. The nurses with moderate computer skills found the class could have been shortened, and sailed through the training. When asked what hindered their learning experience, MH, a moderate-adopter of technology from a high-technology unit, said, “And it makes it seem so much more confusing, when you have got somebody who doesn’t know the basics to a computer.”

**Summary**

In this chapter, the process of how the nurses adopted the EHR into practice and the factors that influenced that process were presented. The process began with the nurses' introduction to the EHR as well as to the training information. This first stage of adoption labeled “Getting Started” was composed of the phases “Being Aware of Their Own Computer Skill Level” and “Managing the Training”. The nurses then progressed to the “Getting Comfortable with the Computer System” stage, which included the phases of “Managing Passwords”, “Being and Feeling Supported”, “Supporting Others”, and “Making Sense of the Computer Information”. Once the pre-existing computerized results viewer was removed, the nurses began the final stage of “Established a Pattern”, reflecting their chosen method of obtaining patient information. This stage was composed of the phases “Hanging On or Letting Go of Old Ways” and “Envisioning a Future of the Electronic Health Record” with the EHR. During this final stage, some nurse chose to use the EHR exclusively; some
chose both the EHR and the paper chart, while still others chose the paper chart exclusively to obtain patient information.

Individual, technical, and organizational factors appeared to influence the adoption of the EHR. The individual factors were: the nurse's age, the nursing role they held, their educational preparedness, their motivation to use the EHR, and the value they held of the EHR. The technical factors were identified as the nurse's computer skill level, their fluency with NORM, and the availability of the EHR program. The organizational factors included the response to change on the nursing units, the availability of time to practice, the availability and nature of support, and how the organization communicated and implemented the EHR. Several factors appeared to influence the EHR training. Whether training was geared to the learner's level, whether there was time to practice during training, the nurse's computer skill level, the level of fear of training, whether there was a sense of information overload, and the make up of the class related to the computer skill mix influenced the success of the training.
CHAPTER FIVE: DISCUSSION

The purpose of this study was to identify the process involved in the nurses' adoption of the electronic health record (EHR) into their practice, to identify the factors that affect the process of adoption, as well as those factors that facilitated and hindered the EHR training experience. In this chapter, a discussion of the stages of adoption, the factors that seemed to influence the adoption process, and the factors that seemed to influence the learning experience will be presented.

Adopting the Technology as a Change Process

The process of nurses adopting the EHR into practice was composed of three stages, "Getting Started", "Getting Comfortable with the Computer System", and "Establishing a Pattern". During the first stage, nurses were confronted with the training for using the EHR, and included the phases of "Being Aware of Their Own Computer Skill Level" and "Managing the Training". During the second stage, nurses began to explore the EHR, and included the phases of "Managing Passwords", "Being and Feeling Supported", "Supporting Others", and "Making Sense of the Computer Information". In the final stage, nurses made a choice of whether or not to use the EHR to obtain patient information. This stage was composed of the phases of "Hanging On or Letting Go of Old Ways" and "Envisioning a Future of the Electronic Health Record".

The adoption of the EHR into practice appeared to involve a change process. Prior to the implementation of the EHR, nurses obtained patient information from the patient's paper chart and from NORM (Nursing On-line Results and Messenger, the pre-existing electronic method of viewing diagnostic results). With the implementation of the EHR, nurses moved from using the paper chart and NORM, to using the EHR. There appeared to be distinct stages in this process, which are consistent with both Lewin's (1951) Change Theory, and Rogers' (1983) Diffusion of Innovation Theory. Common to these change theories is the notion that factors affect and influence the change process. Lewin described these factors as forces, both driving and resisting, and Rogers described these factors as characteristics. Several factors seemed to affect and influence the change process identified in this study. These factors included individual,
Every change process starts with a beginning or introduction of the proposed change. In this study, it was identified that nurses began their change process with receiving information about the EHR and about how the EHR functions during the "Getting Started" stage. Lewin (1951) described the first stage in his change theory as "unfreezing", where driving forces began to outweigh the resisting forces involved with the change. In Rogers' (1983) Diffusion of Innovation Theory, the beginning stage was segmented, and labeled as "knowledge" and "persuasion". The beginning stages appear to parallel each other.

After the change process has begun, individuals enter a transition stage. Different change theorists label this transition stage differently, but describe the transition similarly. Lewin (1951) used the label of "moving", where individuals began to get adjusted to the change. Rogers (1983) used the label of "decision", where individuals utilized different methods and activities that would lead to acceptance or rejection of the change. The transition stage in this current study was labeled "Getting Comfortable with the Computer System", where nurses began to get used to the EHR.

Once the transition is complete, acceptance or rejection of the change occurs. Lewin (1951) labeled this stage as "refreezing", where the change was no longer seen as new. Rogers (1983) divided this stage into two, and labeled the stages as "implementation" and "confirmation". During these two stages, individuals either accepted or rejected the innovation, and then sought confirmation of their decision. In the current study, the acceptance or rejection of change occurred in the stage labeled "Establishing a Pattern", where nurses either adopted or rejected the EHR.

The stages identified in this study seem to support the theory that the adoption of an innovation (e.g. EHR) involves a change process. In another study, the process of adopting an innovation by nurses was also examined and found to have five stages (Maxwell, 1995). As with other change processes, the stages identified by Maxwell parallel those of the change theorists. Maxwell compared her results to Lewin's (1951) Change Theory and found that the first stages of "not knowing anything" and "working toward transition" were paralleled to the "unfreezing" stage, the stages of "becoming accustomed to it" and "problem solving" were paralleled to the "moving" stage, and the
final stage identified as "being an expert" was paralleled to the "refreezing" stage. Maxwell's study illustrates that the implementation of technology to nurses involves a change process and the processes appear to be similar to each other, as well as to the current study.

The change process identified in this study appears to be consistent with other change processes. Common to the change theories is movement through a process with distinct stages, namely an introduction stage, a transition stage, and an acceptance stage.

Factors that Seemed to Influence the Adoption Process

In this study, the nurses were identified as one of three types of technology adopters, based on their use of the EHR. The high-adopters of technology almost exclusively used the EHR to obtain patient information, the low-adopters almost exclusively used the paper chart to obtain patient information, and the moderate-adopters used both the EHR and the paper chart to obtain patient information. The individual factors of age, type of nursing role, level of education, level of motivation towards the computer system, and the personal value of the EHR appeared to influence the adoption process. The technical factors of the level of initial computer skill level, fluency with the previous computerized patient result viewer, and the availability of the EHR program, and the organizational factors of the general response to change on the nursing units, the availability of time to practice, the level of support provided, and communication of the place of the EHR in the organization also appeared to influence the adoption process.

Several of the factors identified are consistent with the driving and resisting forces described by Lewin (1951). Driving and resisting forces play an important role in Lewin's change theory. The driving forces that support the proposed change disturb the equilibrium of the status quo. These driving forces become stronger than the resisting forces that support the status quo. The peaking of driving forces causes the implementation of the change. Finally, both the driving and resisting forces stabilize once the change has been accepted.

The individual factors appeared to affect the change process. These factors parallel Lewin's (1951) driving forces. Romano (1995) also described individual characteristics such as the individual's value of the change, age, and education, as
being predictors of adoption and other studies also identified individual characteristics that affected the adoption of an innovation. These studies found that age had varying degrees of influence on the change process. Some studies found that age did not affect the nurses' attitudes towards computers or the adoption of technology (Miller & Jeffcote, 1997; Murphy, et al., 1994; Scarpa, et al., 1992; Webster et al., 2003). Other studies found that age affected the attitudes and adoption of technology (Hillan et al., 1998; Simpson & Kendrick, 1997). Lee, Lee, Lin, and Chang (2005) found that older nurses used a form of the EHR in practice more than younger nurses. They attributed this to the fact that older nurses are more knowledgeable of patient care aspects, and therefore use the computer to access more patient care plans than younger nurses. In the current study, age did not appear to directly affect the change process, but appeared to influence the nurses' fears and attitudes toward the EHR. Age did appear to influence the computer skill level, thus influencing the adoption process.

Another difference between the high-adopters of technology and the low- and moderate-adopters of technology appeared in the role the nurse held. The nurses who used the EHR exclusively to obtain patient information held staff nurse roles, compared to the other nurses who were in nursing leadership positions. The nurses speculated that the patient information requirement needs of these two positions differed, thus explaining the differences in usage patterns. They indicated that nurses in leadership positions used the EHR and the paper chart to obtain a full picture of the patient, while bedside nurses already had a full picture from their contact with the patients and only required the up-to-date information found in the EHR. Nurses in leadership positions may not need to access the information contained in the EHR so they were less likely to use the technology consistently.

The individual factor of educational background appeared to affect the use of the EHR. Nurses with a higher post secondary education appeared to use the EHR less than those with a lower post secondary education. This finding seems to dispute the findings of other studies. Lee et al. (2005) found that the nurses with more post-secondary education used a form of the EHR more than nurses with less post-secondary education. Webster et al. (2003) reported that the higher the educational background of the nurse, the more likely he or she would use a computer at home. Their study focused on computer use at home, while the use of the EHR was the focus of Lee et al. and this current study. In two other studies measuring the attitudes of
nurses towards computers and the EHR, the educational background of the nurses was not significant in the prediction of the attitudes of nurses towards the EHR and computers in general (Scarpa, et al., 1992; Simpson & Kendrick, 1997).

Nurses' motivation to use the EHR appeared to influence the adoption of the EHR. Motivation to use the EHR appeared to explain some of the differences between the two high-adopters of technology. Nurses who were motivated to use the EHR were able to overcome other obstacles such as rudimentary computer skills and issues with passwords. Nurses without the motivation did not seek the assistance they required to overcome the same issues. It appears that motivation to use the EHR is a major factor influencing the adoption of the EHR.

Some of the nurses did not use the EHR because it did not meet their needs, and they did not access, or value the information contained in the EHR. Other nurses valued the information in differing degrees as seen in their level of adoption. Nurses seem to require different types of patient information depending on their nursing roles and it appears that the value of the EHR held by nurses is a strong influencing factor in the use and adoption of the EHR.

Having computer skills prior to the introduction of the EHR appeared to reduce the amount of time nurses required to practice, and appeared to assist them during the learning process. The EHR being introduced was a Window-based application. Perhaps nurses with a base knowledge of Window-based applications were able to transfer their pre-existing computer skills to the EHR, thus reducing their time to practice and learn the EHR. Those without these skills had to concentrate on learning a new skill and could not concentrate on learning the EHR function.

Most nurses in this study were fluent with NORM, and they continued to use it until it was removed from the nursing units. Nurses commented that they did not have the time to practice their new computer skills and used what was familiar to them in order to access patient information quickly. Was ignoring the new technology until they were forced to use it a method of maintaining control over change? Were the nurses too busy to explore the EHR?

The availability of the EHR program appeared to influence the adoption of the EHR in that some nurses found the location and availability of the EHR program contributed to their use of the EHR. This appears to indicate that the convenience of the computer containing the EHR program is an important aspect in the use of new
technologies. By having the computer containing the EHR application located in central areas, nurses do not have to change their work patterns of accessing patient information from a central nursing station. However, the location of computers containing the EHR program does not guarantee that nurses would become high-adopters of technology. Did other factors such as motivation to use the EHR, the nurse’s level of computer skills, and their personal values they held towards the EHR influence their use of the EHR more than the availability of the EHR program?

The response of the nursing units’ to change appeared to be a factor in the adoption of the EHR into practice. Common to all nursing units was the notion that change was a constant. What differed was the response of the nurses to those changes. Some nurses seemed resistant to change, while others appeared to make the change work for their units. This finding appears to support the findings of Kim and Kim (1996). They found that individual nurses may adopt an innovation, while their unit units’ negativity towards an innovation may impede the adoption of an innovation.

The availability of time to practice appeared to be a factor in the adoption process. The nurses appeared to require varied amounts of time to practice, which appeared to be related to their pre-existing computer skill level. Were nurses with no computer skills “practicing” their computer skills, or were they practicing learning about the EHR? Did pre-existing computer skills affect the time required to practice? These findings appear to support the findings of Saranto (1998) who found that in order for nurses to utilize an EHR, they must have the time to practice.

Nurses commented that the nature and availability of support influenced their adoption of the EHR. They indicated that they required support throughout their shifts, and organizational support was not in place to assist them at that time when they required support. Other forms of support were helpful for them, although some did not utilize the support. It appears that nurses require various types of support (e.g. printed materials, one-on-one support by co-workers and by application specialists, and the Help Desk). In this study, organizational support in the form of the Help Desk and application specialists were not available 24 hours a day, 7 days a week. If these supports were in place, would the outcomes of this study differ?

An organizational predictor in the nurses’ adoption of an innovation is through the use of communication mechanisms (Romano, 1995). Romano found that although the use of communication mechanisms in itself was not a direct predictor of the adoption of
an innovation by nurses, communication was the conduit for increasing the awareness of the innovation to nurses. In this study, the nurses identified that the organization communicated about and implemented the EHR project better than other projects. Through the organization's use of communication mechanisms such as in-services, posters, and emails, nurses appeared to be kept well informed of the changes. Although not a direct predictor of adoption, the use of communication mechanisms seemed to increase the awareness of the EHR for all the nurses in this study.

Factors that Seemed to Influence the Learning Experience

In this study, nurses identified factors that seemed to influence their learning experience such as the nature of the training program, whether the training was geared to their learning style, their level of pre-existing computer skill level, their level of fear about the training, whether there was a sense of information overload, and the make-up of the class in terms of computer skill mix. These factors will be presented below.

The factors that appeared to assist in the learning experience focused on those that met the learner's needs. The nurses identified that hands-on learning and having the training geared to their learning needs positively influenced their learning. These findings seem to support the findings of Webster et al. (2003) who identified that hands-on learning was effective for nurses to obtain and retain computer skills. Romano (1988) echoed this finding when she discussed the for computer training. She indicated that nurses needed to develop computer skills through the use of hands-on training.

Learning specific information about the EHR was also identified as being helpful in the nurses' learning experience in this study. This finding seems to support the recommendations of Romano (1988). She indicated that specific training related to the use of the technology in a specific setting was required when introducing a new technology. Marasovic et al. (1997) also reflected this need for appropriate information. They concluded that the inclusion of appropriate and applied information was needed during computer training in order to increase motivation and belief in the computer system.

The findings appear to indicate that the nurse's pre-existing computer skill level influenced their learning experience. Without having baseline computer skills, nurses appeared to struggle with the training, while nurses with existing computer skills appeared to manage in varying degrees. The nurses who struggled, were not able to
grasp the information about the EHR, but rather concentrated on learning basic computer skills. This illustrates that having pre-existing computer skills positively influence the learning of the EHR, and that these skills are transferable to other Window-based computer applications.

The sense of information overload appeared to influence the learning experience. Some nurses indicated that the training contained too much information to absorb. This finding may be explained by the pre-existing computer skills. Nurses with computer skills did not indicate that information overload affected their learning experience, while those with limited computer skills held a sense of information overload. It appears that the sense of information overload is directly associated to the computer skills level of the nurse.

The nurses indicated that computer application training that was attended by nurses with mixed computer skills hindered their learning. This finding supports the findings by Saranto et al. (1997). In an attempt to understand the information technology (IT) learning environment, they found that computer classes composed of nurses with mixed computer skill levels were not conducive to the IT learning experience. They also suggested that IT classes should be more homogeneous in terms of the students' computer skill levels in order to provide an environment that fosters learning. Warnock-Matheron and Hannah (2000) suggested that training programs acknowledge the differences in computer skill levels of the learners to increase the use of computers within nursing practice, as learners would not only learn about the computer, but would also begin to grapple with the complexities of a new technology within their practice.

Summary

In this chapter, the findings were discussed in terms of the literature. The parallels between change theories and the change process identified in the adoption of the EHR were examined. The factors that seemed to affect the learning experience and the adoption process were also examined. Some of the factors reflected what was identified in the literature but other factors showed different results.
In this chapter, the study is summarized, the limitations presented, and the conclusions described. This will be followed by a discussion of the implications of this study for nursing education, clinical practice and administration, and research.

Summary

In this study, the process of how nurses adopt the electronic health record (EHR) into their practice was examined. The introduction of computers and information technology within healthcare has been fairly new compared to the business community. Ancillary hospital departments, such as radiology departments, have utilized the power of computers to transform their practices. Only recently have computers and information technology begun to surface on nursing units. The EHR is an example of one of these computer applications. The introduction of the EHR begins a change process for nurses.

The EHR was recently introduced to the nurses of the Vancouver Island Health Authority (VIHA), which replaced the Nursing On Line Results and Messaging system (NORM). Through a four-hour training session, nurses learned the basics of the EHR. The use of the EHR varied between nurses, and in an attempt to understand these differences, the problem of how nurses adopt the EHR into practice was explored.

Grounded theory qualitative research methods were used to determine the process of how nurses adopted the EHR into practice, to identify the factors influencing this process, and to identify what influenced EHR learning experience. Six nurses were purposefully selected for this study. Although not a representative sample, they included some variation in both their final EHR adoption use as well as characteristics of the nursing units in which they worked. Each nurse participated in a semi-structured interview that was audio taped and transcribed verbatim. Data from these interviews were analyzed using a constant comparative method, and memos were used to assist in the data analysis. The focus of the analysis was to deconstruct the data into codified segments, and to reconstruct the data in a conceptual manner.

Three stages of the nurses' adoption of the EHR into practice were identified. These stages were "Getting Started", "Getting Comfortable with the Computer System", and "Establishing a Pattern". The first stage began with the introduction of
information about the EHR and EHR training, and ended with the nurses completing the EHR training class. Nurses were given information about the place of the EHR in the organization and information about the EHR application. Training involved hands-on practice and instruction about how to use the EHR and they obtained support resources including brochures. During the first phase of "Being Aware of Their Own Computer Skill Level", nurses then began to assess their computer skill level. Most nurses were not able to accurately assess their computer skill levels. They indicated that their computer skill level was low, despite being able to use other Window-based computer applications. "Managing the Training" was the second phase in this stage. It described how nurses were able to get through the training session. Some of the nurses "sailed through" the training. They kept up during the training session, finished the training within the designated time, understood and assimilated the information quickly, and overcame any fears about the training. Others struggled with the training. They could not keep up during the training and said that they could not understand the information presented to them during the training. There were also those nurses who did not struggle with the information, but did not sail through. They felt that the information was appropriate and adequate, and that the training met their needs.

The second stage began when the nurses returned from the EHR training and finished when NORM was removed from the nursing units. The first phase was identified as "Managing Passwords". The nurses obtained different user names and passwords for both the computer network to access the EHR program, and for the EHR program itself. Both of these passwords changed every 90 days. They managed their passwords differently. Some were able to remember and change their passwords with some difficulties, while others were unable to remember or change their passwords, thus were unable to use the EHR. "Being and Feeling Supported" was the second phase in this stage. Some nurses received assistance with the EHR from the Help Desk, from other nurses, and from the EHR application-training specialists. Just the knowledge of having someone there to support and assist them was enough for some of the nurses to understand the EHR. They experienced some difficulties with the support. "Supporting Others" was the third phase of this stage. Most nurses were able to give support to their coworkers in regards to the EHR. "Making Sense of the Computer Information" was the last phase. Patient information in the EHR displayed differently than in the paper chart or in NORM, so that nurses had to understand what
the presented information contained in the EHR meant. Some nurses were able to understand the information displayed in the EHR without difficulty, while other nurses had difficulties making sense of the information.

The third and final stage began with the removal of NORM and continued to the time of the first interview. The first phase, "Hanging On or Letting Go of Old Ways", was characterized with the nurses choosing whether or not to use the EHR. Those who stopped using the paper chart and used the EHR were identified as high-adopters of technology, those who continued to use both the paper chart and the EHR were identified as moderate-adopters of technology, and those who used the paper chart almost exclusively were identified as low-adopters of technology. "Envisioning a Future of the Electronic Health Record", the second phase, described the nurses' varied views of a future with the EHR. All of the nurses had a positive view of the future with the EHR. Some initially described the steps that they would have to take to be able to use the EHR in the future. They later talked about a future with the EHR, but voiced possible downfalls and barriers to the use of the EHR in the future. Others talked about a future involving the EHR.

Individual, technical, and organizational factors appeared to assist in the nurses' adoption of the EHR. These factors were the individual factors of the nurse's age, type of nursing role they held, their level of education, their level of motivation to use the computer system, and their personal value of the EHR. The technical factors of the nurse's level of initial computer skill, their fluency with NORM, and the availability of the EHR program, and the organizational factors of the response to change on the nursing units, the availability of time to practice, the availability and nature of support, and the organization's communication and implementation of the EHR appeared to influence the adoption process.

The learning experience appeared to be influenced by having the training geared toward the learner's level, having the time to practice during the training, the initial level of computer skills of the nurses, the nurse's level of fear of training, the sense information overload, and the make-up of the class related to computer skill mix.

Limitations

It is important to understand the limitations of this study. One limitation was related to the sample and its very small size and because it did not include the
maximum variation that would have been preferable. The sample consisted of female nurses in their 40's and early 50's and did not include younger nurses, or male nurses. The limitations of the findings presented in previous chapters can be attributed to the composition of the sample. Although the six nurses varied in their EHR usage, and in the type of nursing unit they practiced, the limited variation of the nurses' characteristics may have limited the amount, type, and variation in the data. The additional representation of nurses who were of different ages, genders, and nursing roles may have introduced an increased dimension to the stages and phases. With an increase of the variation in the sample, the factors affecting the adoption of the EHR may have been more evident.

As with other forms of qualitative research, grounded theory research has been criticized in terms of generalizability of the findings. The tenants of grounded theory research limit the ability to generalize the findings to a larger population. According to Corbin and Strauss (1990), the larger the size and diversity of the sample, the further the outcomes can be generalized, as the outcomes and variations within the data are complete and fully understood. However, a focus of this type of work is exploratory as it informs the inductive phase of scientific investigation. In this study, the six nurses gave their perspective on the introduction and use of the EHR in their particular nursing units. Data saturation was not reached, and the level of description reflected this.

Another limitation of this study was the challenges faced by the investigator. As a beginning investigator, there is the potential for premature closure of the analytical process before the outcomes are fully developed (Dey, 1999; Hutchinson, 1993; Sandelowski, 1995). The inexperience of the investigator in terms of interviewing techniques may have limited the type and quality of data obtained from the nurses. Clues and statements made by the nurses during the interview could have been explored further if this investigator had the experience and expertise related to conducting a qualitative data collection interview. In addition, the investigator had only a very beginning level of analytical skill.

The available function of the EHR may also have impacted the findings of this study. The function of the EHR was to view patient information. There was no interaction or data entry required at this stage of the EHR implementation. The information contained in the EHR was also available in the paper chart. This duality of information and the view-only function of the EHR offered nurses some options on how
to access the information. The nurses did not have to access the EHR to obtain patient information. If nurses had to use the EHR for documentation or to obtain patient information, the process of adoption may have been different.

Conclusions

Based on the findings and the limitations of this study, one can only make a tentative conclusion that nurses appear to utilize a process in their adoption of the EHR into practice, which is consistent with some of the other major change theories. The process seems to be composed of three distinct stages, each containing phases. High-adopters of technology were generally staff nurses, who were of similar age, educational background, and differed in their computer skill level. Low-adopters of technology were generally in nursing leadership roles, were of similar age, educational background, and computer skills. The factors that differentiate these two user groups and that influenced the learning experience were tentative at best due to the limited variation of the sample.

Implications for Nursing

The findings from this study have implications in terms of nursing education, clinical practice, administration, and research. Knowing that the adoption of the EHR is a process and that this process is influenced by a number of factors that might be amenable to particular actions directs nursing to pay attention to this in terms of implications. The individual factors of the nurse's age, the nursing role they held, their fluency using NORM, their educational preparedness, their motivation to use the EHR, and the value they held of the EHR, the technological factors of the availability of the EHR program and the nurse's computer skill level, and the organizational factors such as the nurses computer skill mix in the EHR training class, the nursing unit's response to a change in practice, the availability and nature of support, the availability of the time to practice, and the organization's communication about and implementation of the EHR appeared to influence the process of adoption and the learning experience. What follows is a presentation of the implications of the findings as they relate to nursing education, practice, and research.

*Implications for Nursing Education*

Having pre-existing computer skills seemed to assist the nurses in adopting the
EHR into practice. Graduates of undergraduate nursing programs must be able to adopt the EHR into their practice. Nurse educators can assist nursing students in developing their computer skills. Younger students are more likely than older students to have already used computers, both in their personal and professional lives. By ensuring that nurses are comfortable with Window-based computer applications, the ability of the graduates of these programs to adopt the EHR into practice is increased.

The importance and value that the individual holds for both computers in general and for the EHR in particular seemed to assist in the adoption process. Making nursing informatics courses mandatory in a nursing program can assist in the nurses' ability to obtain patient information through computer technology. Nursing programs should create and use a form of the EHR as part of the nursing informatics course. Nursing programs are a time when future nurses practice their skills in order to be able to practice in clinical settings. The use of an EHR within a nursing program will permit future nurses to practice their patient information retrieval skills in order to use the EHR in their clinical settings.

Part of the informatics course should include teaching the practical aspects of the EHR. Through the identification of issues associated with the paper chart, such as legibility, the benefits of the EHR can be presented to students. Case studies of errors related to the paper chart should be presented. The course should also include exercises and discussions that compare the function of the EHR to the paper chart. Students should be given the opportunity to discuss the positive and negative aspects of using an EHR in practice. Discussions should also include the reality that computers will be part of nursing practice now and in the future. These strategies could begin to highlight the benefits and value of the EHR to students.

The establishment and use of an EHR within nursing programs will also decrease the anxiety and fears associated with the EHR. Frequent exposure to new technologies decreases the anxiety and fears associated with the technology and increases comfort level with the technology (Little, 1997). Nursing students practice patient care monitoring and caring techniques within the safety and security of a learning environment to increase their comfort level with these skills. Learning and using the EHR within these learning environments will aid in reducing anxiety and fears about the EHR, and increase the future nurses' comfort level with the EHR.
Implications for Clinical Practice and Administration

Having application training classes composed of nurses with mixed computer skills hindered their learning experience. To improve the nurses' ability to make the most out of training, efforts should be made to ensure that nurses with similar computer skill levels attend application training classes. Through the identification of pre-existing computer skill levels, classes can be offered to those nurses with high computer skills, to those nurses with low to moderate computer skills and to those nurses with no computer skills. The extra effort to ensure application training classes are attended by nurses with complementary computer skill levels will enhance the nurses' ability to understand the concepts of the EHR being presented during training class.

Having some proficiency with computers, not unexpectedly, facilitated the adoption of the EHR. Opportunities must be provided for nurses to have the necessary computer skills prior to implementing a Windows-based EHR. Deployment of computers on nursing units must occur well in advance of the implementation of the EHR. Nurse leaders can assist by having computer applications available on the nursing units that would increase the use of the computer. Such applications include the placement of nursing policy and procedure manuals, and nursing care plans on-line to permit nurses to practice their computer skills. Other computer applications include clinical practice guidelines, and sources of literature related to the specialty of the nursing unit. Nurse leaders can also replace printed workflow tools such as nursing worksheets with on-line worksheets. Nurses can also be encouraged to access on-line professional support organizations such as the Registered Nurses Association of British Columbia, and to utilize the on-line resources such as electronic professional registration and literature search engines.

Nurses seem to need time to practice their new computer skills to become comfortable with new applications. Every effort must be made to permit nurses the time to practice after the introduction of a new technology. Nurse managers should provide nurses an opportunity to practice new computer skills. If it is the expectation that nurses interact with the EHR in the form of placing orders or on-line documentation, opportunity to practice is essential.

The findings could assist nurses responsible for the implementation of the EHR to nurses. The findings indicate that the location and placement of computers appeared to assist in the adoption of the EHR into practice by nurses. Nurses involved with the
implementation of the EHR must ensure that careful consideration of the placement of devices to access the EHR takes place. By understanding the workflows and business process within a nursing unit prior to the placement of computers, future access of the EHR can be estimated, and devices can be placed to maximize use potential. The computers should be conveniently located from the nurses’ perspective. Computers should not be located in areas where the nurses will not use them.

Nurse had considerable difficulty in managing and remembering both their network and EHR application passwords. Although it is important that application security must be maintained through the use of passwords, other strategies are needed to facilitate recall of passwords. Strategies include the use of generic nursing unit network passwords that do not expire, extending the automatic password expiration to decrease the frequency that passwords change, suggesting that nurses use a “core” password that they can change by adding one character, and suggesting that nurses use three passwords consistently.

In this study, the nurses had a choice of whether or not to use the EHR, as information contained in the EHR was also available in the patient’s paper chart. Having the option to obtain patient information from multiple sources appeared to be a barrier to nurses fully using the EHR. The removal of duplicate sources of patient information is necessary to increase nurses’ use of the EHR. Implementation teams should remove the redundancies once an overlap of duplication is complete. It will be necessary to communicate the date that the old technology or source of information is removed to permit nurses the time to practice the retrieval of the information from the EHR.

Nurses require assistance with the EHR functionality 24 hours a day, 7 days a week. Nurses who do not receive the required assistance in a timely manner appeared not use the EHR. In order to assist nurses in the use of the EHR, appropriate support must be available 24 hours a day, 7 days a week. To provide this support, knowledgeable support individuals must be available in a timely manner, either by phone or in person to assist nurses with issues and questions about the EHR.

Nurse administrators should work towards increasing the role of the EHR in the nursing units’ culture. By providing education, and setting an example by utilizing the EHR and other computer applications such as staff scheduling in their practice, nurse administrators can possibly influence the view of the EHR to nurses on the unit. Nurse
leaders should provide forums or other opportunities for nurses to express their concerns about the EHR. Encouragement and one-on-one support should also be provided. Nurse leaders can also present findings from chart reviews and follow-ups from incidents to highlight some of the issues related to the paper chart, such as legibility and transcription errors. By comparing these "downfalls" of the paper chart with the EHR, some of the benefits of the EHR can be highlighted. Administrators should also encourage and support the nurse leaders on the units to increase their computer skills and use of the EHR to become the "champions" of the EHR. These nurse leaders can then support and provide an example to the other nurses during the EHR implementation.

Implications for Nursing Research

This study is one of the first qualitative studies to examine the process of nurses’ adoption of the EHR into practice. This is just a beginning point in developing an understanding of this process. The sample in this current study reflected some, but very little variation in demographic make up and it was therefore difficult to differentiate what influenced the adoption process. Repeating this study using a larger sample that has variation in many nurse factors is the major research recommendation. The sample needs to have much better reflection of age variation, educational preparedness, nursing role, and computer skill level.

Many questions were raised that could guide further research in this field. For example, does the position held by the nurses affect their adoption of the EHR? Does the educational background of the nurse’s affect their adoption of the EHR? Does the functionality of the EHR being introduced affect the adoption of the EHR? Does age affect the adoption of the EHR? Do male nurses adopt the EHR differently than female nurses? Do different methods of implementing the EHR affect the adoption of the EHR? Future research should focus on answering some of these questions raised in this study.
References


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APPENDIX A

VIHA EHR Training and Implementation Process

The VYSTA clinical application implementation team is composed of three application specialists, and one training coordinator. There are three computer training rooms located on-site of the three major hospitals in VIHA. If the class is less than four students, the class is taught by one application specialist, however, if the class is large, two are utilized. The training coordinator decides which nursing unit is to be trained next based upon training resource.

An introduction letter is sent to the unit manager, containing information on training, responsibilities, and the conversion plan. A list of nurses employed on the unit is obtained and each nurse is sent a computer literacy self-reporting questionnaire. The questionnaires are collated and nurses with limited computer skills are offered a four-hour basic Windows class. During this class, nurses learn basic mouse skills, keyboard skills and introductory Windows skills such as closing and opening windows.

Nurses are then scheduled to attend the EHR application class. These classes are offered during the week, in the evenings, afternoons, and mornings. An attempt is made to train like professionals together, for example, an attempt is made to train nurses with other nurses and unit clerks from the same unit. Physicians are trained separately. Other ancillary healthcare disciplines are trained in like groups.

During the class, instruction is given on how to access patient information while each nurse has the opportunity to use the computer to replicate the instruction. The application specialists will explain how to access the information, and the nurses in the class will use the computer to access the information as stated by the trainer. If a nurse is experiencing difficulties, one of the application specialists will assist the nurse, or if there is not a second trainer in the class, the trainer will assist the nurse.

At the end of the EHR training class, the application specialists assist the nurses in accessing the EHR in order to address password issues and to assist in applying the newly acquired knowledge to actual nursing units and patients. Nurses are then encouraged to utilize the EHR upon returning to their nursing units. Support and help information are given to the nurses. Brochures consisting of step-by-step instructions for all of the concepts covered in the training class are given to each nurse on completion of the class. As part of the class, nurses are shown where to obtain on-line
support in the form of an electronic user manual. Follow-up nursing unit visits are arranged by the application specialists to assist nurses by answering questions and offering one-on-one support.

At the end of the EHR training class, nurses are informed that the existing nursing information system currently used to view patients' diagnostic results will be turned off after a period of time. Nurses are encouraged to become comfortable with the EHR during the period of time when both computer applications are available. A notice is sent to the unit manager when a majority of nurses are trained in the EHR. This notice is a reminder that the current nursing information system will be turned off on a specific date and asks that the unit manager remind staff of the conversion. After the conversion, a clinical application-training specialist arranges for another unit visit to address some of the issues facing the nursing unit.
APPENDIX B

Initial Interview Trigger Questions

1. How would you describe your level of computer literacy prior to attending the Windows or EHR training?

2. Prior to your first training session, what were your thoughts about what you were about to learn? What were your expectations of the training, of the EHR computer application? Did you have any fears about training or learning about the computer application – if so, tell me about them?

3. What was the initial application training session like for you? What were you thinking about during the training? When you left the training, what were thoughts about the training?

4. Tell me about the first time you used the EHR computer application on your unit, or the first time you remember. What were the circumstances during this first exposure – did you have time to reacquaint yourself with the EHR computer application? What was going on in the unit?

5. Now that you have been using the EHR computer application in your unit, how would you describe your initial computer training?

6. How often do you use the EHR computer application? Tell me about when you use the EHR and when you do not. How do you determine when you use the EHR computer application and when you do not?

7. How would you describe your current EHR computer application usage?

8. What things helped you to get where you are right now with your computer application use? What things did not help you?

9. What other things helped you?

10. What challenges (if any) did you encounter? How did you overcome them?

11. What support helped?

12. How would you describe the general attitude towards the EHR on your unit?

13. Where would you like to be with the EHR computer application usage? How do you see yourself getting there?
The purpose of this second interview is to validate what I have found thus far, to further my understanding of the process of how nurses adopt PowerChart into practice, and to further my understanding of the factors that assisted or hindered how nurses adopted PowerChart into practice.

I would like to start off this second interview with a description of the initial findings. After the first round of interviews, I have discovered that nurses' move through three phases in their adoption of the PowerChart into practice. I have called the first stage “Getting Started”. During this phase nurses were faced with learning about PowerChart. “Being Aware of Computer Skills” and “Managing the Training Information” are key to this phase. Some nurses “sailed through” the training information without assistance, while others “struggled” with the information. There were those nurses who were able to keep up, somewhere between sailing through and struggling with the information.

The second phase of the process I have identified as “Adjusting to the Computer”. During this phase, nurses were faced with managing their passwords. Some were successful, while others could not manage their passwords. Part of this phase also included a sense of Being and Feeling Supported. With assistance and support, nurses were then able to explore PowerChart. Some nurses provided support for others. Most of these nurses were in a leadership position, though bedside nurses were able to provide support if asked. The final part in this phase was Making Sense of the Computer Information. Learning what information was in PowerChart, what information was not in PowerChart and what the information seen in PowerChart meant was key to this final part. Some nurses were able to give meaning to the information to assist their patients. Some nurses made sense of the information through trial and error, while some were able to make sense by having the time to practice.

The final phase I have called “Establishing a Process”, whereby nurses chose how they would obtain patient information. Some chose to use PowerChart exclusively, some used both PowerChart and the paper chart, while others continued to use only the paper chart. During this phase, some nurses were able to Let Go of their old ways, while others continued to Hang on to their old ways. There were nurses who
immediately let go and used PowerChart when it was available, while others used NORM until NORM was removed. At that point, some used PowerChart, while others reverted back to the paper chart.

All nurses had a view of a future through the use of PowerChart. Some nurses held a positive view of PowerChart, stating the benefits of computerization, while others voiced their concerns regarding the struggles and issues that would have to be overcome. These three phases and their components relate to how nurses are engaging with the technology. Getting Started, Adjusting to the Computer and Establishing a Process seem to describe distinct aspects of being engaged with the technology. Engaging with the Technology describes how users are committed to PowerChart and to making PowerChart work for them in their practice.

1. After considering my description of initial findings identifying the phases involved in using PowerChart, tell me your thoughts about the phases. (Getting Started (being aware of computer skills, and managing the training), Adjusting to the Computer (managing passwords, being and feeling supported, supporting, making sense of the information) and Establishing a Process (Hanging On or Letting Go of old ways, Envisioning the Future)? How well do the phases describe the process you went through? Can you tell me anything about how the process was for you – where it was similar and/or different to this description?

2. There seems to be a progression in adopting the use of PowerChart consistently in nursing practice. What do you think would assist nurses, including yourself, to move through these phases quickly and smoothly?

3. Some nurses commented that they learned just enough information during PowerChart training to be able to use PowerChart effectively, while other nurses stated that there was too much information, so much so that they were overwhelmed with training. Why do you think this was so?

4. To get a better sense of how to change or improve PowerChart training, I am interested in your perspective of PowerChart training and the information that was provided to you during training. What were some of the things about the training session that you found helpful in your current use of PowerChart? What were some of the things about the training session that you did not find helpful in your current use of PowerChart?
5. Expectations about PowerChart training varied from learning concise information on how to use PowerChart to having fears about keeping up during the class. How do you see expectations of PowerChart training affecting the learning of PowerChart? How do you see your prior expectations of PowerChart in general affecting your use of PowerChart today?

Each phase appeared to be affected by different factors. Getting Started was affected by age, fears, nursing units' general resistance to change, and pre-existing computer skills; Adjusting to the computer was influenced by education, expectations, time to practice, nursing position (bedside verses leadership), timing of support, use of NORM, device access, the personal value of PowerChart, and motivation; while Establishing a Method was affected by education, expectations, nursing position, use of NORM, having the time to practice, motivation, device access, and the nursing units' general response to change. I would like to discuss some of these factors now.

6. Older nurses seem to rate their computer skills inferior to younger nurses, thus fearing PowerChart training. Do you think this is true, and if so, why is this the case? How do you see age influencing your experience with PowerChart? Please describe how you see age as affecting your computer skills assessment? Tell me about your view of younger nurses being stronger computer users? How does this make you feel?

7. Some nurses were able to make sense of the computer information in PowerChart, while some nurses were confused with the information displayed in PowerChart. For example, when PowerChart displayed an “In Progress” as a result in the Flowsheet, some nurses knew that this meant while others did not. Why do you think that is? Why do think you could or could not make sense of the information displayed in PowerChart.

8. Some nurses that had time to practice PowerChart on nights, or when the unit was slow, seemed to have had an easier time adjusting to PowerChart. Other nurses did not have the time to practice and appeared just as able to adjust to PowerChart. In what ways, (if any) do you think that the amount of practice time you had, affected how you use PowerChart today?
9. Nursing units have been inundated with change lately and some have developed negative attitudes towards change. How do you see your nursing unit with respect to its experience with and attitude to change? How did you overcome the general feelings towards change?

10. Motivation to use PowerChart was found to influence nurses' use of PowerChart. Why do you think that is? Tell me a little about your motivation to use PowerChart, the paper chart or both?

11. Initial findings seem to indicate that bedside diploma-prepared nurses were those that used PowerChart exclusively, while degree-prepared nurses in leadership positions used either the paper chart alone or the paper chart and PowerChart. What do you think are the reasons for this difference? How do you relate educational preparation to the use of PowerChart?

12. Other differences between nurses at the bedside and nurses in leadership positions have been identified. It appears that nurses in a leadership role were the nurses that actually provided support for other nurses, whilst bedside nurses thought they could provide support. How do you see your role affecting your ability to provide support for other nurses in the use of PowerChart?

13. The initial findings indicate that all nurses had some view of the use of PowerChart in the future. How do you see PowerChart being used in the future for nurses? How do you see the use of PowerChart in the future affecting the care you provide to patients?

14. The initial findings indicate that nurses who are using PowerChart have overcome resisting forces such as new skills, and attitudes on the nursing unit by having stronger driving forces such as motivation. What are your thoughts about resisting forces that may influence the use of PowerChart? What do you see as the driving forces that influence the use of PowerChart?

15. There are different stages in using technology in healthcare, namely substitution, innovation and transformation. How do you see the use of PowerChart in relation to these stages?

16. HL – You stated that the information in PowerChart was confusing when it stated "In Progress", that you did not know what that meant. Tell me how you interpret the term "In Progress" now. Describe how you learned what the confusing information meant.
APPENDIX D

Participant Consent Form for Interviews

The Process of Nurses Adoption of the Electronic Health Record into Practice

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Research undertaken to fulfill graduation requirements for MSN degree.

Purpose:

The purpose of this study is to explore and identify the process of how nurses adopt the electronic health record (EHR) into their practice. It is hoped that results from this study will provide a better understanding of EHR adoption in order to streamline teaching and assist in the development of a support structure for nurses.

Study Procedures:

Registered nurses who have received training in the EHR in the Vancouver Island Health Authority – South Island (VIHA-SI) within the past year, and work in an acute care facility within VIHA-SI will be interviewed for approximately forty-five to sixty minutes. A follow-up interview lasting approximately thirty minutes will also be conducted. During this follow-up interview, you will be asked to review the interpretations for further feedback and clarification. Both interviews will be audio taped.

Confidentiality:

Your personal information will be kept in the strictest of confidence. Your tape-recorded interviews will be coded and the connection between your identity and the codes will be locked in a file cabinet. Only the co-investigator and the thesis committee will know your personal code for the data. During the reporting of this study, your code will be used and not your name. All audiocassette tapes, transcribed documents, and floppy discs with data storage will be locked stored in a locked file cabinet for a period of five years. At that time, all documents will be shredded, all audiocassettes erased, and all floppy discs destroyed. The information stored on the co-investigator’s computer will be password protected.
Contact Information:

If you have any questions or wish further information about any aspect of this study, please contact Richard Cox, at (250) xxx-xxxx or by email (richard.cox@xxxxxxx.org). Dr. Ann Hilton, principal investigator, may also be contacted at (604) xxx-xxxx. If you have concerns about your treatment or rights as a participant, please contact the Research Subject Information Line in the UBC Office of Research Services at (604) xxx-xxxx, or Dr. Ernie Higgs (VIHA-SI) at (250) xxx-xxxx.

Consent:

By signing below, you understand that your participation in this study is entirely voluntary, that you may stop an interview at any time, that you may refuse to answer any question, and that you may withdraw from the study at any time without incurring personal or professional harm.

With your signature, you acknowledge that you have read, understood and agree with the information contained above regarding all aspects of the study, that you have received a copy of this consent and all of your questions have been answered to your satisfaction regarding this study.

By signing below, you are indicating that you have read this consent form and freely consent to participate in this research.

Participant's signature ___________________________ Participatn's printed name ___________________________

Date ______________

Signature of Researcher ___________________________ Date ______________