

**Exploring the Implementation Process of Technology Adoption
In Long-term care Nursing Facilities**

by

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Dedication

This dissertation is dedicated to my strong, compassionate, and encouraging husband Frederick who made this dream possible. To my parents who provided encouragement and understanding. To my colleagues who inspired me for my passion to improve patient outcomes through evidence based practice and caring for patients using technology. Finally, to my friends who are always supportive and helpful.

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ABSTRACT

There is little understanding of how long-term care settings implement and adopt technology. The study purpose was to set forth a model that integrates implementation science and technology adoption frameworks and to explore the process of electronic health record (EHR) technology implementation leading to adoption. Research questions investigated key stakeholders' experiences with the implementation, if adoption occurred, and what themes mapped to the new model.

There were three components of the dissertation. Based on a critical analysis of the literature, a model was set forth that integrates implementation science and technology adoption frameworks. Next, the experiences of 30 key stakeholders in three nursing homes were explored to understand implementation strategies. The third was one in-depth case study to explore EHR implementation and adoption.

The first study was an exploratory qualitative study using grounded theory methods with focus groups (nurses and certified nurse aides) and individual interviews (Directors of Nursing) conducted at three Midwestern nursing homes with various numbers of beds (99-200), locations, and stages of implementation. A stratified random sample was used for focus groups (nurses and certified nurse aides). Data analysis included constant comparison of data. The second study was an in-depth case study at a 124 bed, inner-city nursing home. Data sources were interviews of nurses and nurse aides (15), observation sessions of key care events (15), and leadership meetings. Data analysis included using constant comparison of themes and descriptive statistics

(activity frequencies and percentages). Integration of data occurred to illustrate the dynamics of implementing and adopting the EHR.

Five major themes emerged which included: motivation and EHR adoption, factors that influence the implementation, audit and bi-directional feedback, benefits, and opportunities to improve the EHR. The studies supported the new model with the workflow concept broadened to work processes.

The importance of this dissertation is that it added to the knowledge of individual's and system's perspectives about implementation and adoption of an EHR in LTC facilities. The study supported the new Integrated Technology Implementation model concepts. Future research that is designed prospectively using this new model is needed. Other types of users should be studied such as administrators, physicians, and residents.

CHAPTER 1

Overview

Background

Healthcare technology is used to improve the delivery of safe patient care (Bates & Gawande, 2003). Technologies are widely used in acute care hospitals; however, in long-term care (LTC) facilities technology is less frequently used (Alexander & Wakefield, 2009). Healthcare costs are a challenge for society and hospitals are pushed to lower costs by discharging patients to LTC and skilled facilities. The LTC facilities provide direct nursing care for basic medical needs, activities of daily living and socialization of the elderly resident.

The World Health Organization reports that the number of individuals over the age of 80 will increase to 395 million by 2050 (WHO, 2012). Additionally, they predict that 25-30% of aged people will have some form of cognitive decline by the age of 85. Many of these individuals will lose the capacity to live independently, requiring the care provided by LTC facilities. Adequate LTC staffing (Straker & Atchley, 1999) has proven to be a challenge and implementation of technology is a strategy to transform care delivery in LTC facilities. LTC facility goals should, for this reason, focus on increasing productivity and efficiency in care delivery by increasing the use of technology. The technology should focus on the provider practice, to improve and provide safe health

care for elders. Implementation failures that do not lead to fully adopting technology can be costly to these organizations.

LTC facilities focus on keeping the resident social while addressing their healthcare needs (Mohamoud, Byrne, & Samarth, 2009). The type of facility determines what type of staff and what forms of technology are used for care delivery. For example, LTC facilities may use mostly nurse aides while skilled nursing homes may have more nurses (Mohamoud et al., 2009). Most nursing homes use very little technology while skilled facilities may use more as their residents are younger and are rehabilitating. Vendors have recognized this and are beginning to focus their development efforts in LTC facilities. For example, several tracking devices are currently offered that keep the dementia resident active while caregivers can easily locate them (National Council of Certified Dementia Practitioners, 2015). Introduction of new technology has shown that some organizations readily adopt an innovation while others reject the same technology (Rogers, 2003). If a technology system is not implemented successfully, staff may develop workarounds or minimally use the technology (Vogelsmeier, Halbesleben, & Scott-Cawiezell, 2008). Using workarounds may result in unintended consequences to patients (Ash, Berg, & Coiera, 2004; Koppel et al., 2005).

Statement of the Problem

There is little understanding about how LTC facilities select, implement, and adopt a technology. There are two areas of theories and models currently used when investigating technology: Technology Adoption and Implementation Science (Ajzen, 1991; Delone & McLean, 2003; Fishbein & Ajzen, 1975; Greenhalgh, Robert,

Macfarlane, Bate, & Kyriakidou, 2004; Graham & Logan, 2004; Rogers, 2003; Titler & Everett, 2001). Technology Adoption theories and models focus mainly on how the end users adopt the technology while Implementation Science theories and models describe methods, interventions, and variables that promote the use of evidence-based practice (EBP). These two approaches are not well informed by each other. There is limited conceptualization of healthcare technology implementation frameworks. A study identifying an all-encompassing model is needed.

To understand the key technology implementation factors utilized by leading LTC and skilled nursing facilities, nursing home literature and the prevailing Technology Adoption and Implementation Science theories and models were reviewed. From this review, an Integrated Technology Implementation model (ITIM) was set forth. The new model was used to set forth concepts to guide this study. Understanding the challenges and factors that influence LTC facilities to adopt a technology is essential, including understanding key stakeholders' perspectives of technology implementation strategies. This approach addresses the recommendation from the Institute of Medicine (2010) to explore the transformation of nursing practice with the goal of improving patient/resident care through use of advanced technology.

Summary of the Nursing Home Literature

The first step to explore the gap in understanding technology implementation strategies was a critical analysis of nursing home studies with a particular view toward: (1) support for the ITIM concepts; (2) lack of empirical evidence in some concepts; and (3) emergence of concepts not in the ITIM. The search engines used were Cinahl, Cochrane, PubMed, and Google Scholar. Inclusion and exclusion criteria were

established. Studies were included in the synthesis if they met all of the following inclusion criteria:

1. A research study.
2. The study focused on patient care technology implementation used by nursing personnel.
3. The study reported at least one of the following implementation factors: technology adoption, communication, innovation type, leadership, interfacing systems, users (adopters), workflow, regulatory/accreditation agency, economic environment, facilitators, vendor management, or labor relations.
4. The study was conducted in a nursing home or long-term care facility.
5. The study was written in English.
6. The study was published between 2002 and 2012.

Studies were excluded if:

1. The study did not focus on technology implementation.
2. The study did not focus on LTC facilities.
3. No implementation factors were reported.

The review of literature revealed 105 studies. Reference lists were reviewed and two additional articles were found that met the criteria. These were added to the final data sample. The next step was to review the full text of the 107 articles and to apply the inclusion and exclusion criteria. Eighty five studies were excluded because they did not address the implementation process, were focused on other ambulatory care settings, examined technology used by other caregivers but not nurses, or investigated innovations that did not include technology. Most studies did not address the

implementation process. A total of 22 studies were identified that included at least one strategy of technology implementation. These studies were entered into a chart and organized by citation, technology type, constructs, methods, participants, measure, findings, limitations, and comments/strategies (see Table 1.1).

Three inquiry approaches were used to study implementation of technologies: qualitative (N = 10), quantitative (N = 7), and mixed methods (N = 5). Many of the studies lacked clear methodological data analysis details such as a clear definition of technology adoption and how it was measured. Since little is known about technology implementation within LTC facilities, this is a new area of research. It is not surprising that 46% of the articles used a qualitative approach.

Based on the review of the 22 studies, there are gaps in the literature. One major gap in these studies is a clear definition of technology adoption (Brandeis, Hogan, Murphy & Murray, 2007; Mikus & Luz, 2002; Newman, Gaines, Snare, 2005). The majority of the studies reported outcomes rather than clearly outlining the actual innovation features being used. Omitting measurements of the actual use may lead the facility's leadership to not recognize that the user has developed workarounds that can lead to unsafe practices with the technology. Furthermore, not understanding how the clinicians are actually using the technology does not allow for revising workflow processes or changing the technology features to increase efficiencies. Six studies addressed workflow (Jarvis-Selinger, Chan, Payne, Plohman, & Ho, 2008; Mohamoud et al., 2009; Rochon et al., 2005; Scott-Cawiezell et al., 2009; Vogelsmeier et al., 2008; Wilt & Muthig, 2008). Having a process where the development team works with the caregivers to identify workflow with the technology before and after deployment to

promote more effective work practices is critical for patient care delivery (Rochon et al., 2005).

A second gap is that the studies investigated implementation without sharing clear implementation strategies and outlining each step (Lapane, Cameron, & Feinberg, 2005; Liu, 2011; Rantz et al., 2011). For example, the process of identifying specifications and installation of the technology was not explored. Another example is that business models were not addressed. These are major components of implementation and would provide useful knowledge for other organizations who are also considering purchasing a specific technology. Fully outlined step-by-step directions are necessary in determining the duration of the implementation along with planning for the change.

The literature review revealed that 77% of studies focused on information technology such as the electronic health record (EHR), electronic medication administration record (EMAR), nursing documentation, and administrative reports (Alexander, Rantz, Flesner, Diekemper, & Siem, 2007; Armer, Harris, & Dusold, 2004; Brandeis, Hogan, Murphy, & Murray, 2007; Byrne, 2005; Cherry, Ford, & Peterson, 2009; Cherry, Ford, & Peterson, 2011; de Veer, Fleuren, Bekkema, & Francke, 2011; de Veer & Francke, 2010; Jarvis-Selinger, et al., 2008; Lapnane, Hughes, Daiello, Cameron, & Feinberg, 2011; Mohamoud et al., 2009; Rantz et al., 2011; Rantz et al., 2010; Rochon et al., 2005; Scott-Cawiezell et al., 2009; Teigland, Gardiner, Li, & Byrne, 2005; Vogelsmeier et al., 2008; Wilt & Muthig, 2008; Yeh et al., 2009). These studies did not clearly describe the nature of the technology; furthermore, they did not mention features of the software or hardware, nor the characteristics important to the user such

as the relative advantage of use. Only three studies discussed interfacing systems (Brandeis et al., 2007, Jarvis-Selinger et al., 2008; Rantz et al., 2011). The majority of studies did not describe how the new technology interfaced with other technology systems, such as, an electronic health record interfacing with the pathology system so that results are readily available in the EHR. This is an issue as compatibility with interfacing systems is necessary to ensure all features are working properly. This is another important implementation step that must occur before the technology is adopted in the patient care environment.

Furthermore, when implementing technology, an understanding of workflow is important so that acquired technology meets actual needs and increases efficiency for the clinicians. This effort should culminate in achievement of safe, effective patient outcomes. There were a limited number of nursing home technology studies (N = 3) that utilized workflow mapping to outline critical steps in the care delivery process (Rochon et al., 2005; Scott-Cawiezell et al., 2009; Vogelsmeier et al., 2008). An overarching limitation of the studies was that they did not address how technology affected teamwork or communication changes.

Several concepts were studied in-depth, such as the notion of leadership of various types (Alexander et al., 2007; Brandeis et al., 2007; Byrne, 2005; Cherry et al., 2009; Jarvis-Selinger et al., 2008; Liu, 2011; Mohamoud et al., 2009; Newman et al., 2005; Rantz et al., 2011; Teigland et al., 2005; Vogelsmeier et al., 2008). Leadership was explored in terms of teams, committees, and administrative roles. All of the studies clearly outlined who the users of the innovation would be. Next, the communication concept was thoroughly examined with a multitude of strategies that ranged from

describing different roles (super users, change champions, and mentors), to direct and indirect communication, and finally to training. An area that was minimally addressed in communication was audit and feedback, a concept which is necessary to sustain the adoption of the technology (Tieglund et al., 2005).

Lesser studied concepts were accreditation and regulations which were only addressed in four studies (Jarvis-Selinger et al., 2008; Mohamoud et al., 2009; Newman et al., 2005; Teigland et al., 2005). The studies noted that the Medicare and Medicaid Minimum Data Set was used to meet patient safety standards regarding falls and pressure ulcers. An area of concern raised in the technology studies is maintaining patient confidentiality, with strategies identified for the EHR and when using telecommunication. There appears to be a gap in understanding how technologies can be used to meet other accreditation and regulation standards and additionally, in how these agencies can be used to provide funding to implement technology.

Only two studies addressed the facilitator role (Brandeis et al., 2007; Teigland et al., 2005). The vendor was addressed by eight studies (Byrne, 2005; Cherry et al., 2009; Lapane et al., 2011; Liu, 2001; Mohamoud et al., 2009; Rantz et al., 2011; Rochon et al., 2005; Wilt & Muthig, 2008). Both of these concepts are critical to bringing the external environment knowledge into the implementation process. The vendor brings knowledge from experience with other organizations' implementations. Managing the vendor to ensure that the technology meets patient care needs, is supported during and after implementation, and is compatible with the other technology used in the facility are examples where facilitators play a key role.

This analysis of the literature illustrates that gaps remain in the understanding of factors that can affect a successful healthcare technology implementation in LTC facilities. These gaps include the types of innovation needed, cost and benefits of different innovations, the environmental design of LTC facilities that are able to accommodate technology innovations, users' characteristics that influence technology adoption, staff perceptions of using technology innovations, managing the implementation process, interfacing systems, and barriers to change.

A comprehensive Integrated Technology Implementation Model (ITIM) directed at designing strategies for a successful implementation is needed. Given that 22 studies were found, only one study tested the Technology Adoption Model (TAM) and another used the Technology, Organization and Environment framework (TOE). Implementation was described, however, no Implementation Science (IS) models were used in these studies and the majority focused on electronic health records.

Purpose

With larger numbers of the population aging and the increasing demand for LTC facility services, it is essential to obtain scientific evidence on factors in LTC facilities associated with technology implementation. The purpose of this study, therefore, was to explore the process of technology implementation leading to adoption within LTC facilities.

Only a few studies have examined technology implementation in LTC. To make sense of this process, an exploratory qualitative approach was used which included focus groups, individual interviews, and observations to understand the implementation strategies that lead an organization or individual caregivers to adopt a technology.

Grounded Theory methods are used to investigate a phenomenon for which very little is known and very little data exists (Glaser & Strauss, 1967). Grounded Theory methods use inductive and deductive approaches to explore the factors involved with technology implementation. Grounded Theory approach allows the researcher to discover accurate and useful data relevant to nursing practice with technology.

The first step to explore the gap in understanding technology implementation strategies in LTC was to review technology and implementation models (found in Chapter 2). The second step was conducting focus groups and interviews with key stakeholders from three LTC facilities regarding strategies used to promote adoption of technology (the EHR). The third step involved a case study analysis of one LTC facility to examine the implementation and adoption of an EHR technology. The overall aims of this dissertation were addressed:

1. To set forth an Integrated Technology Implementation Model (Chapter 2)
2. To explore the experience of staff in LTC settings regarding strategies used to promote adoption of technology (Chapter 3).
3. To examine the implementation and adoption of a specific type of technology (EHR) in one LTC facility using an in-depth case study approach (Chapter 4).

The dissertation is divided into five chapters that represent three separate papers developed to address the research questions with introduction and conclusion chapters. Chapter 2 reviews the prevailing Technology Adoption and Implementation Models and studies. From this review of the previous models a new Integrated Technology Implementation Model was set forth to better guide healthcare technology implementations. Chapter 3 explores the experience of staff in LTC with

implementation to promote adoption of technology. The chapter addresses four research questions:

1. What are the experiences of the Director of Nursing (DON), nurses [Registered Nurses (RN)/Licensed Practical Nurses (LPN)], and Certified Nurse Aides (CNAs) with the implementation of an EHR technology in their LTC facility?
 - a. What factors influenced implementation of the EHR at each site?
 - b. What are the similarities and differences with implementation of EHR across the three groups at each facility?
2. What are the similarities and differences of the DON's, the nurses' (RN, LPNs), and CNAs' perceptions with implementation of the EHR across the three facilities?
3. What are the similarities and differences with implementation of the EHR across the facilities?
4. What major and minor themes map to the concepts from the Integrated Technology Implementation Model and what major and minor themes are not represented in the model?

Chapter 4 examines the adoption of an electronic health record (EHR) system technology in one LTC facility using an in-depth case study approach to address the final research question: What is the LTC system's implementation and overall adoption of the EHR? Summary and conclusion of this research and recommendations for further investigation, practice and policy are presented in Chapter 5.

Significance

Health care organizations are increasingly adopting medical devices and healthcare information technology. The effectiveness of using technology depends on the technology design, proper installation, implementation, and proper use by users. Patient care errors can occur if the technology is poorly selected, not integrated into work processes, and/or not maintained. Organizations, such as The Joint Commission, have established patient safety goals and suggested actions to address the use of equipment and medical devices to help prevent patient harm related to implementation and use of technologies. This research proposes to increase knowledge about how organizations implement electronic health record (EHR) technology, as well as how individual health-care providers adopt EHR technology. The research will be the first step in analyzing the ITIM to understand the impact of internal and external influences on implementation that did and did not support technology adoption. This understanding will lay the underpinning for further development of the Integrated Technology Implementation Model.

Table 1.1

LTC Facility Literature Review (2002-2011)

Source	Technology	Construct	Methods	Participants	Measure	Findings	Limitations	Comments
Alexander, Rantz, Flesner, Diekemper, Siem, (2007). Clinical information systems in nursing homes.	Information Technology-electronic health record	Human Factors: operators, machine, environment Innovation-CIS (computer information system-PDA's)	Qualitative-post implementation method. Facilities recruited to voluntarily participate by adverting in nursing home association newsletters. Both urban and rural facilities with mixed ownership types and bed size were sought. Facilities were given an opportunity to receive practical funding for the CIS implementation (no funds by the vendor). Vendor met with facilities to determine infrastructure. Staff participated with focus group interviews with incentives provided. Multiple sessions on each shift were conducted for all employees. Researchers with experience conducted the interviews. Focus	Staff members (RN/LPN, administrator, CNA) from 4 nursing homes in the Midwest N=120	Transcript-based analysis approach identified common themes form the focus groups. Themes were verified by two Gerontological nurse experts and a human factors expert. A matrix of attributes using common themes as one axis, and human factors as the other axis.	Five common themes-cognitive and perception, change, workable systems, competency, and connectedness. Technology absent in LTC-cost of infrastructure, lack of on-site technological expertise, variable competency levels of staff, high turnover, increasing training costs. A charter plan is recommended to structure of a CIS steering committee; resources required, skill sets & training, estimates of costs.	Differences between staff across sites, small sample size, only one type of information system limits the generalizability	Implementation strategies-site preparation, system testing & conversion, start-up, equipment projections, & availability of on-site technical expertise. Human factors themes-perception & cognition; change; workable system; competence; connectedness. Licensed staff overall perception view was that the technology was helpful; CNA's were positive and negative (increase accountability and workload). Administrative staff found the system very helpful.

Armer, Harris, Dusold (2004). Application of the concerns-based adoption model to the installation of telemedicine in a rural Missouri Nursing Home.	Clinical-Telemedicine	Technology concerns-process (implementation & training) & product (computer)	groups audiotaped. Unstructured observations. Pre-post, test design with data collection prior & 12 months post - implementation.	3 nursing homes in 3 different counties of Missouri. Physicians, administrative personnel, nurses, certified medication technicians, housekeeping N=52 (pre) N=40 (post) 40% RN's	Triangulation-survey (Stages of concern), qualitative interview, & observational data (types of nursing communication i.e. Telephone, fax, beeper, or email) with chart reviews Descriptive statistics	Time 1&2 all concern scores decreased. Individual concerns included awareness, informational, personal, management, consequences, collaborating, & refocusing.	Nursing homes from one state were used. Staff turnover during the study.	Individual & small group training. Ongoing education was required; project staff/data collectors were regularly on the units throughout the implementation. Training phases were often available to offer one on one assistance and consultation in early phases. Philosophical approach to using computers (project team & administration).
Brandeis, Hogan, Murphy, Murphy (2007). Electronic Health record implementation in community nursing homes.	Information Technology-electronic health record	Education; systems, costs, training, communication	Pilot study using mixed methods approach-description of the process; pre-during-post review number of visits by MD & NP. Retrospective review of current procedural terminology (CPT) coding trends before-during-after implementation.	11 facilities in Boston MA, with varying bedside and ownership. Physicians (2.0 FTE), Nurse Practitioners (4.5 FTE)	Only describes the process with no measurement details given on the CPT codes data collection process details	No change in MD/NP visits after implementation; no overall change in CPT codes.	The report only describes the process; no information provided on how they measured their findings; sample is only from one state in the east.	Implementation strategies-site preparation (equipment, space, wiring, networking, etc., system testing (unit testing to integrated testing, backup paper systems, use of mentors,), on-site technical support, on site professionals (vendors, professional facilitators, nursing leaders), costs.

<p>Byrne, C. (2005). Impact of prospective computerized clinical decision support information & targeted assistance on nursing home resident outcomes.</p>	<p>Information Technology-outcome reports on falls & pressure ulcers</p>	<p>Evidence (strength of), experience, facilitation, structure, contextual, leadership, facilitation, use, technology tool, coordination, organizational change</p>	<p>Pre-post design, mixed methodology using qualitative and quantitative methodology. Survey, telephone interviews, outcome data.</p>	<p>91 New York nursing homes</p>	<p>Descriptive, common response analysis, predictive modeling, accessing reports</p>	<p>Only 15% of the facilities used the reports. No changes in fall or pressure ulcer rates from pre to post intervention.</p>	<p>All facilities were in one state, large, urban, and had high risk patient populations with increase fall and pressure ulcer rates. Control sites may have had fall programs occurring without the researcher being aware.</p>	<p>Staff viewed that the reports increased workload. There was a high staff turnover, and lacking of administrative support in some homes. Implementation strategies-participant training, project managers, nurse consultants, ongoing communication.</p>
<p>Cherry, Ford, Peterson (2009). Long-term care facilities adoption of electronic health record technology: A qualitative assessment of early adopters' experiences.</p>	<p>Information Technology-electronic health record</p>	<p>Adoption Implementation Funding, development & securing of technology, leadership, staffing, workflow, and interoperability</p>	<p>Qualitative descriptive retrospective design; Reflective Focus groups to test interview questions. One on one interviews & group observations (technology in use for one year)</p>	<p>10 facilities participated out of 33. All staff including the administrators, directors of nursing, charge nurses, facility residents, and families were interviewed. Actual N not reported</p>	<p>Identifying & organizing recurring themes and patterns in the data transcripts</p>	<p>Themes included - electronic health record adoption decision; systems in use; system design, implementation experiences, role-based experiences, human-computer interface, education & training experiences; policy & procedure changes, business models.</p>	<p>Facilities larger in size; several retirement communities participated; only TX homes were used.</p>	<p>Many strategies identified for a success implementation: education sessions (4-6 hours prior to actual use), hands-on training (appropriate for the caregiver), leadership support, policy and procedure changes, time to adjust to the change in documentation, adequate human computer interface. Big bang approach. Business approach-remotely hosted versus purchasing.</p>

Cherry, Ford, Peterson (2011). Experiences with electronic health records: Early adopters in long-term care facilities.	Information technology-electronic health record	Early users experiences	Qualitative descriptive design; semi-structured reflective interviews & group observations	10 facilities using the EHR for a minimum of 1 year Directors of nursing; charge nurses, direct care staff, residents & family members Bed size 60-367. Total N not reported.	Identified and organizing recurring themes & patterns from transcripts. Transcripts were cross validated matching themes with questions & across user groups to identify detail patterns of recurring themes. Two researchers validated the transcripts	Employees were overwhelmingly positive about their experiences with reporting more benefits than challenges.	Generalizability is limited due to small sample size, geographic location in one state. Facilities were above average in size and quality.	Discussed level of adoption; business model; regulatory requirements; role-based experiences; staff experiences, barriers, patients & families; health policy implications & recommendations. Ease of entering MDS reporting was identified by the staff.
de Veer, A. & Francke, A. (2010). Attitudes of nursing staff towards electronic patient records: a questionnaire survey.	Information Technology-electronic health record	Model TAM tested: user characteristics (education level; job experience; job position; hours employed), experience with EHR; healthcare sector; perceived usefulness (quality of care; cost effectiveness; work circumstances), attitude towards using the HER	Cross sectional study post implementation design using a survey. Three point survey scale. Face validity and content validity two researchers in the field; 2 individuals with practical knowledge; one member from the Ministry of health. Survey focused on perceptions of new technologies.	Random sample of 1018 with a total of 685 participants from Dutch hospitals, psychiatric organizations, care organizations for mentally disabled, home care organizations, nursing homes, homes for the elderly. Nursing Assistants & Registered nurses (RNs)	Mean affect calculated; model tested with ANOVA to explore bivariate relationships; step wise multiple regression	Staff did not perceive the EHR had any effect on the patients quality of life; staff did not perceive that they could care for more patients after the implementation; staff expected costs to rise to care for patients; staff perceived a negative effect on workload and administrative tasks; 45% found the technology	Majority of variance is unexplained; unable to identify how long respondents had already been using the technology but did compare it to new users; actual usage not analyzed; cross sectional design does not lend itself to test the TAM as a causal model.	Practical implications discussed implementation strategies: special attention paid to NAs, nursing staff employed for only a small number of hours per week, and those not in management positions. Strategies need to stress the technology leads to better quality of care which fosters a positive attitude towards using the technology, staff who have already worked with the technology can role model for others with no or less experience.

desirable &
34% found it
absolutely
necessary;
attitudes related
to perceived
usefulness;
model tested
explained 32%
of variance.
Study broke
down usefulness
into three
categories:
quality of care
14% of
variance; cost
effectiveness,
and job
attractiveness
only added
1-2% of the
variance.

de Veer, A., Fleuren, M., Bekkema, N., & Francke, A. (2011). Successful implementation of new technologies in nursing care: a questionnaire survey of nurse-users.	IT-electronic health record	Innovation determinants: characteristics of the innovation; characteristics of the adopting person (user); characteristics of the organization; characteristics of the socio- political context. Innovation process: characteristics of the innovation strategy; dissemination; adoption; implementation; continuation,	Quantitative survey post implementation. Random sample. Postal questionnaire 5 point Likert (converted to 3 point for analysis). Questionnaire validity and content validity assessed by 5 experts in the field of nursing care; 2 researchers in this field, 2 nurses in the field of nursing	Nursing staff in the Netherlands (NA, RN's). 685 nurses completed the survey. Dutch hospitals, psychiatric organizations, care organizations for mentally disabled, home care organizations, nursing homes, homes for the elderly.	Descriptive Statistics (totals & percentages). Chi-sq. to explore relationships between the determinants that influence the introduction and the kind of technology. Open ended questions coded to electronic health record, medical devices, and users perceptions	51.2% the introduction of the technology was good to very good; 2 Chi-sq. tests were sig. (relationship between kind of technology & perceived enhancing determinants within the technology itself & impeding determinants within the organizational & political context. Fifty percent only found the introduction of technology successful; factors impeding included the technology itself (malfunctioning, ease of use, relevance, risks to patients.	Not generalizable due to the wide use of Dutch healthcare facilities. Majority of variance is unexplained (explained 32%); attitude is only viewed not the actual use; model used in a non-causal way. Broad variety of technologies; only users were surveyed; stages of adoption or implementation were not differentiated; addressed technologies in the past 3 years.	Questionnaire only in Dutch. Inter-rater reliability coders 81%. Tables provided including enhancing and impeding determinants of the innovation process. Training is the most important factor associated with successful introduction of a technological innovation (and coaching) with focus on how it is helpful in every day practice. Train the trainer is dangerous-insufficient application and faults are easily spread. HELP desks are useful, problems must be addressed immediately, training done just in time. Multiple strategies are important, involvement of the nurses.
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DeVeer
(continued)

Relative advantage, technology is perceived as advantageous & easy to use; support from colleagues in using the technology; nursing staff are involved in the technology innovation/strategy; enough time to use and adopt the technology; training & coaching, support system (help desk); opportunities to evaluate the introduction & share experiences; availability of simple, effective instruction materials, active promotion of the new technology.

Jarvis-Selinger, Chan, Payne, Plohman, Ho (2008). Clinical Telehealth across the disciplines: lessons learned.	Clinical Telehealth (video conferencing)	Telemedicine implementation strategies and adoption; technological conditions; basic technological requirements; monitor placement & room set up; technology compatibility; support; organizational readiness, change management; costs; leadership-protocols, patient confidentiality;	Focused published literature review; Medline, PubMed, PsychInfo, CINAHL, Lexis-Nexis, IPA, EMBASE used for the lit search. Fields of medicine, nursing (including nursing homes), and pharmacy, and rehabilitation, social work, speech pathology were in the review.	Initial 397 articles reviewed with 225 used for the final review	Grouped findings by healthcare profession	1. Technical requirements for implementation; 2. Organizational readiness.	Multiple disciplines and healthcare systems were reviewed unable to pull out the NH results. Five years of literature reviewed. Methods of analyzing the data were limited.	Adequate training; organizational readiness (protocols for system use, availability & maintenance of equipment, change mgmt. strategies, pt. confidentiality with using signed consent if technology is being used; team communication skills; establishing technology compatibility between sites; ongoing technical support; comprehensive change mgmt. plan with change champions; users are competent and comfortable with the technology before implementation; training is context specific; costs direct & direct; protocols for 24/7 & emergency consultations; adoption-quality of care improved.
Lapane, Hughes, Daiello, Cameron, Feinberg (2011). Effect of a pharmacist-led multi-component intervention focusing on the	Information Technology tool	Standardized care and health outcomes with patients having delirium and falls	Nursing homes were randomized to receive the new tool. Nursing homes were stratified by the two Long-term pharmacies providing services	Nursing homes must be Medicare & Medicaid certified, 50 or more geriatric beds, contracts with the vendor of Omnicare, and had a few short stay patients. 26	Descriptive statistics with facility, resident characteristics, & process evaluation.	Fewer falls, less potential delirium, & death (19.4 in 2003 and 17.7 in 2004). More hospitalizations were noted (38.0 for 2003 and 39.4 for 2004). Hospitalizations	Contamination as pharmacists & physicians worked in both pharmacy sites. Administrative data used versus chart reviews	Implementation strategies discussed training for nursing staff lasting 1-1.5 hours. Instructors provided detailed information regarding medications that caused aggravate, or contribute to falls, delirium, reviewed specific symptoms &

medication monitoring phase to prevent potential adverse drug events in nursing homes.

met the criteria. Nurses and pharmacists were active participants in the study N=224 (RNs & NAs)

noted for adverse drug event decreased (2.8 in 2003 and 1.9 for 2004).

signs of adverse medication effects. Case examples were used. Detailed instruction on how to use the specific reports, care plans, & flow sheets. Training was repeated in facilities with turnover. Pharmacists also had training on the reports.

Liu, C. (2011). Key factors influencing the intention of Telecare adoption: An institutional perspective.

Clinical-Telecare

TOE framework Technological context (relative advantage, compatibility, & supplier support), Organizational context (internal need, top management support, technological knowledge), environment (government support & business competition) Other factors- team skills, resources, & user participation.

Reflective questionnaire using a 5-point Likert scale

All Taiwan Nursing homes were contacted with 70 out of 339 nursing home managers responding (21% rate)

Descriptive Statistics on type of technology used and hypotheses testing with structural model utilizing bootstrapping procedure

Distant learning and e-learning (basic) (n=23, 32.86%).

Hypothesis testing: At a significant level of 0.05 revealed 5 factors: Government support (B=0.260); Technological Knowledge (B=0.234); Compatibility (B=0.195); Team Skills (B=0.171).

The total explanatory power of the model 24.0% level (R²=0.240).

Low survey rate; Taiwan Nursing homes only; explanatory power only 0.240 with the potential of other factors influencing adoption.

Intention of nursing homes to adopt include key factors of: Government support, technological knowledge, compatibility, supplier support, team skills.

<p>Mickus, & Luz, 2002. Televisits: sustaining long distance family relationships among institutionalized elders through technology.</p>	<p>Teleconferencing</p>	<p>Communication between family and patient. Video conferencing technology; capability to use the technology; tolerance to the technology; cognitive ability; social interactions; satisfaction with use</p>	<p>Exploratory study. Feasibility testing using pre-post surveys.</p>	<p>10 pairs of resident/family members; 3 skilled nursing facilities Subjects drawn from mid-Michigan area.</p>	<p>survey instrument</p>	<p>Four of 10 pairs continued to use the technology. Research team deployed the system, repeated instructions & demonstrations on usage prior to the first video contacts. Focused on how to use the technology. Units mailed to families with instructions (2 families did this) 8 families needed the researcher to assist with the set up. If the family was local the researcher visited them. Video transmission steps were mailed to families all needed help the first time. Simple instructions were posted on the pt. phone including the researcher number. Staff members were informally instructed on the equipment but were not an</p>	<p>Only 4 of 10 continued using the equipment for the duration of the study. Lack of control group No depressed patients in the study. Technology problems were addressed during the actual study which could have altered the results.</p>	<p>See findings for strategies and interventions. Physical impairment that inhibited the use-vision, hearing loss, & difficulty positioning self to see the camera Low tolerance of experiencing technology problems Cognitive ability influenced the use of the technology.</p>
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						active member of this research. Phones cost 500 dollars each (2 required) no other technology required such as web or phone lines. 12 of 20 pairs reported overall satisfaction Technology image was fuzzy & did not always work.		
Mohamoud, Byrne, Samarth (2009). Implementation of health information technology in long-term care settings, AHRQ.	Information Technology-electronic health record (including barcoding, MAR, EHR)	Implementation success; challenges and solutions; best practices; funding & resources; development and securing technology; leadership; staffing; workflow; interoperability. Data categorized by staff engagement/preparation; working with partners & vendors; technology; managing the implementation.	Qualitative post implementation- In-depth telephone interviews	6 LTC Agency for Healthcare Research and Quality grantees	Themes were how frequently the issue was mentioned, whether the issue was supported by the literature; and reflected a characteristic of long-term care (LTC), importance of the issue to the grantees projects & others implementing health IT in LTC-staff engagement & preparation; working with partners & vendors; adopting software to	Buy-in = how the technology has direct impact in pt. care; working sessions with staff to streamline workflow & identify the link between IT and improved clinical outcomes; use reports to show improved clinical outcomes; tailor message to audience (RN versus aides); include the entire team (MD, RX, Nursing, administrators, clerks); use of	Only six individuals interviewed.	Regulatory and legal concerns also raised such as patient confidentiality, and insufficient funds.

the LTC environment; managing the implementation

champions; DON is involved; workflow analysis is needed to determine what needs to change; vendor relationships; technology itself needs to adopt to LTC needs (functionality, type of data collected, interface with MDS, etc.). Change champions used. Provide personalized and continuous training (in house help, send team to facility, exercises to reinforce lessons, online learning. Ongoing monitoring with reports on quality improvement. Regulatory and legal concerns such as pt. confidentiality. Insufficient funding.

Newman, Gaines, Snare (2005). Innovation in bladder assessment use of technology in extended care.	Portable ultrasound	Innovation-portable ultrasound instrument, clinical application; Leadership with development of necessary documentation practices.	Case study-post implementation	Staff of Crista Senior Community-176 bed long-term care facility, located in Seattle WA.	Non-invasive bladder volume measurement with gender setting. Assess the resident for voiding prior to scan, the inability to void, and the presence of urinary incontinence. Pts. were scanned in bed or chair	Urinary incontinence decreased; resident comfort increased. Nurses were satisfied because they felt urinary retention would have gone unnoticed & UI would have been unchanged without the 2 week analysis of bladder volumes.	Only one large nursing home was studied.	Innovation limitations were included - pts. obesity, moving probe during the scan, presence of indwelling cath., scar tissue, incisions, sutures, and staples, improperly aiming the scanner, inadequate US gel. Case Mgr. to ensure compliance and effective. All staff trained (RNs, LPNs, CNAs) with emphasis on continuing education with return demonstrations. A pre-scan assessment was developed to identify pts. at risk. A protocol was developed including indications, scanning procedure, & parameters, and specific documentation. Physician order was necessary. Post scan assessment was developed with findings, medical necessity, assessment, and treatment plan which is signed by the md and placed in the medical record.
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Rantz, Hicks, Petroski, Madsen, Alexander, Galambos ... Greenwald (2010). Cost, staffing & quality impact of bedside electronic medical record (EMR) in nursing homes.	Information Technology (EMR)	EMR technology; outcomes (costs, quality of care, staffing, staff retention)	4 group design longitudinal design (year one thru three) comparing two intervention groups and two control group. A stratified purposive recruitment approach was used	18 nursing facilities in 3 states Stratified purposive approach used to recruit homes from urban & rural sites Bed size ranged 98-240 Profit & non-profit	Total costs, total direct care costs, staffing costs, direct care staffing hours per resident per day, and staff mix, staff retention. Staff satisfaction measured using focus groups and interviews. Post hoc cost and patient acuity	Total costs increased in nursing homes with the EHR; staffing and retention remained stable; improvement in trends for activities of daily living, range of motion, & pressure ulcers in homes using the EMR Themes-resident care, implementation, technology, documentation, equipment & evaluation.	Only one technology used Small convenience sample size with 18 nursing homes Other confounding factors were not identified.	Education training, project coordinator for planning and implementation, onsite consultation/mentors. Technology prompts to reinforce care. Vendor responsibilities & facility responsibilities need to be clear. Workarounds were used. Technical staff available to support the technology. Ongoing software & hardware costs.
Rantz, Alexander, Galambos, Flesner, Vogelsmeier, Hicks, . . . Greenwald (2011). The use of electronic health record to improve quality of care in nursing facilities.	Information Technology-electronic health record	EMR; implementation; resident care-communication, clinical information, documentation (time), system and structure, monitor function	Qualitative analysis. Retrospective post implementation study. Stratified purposive approach to recruit the intervention sites (profit and non-profit); qualitative interviews, observations, and focus groups were completed 6 months of implementation; they were repeated 12 and 18 months post implementation; two sites were repeated when they reached 24 months; focus groups were	All nursing care givers (administrators, RN's, aides); 4 nursing homes (3 urban; 1 rural)	Content analysis for emerging themes of implementation, resident care, technology, documentation, equipment, and evaluation	Vendor and facility responsibilities need to be clear; training of staff needs to occur prior, during and post implementation; roles and responsibilities need to be clear. Overall documentation increased with accuracy; accessing of information was quicker, concerns regarding time	Limited number of homes which were located in one state; sites came in at different time periods (different base line dates) which then had two facilities reach 24 months for data analysis.	Implementation process not discussed (actual interventions).

			audio taped Total N=161			to complete documentation, some concerns regarding the functionality. All preferred the EHR versus going back to paper.		
Rochon, Field, Bates, Lee, Gavendo, Erramuspe-Mainard, Judge... Gurwitz (2005). Computerized Physician order entry with clinical decision support in the long-term care setting: insights from the Baycrest Centre for geriatric care.	Information Technology-electronic health record	Technology innovation-CPOE and CDS (clinical decision support) adoption. Phases of creation of system development, implementation, improvement, modification	Case study	Nursing home (472 beds); a group of 8 geriatricians, 15 psychiatrists, 14 primary care physicians, pharmacy, information technology, nurses	Descriptive-case study	Ongoing improvements were developed; initial cost savings are not realized; development teams with specialties are necessary; motivating force is important to the success of implementation; continued commitment of the vendor is essential; technology testing is necessary; prescribing issues are unique to nursing homes; large burden on other systems such as computer networks; ability to reinvent the technology by adding CDS; implementation must be	Only one site studied limiting generalize-ability; one technology of medication administration.	Literature review then the development team was initiated (range of specialties); flow chart of the process; development team assist with modifications in the CPOE system; team tested the system and response of the system with changes; displays, and interfaces. Variety of accesses and technology provided workstations, cows, etc. Speed of system was tested. All staff were trained by super users. Support provided when goes live by a nurse, RX, and IT person. Users identified modifications and how to streamline the program.

						flexible; CPOE effects the institution and the institution effects CPOE.		
Scott-Cawiezell, Madsen, Pepper, Vogelsmeier, Petroski, Zellmer (2009). Medication safety teams' guided implementation of electronic medication administration records in five nursing homes.	Information Technology-electronic medication administration record	Medication safety teams; technology; reports;	Case studies using mixed methods approach (interviews, detailed observations, medication errors, root cause analysis). A mediation safety team guided the transition. Bed size 60-400 Profit, faith based, non-profit	Convenience sample from 5 Midwestern Nursing Homes (60-400 beds). Variety of users-practitioners, nursing staff, medication administrators, and nursing home leadership N=not reported	300 hours of observation (200 medication passes for 3700 residents); reviewed medication reports for late entries	Decreased medication errors for late and omitted medications most impact. Medication administration increased from 40 to 57 medications per hour.	Omitted and missing medication information was only reported narratively and not directly by charts or graphs. Not generalizable due to only Midwestern Nursing homes with limited number of sites. Methods not clearly described.	Technology = EHR. The medication safety team monitored the implications of the implementation of technology and the related communication patterns and process for medication safety. Technology features of color coding.
Teigland, Gardiner, Li, Byrne (2005). Clinical Informatics & its usefulness for assessing risk & preventing falls & pressure ulcers in nursing home environments.	IT-clinical informatics web access for reports	Translation of clinical informatics research into practice: MDS data into three reports	Mixed method Quantitative-post implementation, short survey with open ended questions. Web site visits captured to determine use of reports. Sought volunteers (resources versus workload determined participation): Internet access was required: intervention included the development of	91 New York nursing homes Bed size 170-142	Reports based on predictive regression modeling using MDS data	High access and high integration with care planning (N=18; 20%); Moderate to high access and some integration with care planning (N=15; 16%); Low to high access but little integration with care planning (N=33; 36 percent), Little or no access of the reports (N=25; 27	Only studied NY homes.	Reports were user friendly (logical & easy to read, by unit); staff attended a 1/5 day training session (basic stat concepts, benchmarking, trend analysis, interpret data, ongoing emails, annual workshops, phone/email communications from project staff & nurse consultants. Nurse consultants provided new employee orientation. Successful integration-the evidence matched

			three reports (at risk, resident risk profile, feedback			percent). Multiple barriers and success factors identified. 33 nursing homes successfully are using the reports.		professional consensus, the organization was receptive to change with strong leadership, monitoring with feedback. Had a leader and change agents. Reports were built into quality improvement programs. There is a facility champion to keep the process going. Other strategies are discussed.
Vogelsmeier, Halbesleben, Scott-Cawiezell (2008). Technology implementation and workarounds in the nursing home.	Information Technology-medication administration record	Workarounds-"informal temporary practices for handling exceptions to normal workflow	Qualitative evaluation-multiple methods direct observation, process mapping, key informant interviews, field notes from medication safety team meetings.	5 Midwest nursing homes (urban, rural, profit, and not-for-profit) from 3 states Bed size 60-200 N=35 (pre) N=45 (post)	Open and axial coding techniques to categorize types of workarounds in relation to workflow blocks	Workarounds were used as a result of staff attempting to individually problem solve to overcome work flow blocks. Two categories (1) blocks by technology (2) and organizational processes not reengineered to effectively integrate with technology.	Limited number of staff observations; secondary analysis of field notes and process mapping.	Technology blocks (design): intentional technology blocks to enhance resident safety (prevention of ordering excessive medication doses); forced vital signs before medication could be delivered. Ineffective reengineering examples include limited resources limited fax machines or broken machines. Medication team assists with problem solving, open communication is required; lacking management prevented appropriate problem solving.

Wilt & Muthig (2008). Crossing barriers EMR implementation across a nationwide continuum of care.	Information technology-resident center (personal) health record	Implementation model with project statement, costs, & education Scenario-based training	Description of the implementation process used	Erickson Retirement communities including long-term care and skilled care facilities located in 6 states with 20,000 residents	NA – description of the process	Providers had 30% more face time with the patient after implementation. Monthly Order reconciliation decreased by 71 hours. Documentation of vaccine rates increased by 19%.	No description & vague on the actual process of determining their findings (outcomes).	Cost model; communication plan, workflow analysis, system changes such as policies, standardize terms, equipment needs assessed, vendor selection.
Yeh, Jeng, Lin, Ho, Hsiao, Lee, & Chen (2009). Implementation and evaluation of a nursing process support system for long-term care.	IT-nursing documentation system	system development; system implementation; system evaluation	Quasi-experimental: pre, implementation, and post-test. Satisfaction survey and data collection tool on minutes per shift to measure efficacy of the documentation regarding assessment, nursing care, & care planning. Computer internet access; within 30 miles of research center.	5 nursing homes; 27 nurses; RNs and LPNs participated; bed size 32-72; 379 patient records	Satisfaction survey-descriptive stats; Wilcoxon matched-pairs ranks test was used due to small sample size	Time savings 8 minutes per 8 hour shift per nurse in preparing care plans (pre 33-18; SD 21-30) (post 25-17; SD 17-73). Wilcoxon test was non-significant. Overall nurse satisfaction improved between pre-post.	Small sample size; nursing homes participated must have internet access.	Computer literacy was evaluated and in-servicing was provided; 3 hours per week for 6 weeks. Instructions were given on computer generated nursing diagnosis; research team provided one on one hands-on consultation. Adequate computer access is essential.

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CHAPTER 2

Guiding Healthcare Technology Implementation:

A New Integrated Technology Implementation Model

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Consumers expect quality, safe patient care as essential factors when choosing healthcare services. Care providers work in complex environments where they are required to make critical care decisions for sickly patients while working with sophisticated technology. The Institute of Medicine report, *The Future of Nursing: Leading Change, Advancing Health* (2011) recommends that healthcare organizations, as well as “private and public funders collaborate ... to advance research on innovative solutions, including technology, that will enable nurses to contribute to improved healthcare” (p.11). The report recommends that healthcare organizations engage “front-line staff in design, development, purchase, implementation, and evaluation of” devices and technology products.

Realizing the vision of the Future of Nursing report requires transformation of the care environment and use of technology to assist with this change. Implementation of technology varies across nursing units, organizations, and practice settings. Use of

health technology is the application of organized knowledge and skills in the use of devices, medicines, vaccines, procedures and systems designed to solve health problems and improve quality of lives (World Health Organization a & b, 2014).

It is essential that the workforce can sustain the implementation of new technologies in these environments as a routine to promote cost-effective, safe, quality care. Many factors, at all levels of healthcare delivery, affect the success of program implementation (Durlak & DuPre, 2008). These factors of implementation within specific contexts of care delivery are not well understood, especially with technology implementation in healthcare. The first step to try to understand these phenomena was to review 51 theories for technology research and implementation science including Social-Technical theory, Complexity theory, General Systems, Social cognitive, Diffusion of Innovation, Unifying Model of Innovations, Knowledge-to-Action model, and Translation of Research into Practice (TRIP). The emphasis of the review was the theories focused on the organization, individual, or both. In addition, theories were evaluated if implementation strategies were provided. The clarity and most widely used models were further evaluated and used with the conceptualization of the integrated technology implementation model (ITIM).

With this review, there are two theoretical areas that can guide technology use: Technology Adoption and Implementation Science (IS). The first, technology adoption, focuses mainly on how the end users adopt technology. The latter, IS, describes methods, interventions, and variables that promote the use of a variety of innovations such as evidence-based practices (EBP) and models of care delivery.

Motivation for a New Research Model

Given the major differences regarding healthcare technology and implementation frameworks, an integrative model of technology adoption informed by IS is set forth. This integrated model provides a framework for analyzing studies of technology implementation and explicating implementation in healthcare settings. If a technology system is not implemented successfully, it may lead the nurse to develop workarounds or even refuse to use the technology. The potential resulting impact is unintended consequences, causing errors and patient safety concerns. A model is needed that incorporates the characteristics associated with information technology success and the factors noted to result in a successful implementation. An ITIM is set forth to guide researchers, healthcare facility leadership, and engineers on organizational and individual factors that must be considered to lead to a proactive and positive implementation and full adoption of the technology.

Background

Technology adoption models (TAMs) study how users come to accept and use the technology innovation (Davis, 1989; Delone & McLean, 2003; Fishbein & Ajzen, 1975; Rogers, 2003; Venkatesh, Morris, Davis & Davis, 2003). These models are concerned with perceived usefulness, ease of use, actual use of the technology, and social influences. Implementation Science (IS) is the study of methods, interventions, and variables that promote the uptake and sustained use of EBPs by individuals and organizations to improve clinical and operational decision making with the goal of improving healthcare quality (Eccles et al., 2009; Eccles & Mittman, 2006; Rubenstein & Pugh, 2006; Titler & Everett, 2001). Eccles et al. (2009) stress the importance of

considering the multiple levels in which healthcare is delivered, as well as the interplay between the practice culture, the development of an intervention involving choosing a technology and method of delivery to influence a behavior change.

Technology Adoption Models

Most of the TAMs focus on the individual user's behavior with the intention to use the technology. Little attention is paid to which implementation strategies work, in what setting these strategies work, and why. When exploring key factors that influence technology adoption in healthcare facilities, the actual physical setting, types of providers, team skills, education level, experience with technology, workload, support staff, and communication of the implementation process are important considerations in developing strategies for the implementation of technology. Finally, the external drivers such as accreditation standards, government funding sources, vendors, and so on, and how they can affect the implementation process are not discussed with these models.

Critical Analysis of TAMs

There are several models of technology adoption that focus on individual user's perception of use and ease of use of technology leading to adoption, within the context of information technology (Delone & McLean, 2003; Fishbein & Ajzen, 1975; Venkatesh et al., 2003; Venkatesh & Davis, 2000). Later TAMs, such as Diffusion of Innovation (DOI), attempted to address how additional factors influence adoption such as the technology's relative advantage, compatibility, complexity, and trialability factors (Rogers, 2003). Several models were extended to measure net benefits (outcomes). The strength of these models is their focus on the individual adopter. Limitations of these models are in their explanatory power with gaps in actual strategies and steps

(process) needed for systematic implementation of technology resulting in tangible practice changes. Technology is deployed in organizations where the behaviors of multiple individuals are interwoven to comprise an organizational behavior. In addition, in some instances technology may be beneficial for one professional but contrary for another. The TAMs do not address how the organization behaves and reacts to assist individuals so that users and the organization can be more effective. Organizational variables that should be addressed include leadership styles, values, goals, strategies, social norms, nature of job duties, time constraints, costs, and technology environment factors (infrastructure), with some or all of the variables fostering the individual adoption of the technology. Technology Adoption Models did not address which organizational change or implementation strategies should be used to lead to technology adoption. Other considerations that were not addressed with TAMs include the context of patient care or external forces such as policy decisions, regulations and accreditation standards. To understand the necessary implementation strategies, the IS models for healthcare were reviewed.

Implementation Science Models

Implementation Science theories and frameworks try to answer the question of how innovations are diffused through-out an organization and sustained in daily healthcare practices. Implementation Science focuses on understanding which implementation strategies work, in which context, and why (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005; Grimshaw et al., 2006; Grol & Grimshaw, 2003). There is no overarching implementation theory, but rather a variety of implementation models and

frameworks including the Unifying Model of Innovations, Promoting Action to Research in Healthcare (PARiHS), Knowledge-to-Action, and TRIP.

Critical Analysis of Implementation Models

The implementation frameworks and models are diverse, and each has key features which differ in their precision and in the actual process of implementation. All of the models share the dependent variable, adoption of the innovation. The implementation frameworks and models are directed at designing implementation strategies to get evidence into healthcare practice. The majority of the frameworks and models are also focused on the translation of research evidence into practice. The exception is the Unifying Model of Innovation (Greenhalgh, Robert, Bate, Macfarlane, & Kyriakidou, 2005), which describes the innovation as an idea, practice, or object (i.e., product, device, system, process, policy, program or service). Given the IS models are predominately used in introducing EBP which is considered an innovation, these models provide approaches to assist in a successful implementation strategy for an assortment of evidence, individuals, and contexts. These approaches can easily transfer to other implementations such as technology. For example, leaders have a key role in creating a culture with defining clear roles, teamwork, and organizational structures to support the technology implementation. Another example is the use of the informatics nurses as facilitators who promote and facilitates the use of the technology in clinical practice.

The frameworks and models define potential users of the EBPs as healthcare providers and healthcare systems. The Knowledge-to-Action framework and Unifying Model of Innovation also include policy makers as potential users. Common functions across the implementation models and frameworks include identification of a clinical

problem; analyzing and synthesizing the quality of evidence; defining and using implementation strategies, and evaluation of adoption of EBPs.

Studies using IS models used with healthcare technology implementation research is limited. One study conducted by Tschannen's team found using the TRIP model assisted with the implementation of diffusion of an electronic tool that was printed daily by the nurse addressed complex pressure ulcer prevention and treatment (Tschannen, Talsma, Gombert & Mowry, 2010). Another study evaluated using an implementation framework with developing strategies for a computer-based tool for screening and brief intervention regarding alcohol use and physical activity (Carlford, Andersson, Bendtsen, Nilsen, & Lindberg, 2011). The study found that using the framework was more successful than a strategy in which the tool was introduced and immediately used for patients. The focus of these studies is to get knowledge into practice using a technological tool as one element of the implementation. Finally, another study used a multi-level framework predicting implementation outcomes with preferences of users of the electronic medical records quantifying the importance of barriers and facilitators of innovation (Struik et al., 2014). This study revealed different users have different needs during the implementation of the electronic health record (EHR) innovation.

TAM & IS Commonalities and Differences

Technology Adoption Models and Implementation Science models share the level of analysis at the individual level with innovation adoption. See Table 2.1 for commonalities and differences across IS and TAM models. The major difference between the models is that IS models focus on strategies for implementation, whereas,

TAM models focus on the individual user's perceptions. Implementation Science models focus on analysis at the organizational level, a practice environment that is limited to health systems, consideration of external influences (i.e., regulations), and implementation strategies that are provided. Many of these models simply describe the process of implementation. Technology Adoption Models focus on the individual user's perception of usefulness, ease of use, and actual use. Newer technology frameworks and models have been extended to include demographics of the user, social influence, context, attributes of the innovation, and facilitating conditions.

Table 2.1

Commonalities & Differences Across IS & TAM Models

Comparison	IS Model	TAM
Level of Analysis	Organization	Individual
Dependent Variable	Adoption of EBP	Adoption of Technology
Implementation interventions	Yes	No
Context	Healthcare	Information technology & other technologies
Assess for Barriers	Yes	No
Patient Experience	Yes	No
External Factors Considered	Yes	No

Integrated Technology Implementation Model (ITIM)

The purpose of the newly developed ITIM (Figure 2.1) is to highlight elements that affect the process of getting technology implemented into practice. The key construct of the ITIM is healthcare technology implementation and adoption. The ITIM

addresses the key concepts associated with the technology implementation and adoption.

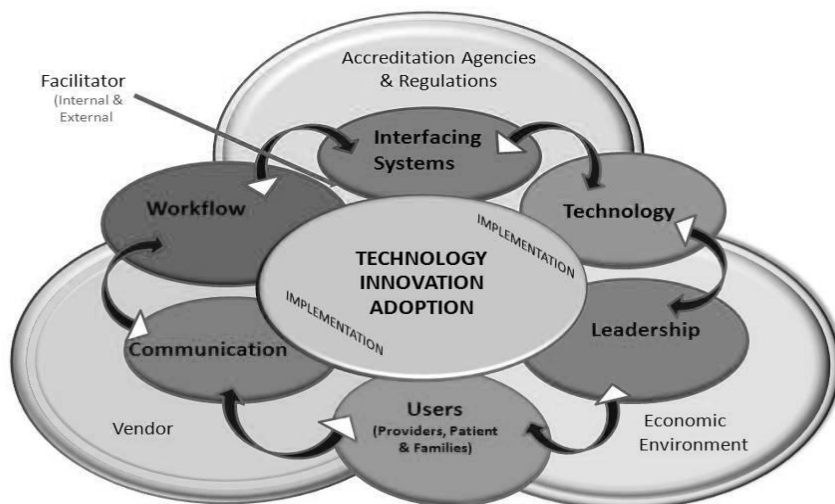


Figure 2.1. Integrated Technology Implementation Model (ITIM).

Theoretical factors were derived from the systematic reviews of the TAM literature. These studies found that TAMs focus on the individual's behavior with the intention to use the technology (Ajzen, 1991; Chang, Chou, & Yang, 2010; Davis, 1989; Delone & McLean, 2003; Dwivedi, Rana, Chen, & Williams, 2011; Fishbein & Ajzen, 1975; King & He, 2006; Legris, Ingham, & Colletette, 2003; Petter, Delone, & McLean, 2008; Petter & McLean, 2009; Rogers, 2003; Shannon & Weaver, 1949; Venkatesh et al., 2003). Key findings with these reviews included the user's perception of using the technology, technology's relative advantage, compatibility, complexity, and trialability. Other key factors include age, gender and user profession, whereas, IS factors were found with synthesis of existing implementation theories from the literature and systematic reviews (Damschroder et al., 2009; Godin, Belanger-Gravel, Eccles, &

Grimshaw, 2008; Greenhalgh et al., 2005; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Helfrich et al, 2010; Logan & Graham, 2010; Powell-Cope et al., 2008; Rycroft-Malone, 2010; Tanriverdi & Iacono, 1999; Titler & Everett, 2001). Key findings included the innovation, context, planned change, social system, users, and communication all affect a successful implementation.

The benefits of the new comprehensive model are directed at designing strategies for a successful implementation with focusing on the innovation, methods, interventions, and variables. The combined model focuses on the interdependencies of the two sciences with each emphasizing end users adopting the technology. An example of the interdependencies is if comprehensive training is not provided (IS element) the user may find that the technology is not easy to use. Given that most technology innovation decisions to solve a problem are made at the organization level this model focuses on both the organization and the individual adopting the technology innovation. The Technology Acceptance and IS models guided the development of the ITIM. This new model is informed by (a) Unifying Model of Innovations and (b) concepts from DOI, TRIP, and PARIHS models.

The new ITIM has two major environments, an inner and an outer context, that organize its concepts (Greenhalgh et al., 2005). The inner context is defined as the organizational structures (e.g. decision making, rules and procedures, and technical knowledge), the culture, and the ways of working within the organization that lead to adoption of the technology. The outer context is defined as factors external to the organization that influence, in part, the organization's adoption of a technology. Examples of these factors include accreditation and regulatory standards, economic

environmental variables such as uncertainty, the vendor, and a facilitator role. These elements of the model, the inner and outer contexts, are used to organize the major concepts that affect an organization when implementing technology.

The ITIM (see Figure 2.1) is comprised of 12 concepts that are central to the process of technology adoption, which have been extracted from implementation science and technology models: (1) adoption, (2) implementation, (3) nature of the innovation/technology, (4) interfacing systems, (5) workflow, (6) users (adopters), (7) leadership, (8) communication, (9) accreditation/regulation, (10) economic environment, (11) facilitators (boundary spanner), (12) vendor. Table 2.2 provides a narrative description of each of these elements.

Table 2.2

Integrated Technology Implementation Model (ITIM)

Concepts	Definition
<i>Inner Context</i>	Organizational context that influences the adoption, spread, and sustainability of the technology innovation through active implementation strategies
Adoption (D)	When a user is introduced to a new technology and begins to use it routinely and fully when delivering patient care
Implementation	The path to identify specifications, creations, and installation of technology, organizational readiness and active implementation strategies including: users' attitudes are changed, skills are built, policies/procedures for each of the components are defined and executed
Nature of the Innovation/Technology	Technology innovation is a device that is used when delivering patient care and usually has two components: <i>Software</i> -provides information & knowledge <i>Hardware</i> -tool that embodies the technology as material or physical object <i>Characteristics</i> include the relative advantage, complexity, compatibility with norms, values, perceived need, trialability
Interfacing Systems	Supplementary technology that interfaces or communicates

	with the new primary technology (innovation)
Workflow	The systematic steps of accomplishing a patient care task (when using a technical process or device) to achieve a desired outcome
Users (Adopters)	Individuals that are in a social system (i.e., LTC) that the technology are targeted to be used by for delivering care who may include RNs, LPNs, aides, physicians, pharmacists, administrators, director of nursing, clerks, and patients. Characteristics include users' education preparation, profession, context of the work environment, experience with using technology
Leadership	Roles, specific responsibilities, and required activities (executives, managers, consultants) that promote technology adoption
Communication	The process of sharing information within a targeted social system using a variety of strategies that include interactive education programs, written communication, communication roles & networks, audit & feedback
<i>Outer Context</i>	The processes and factors external to the organization that have a synergetic relationship to the internal factors affecting a successful technology implementation. These include: accreditation standards, the economic environment, regulatory requirements, vendor, technical environment changes
Accreditation/Regulation	An official agency (external force) that identifies criteria to meet established standards that influence the adoption of the technology
Economic Environment	The extra-organizational economic determinants that affect the organization's innovativeness such as the changing economic and political environment; government sponsored program, business competition, etc.
Facilitators (Boundary Spanner)	A person who assists, directly or indirectly, by providing guidance to the implementation of technology. This person can be internal or external to the organization.
Vendor	Any person or company which represents, sells and services the technology which may/or may not be the innovator. Commitment of the vendor to assist and support the facility operations (quality, knowledge, resources, costs), experience with implementing the technology, etc.

Note: D=dependent variable; LTC=long-term care.

The newly defined model examines individual and organizational elements that address the multifaceted active implementation strategies needed to promote

technology adoption. From IS, the ITIM was informed with the concepts of communication, leadership, facilitators, users (adopters), accreditation and regulatory groups, and economic environment. Technology Adoption models informed the new model as well, with the concepts of adoption, workflow, vendor, systems, and nature of the innovation.

Diffusion of Innovation informed the new model by defining the technology innovation as a device that is used “for instrumental action that reduces uncertainty in cause-effect relationships involved in achieving a desired outcome” (Rogers, 2003, p. 8). The device usually has both a hardware and software component.

Dependent Variable: Technology Innovation Adoption

Technology adoption is the dependent variable of the new ITIM. Technology adoption is defined as when a user is introduced to a new technology and begins to use it routinely and fully.

Inner Context

Once the organization has identified a need to change, and the appropriate technology has been identified, it must scrutinize system factors and active implementation strategies to address the patient care delivery needs. This will ensure that systematic steps are taken so that the human-to-technology interactions achieve efficiencies for the nurse and safe outcomes for patients. Here, the inner context comes into play.

The inner context is defined as the processes and factors internal to an organization that must be addressed for a successful technology implementation. The inner context is further described as an organizational context (healthcare services

facilities) that influences the adoption, spread, and sustainability of the technology innovation through active implementation strategies. The ITIM's inner context concepts include system factors such as other processes or technology that affect the technology innovation (i.e., interfaces and policy changes), leadership types and activities, users of the technology, communication processes utilized to influence adoption, and workflow assessment.

Nature of the technology/innovation. Technology in the ITIM is defined as a new technological-based solution for use in accomplishing a specific task or care process to achieve defined outcomes. This definition is aligned with Rogers's (2003) definition of innovation as a practice or object new to individual or groups. The technology has a software component, which provides information and knowledge to the user. In addition, technology has a hardware component that embodies the technology as a material or physical object, such as a server that runs the software, a mouse, keyboard, and wires. Next, the solution involves the actual physical location of the equipment. For example, the function of charging of supplies in an EHR is inhibited if there is not a workstation in the supply room. Attention must focus on the amount of equipment being available and located at a convenient location to facilitate the use. Another consideration is ergonomics, which is the interaction between the user and the computer system. The computer locations need to be at a comfortable level to prevent physical stress such as shoulders cramping when charting using a kiosk workstation positioned too high. The characteristics of the technology innovation include the user's perceptions regarding its relative advantage, complexity, compatibility with norms, values, and need for the innovation. The relative advantage of the technology is

perceived as better than the previous process used for completing the care requirement. Compatibility with norms is the perceived alignment of the technology with existing organizational and individual values, past experiences, and actual need. Complexity of technology is the simplicity or degree of understanding and number of actual steps in using the technology in care delivery.

Interfacing systems. There is an importance to have the primary technology solution (EHR) interface with existing and future systems to achieve higher levels of care coordination between providers and other facilities in reaching the national goals of improved care. In the ITIM, the new primary technology solution functions independently but also interfaces to communicate with other systems outside the organization. With this new model, interfacing systems have been identified as a separate concept as many healthcare facilities such as long-term-care need to interface to contracted services such as pharmacy systems. These interfaces require a significant amount of coordination between the organization, multiple vendors, and other facilities such as hospitals. These secondary systems bringing together the primary system and information systems located outside the organization that is critical for patient care. These components may include other technology software or devices. For example, telemedicine cardiac monitor technology not only functions on its own but also interfaces with a phone for notification to the nurse that an abnormal rhythm has occurred.

Workflow. The third concept in the ITIM, workflow, is defined as the systematic steps in accomplishing a patient care task to achieve a desired outcome (Niazkhani, Pirnejad, Berg, & Aarts, 2009). This clinical sequence of care delivery focuses on the

patient's condition, patient care plan, interventions performed, and the patient's response to these interventions (Whittenburg, 2010). This workflow analysis is needed to understand this sequence and how it will be impacted by using the new technology. The analysis should include identifying critical elements, potential barriers to workflow, and any improvements based on use of the technology.

During planning and implementation, understanding the workflow of clinicians or others impacted by the technology provides a baseline on workflow processes critical for safe patient care delivery and the relationship to a new technology. Organizations that evaluate workflow design are more likely to be successful in adoption of technology (Ash et al., 2007). This will also help ensure an end result where fewer patient care errors are made by staff. A goal of this analysis is to minimize disruption to patient care during and after the technology implementation.

Users. The ITIM's fourth concept, users, is informed by DOI and is defined as members of a social system that adopt an innovation. There are specific user characteristics that have been found to influence adoption. These include greater intelligence, increased social participation, greater ability to cope with change, higher education, and greater knowledge of innovations (Rogers, 2003). Building on these notions, the ITIM defines users as individuals in a social system (healthcare services facility) where technology is targeted for use in for delivery of care by RNs, LPNs, aides, physicians, pharmacists, administrators, Directors of Nursing, and patients. Specific characteristics of users are education preparation, context of the work environment, and experience with working with technology.

Leadership. The IS literature describes the concept of leadership as creating an environment that embraces innovation and establishes organizational strategies, structures, and systems that facilitate an innovation (Greenhalgh et al., 2005). Building on this IS description, ITIM defines leadership as the roles, responsibilities, and required activities of leaders. Leaders important to technology adoption are executives, nursing directors, and front-line managers. Activities of leaders are setting forth organizational vision, goals and strategic plans, policy development, performance expectations, and communication strategies. Technology implementation in healthcare facilities will require many months of planning for the change, where leaders must formally share their plans for purchasing and deploying the technology. Leaders must also effectively communicate all aspects of the change including the positive impact of technology on patient care so that employees are well informed and feel supported through the implementation process.

Communication. The ITIM defines communication as the process of sharing information in a targeted social system using a variety of strategies that include interactive education programs, written communication, communication roles, networks, audit, and feedback that affect adoption (Greenhalgh et al., 2005; Rogers, 2003; Titler, 2010). This communication is targeted at why an organization is going to use the technology, outlining workflow changes, addressing how other interfacing systems will be affected, and defining changes in users' roles and responsibilities.

Strategies include using didactic and disseminated approaches through emails, newsletters, and announcements to stakeholders about the innovation during the knowledge stage. During the decision making and persuasion stages the healthcare

provider actually uses the innovative technology (Rogers, 2003; Titler & Everett, 2001). The communication process occurs within a targeted social system of interrelated individuals who are involved with joint problem solving using patient care technology (Rogers, 2003).

Rycroft-Malone and Bucknall (2010) indicated strategies for communication roles. The roles include social networks that provide support and communication (RN unit staff), change champions who continue to support the use of the innovation, opinion leaders from the local setting who are respected and influence their peers, and boundary spanners who have social ties within and external to the organization who can filter and link knowledge about the innovation during the early stages of implementation.

Another important communication strategy is to utilize audit and feedback, which provides users with information regarding their current performance and areas for improvement. Hysong (2009) found that using a combination of strategies such as providing specific suggestions, placing these in writing, and providing feedback frequently has a positive effect on quality outcomes. Using graphs and providing verbal feedback, however, had less of an effect with change.

Outer Context

Once the organization has identified a need to change, a technology has been identified, and the inner context concepts have been addressed, the organizations must also address external system factors. Here, the ITIM's outer context comes into play. The ITIM describes the outer context as the processes and factors external to the organization which possess a synergetic relationship with the internal factors, thereby affecting a successful technology implementation (Greenhalgh et al., 2005). These

factors include accreditation and regulation agencies, accreditation standards, the economic environment, a facilitator, and vendors which are further described in the following sections.

Accreditation/regulations. The ITIM incorporates accreditation and regulatory requirements from external official agencies such as Centers for Medicare and Medicaid Services (CMS). The agency identifies or mandates criteria to meet established care standards, which influences the selection of technology. For example, CMS (2012) has identified standards with physical restraints to prevent harmful effects to the patient. These regulations influence the selection of technology to meet the standard that physical or chemical restraints are not used for staff convenience and patients have a right to move around in these facilities.

Economic environment. The ITIM defines the economic environment as external factors that influence the ability of the organization to purchase and use technology. These factors include government incentives for procurement of technology such as the electronic health record (EHR), interest rates, public policies and legislation such as Patient Protection and the Affordable Care Act.

Facilitator. Another important concept within the ITIM is the facilitator role, which guides the implementation. Integrated Technology Implementation Model builds on the IS literature, which defines facilitation as the process of making implementation simpler. This may involve individuals guiding the change, environmental or political factors, or a leadership philosophy of commitment to change and endorsement of the innovation for the organization (Brown, Wickline, Ecoff, & Glaser, 2008; Harvey et al., 2002; Melnyk et al., 2004).

A facilitator is the person whose specific role is to assist the team and individuals in implementing the innovation (Carroll, Thirlwall, & Wilson, 1993; Graham & Logan, 2004; Rycroft-Malone, 2010). The facilitators may be internal or external to the organization (Damschroder et al., 2009; Greenhalgh et al., 2005). Large organizations have the ability to have employees serve this function, whereas smaller facilities such as physician offices or long-term-care facilities vendors to serve in this role. The role of the facilitator can be fulfilled by many different individuals such as super-users, vendor employees, and hired consultants. Other facilitators are information technology departments initially serving in the facilitator role with ongoing responsibilities of technology support. As well, informatics nurses initially serve as facilitators because they understand the complexities of health care practices and are able to assist with the implementation of technology innovations while promoting the continuum of care and safety. Many large organizations hire nursing informatics staff to be part of their leadership team with providing ongoing translation of patient and staff needs into technology systems, whereas smaller organizations will hire this role only for the implementation. Facilitators possess skills and knowledge that can effectively be used to assist users in applying the innovation to their routine practice. These include excellent communication skills to market the innovation, project management expertise, technical skills, practical skills that lend clinical credibility to users, and the ability to be flexible to meet the needs of the facility (Craddock, 1993; Rycroft-Malone, 2004).

The ITIM defines a facilitator as a person who, either directly or indirectly, assists by providing guidance in the implementation of technology. Facilitators contribute structure and process to the interactions of groups so that they can function effectively

and make quality decisions (Kitson et al., 2008). These decisions may be related to the economic resources, training requirements, and conflict resolution. Facilitators can provide information and influence decisions within the facility, and can represent the facility in the external environment such as with the vendor (Damschroder et al., 2009; Greenhalgh et al., 2005; Kitson et al., 2008). Greenhalgh et al. (2005) describe boundary spanning with linking the facility to the external healthcare environment. The new model represents the facilitator, with linkages of the internal and external context, as boundary spanners to facilitate implementation. This role is critical to a successful implementation.

Vendors. Vendors are the final concept in the ITIM which have a significant impact on acceptance and implementation. Business and marketing science define a stable vendor as a reputable organization with a sound financial position. They have the ability to provide a product and service at a reasonable price, openly communicate with the customer (healthcare facility), and service their product after implementation (Dempsey, 1978). Vendors provide facilitation of the implementation process. Many complex technology solutions and the implementation depend on the cooperation among multiple vendors. For example, in long-term-care, the pharmacy software vendor will need to work with the EHR vendor to ensure interoperability. This work is done outside the context of the long-term care healthcare agency. The ITIM defines the vendor as the entity that makes and sells the technology. They may or may not be the innovator. The vendor role includes supporting the functionality between and among products, devices, and accessories (Harrell, 2013).

Attributes of vendors that promote implementation include: (1) technical expertise (certifications and experience) to assist with problem solving, (2) ability to communicate with technical staff in the organization on current systems and make recommendations for upgrades, (3) ability to provide a detailed explanation of the current systems and make recommendations for upgrades, (4) ability to be creative in identifying solutions to reach patient care need goals, (5) ability to complete the work within the technology budget, (6) being knowledgeable of new and relevant technology and make recommendations to be considered for the future, (7) share the urgency of restoring facility operations when the technology is malfunctioning, (8) ability to troubleshoot problems and provide correct solutions, and (9) having cooperation among the vendors for the solution to ensure the technologies supports all critical functions.

Summary

Beyond the technology intervention design, studies are needed to examine adoption interventions that promote use of technology in healthcare. The ITIM herein provides a conceptual guide for selecting interventions to test in healthcare technology adoption research studies. Studies should address inner and outer organizational contexts that are central to the process of implementation: (1) the nature of the technology, (2) interfacing systems, (3) workflow, (4) users, (5) leadership, (6) communication, (7) accreditation and regulation, (8) economic environment, (9) facilitators (boundary spanners), and (10) the vendor community. Using the new ITIM to guide research on technology adoption in healthcare makes a significant contribution to explicating factors that impact technology implementation and use in a variety of healthcare settings. This empirical understanding is essential to maximize technology

applications to improve processes and outcomes of care delivery. At present, the new ITIM is being tested in a variety of healthcare settings to support its use in research.

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CHAPTER 3

Uncovering the Implementation Factors that Lead to Technology Adoption

The implementation of healthcare technology has accelerated in the United States. The World Health Organization describes the use of health technology as the application of organized knowledge and skills in the use of devices, medicines, vaccines, procedures, and systems designed to solve health problems and improve quality of lives (World Health Organization, 2015). The literature highlights the effects of quickly and poorly implemented healthcare information technology systems (Ash, Sittig, Poon, Guappone, Campbell, & Dykstra, 2007; Han, et al., 2005; Koppel, et al., 2005; Schoville, 2009). Many factors, at all levels of healthcare delivery, affect the success of program implementation (Durlak & DuPre, 2008). These factors of implementation within specific contexts of care delivery are not well understood, especially with technology implementation in healthcare.

Furthermore, there is little understanding on how long-term care (LTC) facilities implement and adopt technology. Introduction of new technology has shown that some organizations readily adopt an innovation whereas others reject the same technology (Rogers, 2003). Poorly implemented technology can result in unintended consequences. These consequences include poor quality and unsafe delivery of resident care (Ash et al., 2007; Han, et al., 2005; Koppel et al., 2005). The result of the

poorly implemented technology can lead to nurses developing workarounds or even refusing to use the technology (Vogelsmeier, Halbesleben, & Scott-Cawiezell, 2008).

As noted in the review of the science on healthcare technology adoption and implementation in chapter 2, there are gaps in the science. Jones, Rudin, Perry, and Shekelle (2014) found that the most commonly reported context domains related to health-information technology implementations are the facilities' financial status and existing infrastructure. The implementation domains included using a timeline and the description of education. Jones et al. (2014) note that reporting contextual and implementation factors will advance the science of implementation of healthcare technology. These researchers emphasized the need to understand that implementation must include how positive effects can be maximized, and negative effects can be avoided or remediated. To deepen our understanding of how long-term care (LTC) facilities implement and adopt technology a study is needed to contribute to and clarify factors and strategies to implement technology related to technology adoption.

Purpose

This study analyzed technology implementation strategies use in LTC facilities. The study aim was to explore the experience of staff and key stakeholders in LTC settings regarding strategies used to promote adoption of an electronic health record (EHR). The research questions include:

1. What are the experiences of the Director of Nursing (DON), nurses [Registered Nurses (RN)/Licensed Practical Nurses (LPN)], and Certified Nurse Aides (CNAs) with the implementation of an EHR technology in their LTC facility?

- a. What factors influenced implementation of the EHR at each site?
 - b. What are the similarities and differences with implementation of EHR across the three groups at each facility?
2. What are the similarities and differences of the DON's, the nurses' (RN, LPNs), and CNAs' perceptions with implementation of the EHR across the three facilities?
 3. What are the similarities and differences with implementation of the EHR across the facilities?
 4. What major and minor themes map to the concepts from the Integrated Technology Implementation Model (see Chapter 2) and what major and minor themes are not represented in the model?

Conceptual Framework

The study is guided conceptually by the Integrated Technology Implementation Model described in Chapter 2. The model posits that healthcare technology implementation is affected by both internal and external contextual factors leading to adoption. The model highlights that there is not just one single variable that results in a successful technology implementation. The internal context is the organizational factors that influence the adoption, spread, and sustainability of the technology innovation through active implementation strategies. These strategies include the active implementation process used, nature of the technology, interfacing systems to the primary system, and workflow. Others are the actual users' skills with technology, leadership activities, and communication used throughout the implementation process. The outer context focuses on processes and factors external to the organization that

have a synergetic relationship to the internal factors. The external factors include accreditation and regulations, economic environment, facilitators, and the vendor.

Electronic Health Record System (Innovation)

The study examined the implementation of a specific commercial electronic health record (EHR) technology application. The implemented certified EHR system in use is an enterprise integrated software system for LTC. The system includes the medical record, touchscreen point-of-care (POC) documentation, finance and billing, materials management, and offers interoperability by safely exchanging information between hospitals and physician offices. The system is in a secure web hosting environment which requires less server hardware purchasing and ongoing maintenance costs. The system uses workstations and kiosk touchscreens located in the resident care hallways. The nurses typically use the workstations found at the nurses' station or the laptops on the medication carts, whereas the CNAs use the kiosk touch-screens.

All sites used the strategy of a phased approach with initially implementing the CNAs' point-of-care (POC) documentation. Next, the implementation focused on the nurses with notes and care plans, then medication administration and treatment records. The final phase of the implementation was physician order entry. The first site had completed all phases of the implementation. The second site had implemented the CNAs' point-of-care (POC) documentation, then followed by focusing on the nurses with notes and care plans. The next phase being planned for implementation included medication administration and treatment records. The third site implemented nursing documentation and CNAs' point-of-care (POC) documentation. Their next phase is in the planning stages and it will be medication administration and the treatment record.

Methods

Research Design

This exploratory, qualitative study used the grounded theory methods approach (Denzin & Lincoln, 1994; Glaser & Strauss, 1967; Miles & Huberman, 1994; Strauss & Corbin, 1994) with use of focus groups and individual interviews to explore implementation strategies that lead the organization and individual caregiver to adopt EHR technology in their LTC facilities. The study used multiple stakeholders' perceptions that were helpful in understanding a complex EHR technology implementation. This inductive method allowed identification of patterns found from informants without being influenced or making assumptions about the important dimensions (Patton, 1990). The approach allowed the stakeholders to explain, in their own words, their understanding of reasons to implement the EHR technology. Additionally, they could describe the process and strategies used for implementation and the experience of using the EHR technology that leads the individual to adopt.

The study unit of analysis was the informants focusing on experiences of EHR technology implementation leading to the adoption in three LTC facilities. The procedure started with analyzing and fully understanding the data. Next, the data were reviewed collectively to identify repeated patterns and then combined across multiple dimensions. Glaser and Strauss (1967) indicated findings are grounded in real-world patterns when using this process. Other characteristics of Grounded Theory methodology are the procedures that the investigator uses, such as generative and concept related questions, theoretical sampling, coding procedures, and using a theme matrix (Strauss & Corbin, 1994).

Setting

Maximum variation of facilities was sought to ensure that patterns were consistent resulting in confidence in the findings. The study settings were three licensed non-profit LTC facilities located throughout Michigan, all within one corporate system with bed sizes ranging from 99-200. Long-term care provides medical, social, and personal care services on a recurring basis to a person with chronic physical or mental disorders. See Table 3.1 for site demographics including Centers for Medicare Services, a nursing home quality rating, and staffing hours per patient day. The sites were at different stages of implementation. Two sites were post implementation with one site using the system for 14 months and the other ten months. The final site was in active implementation with the first phase in use for five months (see Table 3.2).

The inclusion criteria for facility sites was that they provided medical, social, and personal care services on a recurring or continuing basis to persons with chronic physical or mental disorders. Twenty-four hour nursing care was provided to residents. The exclusion criteria included facilities that focused on sub-acute care with an emphasis on patients who have an acute illness, injury, or exacerbation of a disease. These sub-acute patients required treatment of active or complex medical conditions, or administration of technically complex medical treatments in the context of the person's long-term condition. The goal for these patients is to return to their homes unlike residents of LTC.

The corporate administrator (Chief Nursing Officer) was contacted, to explain the study and seek permission to participate. A letter requested from the LTC corporate administrator, who agreed to participate, was submitted to the University of Michigan

Institutional Review Board (IRB). The corporate director of clinical services informed each site of the research program and requested their involvement. After obtaining IRB approval, site arrangements were made for introductions, to answer any questions, and tour the facilities.

Table 3.1

Site Ratings and HPPD

Site	CMS star rating	RNHPPD (minutes) site/state/national	LPNHPPD (minutes) site/state/national	CNAHPPD (minutes) site/state/national
1	5	53/51/60	24/47/60	155/154/120
2	5	38/51/60	38/47/60	131/154/120
3	2	39/51/60	50/47/60	124/154/120

Note. HPPD=hours per patient day (in minutes); CMS=Centers for Medicare Services (5 star rating=best quality to 1 star=quality below average); data found at <http://comparehealthcare.com/NHS>.

Table 3.2

Site Variation Table

Location	City population	Race	Bed size/ occupancy (%)	EHR implementation date (post-implementation)
Site 1		White 57%	99/92%	10/2012
Northern Michigan	37,213	Black 35%		(14 months)
		Other 8%		
Site 2		White 58%		2/2013
West Central Michigan	190,000	Black 19%	187/94%	(10 months)
		Other 23%		
Site 3		White 78%		7/2013
Eastern Michigan	134,000	Black 14%	200/72%	(5 months)
Central Michigan		Other 8%		

Sample

The population of the study consisted of the following groups: Nursing Directors, nurses (RNs and LPNs), and Certified Nurse Aides (CNAs) employed in the three LTC facilities. The target sample was 3 RNs, 3 LPNs, 3 CNAs and one DON at each facility. A randomized purposeful sampling was selected from staff working in one of the three sites with EHR responsibility (Coyne, 1997; Patton, 1990). Staff inclusion criteria were English speaking, had implemented EHR within the last two years, permanent employee, and working at least 20 hours per week. Exclusion criteria included per-diem or agency staff and staff working less than 20 hours per week.

Sampling procedures. The DON at each facility provided three staff lists to the researcher including RNs, LPNs, and CNAs. The excel randbetween function was used to generate a random number and the individual assigned the generated number was selected for the focus groups. Randomizing prevented potential DON biases with selecting preferred participants. At each site, there were five participants randomly selected from the CNAs and five participants from each of the nursing groups. These numbers included two alternatives in case someone was unable to participate (see Table 3.3 for sampling pool, number of selected participants and actual participants). These individuals were invited to participate by the Nursing Director who informed the staff members that they had been chosen to take part in the study. One CNA refused to participate the day of the focus group and staffing issues prevented another member to join the discussion. At one site, two nurses refused to participate, three nurses requested to be allowed to participate, and accommodations were made to have them join these focus groups.

Sample Size

The recruitment target was 30 participants; and, the actual number of participants was 30. Data saturation (or redundancy) had been achieved (see Table 3.3). Qualitative sampling usually consists of small samples of people (24-32) and is studied in-depth (Alexander, Rantz, Flesner, Diekemper, & Siem, 2007; Miles & Huberman, 1994; Yeh et al., 2009). There are no firm rules for sample size; rather the number depends on the saturation of the data regarding the phenomenon, purpose of the study, and which data are useful and credible. Another factor is resources such as time and money (Denzin & Lincoln, 1994; Miles & Huberman, 1994; Patton, 1990). The key criteria are to identify information rich sites and stakeholders in order to achieve saturation of the data. Variation in cases selected within and across facilities adds strength and shared patterns that emerge from the data regarding general constructs and their relationships (Miles & Huberman, 1994). Sampling termination occurred when no new information came forward and saturation was achieved.

Table 3.3

Informants

Sites (size)	Sampling pool (N)	Number selected (N)	Focus groups informants (N)	Interviews (N)
	RNs=13	RNs=5	RNs=5	
Site 1 (99 beds)	LPNs=8	LPNs=5	LPNs=3	DON = 1
	CNAs=56	CNAs=5	CNAs = 2	
	RNs=20	RNs=5	RNs=4	
Site 2 (187 beds)	LPNs=12	LPNs=5	LPNs=3	DON = 1
	CNAs=52	CNAs=5	CNAs = 3	
	RNs=13	RNs=5	RNs=2	
Site 3 (199 beds)	LPNs=23	LPNs=5	LPNs=2	DON = 1
	CNAs=58	CNAs=5	CNAs = 3	

Note. N=29 females; N=1 male (CNA); target N=30.

Ethical Considerations

Non-regulated status approval of this study was obtained from the Health Sciences Institutional Review Board at the University of Michigan prior to data collection. Provisions were made to obtain signed consent, ensure confidentiality, and minimize risks. All participants signed subject consent forms to take part in the study and their consent for audio-recording of the interview. A transcriptionist was hired and signed a confidentiality statement before beginning transcribing. Transcripts were de-identified and all tapes were destroyed after transcription was completed and checked for accuracy. Transcribed data coded for site and type of informant was stored in a secure file.

Instrument

A semi-structured focus group guide for nurses and CNAs and an interview guide for DONs were both developed for this study using semi-structured open-ended questions. The Integrated Technology Implementation Model (ITIM) guided development of the questions. The questions sought to understand the complex nature and systematic approach of implementing the EHR. Additionally, conversational probes were used to obtain further clarification during the actual focus groups and leadership interviews. Being consistent with Grounded Theory methods, questions evolved as each interview or focus group session informed the researcher with new data. Focus group and interview major questions are found in Table 3.4 (refer to appendix 3A and 3B for the complete instruments).

Table 3.4

Major Questions

Major questions
When thinking about the EHR implementation compared to other technology implementations was it well (or poorly) introduced to you?
Describe to me what things (factors) helped you to decide to use the EHR System.
Describe the functions currently being used with this EHR technology.
Describe how the EHR works with other devices (or software) to deliver patient care.
Tell me how using this EHR technology has impacted how you deliver patient care.
What motivates you to learn something new?
Describe how the leadership has been involved with the implementation of the EHR.
I want to ask how you learned to use this EHR.
Describe who took lead in (implementing) helping you use this new EHR technology.
Can you describe how this EHR technology will impact your site survey?
Given the economic environment describe any other things that helped you (and the LTC facility) to decide to use this EHR technology.
Describe what activities the EHR technology vendor did before implementation.

Instrument Validation

The focus group and interview guides were validated by an implementation Ph.D. nurse and three informatics nurses. The initial approach was to validate the focus

group and leadership interview guides by working with a team of nursing informatics and implementation science experts with experience deploying technology. These experts reviewed the questions and provided feedback for revisions. The second approach was to pilot questions with a rehabilitation unit that had similar employee job categories and patient populations (nurse manager, nurses, and CNAs), and additional revisions were made. Revisions included changing the word “implementation” to “when you began using technology.” Conversational probes were developed to elicit reasons that the LTC facility decided to use the technology and how technology impacted resident care. A final leadership question was revised to ask how they knew if staff were using the features. The focus group and leadership interview guides are in Appendices 3A and 3B.

Data Collection Method

The primary data collection procedure for this study was in-depth interviews with DONs and focus groups comprised of nurses (RNs and LPNs) or CNAs (Waltz, Strickland, Lenz, 2005). Focus groups were conducted at each site; one focus group with CNAs and two focus groups with nurses. This approach resulted in direct care providers (nurses and CNAs) being open and honest with their shared experiences (Liamputtong, 2011). Directors of Nurses, who have assisted with the electronic health record implementation, were interviewed at each site.

Focus group methodology features included a small number of nurses and CNAs needed for a specific in-depth discussion regarding the implementation process. Focus groups allowed for exploring and clarifying each point of view. The goal was not to make a decision or reach consensus but to understand their experiences, points of

view, and concerns regarding the technology implementation process (Liamputtong, 2011). Nursing Directors were excluded from focus groups to prevent nurses and CNAs from feeling intimidated by their involvement.

Individual DON interviews were used rather than focus groups as there was only one DON at each site. The primary advantage of the DON interviews was flexibility in probing the meaning of given responses by changing the order and phrasing of questions. The respondents could freely discuss their perceptions about implementation. In summary, using focus groups with nurses and CNAs, and interviews of DONs provided data to gain in-depth understanding of the implementation of EHR technology.

Appointments were made for the researcher to be at each site for one day, eight hours to conduct focus groups and interviews. A specific place was set aside for the DON interview and focus group sessions. The interviews and focus groups were conducted in December 2013. The participants were informed about the study and its purpose and asked to sign an informed consent document. The focus group sessions each (N=9) lasted 45-67 minutes. Director of Nursing interviews (N=3) conducted at each site lasted between 52-67 minutes. Focus group and interview participants were given a \$10.00 gift card at the conclusion of the session for participating. Audio recording of the session was used to ensure that all conversations were captured and transcribed for analysis. All the transcribed data were compared to tape recordings, to validate the accuracy, ensure logic, and check at every step of the documentation process.

The interviews and focus groups began with asking each participant basic demographic information such as age, level of education, and how long they have worked in LTC (see Table 3.5). The average age of all staff was 37 years old (range: 21-59) and average length working in LTC was 9.28 years (range: 1-18). Level of education ranged from high school to Bachelor of Science of Nursing.

Table 3.5

Informants Demographics: Average Age and Level of Education

Role	Average age (range)	Level of education
DON (N=3)	48 (42-56)	100% Nursing Bachelor of Science
RN (N=11)	37 (31-50)*	73 % Associate Degree
LPN (N=8)	37 (28-59)*	27% Bachelor of Science
		29% Had Some College
		50% Some College
CNA (N=8)	32 (23-49)	50% High School

Note: RN=Registered Nurse; LPN=Licensed Practical Nurse; CNA=Certified Nurse Aide; *=missing data.

Data Analysis

Tapes were transcribed by the researcher and transcriptionists and each site was de-identified using a nine digit code. After audio tapes had been transcribed and the transcription compared to the tapes for accuracy, the tapes were destroyed. The transcribed and coded data was stored on a universal serial bus (USB) memory device and placed in a locked filing cabinet. Only the researcher had access to this information.

Coding Procedure

The main steps began with reading transcripts twice to get an overall gestalt of the EHR implementation. Second, line-by-line coding for minor themes was noted in the margins of the transcripts. To validate the interpretation of the findings twenty-five percent of the transcripts were independently coded by two experienced Ph.D. nurse

researchers for minor themes and compared to the initial coding. There was a reliability of greater than 91% between the three researchers. Third, minor themes were clustered together when they reflected similar concepts. Fourth, the clustered minor themes were reviewed and then given a major theme name that reflected the overarching concept of the minor themes. These were validated by the Ph.D. nurse researchers with minor themes and quote files to ensure all themes were brought forward to major themes. There was 93% reliability between the two coders. The names of each of the major and minor themes were discussed and agreed upon between the researchers. A qualitative matrix was used with this study to analyze each group's (DON, nurses, CNAs) major and minor themes. This qualitative matrix provided the ability to understand the similarities and differences between and across the groups with respect to implementation of EHR in LTC.

Results

Data were analyzed by research question, across, and between user groups to identify patterns of recurring themes. Presentation of findings is by research question. Data are presented by site for each major theme with associated minor themes, followed by similarities and differences across DONs, nurses, and CNAs (see below).

EHR Implementation Factors

The first research question focused on the experiences of the DON, nurses (RN and LPN), and CNAs with the implementation of an EHR technology in their LTC facility. Factors, which influenced the implementation of the EHR at each site, were analyzed (research question 1a) followed by analyzing the similarities and differences across the groups (research question 1b) at each site.

Motivation and EHR Adoption Decisions

The first major theme that emerged was motivation and EHR adoption decisions to implement the EHR technology. This major theme emerged from the minor themes of decision making, motivation, and extra-organizational determinants.

Site 1. Three minor themes emerged related to the major theme of motivation and EHR adoption decisions. The themes included: (1) how decisions were made, (2) the motivators to implement the system, and (3) extra-organizational determinants (see table 3.6).

Decision making. First, each group with various experiences addressed decision making. The DON, nurses and CNAs agreed that the corporate office made the final decision to purchase the EHR technology. However, the DON offered more involvement with the decision than the nurses and CNAs did. Decision making reflected by the DON was emphasizing how the organization reached out to key people to assist with the assessment of the EHR technology while not including direct frontline staff.

The DON offered:

“All those decisions are made at a corporate level with various expertise type people.” The DON offered that the decision:

Was mainly done at our home office because it was going to be a system that was going to be in all of our communities, but they did reach out to other key people. You know, for instance, umm, I was part of the, you know, clinical team as were, umm, other clinicians not just the VPs of [LTC facility name]. Umm, I know our business office manager was involved with going to the home office to see the vendors, umm, for like the financial and the billing component. Umm, so there were, umm, front line users, people out in the field that were part of, you know, the teams that, you know, saw the presentations and all of that. They reached out to—of course you can't have everybody. But they did, you know, reach out to some individuals in the field.

Whereas nurses and CNAs indicated that they did not have a choice about whether or not to use the EHR system and their input was not sought. One nurse offered, “We weren’t really involved in the decision.” A CNA said: “I think it [was] probably corporate” who made the decision.

Motivation. The second minor theme was the motivations to use the EHR with a variety of reasons offered. The DON indicated that staff were highly motivated and seemed to embrace the EHR. The DON said, “I think really it was just trying to, you know, get on board and stay ahead of the trends for where healthcare is going.” A nurse offered that a motivator was that she wanted to do a good job. Another nurse stated:

So, and I think, you know, it’s all for a purpose. I think it’s all meant to benefit so, you know, why not change and see? It might make your life easier. I think for having a lot of friends who are nurses too I’m hearing the cool things that they’re getting to do, it’s like well I want to try that.

One CNA offered:

Motivates me (laughs); Umm, that’s a good word “curious” because I am always curious about new things that are going on with the new residents and stuff. I always like to know. I’m not, I don’t like to be nosy, but I like to know what’s going on with my resident, any changes or what not.

Other reasons provided as motivators for using EHR were staying current with the trends in the industry, better financial outcomes, increasing efficiency and accuracy with documentation, helping with Medicare billing accuracy, enhancing communication, improving compliance with the Health Insurance Portability and Accountability Act (HIPAA) by making it easier to send and keep information confidential, and better outcomes.

Extra-organizational determinants. The third minor theme was extra-organizational determinants that focus on the economic environment such as

government incentives that helped the LTC facility to decide to use the EHR technology. Comments offered by study informants included that it was a government standard and laws such as HIPAA supported the implementation. However, many of the informants did not have an understanding of these determinants. The DON offered:

I know they measure, umm, you know, like your account payable days and how long people pay you and how long so you know, there could be some, you know, financial implications that would be more probably on the home office side, umm, than our side, but I mean, I think, yeah, I just think if we can, you know, have more time for the residents then we should have better outcome.

A nurse offered, “I don’t know anything about that.” A CNA thought it was “more accuracy” and did not offer any financial incentives.

Table 3.6

Site 1 Motivation and EHR Adoption Decisions (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Motivation and EHR Adoption Decisions	Decisions	<p>DON- “We’re part of the decision making from the beginning; I’m guessing the upper level of management at the home office then made the final decision for what vendor we were going to go with.”</p> <p>NURSE- “I’m guessing the upper level of management at the home office then made the final decision.”</p> <p>CNA- “corporate who made the decisions”</p>
	Motivation	<p>DON- “To grow your organization continue to stay current, you know, with trends in the industry.”</p> <p>NURSE- “My motivation changed after it was implemented and it was like, ‘Okay, now it’s time to...’ You know, I want to do a good job because I come to work every day to do a really good job and so I certainly don’t want to do a bad job and I don’t want to get us in a regulatory situation or a legal situation so then my motivation changed to, you know, you better get this right—you have to get this right.”</p> <p>CNA- “Insurance. I assume that they want to be able to capture almost any time we touched or did anything with the resident. We are supposed to get you know I am not going to make like I know if we get paid better, but I know it’s for insurance purposes.”</p>

Extra-Organizational Determinants	<p>DON- "I mean, that, you know, I don't really do financing or billing so that certainly could be, you know, an economic piece." NURSE- "I don't think we're privy to that information." CNA-"billing"</p>
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Similarities and Differences

Similarities and differences among the DON, nurses and CNAs are decision making, motivation to implement, and extra-organizational determinants. Similarities and differences are found in Table 3.7.

Site 1. Similarities and differences concerning motivation and EHR adoption decisions across the three groups at Site 1 are discussed next. The DON offered her involvement with the decision to implement included being on a multi-disciplinary team that met with the vendor; she went on a site visit and brought the information back to the corporate leadership. A similarity was that the three groups (nurses, CNAs, DON) were highly motivated to implement and offered various motivational explanations. The DON offered that the nurses and CNAs were highly motivated. Additionally, she added the facility was trying to stay ahead of the trends.

A difference is nurses and CNAs reported not being involved in the decision. Another difference was a variety of responses by nurses and CNAs were offered regarding extra-organizational determinants. Some nurses and CNAs offered a broader understanding of extra-organizational determinants such as laws influencing the decision to implement. The DON had little understanding of extra-organizational determinants.

Table 3.7

Site 1 Motivation and EHR Adoption Decisions Similarities and Differences Across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Motivation and EHR Adoption Decisions	<ul style="list-style-type: none"> All informants discussed corporate office made the decision to use the EHR Extra-organizational determinants included LTC facility trends & laws 	<ul style="list-style-type: none"> DON offered involvement with decision while CNAs & nurses were not involved Nurses and CNAs had a broader understanding of extra-organizational determinants such as laws

Site 2. This site had the same minor themes emerge from the data related to the major theme motivation and EHR adoption decisions. The themes included: (1) decision making, (2) motivation, and (3) extra-organizational determinants (See Table 3.8).

Decision making. The first minor theme was that the facility employees didn't participate with EHR implementation decisions. The corporate level makes these decisions. The DON offered:

I would say our corporate VP. I mean we have; I know it was discussed over a long period of time over several years it didn't just happen overnight. With, um, the board of directors and um which also includes the hospital board not just the Senior Living Communities.

A nurse expressed, "I think corporate." A CNA conveyed, "We just knew we were going live on a certain date."

Motivation. Motivation was the second minor theme offered with comments focusing on reasons to use the EHR system. Overall, this site was able to identify multiple reasons to implement the technology. The DON offered reasons including

meeting health-care reform by increasing the continuum of care with electronic exchange of information between healthcare facilities. The DON said:

I think healthcare reform was a huge factor. Um, the fact that you want to be able to tie in electronically to um, the continuum of care, and if everyone else is moving forward on electronic you don't want to be the lone wolf who can't electronically send your documents or um, particularly like our sister hospital we want to share information about our same patient.

Both nurses and CNAs mentioned law and for insurance purposes. A CNA expressed "I heard that it was one of the Michigan laws everybody is to go to computer versus paper. I am not sure how true that is. I just heard that word of mouth." Another reason offered by the DON and nurses is that they wanted to be part of the innovative future of LTC with keeping up with technology. A nurse conveyed:

It is trending it is status quo, I mean the more leading in technology you are the more likely they [resident] will go to you than some small ma and pa nursing home in the country because they saw it on the internet or whatever.

Additionally, nurses identified that the system was efficient, thorough, and the electronic charting allows the payor source to determine reimbursement for resident care. Care providers (nurses and CNAs) offered that it is exciting to learn something new and that it has to interest them. Also, they stated wanting to be more efficient with making every minute count. The DON offered the biggest motivator is to understand the "reason behind why it's important to learn the system and how it impacts them. They need to get on board; this is going to happen with or without me."

Extra-organizational determinants. Discussing the third minor theme, extra-organizational determinants, informants focused on laws and healthcare reform factors that were a motivator for implementation. Informants had no understanding of any government or business monetary incentives for purchasing the system. The DON offered: "I think healthcare reform was a huge factor." A nurse offered: "State laws,

isn't there like a federal law where you know with all this transition a law that everybody needed to go to an electronic medical record at some point?" Finally, one CNA offered: "I heard that it was one of the Michigan laws everybody is to go to computer versus paper."

Table 3.8

Site 2 Motivation and EHR Adoption Decisions (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Motivation and EHR Adoption Decisions	Decisions	DON- "Decisions are made at the corporate level with various expertise people." NURSE- "Corporate decision." CNA- "We just knew we were going live on a certain date."
	Motivation	DON- "I think everyone wants to not use paper really; even though we like it in front of us." NURSE- "I think just a push over-all in the world. We are all going technology the hospitals LTC and we need to step it up, you know." CNA- "I heard that it was one of the Michigan laws everybody is to go to computer versus paper. I am not sure how true that is. I just heard that word of mouth."
	Extra-organizational determinants	DON- "I am not aware of any of that (funding or incentives)." NURSE- "Like a federal law." CNA- "I have no idea."

Similarities and Differences

Similarities and differences among the three groups at site two (DON, nurses and CNAs) are decision making, motivation to implement, and extra-organizational determinants which are found in Table 3.9. A similarity was that the DON and nurses offered that decision making is done at the corporate level. CNAs were not aware who made the decision to implement the EHR. All groups offered a variety of motivations to implement the system. The DON and nurses offered that they were not aware of extra-organizational determinants of government funding sources. However, all informants

indicated laws were extra-organizational determinants that supported the facility to implement the EHR.

Table 3.9

Site 2 Motivation and EHR Adoption Decisions Similarities and Differences Across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Motivation and EHR Adoption Decisions	<ul style="list-style-type: none"> • Extra-organizational determinants included laws 	<ul style="list-style-type: none"> • CNAs not aware of who made the EHR decision while nurses and DON indicate the decision was made by corporate • Various motivation explanations given

Site 3. Again, this site had the same minor themes emerge from the data related to the major theme motivation and EHR adoption decisions. The themes include: (1) how decisions were made, (2) the motivators to implement the system, and (3) extra-organizational determinants (see Table 3.10).

Decision making. The first minor theme was about implementation decisions. Informants stated that decision making is at the corporate level, or they (users) didn't know. The DON only said, "That would be the home office staff" who made the decisions. CNAs expressed similar comments. One stated that "someone from corporate" made the decision. Whereas a nurse voiced, "It wasn't up to us. Yeah, it was just like a corporate thing."

Motivation. The second minor theme was motivation to implement and adopt the EHR. Overall, this site was able to identify multiple reasons to implement the technology. These include responding to change and sharing information with physicians, hospitals, home healthcare, and other partners. The DON offered that the

primary organizational objectives were to obtain standardization, increase efficiencies (such as less time charting), improve care, ease of auditing, and to obtain compliance related benefits. The DON offered:

Well, standardization is one thing; efficiency, which I think, would be gained overtime; uh I think better care ultimately; better care is what we're trying to get to, to give the nurse more time for actual hands-on care and less time writing. Uh, I think again the gains would be the daily audits, the ease in auditing the record, and there'll be some compliance-related benefits. So I think those are probably primary objectives.

The DON also indicated that staffs are motivated by wanting to know, understand new processes, and to be involved with the change. Nurses offered that it had to interest them and must have a benefit to them to learn and apply it to their daily work. A nurse expressed, "because they (corporate) said everybody, all the facilities and it's a statement that by 2015, everything goes electronic, that's what we heard." Other nurses indicated they "didn't have a choice" and need to "go with the flow and just accept it." CNAs reported technology is taking over, and it's intriguing. A CNA offered:

"It's intriguing. I want to see if this step, I mean if it can get better, you know it's something new that I've never seen before; it's intriguing. You have to learn something new every day.

Another CNA conveyed being motivated to adopt the system because there are consequences of being disciplined.

Extra-organizational determinants. The third minor theme offered was an extra-organizational determinant with users having a limited understanding of forces outside the organization effecting the implementation. The DON offered: "I don't know about economic incentives." A nurse further supported this notation of lack of understanding by saying, "I think they're supposed to be getting, places are supposed to

be getting money, I think, for, as incentive, but I don't know really." Finally, one CNA conveyed, "That's something that they (leadership) wouldn't tell us."

Table 3.10

Site 3 Motivation and EHR Adoption Decisions (Research question 1a).

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Motivation and EHR Adoption Decisions	Decisions	DON -“That would be the home office staff.” NURSE -“It wasn't up to us. Yeah, it was just like a corporate thing.” CNA -“I don't remember.”
	Motivation	DON -“Responding to the changing environment.” NURSE -“Don't have a choice.” CNAs -“I mean if it can get better, you know it's something new that I've never seen before; it's intriguing.”
	Extra-organizational determinants	DON -“I don't know” about economic incentives” NURSE -“I don't know” CNA -“We would not know any of that.”

Similarities and Differences

Similarities and differences among the three groups at site three are decision making, motivation to implement, and extra-organizational determinants which are found in Table 3.11. At this facility, the DON, nurses and CNAs reported that the corporate level makes the decisions regarding implementation of the EHR. Motivation for the DON and nurses was the positive elements of using the EHR such as sharing information between sites, increased efficiencies, and ease of auditing. In contrast, CNAs expressed negative consequences if they did not use the system resulting in disciplinary action as their motivation. The DON and nurses offered not knowing about economic incentives and had little understanding of extra-organizational determinants that influenced the implementation, such as laws. In contrast, CNAs offered that

extensive charting was being done for reimbursement reasons. CNAs desired that the management team share extra-organizational determinants and wanted to know the rating of the facility, how much money they make, and how the economic environment impacted their facility.

Table 3.11

Site 3 Motivation and EHR Adoption Decisions Similarities and Differences across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Motivation and EHR Adoption Decisions	<ul style="list-style-type: none"> • Decisions were made by home office 	<ul style="list-style-type: none"> • CNAs experienced negative consequences to motivate them to use the system • CNAs have a greater understanding of the extra-organizational determinants and frustrated with management who does not share budget outcomes

Factors that Influence the Implementation of the EHR

The second major theme was factors that influenced the implementation of the EHR that impact use in clinical care. Implementing an EHR system is complex and multi-faceted approaches are needed that guide the implementation activities. For example, the organization sets a goal to implement, selects a vendor, and identifies key personnel to assist with the implementation. Also, the facility must prepare to deploy the technology (see Table 3.12).

Site 1. There were eight minor themes that emerged as important factors that influence implementation at this site. These included: (1) organizational factors, (2) vendor selection and contracted services, (3) facility preparation, (4) key personnel, (5) education and training, (6) communication strategies, (7) support (teamwork), and (8) user perception and skills (see Table 3.12).

Organizational factors. The first minor theme offered by informants was organizational involvement with oversight from the home office. Funding was identified for the project by the home office. Then, the work of choosing the EHR product occurred. This was followed by changes with using the EHR being communicated, education, and initial and ongoing facility support provided. The corporate team provided the direction and support with the implementation process and strategies such as a plan with timelines, and project teams assisted with the implementation. The DON offered:

The organization had set a goal that they were going to implement electronic medical record, um, I want to say in like 2012. So what they did then was they, you know, the monies got approved, the monies got set aside and then what they did is they went out and sought vendors.

Next, the data revealed that the corporate organization communicated about the change to their facilities. A CNA said, "They gave us a heads up, um, some months before we actually, um transitioned to it..." The DON offered, "Um, we had our weekly (with corporate office) phone calls which encompassed um, everything from education to equipment." Many nurses were not aware of the organizational factors; whereas other nurses indicated "vendor activities [were] being coordinated" by the home office such as education.

Vendor selection and contracted services. The second minor theme is vendor selection and contracted services. The organization used a process for selection of a vendor and contracted services. The DON offered that the organization must choose and ensure the vendor “is going to be available and support you and work with you and be willing to customize their system.”

The selection process included a multidisciplinary team who went on site visits and shared their feedback upon returning. The DON offered:

I was actually part of the team that went to Kansas to one of the facilities that was using the Umm, XXX System, so we actually, it was a multi-discipline team because we had not only, umm, the nursing component for [how] was this going to work for nursing, but had to work for finance, it had to work for admissions, it had to work for billing. Um, so we actually went down, umm, you know, and toured, umm, a facility that was actually using it, met with vendors and then we kind of brought all that feedback back to the home office, had some phone calls and then I’m guessing the upper level of management at the home office then made the final decision for what vendor we were going to go with.

The DON was not privy to the final contract but was sure that the corporate staff included having technical support and having a key person assigned to the account.

The DON offered: “The biggest thing that the vendor did—I’m sure they did a lot of things behind the scenes which, you know, converts paper forms to forms in the system that we could use.” A nurse stated, “I don’t know anything about the vendor.” CNAs reported the last time seeing the vendors was when they came on site for when the nurses went live.

Additionally, there were activities done by the vendor pre and post implementation. These activities included doing a walk through with placement of kiosks, converting the facility to WI-FI, changing paper forms into electronic documents, providing training, and providing support during the deployment. Post implementation the vendor reached out to the facility for additional training with webinars and is involved

with the resolution of support tickets. The nurses and CNAs were not aware of the on-going vendor relationship.

Facility preparation. The third minor theme was facility preparation that included preparing the technology (software and hardware), formal changes to policies and processes, and development of incentives for acknowledging a job well done. First, communicating the change was one activity. A CNA conveyed, “They gave us a heads up some months before we actually transitioned to it and then we had our training.” Other facility preparation activities included providing enough computers and switching out the kiosks and placing them in a higher location. Another activity was guaranteeing computer technology equipment is functioning by setting up more upgraded computers and kiosks. Leadership prepared the electronic record by scanning and attaching documents and preparing the skinny chart (paper chart) with the remaining paper documents that would not be scanned. A nurse offered:

Leadership people dealt with most of the organizational standpoint, as far as, you know, they're the ones that initially inputted everything into the computers, so then the day that we went live it was all that information and everything was there, and it was accessible to us.

Another nurse said, “Umm, they set everything up for the, you know, entered, inputted everything in, all the med sheets, all the treatment sheets they had everything inputted and ready to go for us.” The DON offered facility activities included:

The work is getting everything into the system. Facility walk through for where did it make the most sense to put the kiosks for the staff so that they were, you know, spaced out where it was ease of use for everybody.

Policies needed to be developed or updated to guide the nurses and CNAs when using the EHR. Policy changes included CNAs charting immediately after completing

patient care versus writing it down on a piece of paper with data entry later into the electronic record. The DON offered regarding CNAs charting:

Is intended to be used, you know, it's point-of-care, um, charting, especially for the CNA staff that, you know, they can come right out of a resident room, the kiosk is there, boom, go right in there and you know just quickly while it's fresh in your mind put in what's there versus maybe writing it on a piece of paper and then having to come back and transcribe it to a secondary, um, paper form kind of a thing.

CNAs had limited understanding regarding policies. One said, "I don't think it's changed too much from the paper charting or there are any policies or procedures, just the when you touch a resident, you know, try to touch the computer" (POC charting). A nurse said, "The privacy policy went to include like (electronic) medical records."

Informants offered another facility preparation activity was modifications in the existing process of documenting immunizations. For example, how immunizations were tracked and managed from a book method to the electronic record and ensuring the data were accurate in the EHR. The DON offered:

Come up with new systems for how we were going to do things. Um, you know, how we tracked and manage infection control and immunizations, you know, our infection control nurse really had to sort of come up with a way that she was— she was used to everything sort of in a book and a paper process, and so it's just making sure everything got loaded into the computer accurately, got kept up accurately, um, so she really made sure all of that stuff was on top of it.

Other processes that changed included checking the accuracy of orders by the Clinical Care Coordinators (CCCs). The scanning of paper documents was developed initially for implementation with an ongoing process identified with the "key person" completing this work. A nurse offered:

There definitely was a lot of process changes, things that we were used to doing that we, um, had to change our process for. We slowly started scanning stuff into the systems. So that was like new to us where it's like, okay we had to go through all of our charts and tag what we wanted scan and then, you know, we'd

have them scan it in and where'd it go, and, so definitely a lot of process. A lot of process changes happened.

Nurses offered that processes that did not change included narcotic counts, physician signatures, and shift paper report. In contrast, a CNA offered: "Um, I don't think so" regarding processes not changing.

Incentives are one type of strategy to acknowledge the caregiver with a job well done. There was planning, at this site, to acknowledge nurses and CNAs work during and after the initial implementation. The DON offered providing food around the clock to everyone. For the nurses, Bath and Body Shop products were provided as a stress relief and to acknowledge that they had gotten through the first few hours with the second implementation. An interesting finding was that the nurses and CNAs did not comment on incentives as being an important reason to adopt the EHR.

Key personnel. The fourth minor theme included a team effort with leads for implementation who guided the process. It was reported key lead personnel included Administrators, DON, Corporate Office Educator, Director of Education (DOE), Corporate Clinical Nursing, Clinical Care Coordinators (CCCs), and super-users. The DON was the facility lead for the entire project with the DOE being responsible for staff completing their training. The corporate office and vendor did the actual training. The facility scheduler got staff scheduled for training. Finally, super-user roles were developed for initial and ongoing support. The DON offered:

I (DON) was the lead for the entire project. Um, you know, DOE was the lead resource person as far as the staff education and development went. Um, you know, I was the behind the scenes coordinator organizer. Um, and then, you know, the trainers both from the home office and the vendor, you know, took a lead in doing all of our training and education, but yeah I would say DOE is primarily the staff support person.

Nurses supported the DON's comments with one offering, "XXX" (Director of Education) was lead. The DON, Director of Education and staff coordinator." CNAs highlighted that the Director of Education was the lead.

Informants offered that there were no new roles developed at the facility for the implementation. However, some staff assumed additional responsibilities such as the "key" person role. The DON offered the importance of this role:

Key person for both, umm, you know project implementations because she's actually, you know, the person who we identified that said, you know what, she cares about her job, she's computer savvy, she can take on the extra responsibility, she loves the extra responsibility, she has the opportunity, umm, you know, to make some additional money because she's hourly so, you know, this is just great for her. She's willing to do it, she wants to do it, and you know, you can trust that what she's going to do is going to be accurate. So honestly, she really bore the hugest responsibility from the implementation standpoint just because, you know, for the first part of it, she had to scan everything from the resident's old paper chart into the system and scan it and she had to attach it to everything. Umm so that's, honestly that's all the work is getting everything into the system. Anybody doing this identify your key person is what I would tell them because, you know, it made your life, my life, so much easier because you knew that she had this, umm, she meets timelines and everything so, you know, once we identified that key person and then just communicated this is how we're going to go about the data entry into the system, umm, and communicated that, umm, it really took a lot of burden and load off of all the rest of us because she really bore and did, you know, all of that you know, backfill for us.

In contrast, nurses and CNAs did not mention this key role as important to the implementation. However, care providers (nurses and CNAs) were aware of some roles having additional responsibilities. A nurse offered, "You know but they kind of stayed in their same roles. I don't think there were any new roles." CNAs did not comment on any new roles.

Informants mentioned the importance of the super-user role despite not identifying any new roles. The super-users are the go to people to answer system functionality and process questions. The DON offered that it was not hard to recruit staff to be super-users: "I was able to get people on board to be super-users; I mean

everybody just was like 'yes'. They were excited about it." Informants offered, "Super-users are part of the leadership and staff who assisted with the implementation." A nurse conveyed, "We had the super-users available twenty-four hours a day for the first week or so, or the first couple weeks." One CNA offered super-users were "Ones that really knew the system." Other care provider informants had varying experiences with super-users. Some of the super-users knew the system well while others didn't know how to troubleshoot all the steps. Super-users' support activities included hands-on assistance by entering all orders, answering questions, availability to help users with logging in problems, providing supervision during go live, and being available on-call. This role is still being used. One nurse reported not being aware that she was a super-user and another reported that the role is hard.

Education and training. The fifth minor theme was education that influenced the implementation of the EHR. Minor themes included strategies used for education, content of education, barriers, and suggestions for improvement for education.

Participants reported training could have been better. The DON offered:

You know we had the vendor and home office staff come in and do the training and the education. Um, and then there was, um, follow-up competency done by the staff development nurse where she sat down with the nurse and sat down the CNA and, you know, had them demonstrate that they knew how to do it and then she, you know, signed them off on competencies on how to use the electronic medical record and then it was the same thing.

Training was provided by the home office (educator) and vendor. Nurses received six hours of on-site in-service training whereas CNAs received one-hour classroom training. The teaching content included logging in and out, finding the census, and locating the EHR note and assessments. Both groups were tested at a later point on their learning

by the staff development nurse. According to the DON the web-based education provided to leaders was difficult to complete.

The training provided by a corporate educator and the vendor was reported to be less than desirable. Nurse informants offered that there was inconsistency of presented materials between sessions. Informants wanted the education to focus more on tasks specific to their actual daily practice such as how to update a care plan, or how to complete an admission from beginning to end. Informants found the practice environment difficult to use during productive shifts and recommended having access from home. Informants' frustrations included that the trainer didn't have a nursing background and appeared scattered and ill prepared. They would have liked to have received supporting reference documentation. Nurses offered other strategies and suggestions for improving education. One example given was using a facility resident's actual information and walking through the entire record by entering the admission data and medications versus using a fake resident. Another example offered by the DON and a CNA informant was the requirement of continuous education with review sessions.

A consistent education suggestion was that informants needed more time to learn the system. A nurse offered, "A day's worth of training, and I was familiar with it so I was comfortable, but I think that there were some people who struggled with that because it wasn't quite enough." Another nurse offered:

We should have had an initial training like we did a while before it went live and then another training because I mean that's a lot of information in one training just to take in. It was like Pfff; you're blowing my mind here.

Certified Nurse Aides further supported the notion of needing more education. One

CNA offered:

They went over how it would work and they showed us examples on the um, big screen, um, and kind of quizzed us on certain things on how it's going to work. Maybe a little more training I think for those who didn't quite understand it.

Communication strategies. The sixth minor theme was communication strategies. Communication is the process of informing users about the technology and implementation. Communication strategies were used to inform users regarding the implementation of the system and education on how to use the system. The facility used a variety of approaches. The DON said, "A manual is available that walks them through not only trouble shooting, but, you know, entering if you got an after-hours admission or how do you do an order, you know, all of that stuff." A nurse conveyed, "They always hand out [an] education sheet for us, like there's been three or four education sheets since we went live with, with EMAR tips or different tips we should use." One CNA offered, "I think it was pretty much word of mouth. Maybe there was some postings."

Support. The seventh minor theme is support strategies being significant to the implementation of the system. Participants offered types of support provided from resources, support staff, and their activities. A variety of support strategies were used such as resource manuals, tip sheets, and adequate human resources such as being well staffed during the deployment of the EHR. Also, having support available 24/7 with initial support teams on site, followed by on-call leaders, and the HELP desk support were additional support strategies. Specific support activities included the visibility of resource teams (corporate staff, vendor, super users, DON, staff development

personnel, information technology staff, Business Office Manager, DOE, charge nurse, pharmacy, etc.). They approached and asked users if they had questions. The DON offered:

We try to be positive too with um, you know, this is coming, you know, here's what the functionality is going to be, isn't this going to be great? You know, like sell it on the front end um, so that, you know, that they're not just sort of feel like we have to do this because they said kind of a thing.

A nurse conveyed:

We had all the support you could ask for. I mean, we had each other cause it was new to all of us, we had the DON, scheduler who's a super-user, the CCCs, you know, and if you would ask one of them and they didn't know, they'd be like, okay, well let's go check with so and so and we'll find out. We'll, you know, make sure that you know. And even if you didn't need anything, people when they first implemented it, people were coming, how are you doing? You know, is there anything you need help with? So I would say we were fortunate.

One CNA offered: "She's (DOE) always, her office is always open for us to come in there and ask questions. She's usually really good about answering them."

Other support strategies included staff having the ability to reset functionality.

The HELP desk was able to dial into the workstations for immediate problem-solving.

Leadership listening to nurses and CNAs concerns, communicating to the appropriate

individuals for resolution, and bringing back the outcome to the care-provider was

another strategy. It is obvious that throughout the implementation process support

needs to be ongoing after the deployment of the system. CNAs were found to have less

knowledge about the support resources available and they need them so they can

quickly problem solve when the system is not working.

Another important support was teamwork. Informants shared how teamwork and peers assisted them during the transition and provided them ongoing support.

Examples of teamwork presented were that they utilized each other to answer questions

and help each other with the system. The DON emphasized she “saw a lot of, you know, utilizing each other for resources.” A nurse further supported the importance of teamwork: “The ones that got it really good, they were like, ‘I’ll help you! I got this!’” A CNA conveyed, “We had a lot of team work around that time” (implementation).

User perceptions and skills. The eighth minor theme, user perceptions and skills, is factors that influence an effective implementation leading to technology adoption. Overall, the users were positive about the EHR and implementation experience. One nurse’s perception of using the system was stated: “I feel more in touch with what the other people are writing, and it makes me write, it makes us all look smarter because we’re writing off each other.” The DON offered her perception of the implementation was “well ran, it was very well organized, it was very well communicated.” A nurse said, “I think they did well preparing us.” Another nurse said that it was “really well supported, and I would say it was a pretty good transition.” A CNA said, “It went pretty well.”

Another user characteristic is user technology skills. Computer literacy skill levels varied with a diversity of ages of staff members. The DON offered:

Some of the older nurses who weren’t computer savvy and so you knew they were the ones that were a little bit fearful about this, so you really needed to, umm, you know, make sure they got the training and the education and the support that they needed.

A nurse further supported the notion that users had varied skills and offered:

Some of our nursing staff too, umm, you have your younger ones that are fresh out of school, umm, are really familiar with computers, umm, caught on to it real quick. There are ones that haven’t even turned on a computer, you know, they struggled.

Additionally, a nurse offered that new nurses, who have never worked with the computer system, were lost. Whereas a CNA offered, “I started out to use the

computer, so there really wasn't any strain." CNAs reported they were able to easily transition to the new EHR since they had already been electronic charting on another system.

Finally, nurses were worried about the residents' perception with staff charting on the kiosk workstations located in the hallways. A nurse offered:

Plus the perception of residents, if you see someone going (charting) against a wall going like this, the perception is that they're (nurses) not paying attention to you (resident) for standing in the middle of the hallway, and it (kiosk workstation) is in the middle of the hallway. So if lights are on and things are happening they're (nurses) like, Let me just finish this one (charting). And so not that they could have had them on the paper, but the perception of the residents and the people around is that you're not paying attention.

Table 3.12

Site 1 Factors that Influenced Implementation (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Factors that Influence the Implementation of the EHR	Organizational factors	DON- "Choose the best product; communicate the change; provide training; staff people to be at the facility for user questions during go live; super-users are available for initial and ongoing support." NURSE- "Corporate. I'll say trainings." CNA- "I'm not really sure."
	Vendor selection & contacted services	DON- "The biggest thing that the vendor did—I'm sure they did a lot of things behind the scenes with, you know, convert paper forms to forms in the system that we could use." NURSE- "He's [vendor name] a contactor to train for the program". CNA- "I'm not quite sure."
	Facility preparation	DON- "Providing education and training." NURSE- "Our computers were upgraded. Um, we had more computers. Kiosks as well. Switched out the kiosks to higher." CNA- "We had our training"
	Key personnel (leads for implementation, key person, new roles, super-users)	DON- I (DON) was the lead for the entire project. NURSE- "We had the super-users available." CNA- "It was XXX (Director of Education)."

Education/training	<p>DON- “Webinars if anybody wanted additional training or education.”</p> <p>NURSE- “Training a few weeks before it rolled out and I don’t necessarily think that was beneficial.”</p> <p>CNA- “Maybe a little more time to actually learn the system, find out where everything was, how to operate it.”</p>
Communication strategies	<p>DON- “A manual”</p> <p>NURSE- “They had training and the handouts that we got.”</p> <p>CNA- “It was word of mouth.”</p>
Support (strategies; team work)	<p>DON- “We had support from the home office.”</p> <p>NURSE- “I think having corporate support here up until time that we went live, you know, just kinda giving us more of a training opportunity.”</p> <p>CNA- “I think they was supportive (peers). If anybody needed help I would help them (teamwork).”</p>
User perceptions & skills	<p>DON- “It (implementation) was very well ran.”</p> <p>NURSE- “They did well preparing us.”</p> <p>CNA- “Some confusion and some glitches with the system, but pretty much I think it (implementation) was solid.”</p>

Similarities and Differences

Similarities and differences across the three groups brought forth factors that influenced the implementation of the EHR. Similarities with the DON, nurses, and CNAs included the informants’ highlighting that the organization communicated the change of using the EHR (see Table 3.13). Additionally, all informants were aware of facility preparation such as policy changes and the identification of important existing key roles such as the Director of Education. However, all informants indicated that there was no development of new roles although some facility roles increased their responsibilities, such as the scheduling secretary and super-users. Informants identified a variety of communication strategies used with the implementation such as the manual. All informants offered that education and training were less than desirable.

However, all informants agreed that they had support during the implementation.

Moreover, they highlighted that good teamwork was evident during the implementation.

Differences across the three groups included incentives, vendor activities, and user skill levels. A facility activity, which was highlighted by the DON, was use of incentives to acknowledge a job well done. In contrast, nurses and CNAs did not note incentives as important. A difference was that nurses were not aware of vendor activities. Another difference was that nurses worried about the residents' perception of them using the hallway kiosks for charting. Nurses and the DON highlighted that user skills varied with the diversity of ages.

Table 3.13

Site 1 Factors that Influence the Implementation of the EHR Adoption Decisions Similarities and Differences Across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Factors that Influence the Implementation of the EHR	<ul style="list-style-type: none"> • Organizational Factors-the change was communicated • Facility Preparation-policy changes • Key Personnel for Implementation included the DOE & Super-users • Education/Training-needed more • Communication Strategies-variety used • Support was good • Good teamwork 	<ul style="list-style-type: none"> • Most nurses not aware of vendor role • DON only discussed incentives • Nurses and DON highlighted user skills varied with diversity of ages • Nurse users worried about the resident perceptions when charting in the hall on kiosk workstations

Site 2. Eight minor themes regarding factors that influenced the implementation of the EHR emerged from Site 2 data. These include: (1) organizational factors, (2) vendor selection and contracted services, (3) facility preparation, (4) key personnel, (5)

education and training, (6) communication strategies, (7) support (teamwork), and (8) user perceptions and skills (see Table 3.14).

Organizational factors. The first minor theme was organizational factors that supported the EHR implementation such as budgeting for the project, using a phased approach for implementation, and support. The DON and staff were not aware of the budgeting of the project. However, CNAs were aware that there was not insurance funding available for replacement equipment requiring them to be very careful with the kiosks. Informants commented about the organization using a phased approach while implementing the EHR system. Another organizational factor was that the site participated in weekly corporate phone calls which encompassed equipment needs, education, training, and skill competencies that provided direction to the site for the implementation process. The DON offered:

I mean several things contributed organizationally. Um, we had our weekly phone calls, which encompassed um, everything from education to equipment. Um, to training and skills competencies, um, a lot of training for super-users who could troubleshoot the types of calls and questions that would come their way, um, 24/7. And, there were manuals um, with policies in them for each area of the new phase that um, required a lot of edits and changes and then we also found um, when we were organizing the corporation to come in and do training that there were variations with that.

A nurse conveyed, “Corporate office you know worked with XXX (vendor) you know bringing them over, and they did the one day training with everybody for a certain amount hours.” Finally, a CNA offered an organizational factor as a “Policy changed as far as charting after every patient like before at the end of the day.”

Vendor selection and contracted services. The second minor theme was the vendor selection and contracted services. The DON stated about the vendor, “It’s like the obscure friend.” A nurse offered how the vendor provided education: “He (vendor)

showed us on the overhead like he had his computer, and he could show us what he was doing and then we would do it with our computers.” CNAs were less aware of the vendor’s services and one conveyed that they “don’t know” what they did for the implementation. Another CNA offered that they were on site to ensure that the passwords were functioning. Additionally, the vendor remains available for questions by calling or directly emailing them. Nurses indicated a need to work, with the vendor, to make the system better. One nurse offered, “I think if actual the company, who made the program, asked nurses who use it on a daily basis I think they can make it much better.”

Facility preparation. The third minor theme was facility preparation. The DON offered that the LTC facility funded laptops, human resource costs including super-user overtime costs, and supplies such as binders. Informants shared information about preparing for implementation such as paper documents being scanned into the electronic system, scheduling extra staff during the holidays, installing of equipment, and facility policies and procedures changing to reflect the EHR. Incentives are one type of strategy to acknowledge the caregiver with a job well done. At this site, CNAs offered that they didn’t get raises and a lot of people asked for them. Nurses did not comment on incentives as being important reasons for adopting the EHR.

The next activity was the review of paper documents to ensure they were complete (crisp) for scanning. The DON offered: “A lot of review of documentation to ensure it was crisp for scanning.” Nurses highlighted that resident paper charts were thinned (hybrid chart developed), with the scanning of documents into the EHR. The

facility determined what shredding of paper documents could occur, as some scanned documents were not easily legible.

The DON emphasized that communication was sent to users so that they knew it (EHR) was coming with deadlines offered. Additionally, she discussed with staff that they had accountability in making sure that they attended education sessions and if they didn't understand that they sought out the Director of Education. Nurses conveyed that training occurred. Human resource planning was a key activity since the implementation occurred during high scheduling needs with a November rollout. The DON noted the "bulk of the holidays to contend with um Thanksgiving through New Year's; and, um, again requests for time off surrounding key times" needed to be monitored. Finally, equipment was upgraded with all computers being changed over in the building and installing ones on the medication carts. A nurse stated that facility preparation included: "They changed over all the computers in the building and installed the ones on our med carts." Finally, a CNA offered that "switching computers" was a facility preparation activity.

Other facility preparation efforts included policies and procedures changing, with the implementation, to reflect the use of the EHR system. There were varied experiences with these changes. The DON offered:

Um, not the mission statement but certainly policies are fluid. Um, we get addendums to the policy book probably every couple of months where it could be one small thing but um I would think that will continue to happen.

A nurse offered: "The mission statement stayed the same." The nurses did not mention that policies changed with the implementation. Whereas CNAs identified point-of-care documentation as a policy change. One CNA offered, "Policy changed as far as

charting after every patient like before at the end of the day. So I guess that part of the policy changed.” Another facility activity included modifications in the existing process of hospice and student nurses accessing the system. The DON offered:

We have a person in the front office, who will pursue getting them (hospice and student nurses) a pass code and what we found we can do, is give them a password for designated time. So that, after this date, it's no longer valid so once they're done with their clinical here they can no longer access if they were in the building or something.

A nurse explained that process changes were minimal, “Procedures a little bit...we kind of knew where we would have to find things or where it would go automatically.” Finally, CNAs did not offer any process changes.

Key personnel. The fourth minor theme included a group of key personnel who guided the implementation process. Key personnel included the DON, DOE, super-users, and Clinical Care Coordinators. The DON offered: “It was a team not individually but um over all you were guiding the process” [Operations, Corporate Vice President, super-users, DOE, corporate nurses]. A nurse offered: “I mean the Director of Education at the time. Definitely, and then um, you know super-users, and you know the supervisors.” Finally, CNAs offered a lead was “XXX (DOE) who knew about it and tried to educate everybody else about it.”

Other key personnel were in a super-user role. The super-user assists with troubleshooting calls and questions. Super-users are available for problem-solving and on-call during go live for support. The DON offered, “Super-users are the go to [person] if you have questions.” The DON and nurse informants offered that super-users are part of the leadership and staff who assisted with the implementation. Super-users have other jobs and the EHR is not their specialty. Next, nurses reported that a lot of training is required for super-users so they can support users' questions. Additionally,

they said that role duties changed with current staff assuming super-user duties. The DON offered:

The super-users, um, as far as new roles it did. Roles it did change the way the unit secretaries go about their day. Probably more than anyone because they have to make sure anything that needs to be scanned, is scanned. Um, efficiently and properly; so every day they're rounding in the building making sure everything is scanned.

A nurse further supported the notion that a new role was a "super-user." There were a variety of perceptions regarding this role. Nurses reported that this super-user role did not go as well as planned with them not knowing who these individuals were. One nurse reported not being aware she was a super-user. A nurse offered: "Super-users, as they call them, on every hall, but that seems like that didn't go as well either nobody knows who their super-user is." Despite these barriers, nurses reported needing super-users on each shift. A CNA conveyed, "There were super-users but nobody you know for the second one (implementation)." Certified Nurse Aides expressed that it would have been helpful to have super-users follow a CNA so that they knew how it (EHR) worked for real practice and to give them advice how to use it better. The plan at this site is that the super-user role will continue with Phase 2 implementation.

Education and training. The fifth minor theme was education and training. The data revealed a variety of education strategies that were used to reinforce learning the new EHR technology. Informants discussed types of trainers and training, using a practice environment, and needing more training.

The DON offered: "I hate to say mandatory, but anybody that would be utilizing this system, um, was involved in the training process." She additionally offered education was rushed:

Not so well; it felt a little rushed like we had a deadline and um, there was really tight timeline but the timeline did not allow for um, enough opportunities to delve deeper into a more thorough understanding of what the program do's and don'ts truly were. Um, so in that respect I think we felt it was substandard.

A nurse offered further support of this opinion. She said, "It was six hours of training three weeks before implementation and then never looked at it in between; so, kind of had to teach myself all over again." Further, reporting by all staff was that training was not adequate, with not enough practicing using basic information, and that they needed more on how to navigate through the program using scenarios. For example, a CNA offered that they needed "more time to actually learn the system, find out where everything was, how to operate it." Another example given was that new nurse orientation was too fast and the user had to teach herself. Nurses reported that getting all this information thrown at them at one time was too much too fast.

Nurses received four to six hours of on-site in-service training whereas CNAs received less than one-hour classroom training. There was testing of both groups at a later point on their learning. The DON received web-based education during this education she found it difficult to follow along with the presenter. Training provided by a corporate educator and the vendor was less than desirable with variations between sessions. The teaching strategies included logging in and out and locating the EHR notes and assessments. Other strategies included return demonstrations, one-hour competency testing, and review sessions. Users wanted the education to focus on activities more specific to their actual daily practices such as how to charge supplies. Users found it difficult to use a practice environment when providing care and recommended having access from home. All informants offered that they required continuous education with review sessions and monthly meetings. Informants offered

suggestions for improved education. Suggestions included offering electronic education often, providing scenario-based education, making more computers available which had a practice environment program, and providing a new nurse orientation which thoroughly covered the EHR.

Communication strategies. The sixth minor theme offered was formal and informal communication approaches used to inform users about the technology. All groups indicated that communication was important and offered strategies that influenced the implementation. These strategies included emails, newsletters, signs, a project plan, meetings, phone calls, and super-users. The DON offered: "I can broadcast email and then um, I believe we also put it in our newsletter." A nursed offered that they "had user manuals." Whereas one CNA said, "Don't get emails. We don't get that now it's more through the nurses, and they're supposed to relay it."

Support. The seventh minor theme was support strategies. Having support available at the time of implementation and ongoing was highlighted as being important. Informants said that the types of support provided included resources, support staff, and activities. Informants offered a variety of support approaches with leadership visible out on the units and on-site 24/7 during go live. Other support strategies included having a corporate organizational Resolution Center (HELP desk) available 24/7 except on weekends, supervisors available on-call for questions, and super-users available to problem solve with staff. Corporate resources are available during the monthly corporate phone calls as a support strategy for the facility leadership. The DON shared how the facility leadership supported nurses and CNAs. She offered, "The availability of

us making sure that we were here all night (support), making sure 'cause it goes live at midnight. So, we needed to make sure midnight crew feels supported.”

A nurse conveyed the following:

Um, I mean that is who [leadership] you go to for your questions then you know they would get the answers. I think they made themselves more available at the time [implementation] they came around you know do you have any questions; is there something that I can show you...

A CNA offered: “Try to get us pumped up for it. Um, they [leadership] talked about it a lot; and, they really encouraged us to play around with the system.”

Next, the data revealed that good teamwork affects the implementation. Nurses and CNA informants offered that their peers were also a support strategy. Nurses and CNAs offered that there was a lot of teamwork with showing each other how to do things in the EHR, which was helpful. Peers offered their telephone numbers so they could be contacted at home to assist with questions. The CNAs further supported how teamwork affected the implementation with one stating, “Everyone was trying to be helpful.” The DON conveyed, “We were in the trenches together.” A nurse offered:

I think it is very helpful, I mean, if I know I have an issue and you have to do something it is nice to know that you can call another unit or call another nurse, and they are more than willing, if they know they will help. If they don't, they'll help you find somebody that does cause they usually want to know too.

Participants offered that additional support was needed including more training and coverage during the training sessions. Additionally they expressed that more education is required regarding the use of technology support tickets (HELP desk). Certified Nurse Aides needed resources developed for their EHR activities such as a reference and ordering list for supplies. Nurse and CNA informants offered needing more support with training before implementation and more timely communication from the Resource Center.

User perceptions and skills. The eighth minor theme was users' perceptions regarding the implementation and the technology skills of nurses and CNAs.

Informants' perceptions included a variety of responses which were both positive and negative about how the implementation process went. Common responses included time frames "being too tight; transition went well; too quick." The DON offered:

I would like to see a friendlier more courteous well thought out implementation plan that shows care and compassion for the nurse who has been pulled off the floor to do this training or deemed as a super-user and still has to complete all their regular duties on top of these things.

Another perception offered by a nurse was, "it was implemented well, transition went well." While a CNA conveyed "I can't say poorly...too quick."

All groups offered that the skill level of users, which influenced the use of the EHR, varied, with CNAs using less technology. Skills with technology use varied with CNAs having less experience than the nurses did. One CNA reported needing her daughter to help her use technology at home. The DON said, "Nurses that were less computer savvy finding that they were a little frightened to start charting." A nurse offered,

There are some people that are not literate with computers, and I know for some of our CNA staff and some of our nurses hadn't had any experience with computers there was just a basic lack of knowledge of computers.

Finally, one CNA said, "I would like to be more technology savvy."

Table 3.14

Site 2 Factors that Influenced Implementation (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Factors that Influence the Implementation of the EHR	Organizational factors	<p>DON-“The corporation to come in and do training.”</p> <p>NURSE- “Four hour training session you know with corporate and who they hired to come in & teach us about Vision.”</p> <p>CNA-“I think it was about a month they had the charts up where we could chart and it didn’t register so we could do the charting and the paper charting” (provided a practice environment).</p>
	Vendor selection and contracted services	<p>DON- “It’s like the obscure friend.”</p> <p>NURSE-“A lot of the training.”</p> <p>CNA-“Don’t know.”</p>
	Facility preparation	<p>DON- “A lot of scanning that had to occur.”</p> <p>NURSE-“They changed over all the computers in the building and installed the ones on our med carts”</p> <p>CNA-“They talked about it a lot.”</p>
	Education/training	<p>DON- “A lot of training.”</p> <p>NURSE-“They came in with the computers; and they had like a like a fake the program was real but had fake information so we could test records.”</p> <p>CNA-“They could have a little bit more training.”</p>
	Communication strategies	<p>DON- “Manuals um, with policies in them.”</p> <p>NURSE-“There is a book too you can go through if you need assistance doing it.”</p> <p>CNA-“I don’t remember or recall any of that” (manuals or cheat sheets).</p>
	Support (strategies & teamwork)	<p>DON- “Oh, they were great. They um, um, I saw a lot of I see some now but it’s less frequent” (teamwork).</p> <p>NURSE-“I thought we all worked well together. You could always ask somebody.”</p> <p>CNA-“My co-workers helped me through it.”</p>
	User perceptions & skills	<p>DON-“I have so many 30-something nurses that they were getting ahead and we had to pull them back. They were finding ways to add things to the ribbon and um go live with things that we didn’t have the OK to go live with yet. It was like whoa slow down the horse you guys we can’t you know we are not authorized to do this yet.”</p> <p>NURSE-“A lot of us grew up with the technology.”</p> <p>CNA-“I got the internet this year. I just got it not necessarily I use it. I don’t even know necessarily what some of the stuff is called.”</p>

Similarities and Differences

Similarities and differences with factors that influenced the implementation across the three groups at Site 2 are summarized in Table 3.15. First similarities will be discussed followed by differences between the three groups.

An organizational factor is budgeting the project. All informants had similar responses with not being aware of the project budget. All informants discussed facility preparation activities which included scanning documents into the EHR and deploying new computer equipment. Another factor was the identification of key personnel. All informants agreed that the Director of Education was key to the implementation. Another similarity was that all informants discussed that education and training were not adequate. Nurses and CNAs wanted more education provided. Informants noted that a variety of communication strategies were used with the implementation. However, fewer communication strategies were used with CNA staff. The use of fewer strategies might be because this group had previously been using a different POC charting system. Another similarity was informants felt supported during and after the implementation. Finally, all informants discussed that there was good teamwork during and after the implementation.

Differences with factors that influenced the implementation across the three groups included vendor activities, a reference contact for implementation, incentives, policy changes, super-user role, perceptions about the implementation, and user skills. A reference contact is someone who can comparatively discuss with the DON how the EHR was implemented and adopted facility to facility. First, CNAs were less aware of vendor activities whereas nurses and the DON were aware that one activity provided by

the vendor was education. The DON needed a reference contact (boundary spanner) “who has been up close and personal” to the EHR system “to help them know what worked and didn’t work.” This site did not provide incentives and CNAs wanted to be acknowledged with raises. The nurses or DON did not address incentives. Another difference was the facility activity of policy changes to reflect the EHR was not mentioned by nurses. Yet another was the development of the super-user role with care providers (nurses and CNAs) having a variety of experiences, which were both positive and negative with utilizing this resource. Nurses said that the super user role did not go as well as it could have because they were not aware which individuals were assuming these responsibilities. In contrast, the super-user role was not used with CNAs during this system implementation. However, they did indicate the vendor was a super-user, who knew the system well. Additionally, nurses and CNAs perceptions of how the implementation went varied with statements of both positive and negative comments. Finally, care providers (nurses and CNAs) had variable skill levels with using technology.

Table 3.15

Site 2 Factors that Influenced the Implementation of the EHR Similarities and Differences Across the Three Groups

Major theme	Similarities	Differences
Factors that Influence the Implementation of the EHR	<ul style="list-style-type: none"> • Organizational Factors-not aware of budgeting of EHR implementation • Facility Preparation-scanning of paper documents • Key Personnel for Implementation-DOE • Education/Training-not adequate • Communication Strategies-variety used • Support-well supported • Users-had good teamwork during & after implementation 	<ul style="list-style-type: none"> • DON needs a reference contact who has been up close and personal to the EHR to help them know what worked and didn't (organizational strategy) • CNAs less aware of vendor activities • Nurses did not mention policy changes (facility) • Nurses needed more training • Less communication strategies offered by CNAs • Only CNAs offered the minor theme incentives regarding not getting raises (facility preparation) • Nurses had a variety of experience +/- with the super-user role and CNAs didn't have super-users with this POC implementation • Various perceptions regarding the implementation experience • CNAs are less technology proficient • Variable computer skills

Note: Positive=+; Negative=-.

Site 3. The informants at this facility discussed eight minor themes that influenced the implementation of the EHR. These included: (1) organizational factors, (2) vendor selection and contracted services, (3) facility preparation, (4) key personnel, (5) education and training, (6) communication strategies, (7) support, and (8) user perceptions and skills (see Table 3.16).

Organizational factors. The first step was the corporate office making the decision to implement the technology followed by identifying funding and choosing the EHR product. The DON and staff were not involved or aware of the above corporate process of choosing the EHR system or budgeting of the project.

Informant comments reflected organization factors. These included the corporate office setting the direction of the implementation, providing new policies reflecting the EHR system, providing ongoing communication, and providing support by coming on-site and meeting with staff. The DON offered that organizational factors included developing processes for scanning paper documents, new policies such as downtime or loss of system procedure, and a procedure for regulatory bodies accessing information. The DON described how the organization supported her during the implementation:

We had maybe about four weeks where we did calls to see where we were at. They [home office] did them daily for the first week, and then they went down to less regular. Ah, and then they I think they ended the implementation team within a certain amount of time. We still interact with those people on a regular basis you know.

Many nurses were unaware of organizational factors. A nurse said, “don’t think they [organization] did” anything for the implementation. Other nurses indicated vendor activities coordinated by the home office such as education. One offered, “Yeah,

there's a guy that came and, um, did, um, in-service for I think four hours." CNAs identified education and in-services as an organizational factor. A CNA offered: "They [corporate] sent someone out to talk to us about it and let us know that this will be coming and that's about it." CNAs also identified that the "Corporate person told them [communication] they were going to go on [the EHR]."

Vendor selection and contracted services. The next minor theme was vendor selection and contracted services. The data revealed coordination of vendor selection was by the corporate office. The DON and staff did comment on contracted services. For example, the vendor did the initial system set up, mounting of kiosk computers, and provided in-servicing and education on the system. The DON reported, "They [vendor] played more of a background role. Ah, I think we only had the vendor on site once" but not present since implementation. A nurse offered: "I think the first week, it [EHR] was out there, was supposed to be somebody here, but I never seen him." The DON and nurses believed the home office knows how the vendor guaranteed the system.

Nurses reported the vendor activities included providing in-services, providing support for implementation, providing the initial set up of the technology including pulling wires and installing monitors, and assisting with logging in/scanning paper documents into the EHR. In contrast, one nurse reported that she never saw the vendor. The vendor provided support to the CNAs by reassuring them the technology would be faster but they would encounter problems (setting realistic expectations regarding the technology). A CNA said, "They [vendor] told us what the cause [problem resolution] was, you know, while we're doing it, they showed us right here. He [vendor] took us step-by-step." Finally, the DON offered that the EHR is not LTC focused and that

involvement of nurses and CNAs with the vendor for further development of the technology is needed.

Facility preparation. The third minor theme was facility preparation that influenced the implementation of the system. These activities included communicating the change, developing an electronic filing system for scanned documents, and then scanning paper documents into the electronic system. The coordinators (unit clerks) did the scanning. Computers were upgraded and placed in the hallways and on medication carts. The DON offered, “Took a lot of hands-on processing [paper documents], and we had to first scan it in, then put it into an appropriate folder.” Other preparation included being informed that the electronic charting was coming. A nurse offered:

They just told us we’re going to electronic. The computers put in. The computers they changed, because before the CNAs were using it already, and they have been using it, but it’s just like the behavior, but then they program it again to XXX [program]. Like before I don’t know what kind of program was that? Just the behavior and the rest of the behaviors we had to input if they have behavior problems or whatever. They put the computer in our carts and they put more computers, um, in the hallways, and they ask us to attend the four hour in-service and that’s it.

A CNA offered: “They let us know that it was coming in July, and then that was it and then they brought them in July, and the in-service and gave us papers, took us through stuff, how we’re going to use it.”

Another facility preparation activity was organizational policies and procedures needed to be developed or updated to guide the nurses when delivering patient care with utilization of the EHR. These policies and procedures included downtime or loss of the system processes, accrediting bodies accessing the system, issuing new passwords, and POC charting immediately after a patient care event. The DON offered:

We did have new policies I mean we had quite a few new policies come through ah the home office. Um, based on um, EMR but um like the process of how to

complete things. Um, well, and downtime or loss of system use what the procedure was for that.

Some nurses indicated there were no new policies. A nurse said, “Still the same; we have a lot of policies, but then I don’t think it like really with the computer if something happen they have new policies that we have to follow so we just have to do it.”

Whereas other nurses indicated, policy changes did occur with the EHR, for example, scanning paper documents and passwords. Certified Nurse Aides offered that POC charting was a policy change. One CNA said, “They told us no we have to chart every single day. You’re not to go back” and chart on previous days.” Certified Nurse Aides further discussed the consequence for not completing documentation was a write-up. All groups indicated that there were no changes with the mission statement.

Additional facility preparation activity was developing modifications to existing documentation processes to reflect the use of the EHR. One process development was scanning the initial and ongoing paper documents. A nurse offered, “Ward clerk they’re mostly scanning whatever paper works that we do, some that we wrote they still have to scan it so that it will be in the computer.” The DON offered that “addressing regulatory bodies and how they would access information was a new process.” In contrast, CNAs offered no comments regarding changing processes related to the implementation of the EHR.

Key personnel. Leads for implementation were also important for the implementation. Users identified the leads for the implementation including DON, DOE, administration, and Clinical Care Coordinators (CCCs). The DON further discussed “it [implementation] was a team effort everybody helped and assisted.” A nurse offered, “Well to us it’s our CCCs are the ones really reminding you that oh we’re doing it in the

computer. Like she will tell us like she will be the one updating us.” A CNA conveyed that the DOE was the lead for them. “She [DOE] did it [took lead] all by herself.”

Next, the facility used the super-user role so there were individuals available to answer questions and problem solve. Support activities of the super-users included being visible during the initial implementation helping with the first couple of logins then walking them through assessments, care planning, and notes. This site used leadership and selected patient care staff members as super-users. Informants offered that these individuals have other jobs along with the super-users role. Nurses reported that leadership used a secretive and confidential process when choosing super-users. One nurse offered “cloak and dagger mission, a secret. Yeah. Hush. Hush.” The DON offered, “We had nurses on every shift that were trained to be super-users.” She also offered that staff had become their own super-users walking each other through the system. In contrast, a nurse stated, “I don’t think I know who the super-users are.” Another nurse offered: “and they assign super-users to assist you, but the super-users are also confused a lot (laughs) on what to do sometimes.” A CNA conveyed “that’s XXX [DOE]” is a super-user. Additionally, CNAs expressed they would like to have CNA super-users available to them.

Education and training. The fifth minor theme related to the implementation of the system was education and training. The vendor and DOE provided the initial training. Informants raised the concern that the competency level of the trainer was not adequate and affected learning. The site used numerous education strategies. Education strategies included four hour training sessions with 3-4 nurses attending together followed by competency checking. Other strategies were 1:1 training, slide

shows, return demonstrations, informational sheets for competency testing, and a practice environment with laptops. The training was basic and included reviewing how to locate the census or a resident and how to review the CNAs' charting. Nurses indicated the training must focus on what they need for daily practice. A CNA said, "They showed us step-by-step and we got in-serviced on it twice." Common issues were that there was not enough education, education should occur closer to the implementation, and there was a need for follow-up education. The DON offered, "I just think that as far as integration to the community could have been better as far as training." One nurse emphasized that education was "like a rush, rush, rush, rush, rush, rush." Another nurse conveyed:

I mean educate, they just don't invest very much time or energy into education, especially for something that was going to be this, you know, big of a um...Implementation. Yeah, I mean. Four hour, a four hour in-service (laughs) is, I mean it's just like what?

The DON offered they needed more trainers, more training sessions, and more practice time for staff. Nurses needed trainers who could guide them with their questions. Nurses offered suggestions for improvement with training focusing on more efficient approaches when using the system. They desired refresher courses.

Communication strategies. The sixth minor theme for factors that influenced the implementation was communication strategies to inform users about the technology and implementation. Communication strategies included manuals, posting information in strategic places within the facility, and in-services. Others were use of formal and informal communication methods, and engagement through daily meetings to cover problem resolutions. Phone calls were conducted with the corporate office daily and then less frequently after the deployment regarding the implementation plan and

problems. The DON stressed the importance of reference resources as a communication strategy. She offered:

We would always have them refer to the bible which is the green book. Yah, the manual and they walk directly through the manual. We were trying to take them back to the manual, so they get more compliant on how the system works.

A nurse offered:

A little bit of information here and there about, "Oh, it's going to be like this or it's going to be like that." But nothing was ever really official and it was never, it was kind of a negative. It had a lot of negative.

In addition, a CNA offered: "It trickled out it was coming. We're going paperless."

Another strategy used was the DON would remind staff to chart including calling in on her day off (auditing).

Nurses and CNAs were forthright with barriers to communication. Nurses offered, "Management don't listen" to what nurses say about problems, were not responsive to feedback, and were secretive and confidential. For example, when looking for super-users, the process was secretive. Some staff would have liked to have been offered the position of a super-user. CNAs offered that there were inconsistent messages from leadership as to whether or not they could go back and chart at a later time. CNAs reported that the management team did not share openly about the finances of the facility. They had worked with previous management teams who were very open about the organizational finances. They preferred this style of communication. Nurses reported that staff did not hear about changes directly from the leadership but from other employees. Informants indicated that communication from leadership was negative and fragmented, and provided no apparent conclusions to guide their actions.

Support. The seventh minor theme was support for, during, and after the implementation. Informants offered that types of support included support staff and their activities. Support strategies included information technology (IT) help desk and leadership staff (DOE, CCC) being available 24/7. The DON stated, “We had people here on site, um 24/7 to coach them you know as they’re going through and entering notes, and assess and doing their assessments.” A nurse offered a similar strategy “the administrative staff did come in on midnights, and I think they were here to help them train and transition it, and I don’t know how long they stayed.” Finally, a CNA offered: “Director of Education is always there. All, you have to do, is call her and [ask] any questions. Now if she wasn’t here I don’t know what we’d do.”

Nurses reported barriers including that they did not get a timely response with requests for help. Information on enhancements of the technology was not provided. They also felt resources were not readily available such as super-users. Nurses and CNAs needed more information on the support resources available to them. Finally, staff highlighted that the corporate and vendor educators needed to stay longer to support the facility DOE and users.

Another factor offered was that teamwork was essential for the implementation. The DON offered, “They [peers] helped each other out a lot.” A nurse further supported this statement by saying, “If you ask them [peers] a question and if they know it, they will teach you how to do it.” A CNA conveyed:

We would go to each other, you know, because there’s been a time where I didn’t know something so I went to one of the CNAs, and she would say she’d help me and then vice versa if there was something that she didn’t know, so we had to, share like that.

User perceptions and skills. The eighth minor theme was user perceptions of the implementation and their skills. Users offered a variety of experiences about the EHR and implementation experience. These experiences included excitement, fear of the unknown, and fear of getting into trouble. Other experiences were frustrations, animosity, bad feelings, feeling threatened or ignored, and being worried documentation would take longer. There were concerns regarding the scope of their practice. The DON stated that it was not “poorly introduced. Time was a barrier, but they did a good job with preparing.” Meanwhile, other responses by nurses and CNAs conveyed a variety of both positive and negative experiences. For example, one nurse felt the implementation was rushed and expressed worries with the next phase being a “hot mess.” A nurse offered “rush, rush, rush, rush, rush when they finally implemented the system.” Both the DON and nurses focused on training needing to be better which would have helped with the implementation experience. A CNA offered, it was “well introduced.” However, this employee group had previous experience with electronic POC charting.

The data revealed the next user characteristic is the skill of users, which can affect the implementation. Computer literacy skill levels varied with a diversity of ages of staff members. The DON offered, “I think age of users was definitely a barrier; some people very familiar; very comfortable; some people not so comfortable.” A CNA described limited skills with only using “kiosk” and “wander guard” technology. A nurse discussed her skill level as follows:

The nurses here on the XXX unit are probably more effective with using the software than I would be back on a XXX unit. Because we don't get the number of admissions, so the only information, that I'm generally entering, is a nurse's note.

Table 3.16

Site 3 Factors that Influenced Implementation (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Factors that Influence the Implementation of the EHR	Organizational factors	<p>DON-“We did have new policies I mean we had quite a few new policies come through ah the home office.”</p> <p>NURSE-“A guy that came and, umm, did, umm, in service for I think four hours.”</p> <p>CNA-“Education and in-services.”</p>
	Vendor selection & contracted services	<p>DON-“That was really all worked at home office” (contracted services).</p> <p>NURSE-“The vendor was the one who gave us the, the in-service.”</p> <p>CNA-“He was here” for in-services.</p>
	Facility preparation	<p>DON-“Training.”</p> <p>NURSE-“They put the computer in our carts and they put more computers, umm, in the hallways and they ask us to attend the four-hour in-service.”</p> <p>CNA-“Did an in-service.”</p>
	Key personnel (Leads, new roles, super-users)	<p>DON-“It (super-users) was management; it was staff.”</p> <p>NURSE-“They assign super-users.”</p> <p>CNA-“Ask her (super-user/Director of Education) any question, in-service and if you didn’t understand something. She’ll call you up. You come and ask XXX and she’s going to stop whatever she’s doing to show you....She’s very good.”</p>
	Education/training	<p>DON-“Timing of the training was you know sometimes 3 & 4 weeks out from the start of the use of the product & that’s a long time to go. So I would narrow that gap between training and start.”</p> <p>NURSE-“One four hour session, which we were just shown basically what the software could do, but not really specific to what it is that we were going to need to do and it was not specific to where we would find certain types of information and how to retrieve the information that we would need on a day-to-day basis.”</p> <p>CNA-“We did an in-service and they showed us exactly what we would be doing when the kiosk got there.”</p>
	Communication strategies	<p>DON-“Posted training, you know different places.”</p> <p>NURSE-“We have these manuals but the manuals are not helpful either because they’re just filled with, it just doesn’t even seem to watch what’s happening on the screen.”</p> <p>CNA-“Did they use e-mails or posters? No.”</p>
	Support (and teamwork)	<p>DON-“They (peers) helped each other out a lot.”</p> <p>NURSE “We all tried to help each other.”</p>

User perceptions & skills	<p>CNA-“We would go to each other, you know, because there’s been a time where I didn’t know something so I went to one of the CNAs and she would say she’d help me and then vice versa if there was something that she didn’t know.”</p> <p>DON-“I think age of users was definitely a barrier. Some people very familiar; very comfortable; some people not so comfortable.”</p> <p>NURSE--“The nurses here on the Medicare Unit are probably more effective with using the software then I would be back on a Dementia Unit because we don’t get the number of admissions, so they only information that I’m generally entering is a nurse’s note.”</p> <p>CNA-“Kiosk, wander guards” (experience with clinical technology).</p>
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Similarities and Differences

Similarities and differences between the groups are compared by factors which influenced the implementation (see Table 3.17). Similarities will be discussed first, then the differences among the three groups.

First, all informants were not aware of how choosing and budgeting the EHR occurred. All groups discussed that there was not enough education provided. Additionally, all groups highlighted a variety of education strategies which were used during the implementation. All three groups discussed that good team work occurred during the implementation. In addition, all groups discussed the vendor services such as the initial system set up and education of staff. However, they were all not aware of the vendor selection. All informants discussed the super-role and that the role continues to be available.

There were numerous differences between the groups regarding, policy changes, negative communication, support, experiences with super-users, implementation experience, and user skills. Both nurses’ and CNAs’ knowledge regarding policy changes varied, they did not understand that changing passwords on a scheduled basis

was a system security policy. In contrast, the DON discussed new policies such as downtime. In addition, CNAs did not identify process changes as important with the implementation. Whereas, nurses and the DON identified process changes such as scanning paper documents.

Communication strategies varied between the groups. The nurses offered multiple strategies with a theme of “negative” overtones and “threatening type creating a lot of animosities.” The CNAs identified communication regarding the implementation “trickled out” and was by “word of mouth.” In contrast, the DON offered communication resources as important for compliance with how to use the system. When new information about the EHR became available she shared it with the unit managers and Director of Education who then disseminated the information. She also discussed how staff came to her because she uses a communication strategy of an open door policy.

Support is the next theme with nurses reporting barriers to timely responses with their concerns. In contrast, the DON discussed how she had daily engagement with nurses and CNAs with problem solving and walking them through problems. Both nurses and CNAs needed more information about resources available to them. Additionally, CNAs were less knowledgeable about what support was available and how to problem solve when confronted with issues. Nurses and CNAs offered a variety of super-user experiences. One theme was that some of the CNAs did not know who the super-users were. Other nurses and CNAs indicated that super-users are good because they can help them obtain passwords. One CNA offered that having CNAs being super-users would have been helpful. In contrast, the DON discussed that the

super-user role was helpful and that their names were posted so staff could be aware of this resource.

Another factor was that the users' perceptions varied about the implementation from being excited to having concerns. One nurse shared concerns about nursing's scope of practice and oversight of the EHR usage by CNAs. This nurse did not feel it was her responsibility to oversee the CNAs' documentation. The nurses did not have a positive experience with the implementation. In contrast, the DON believed the implementation was not poorly introduced. The CNA group also thought the implementation was well introduced. Users' computer literacy varied with diversity of ages and CNAs had less experience with technology use.

Table 3.17

Site 3 Factors that Influence the implementation Similarities and Differences Across the Three Groups (Research question 1b)

Major theme	Similarities	Differences
Factors that Influence the Implementation of the EHR	<ul style="list-style-type: none"> • Organizational Factors-users not familiar with the process of choosing or budgeting the EHR; no changes in the mission statement • Education/Training-not enough • Variety of education strategies used • Super user role was being used; DON offered that super-users role was positive, posted super-users names, and this role continued after implementation • Good teamwork 	<ul style="list-style-type: none"> • Vendor experiences varied by informant groups • Variety of knowledge with CNAs and nurses regarding policy changes (facility) • Various key personnel identified by informants (CNAs-DOE, Nurses-CCCs, DON-team effort) • Communication strategies were less for CNAs • Communication was reported by nurses as negative • DON discussed using an open door policy • CNAs less knowledgeable about support & how to problem solve issues • Variety of experiences with super-users offered by both nurses & CNAs • Variety of perceptions of the implementation was offered by user groups • Users' computer literacy varied with diversity of ages • CNAs use less technology

Users and Leadership are informed by Audit and Bi-directional Feedback

The third major theme is the post-deployment activities of auditing and bi-directional feedback found in Table 3.18. These post-deployment activities are to inform leaders and users about the adoption of the technology and opportunities for improvement. Auditing is a systematic examination of EHR performance metrics to

determine the reliability of the system. The parameters of these metrics included accuracy, missed documentation, and compliance requirements. Outcomes were used to determine education needs. The data revealed bi-directional feedback was being used by both employees and managers regarding how well the system was performing. The feedback was used to put plans in place to make changes to improve performance. The mutual goal of auditing and bi-directional feedback was to improve performance of documenting resident care.

Site 1. After data review, there were found to be three minor themes related to audit and bi-directional feedback. These minor themes include: (1) purpose of auditing and feedback, (2) who is involved with auditing and feedback activities, and (3) auditing and feedback strategies.

Informants said that the reasons for auditing were to find missed documentation, auditing for checks and balances, better ways for documentation, and information for insurance companies. Auditing and feedback were multidisciplinary with the DON, Minimum Data Set staff (MDS), Clinical Care Coordinators (CCCs), and social worker participating. Auditing strategies include running reports from the electronic system and communicating findings to staff for process improvement. The DON offered:

We can audit. Um, like, for instance, like twice a week I'll pull a missing captured, um, exception report so I'll know where was documentation missed you know from MAR and TAR. Um, the MDS girls are daily looking at the ADL scores so they know if they need to change anything, um, from you know from MDSs and capturing the right (inaudible) so they're able to document and see that the CNAs are putting in the level of care that the resident required for care. Um, you know, I'm reviewing notes, the CCCs are reviewing notes, so I think, really, it's almost sort of everyone is checking and balancing. Um, you know the social workers will be in there and um, if they see something and then, of course, we can run tons of reports for it you want our vital signs in there and all of that.

A nurse conveyed that auditing activities were occurring: "They'll (leadership) print out what you actually charted and come to you and talk to you about it." CNAs further validated that multidisciplinary auditing was important. From one CNA, "Guys from reimbursement will usually come and talk to us about why we chart and better ways to document." Also, informants offered that auditors gave positive feedback to recognize good documentation.

Feedback about the system was bi-directional. For example, staff was not hesitant to let the leadership know when the system was not working. The DON offered, "I hear it [feedback] on a daily basis." Nurses and CNAs feedback was escalated to corporate for problem-solving then the facility leadership communicated to users the resolution of the problem. One example of feedback offered was the changing of the nomenclature of scanned documents after nurses had expressed how difficult it was to locate these documents. A nurse offered an example of feedback being bi-directional:

The downtime when we first rolled out there was no, nobody knew that there was like this separate icon to click for when the system's down, or whatever. And, so, they made sure, you know. One of the third shift nurses actually is the one that brought it up, and so it was brought to their attention. And then they gave us education. Okay, if the system's down you can get your meds, your treatments, and advanced directive stuff if you go to this different icon.

CNAs further supported the notion that bi-directional feedback was occurring with leadership being supportive by recognizing that the system had issues and then being "proactive with getting it fixed."

Table 3.18

Site 1 Users and Leadership are Informed by Audit & Bi-directional Feedback (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Users and Leadership are Informed by Audit & Bi-directional Feedback	Audit/Feedback (purpose, who, strategies)	<p>DON-“Something is not working like it worked before and we’ve got to tweak something or whatever and then we go ahead and communicate and bring that feedback back to the staff.”</p> <p>NURSE- “I think we’re all heard, at least when we have concerns, they listen.”</p> <p>CNA-“They’ll print out what you actually charted and come to you and talk to you about it.”</p>

Similarities and Differences

Highlighted below are the similarities and differences in how leadership and users were impacted by audit and bi-directional feedback while using the EHR (see Table 3.19). All informants offered that audit and bi-directional feedback influenced the implementation. They agreed that feedback was bi-directional with all staff notifying leadership when problems were occurring with solutions then communicated back to staff by leadership. The nurses and CNAs believed that they were listened to and heard when feedback was given. The only difference found was that only the DON and CNAs identified auditing as multidisciplinary. For example, the Minimum Data Set nurse audited the CNAs resident documentation. The nurses did not identify auditing other than by the DON.

Table 3.19

Site 1 Users and Leadership are Informed by Audit & Bi-directional Feedback Similarities and Differences across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Users and Leadership are Informed by Audit & Bi-directional Feedback	<ul style="list-style-type: none"> • DON, nurses, and CNAs offered auditing is occurring • All informants offered feedback is bi-directional 	<ul style="list-style-type: none"> • DON and CNAs offered that auditing is multidisciplinary

Site 2. There were similar findings at this site with the three minor themes of audit and bi-directional feedback: (1) purpose of auditing and feedback, (2) who is involved with auditing and feedback activities, and (3) auditing and feedback strategies (see Table 3.20).

This site reported that auditing occurred so that documentation reflected the resident status, data entry was correct, the system was working correctly, and missed charting was identified. Nurses were less aware of formal auditing. A nurse offered:

I think it's done behind the scenes as far as the DON and the CCC pulling reports and looking at is data being entered; is the system working properly. I think that all that kind of happens behind our scenes. I don't think we see it.

Another nurse offered "if there is a personal issue that they would identify, like you know we are seeing that you are not getting that report done, they would I think that they would talk to you personally." One CNA said, "Just that we're not doing it [charting] enough."

The DON pointed out that communication was bi-directional, as when feedback was being solicited in staff meetings. Her belief was that the provider is up close and personal to the actual daily use and knows what the problems are, thus, the reason for

soliciting this feedback at staff meetings. A nurse provided another bi-directional feedback example:

Usually, it's like I would email the DON, and she would, she will email it to whoever oversees it in the corporate section, and she will communicate back to us. Email has been our biggest means of communication of glitches or suggestions or anything like that and then we generally get an answer pretty quickly.

A CNA offered that she would give feedback to her supervisor and offered, "nothing was ever followed through." Another CNA wanted more feedback and thought it would "be nice if there was a monthly meeting for electronic [documentation], are we keeping everything up to date?"

Auditing and feedback were multidisciplinary with the DON, Director of Education, Infection Control Nurse, Administrator, and supply distribution department. A nurse offered: "the DON and the CCC pulling reports and looking at is data being entered; is the system working properly" as an example of who audits. Activities for auditing included pulling reports and coaching staff with pointers to improve documentation. The DON offered:

Review, after review, after review; for probably six months I read every nurse's note. I would come in early I would pull up I would read from the last 24 hours, um, on a Monday I would read from the whole weekend. I also had the clinical care coordinators honing in on just their neighborhoods looking at the documentation making sure that there were not any surprises in it. Um, that it was consistent with what the resident looked like. Um, and that it captured all of the um; information that it needed to, so if someone was talking about pain in their note it didn't just drop off without any interventions or efficacies.

A variety of feedback strategies were used. A strategy used by the DON was that she talked personally to the nurse or CNA if documentation was not getting done. Certified Nurse Aides got feedback from the MDS staff. A CNA further supported the notion of

getting feedback and stated “They [MDS] do randomly come in once in a while and let you know how it [charting] is supposed to be done.”

Table 3.20

Site 2 Users and Leadership are Informed by Audit & Bi-directional Feedback (Research Question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Users and Leadership are Informed by Audit & Bi-directional Feedback	Audit/Feedback (purpose, who, strategies)	<p>DON-“I always ask about what’s working what’s not working and I solicit, um, feedback because they’re the ones that are up close and personal to it. And, what they’re doing versus what I’m looking at reports.”</p> <p>NURSE-“Usually it’s like I would email the DON and she would she will email it to whoever over-sees it in the corporate section and she will communicate back to us. Email has been our biggest means of communication glitches or suggestions or anything like that and then we generally get an answer pretty quickly.”</p> <p>CNA-“Director of Education, she’s called them (HELP desk), and they have put in” (response to feedback).</p>

Similarities and Differences

Highlighted below are the similarities and differences in how leadership and users were impacted by audit and bi-directional feedback while using the EHR (see Table 3.21). This site reported that audit and feedback were occurring with nurses being less aware of the formal auditing activities. The informants identified numerous reasons for multidisciplinary auditing such as ensuring correct documentation was occurring, the system was working, and for educational purposes. Bi-directional feedback stated with problem identification by nurses and CNAs. The DON shared the resolutions to the problems with the nurses and CNAs. However, some CNAs believed that their feedback was not acted upon. The CNAs wanted more communication and suggested a monthly meeting to address whether or not they were keeping everything up to date in the system.

Table 3.21

Site 2 Users and Leadership are Informed by Audit & Bi-directional Feedback Similarities and Differences Across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Users and Leadership are Informed by Audit & Bi-directional Feedback	<ul style="list-style-type: none"> Audit and feedback was occurring for correct documentation, system was working, and so that education needs were identified 	<ul style="list-style-type: none"> Nurses less aware of formal auditing activities CNAs need a monthly meeting regarding if they were keeping everything up to date (more feedback needed) CNAs' feedback is not always acted upon

Site 3. The three minor themes that emerged from the data for site three were the same as the other two sites and included: (1) purpose of auditing and feedback, (2) who is involved with auditing and feedback activities, and (3) auditing and feedback strategies (see Table 3.22).

This facility audited to determine the usage of the system functions, to check for missed charting, and to discover if compliance requirements were met. The DON offered that auditing helped with determining the competency of the staff when they were using the EHR. Additionally, she offered:

I do the daily audits and look by shift documentation like at 2:30. I call around or go around and say ok you should document in the system because the system stops at 3:15. Fifteen minutes prior to the end of every shift so I make sure I engage the staff or engage the department heads making sure assessments are completed into the system.

Nurses and CNAs stated that auditing was occurring by multiple members of the team (Management, DON, CCCs). One CNA offered that the DON “audit(s) and coach(s) you.”

Strategies for feedback included sharing audits in the daily leadership meetings and providing individual feedback to staff. Another strategy, was the DON, on her day off, audited the shift documentation. She called from home to remind staff to complete their documentation before the end of the shift. The DON offered:

I share daily. I audit it [electronic documentation] daily, shift-wise [each shift] and also if we feel the need to go back in and focus on this skill and why this person is here. We try to do that through our daily meetings.

CNAs supported that auditing for compliance of documentation was occurring and that they received feedback on their performance. One CNA said, “At the end of the day the DON can tell us what percentage rate [completed charting] we’re at doing...” Although, some nurses did not mention or were not sure that auditing was occurring, whereas others were aware of the DON auditing activities.

Another example of this important minor theme (auditing and feedback strategies) was informants offered that feedback was bi-directional with variability of staff participating in giving feedback. Staff members did not believe leadership received feedback well and others believed it was falling on deaf ears. Nurses offered that feedback was not acted upon when the system malfunctioned. One nurse conveyed, “So with the computer we tell them, ‘You know, this is happening or that...’ hasn’t changed. They’re not responsive to that.” Another nurse reported they “could give feedback to the CCC or like the DON. They’re like open to communication so you could tell them, but I don’t know if they will do it [follow-up].” A CNA offered, as an example that they gave feedback to the leadership regarding the computers being down at the end of the shift without a solution provided. Certified Nurse Aide informants offered that there would be repercussions if the charting was not completed before they left.

Another CNA offered that she gave her feedback to management and they “listen.”

Email is not available to direct care providers (nurses and CNAs) at this facility.

Strategies used for feedback were one-on-one interactions and in staff meetings.

Table 3.22

Site 3 Users and Leadership are Informed by Audit & Bi-directional Feedback (Research Question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Users and Leadership are Informed by Audit & Bi-directional Feedback	Audit/Feedback (purpose, who, strategies)	<p>DON-“I do the daily audits and look by shift documentation like at 2:30. I call around or go around & say ok you should document in the system because the system stops at 3:15. Fifteen minutes prior to the end of every shift so I make sure I engage the staff or engage the department heads making sure assessments are completed into the system.”</p> <p>NURSE-“You could give (feedback) them to the CCC or like the DON. They’re like open to communication so you could tell them, but I don’t know if they will do it.”</p> <p>CNA-“Cause then if you could come, you know, if the kiosk has down for the whole weekend and you can open your mouth to say if it’s done, if it’s not done by the end of the day there will be repercussions, then that’s not listening to your membership. And that’s said three o’clock and we get off at three thirty, you got to chart on like ten people. So that’s falling on deaf ears.”</p>

Similarities and Differences

Similarities and differences of users and leadership being informed by audit and bi-directional feedback using the EHR between groups are highlighted next (see Table 3.23). The site informants reported various experiences regarding audit and feedback. The DON, CNAs, and some nurses reported that auditing was occurring. The data revealed numerous explanations which were offered for auditing. These included: to

find missed charting, to assess for compliance, and to determine educational needs. Some nurses were not aware that auditing was happening. The DON described her feedback strategies which included sharing information, coaching, and encouraging staff with their documentation. She shared that she had an open door policy and staff could come to her with feedback. In contrast, nurses believed that management did not listen or respond when issues were raised. CNAs' experiences varied when giving feedback to management. Some felt management listened and responded to their concerns, while other CNAs shared having negative experiences similar to those of the nurses. Feedback is falling on "deaf ears." One CNA shared that there would be "repercussions if charting didn't get done" when the kiosk workstations were down preventing them from documenting.

Table 3.23

Site 3 Users and Leadership are Informed by Audit & Bi-directional Feedback Similarities and Differences Across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Users and Leadership are Informed by Audit & Bi-directional Feedback	<ul style="list-style-type: none"> <li>Auditing is occurring by the DON 	<ul style="list-style-type: none"> <li>Some nurses and CNAs believe that management doesn't listen or respond to feedback

Benefits of Using the Electronic Health Record Technology

The fourth major theme is benefits of using the EHR technology (see Table 3.24). A benefit describes something that promotes or enhances the user experience when using the EHR system with patient care. All groups found the system to be helpful or useful.

Site 1. The benefits of using the EHR system included three minor themes including (a) increased efficiencies, (b) improved communication using the technology, and (c) modifications in work processes using the technology.

Increased efficiencies. Efficiency is described as: when a user is able to competently complete their work with the least amount of time and effort. Informants discussed the technology as being easy to use. Comments reflecting the system's ease of use included convenience with everything being "right at your fingertips." Other comments were that the user did not need to locate the paper chart or decipher handwriting, the system was faster than writing, and that the system layout made charting easier. The DON offered:

From my perspective, what's nice is, you know, everything is right there at your, at my fingertips. So if I want to see, you know, what's going on. Um, from, you know, like for instance follow-up; maybe we've had an incident with a resident whether it's behaviors or something reportable, to the state, you can just go in. I can print a report and say what's the social worker notes, follow-up for this, what's the nurse's notes, follow-up for this, boom, you know it's right there.

A nurse conveyed:

Everybody that needs to have access to the medical records and the charts and the um, medication administration record; it is a lot less frustrating for me. Because now if somebody has, you know, the paper; which 's there not much in our little hybrid chart [paper chart]. But, you know, before people would be coming and standing at your med cart trying, to flip through your book, to look up somebody's med [medication]. And you're like, Hey, I'm in the middle of a med pass here." You know? And so now, so what now they can just look it up on their own computer. So that is, that has helped a lot.

A CNA offered, "The screens are laid out fairly good with a drop down options to choose."

Another efficiency benefit with EHR technology is ergonomics. Nurses will maximize their performance if they are comfortable with minimal physical demands placed on them when documenting. A nurse said that ergonomics were better with

electronic charting, saying, “My hands don’t hurt as much.” The DON and CNAs did not offer any comments about ergonomics.

Lastly, new features were offered as a benefit for further improving efficiencies.

A physician signature application and electronic entry of physician orders were new features that were planned. The DON offered:

They’re right now asking physicians to; there’s like an app [application] that they can go to sign stuff. Um, so they’re in the process now of asking physicians will they participate in like the trial of, um, it’s called XXX (program name). Where they can go in and sign all of their orders; so we’re just in the phase of trialing it to the physicians. So, um, I would say 2014 um, but no date as to for sure when it’s coming.

Nurses were aware of the planned new physician applications. A nurse offered:

The doctors, they’re working on the doctors are going to get their own little tablet so they can input their own orders. And, then they’ll be like a draft order, and we have to go in and make them active, because right now we’re still using paper orders, so that’s one function.

Whereas, CNAs did not state that any new features were being planned.

Improved communication. The second benefit was that using the multidisciplinary EHR increased communication among nurses, CNAs, managers, and ancillary staff. Informants also found the record to be in chronological order making this communication easier. An example of communication being facilitated and increased was users producing reports at the beginning of the shift to understand what occurred with the resident on the previous shift. The DON offered, “It’s a lot easier, you know, for me to find information to, you know, send for audits and things like that.” A nurse expressed,

I like the nurse’s—when I go to clinical notes now, I can see all the dietary, social work, nursing. I can see all my nurse’s notes. I find that that is super, super good for me because I can—it’s at a glance.”

A CNA said, “I think there’s much better communication now ‘cause nurses are able to look into what we charted on.”

Modifications in work processes. The third minor theme was that the modifications in work processes when using the EHR system were a benefit. Work processes described the sequence of activities and use of technology to achieve quality patient care for the resident. The informants further described these processes to include the EHR use during the accreditation process. They also described the care providers’ (nurses and CNAs) typical day as not changing when using the EHR.

First, informants discussed the use of the EHR for accreditation as a benefit. This site had a regulatory survey and using the EHR went well. The facility users thought the EHR could benefit the survey outcome, but they also understood that it is the data in the system that makes a survey go well. The DON said, “It makes it easier to find things, you know, quicker. I don’t know that it makes it better from a regulatory standpoint.” A nurse offered, “I hope that it [EHR] can be a streamline for them because I don’t want to stress them out because they’re here, you know for five days.” Finally, a CNA conveyed:

Um, I think it [EHR] can affect it in a big way if you’re not charting or charting incorrectly. Um, I think it [EHR] can affect reimbursement. Um, maybe different citations I don’t know, I’m not sure. From what I think, I know the charting really helps the Medicare billing; not charting right that means the residents aren’t getting billed right, and that’s how we’re getting paid. So, like, you know what I mean? It’s like a big circle. So we need to make sure that we’re charting right for that process to go smoothly.

The next minor theme discussion involved work processes with their typical workday processes not changing with the use of the EHR. The DON said, “I think it’s just all the things you used to do on paper, you know, just doing it, um, electronically.”

A nurse offered:

It [typical day] really hasn't (laughs) for me. I mean, I don't want to sound like it's not made any improvement in my life, but my work life it really hasn't changed my function of being a nurse or what I do as a nurse.

Finally, a CNA stated, "It's [typical day] pretty much been the same. I don't think it's changed too much."

Table 3.24

Site 1 Benefits of Using the EHR (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Benefits of Using the Electronic Health Record Technology	Increase efficiency	<p>DON- "It made things faster for them, it was quicker umm to have everything electronically, you know, versus paper. Umm, so yeah, I think, you know, just having more time and increased time."</p> <p>NURSE- "A big increase in our productivity because now we can spend more time with the residents. I think we're able to multitask."</p> <p>CNA- "It's (electronic documentation) easier."</p>
	Improved communication	<p>DON- "It's a lot quicker, it's a lot easier, you know, for me to find information to, you know, send for audits and things like that."</p> <p>NURSE- "You don't just flip through a bunch of pages, it's just a lot easier just to find something and just click on them and then you can see everything."</p> <p>CNA- "Faster care because you can find your information a lot faster."</p>
	Modification in work processes	<p>DON- "I think it's just all the things you used to do on paper, you know, just it, um, electronically."</p> <p>Nurse- "It [typical day] really hasn't [changed] for me."</p> <p>CNA- "I don't think it's [typical day] changed too much."</p>

Similarities and Differences

The similarities and differences in the benefits of using the EHR technology across the three groups at Site 1 are found in Table 3.25. Nurses offered that ergonomics improved with their hands not hurting from writing, and that was important to adopting the new system, whereas the DON and CNAs did not indicate this as a benefit. All informants identified examples of how easy the system was to use and that

their typical day had not changed. One difference was brought to light when an accreditation survey had occurred using the new EHR system. The DON indicated the survey process using the EHR went well. Nurses and CNAs were not aware that an actual survey occurred using the EHR system. Nurses did not know how the EHR would affect surveys. In contrast, CNAs believed a survey could be impacted in a “big way if not charting correctly.”

Another benefit, which all informants discussed, was how communication between providers improved. Nurses and the DON discussed that the system was used by multiple disciplines within their facility. New features to be implemented were identified by the DON and nurses. The feasibility of physician order entry and the system interfacing with the pharmacy will enrich their experience with the system. In contrast, CNAs were not aware of any new features.

Table 3.25

Site 1 Benefits of Using the EHR Similarities and Differences Across the Three Groups (Research Question 1b)

Major themes	Similarities	Differences
Benefits of Using the Electronic Health Record Technology	<ul style="list-style-type: none"> • All informants offered the system was easy to use • The EHR increased communication between care providers • The users' typical day has not changed 	<ul style="list-style-type: none"> • Nurses only offered ergonomics as a minor theme • Nurses and CNAs not aware of a survey that occurred using the EHR • Nurses did not know how the EHR would affect a survey; CNAs felt it could • New features were not offered by CNAs • Nurses and DON offered the EHR is multidisciplinary

Site 2. Informants from this site offered three minor themes which addressed the benefits of using the EHR technology: (a) increased efficiencies, (b) improved communication, and (c) modifications in work processes (see Table 3.26).

Increased efficiencies. The first benefit noted was the system's ease of use. Comments reflected that the EHR was multidisciplinary and flowed nicely with easier access to information. The DON offered:

I can really grasp what's going on with the individual. Because, I'm getting all the interdisciplinary team members input; where before in the paper chart you went under a tab, and you would flip back and forward. This way flowed nicely.

CNAs further supported the premise of easier access by offering that the electronic record was easier than trying to find the chart in the hallway. A nurse offered another benefit:

When you log directly in they show you the updates right on the page that is kind of nice. It shows us not just our facilities but like I was noticing when they did the flu vaccinations they did an update on there on that.

The final efficiency benefits stated by informants were the new features being planned by the administrators at the corporate office, such as physician orders being entered into the electronic system. The DON said, "Well everything surrounding e-prescribing is not being used yet, so there's e-prescribing, there is um, administration of medications and treatments not being used." A nurse offered, "I'm looking forward to the orders going in [from] the doctors so we can read them." In contrast, CNAs did not have any comments regarding any new features that were being planned.

Improved communication. Another benefit was easier communication, which had improved with resident summaries that could be used to view care needs. Another improvement is the main screen displaying and highlighting important data elements such as when an influenza injection is due for administration. Additionally, the system is

multidisciplinary making it easier to access resident information. The DON commented: “EHR flows nicely, and I [DON] can grasp what is going on and get a good picture of the resident.” A nurse offered:

What’s nice too is, um it is nice to read everybody’s notes that goes in there. It’s social work, it’s physical therapy, it’s nurses, it’s the physicians, you know the physician assistants (PA). So you can see a history and what’s been done, you know it’s easier to access; you know on their chart in general to just view through their hospital record.

A CNA offered:

You can um read about the patient. Like if you go, to another hall, you could read about; I can read about it there when you did paper you really you know you had to go to the chart in that hall.

Modifications in work processes. This site found work that processes were the same or improved. Informants discussed the improvement in the accreditation process and that their typical day had not changed with using the EHR. Concerning the first use of the EHR for the accreditation process, the DON and nurses thought that the EHR would be helpful. Certified Nurse Aides were worried about data not being entered and available to the surveyors. The use of the system for three resident complaints resulted in the survey going well. Nurses and CNAs were not aware that the site survey had occurred and that the EHR was used for this review. Users acknowledged that the system was easier to access and to use to find information needed by the surveyor.

The DON offered modifications in the accreditation work processes:

We have used this particular record, for three complaint surveys this year. And, um, what we did in those circumstances was our medical records person um hooked them up and got them logged in. And um helped them to maneuver their way around to find things and that type of thing, and that went really well with those citations.

A nurse expressed:

I think for the state surveyors instead of having to go around to every unit and going through charts. They can say oh, let's see so and so, and type in and look, it is all there for them. It is convenient for them.

In contrast, a CNA conveyed:

I think it could be a problem some because like if you know you charted something, and they could come and say you charted this, but you don't know. You can't say, because when you are charting it you are in a hurry, and you can't go back and chart you toileted someone. But, you can't go and see on how you toileted them did you walk them did you do that. The first one you could but this one it just shows you toileted them. And, like you can't go back.

Next, informants discussed that the work processes of their typical day had not changed since the EHR implementation. Having their typical day not change made it easier for users to integrate the EHR into their delivery of resident care. The DON said, "I don't think so [work processes changed] I don't think so. It is just a different method." Nurses and CNAs offered that their typical day did not change when using the system. To the question: Has your typical day changed? A nurse responded: "Not a lot". A CNA said, "No" when responding to the same question.

Table 3.26

Site 2 Benefits of Using the EHR (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Benefits of Using the Electronic Health Record Technology	Increase efficiencies	<p>DON-“I think for me being able to sit in my office and read a chart and not have to go and get a paper binder. Um, I can look at things from the census to consent, all the attachments that we added with labs, recommendations from wound clinic to pain clinic. Um, those things I think were very helpful.”</p> <p>NURSE-“It’s nicer to read printed than trying to decipher somebody’s hand writing.”</p> <p>CNA-“It seems more accurate with the electronics.”</p>
	Improved communication	<p>DON-“I am getting all the interdisciplinary team members input [using the EHR].</p> <p>NURSE-“When you log directly in they show you the updates right on the page....”</p> <p>CNA-“I think there’s much better communication now cause the nurse can look at what we charted.”</p>
	Modifications in work processes	<p>DON-“We have used this particular record, for 3 complaint surveys this year. And, um, what we did in those circumstances was our medical records person um hooked them up and got them logged in and um helped them to maneuver their way around to find things and that type of thing, and that went really well with those citations.”</p> <p>NURSE-“I think for the state surveyors instead of having to go around to every unit and going through charts. They can say oh, let’s see so and so, and type in and look, it is all there for them. It is convenient for them.”</p> <p>CNA-“No” (when responding that her typical day changed).</p>

Similarities and Differences

Similarities and differences with the benefits of using the EHR technology across the three groups at site two are identified in Table 3.27. The first difference is that the DON highlighted system use with recent citations and the regulatory visit which went well using the EHR. Nurses and CNAs were not aware of the citations and the regulatory staff using the EHR for the site assessment. But nurses did believe the site surveys would go well with the system. In contrast, CNAs feared that there could be

problems if documentation got “screwed up” since the visibility of this documentation would be more noticeable in the EHR system. All informants discussed how the EHR increased communication of the resident information. Nurses, CNAs, and the DON offered that the typical day had not changed. The DON mentioned that a physician order entry feature was coming and this would improve the EHR and work experience. Nurses would no longer have to decipher physicians’ handwriting. Certified Nurse Aides did not discuss any new features that would enhance the EHR experience.

Table 3.27

Site 2 Benefits of Using the EHR Similarities and Differences Across the Three Groups (Research question 1b)

Major Theme	Similarities	Differences
Benefits of Using the Electronic Health Record Technology	<ul style="list-style-type: none"> • System Ease of Use was discussed by all informants • Informants offered communication about the resident increased; was multidisciplinary; critical information is displayed • Workflow Processes-typical day has not changed 	<ul style="list-style-type: none"> • CNAs thought using the EHR for regulators could be a problem if something (documentation) got “screwed up” while the nurses thought it would be a benefit • CNAs and nurses are not aware of the site surveys using the EHR; DON aware & utilized for 3 complaints • CNAs did not mention new features

Site 3. Informants from this site offered three minor themes addressing benefits: (a) increased efficiencies, (b) improved communication, and (c) modifications in work processes (see table 3.28).

Increased efficiencies. The first minor theme highlights benefits of the EHR technology. Informants offered that the system was easy to use. For them, ease of use included the system being multidisciplinary and helpful when reviewing every resident’s

care plan. The system having alerts to indicate charting was completed further contributed to the system's ease of use. The EHR was also easier and faster when completing documentation and finding information. The DON offered:

I think the clinical notes um it is very useful. Um, you can go right into the system and get every note on the resident immediately. If you want to look for patterns, or you want to look for follow up. I think that is a better process than going through a paper note you can't sometimes understand somebody's writing and so on and so forth. I think that was useful. I also think um being able to look at every care plan for that resident and from multiple departments is also useful.

A nurse offered, "You click something, and it will add for you, so I think it's faster." A CNA said, "Find out if this person is one person assist, or two person assist that is very helpful."

A benefit of using the system for accreditation was that it was helpful to demonstrate the follow through with coordination of care. It was easy to find information and monitor acute conditions. The DON offered:

Really benefit um, follow through um, coordination of care to the physician, between physicians. Monitoring of acute condition changes would be there in the system; making sure that they can um be able to readily, see a view of documentation. So, I think that is something that will benefit.

A nurse said, "They (surveyors) can just go to the computer and view whatever they want to read." A CNA stated, "I think it's helpful for them. They can just punch it in, punch in that resident's name and see what's going on, you know, instead of going through some paper."

The last efficiency benefits will be the new features of the technology which are planned for implementation by the administrators at the home office. This site had not fully implemented all system features. For example, the medication administration record (MAR) feature is forthcoming and will be helpful when delivering medications. The DON offered, "MAR and treatment administration record (TAR) tab which is not

actually integrated yet.” Nurses and CNAs were not aware of any new features or functionality that were in the planning stages for implementation.

Improved communication. Another benefit of technology was increased communication such as improved ease of finding resident information. The DON offered, “I guess awareness of what happened the shift before. You know it’s a communication compliance thing that I guess everybody is open to you can send a note through the system to another nurse or a manager.” A nurse stated, “Most of the information on the patient is already in the computer.” Finally, a CNA conveyed, “Find out who they [resident] are, what they’re capable of doing that’s the most important function I believe.”

Modifications in work processes. The third minor theme was work processes. The DON and nurses (RNs and LPNs) believed the use of technology did not change their typical day as was evident by their responses. The DON said, “I don’t think so” (typical day has not changed). Nurses indicated that their day had not changed. A nurse stated, “The same thing” (typical day has not changed). While some CNAs discussed that their typical day changed regarding the time spent away from residents.

Table 3.28

Site 3 Benefits of Using the EHR (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Benefits of Using the Electronic Health Record Technology	Increase efficiencies	DON -“Readily see a view of documentation so I think that is something that will benefit.” NURSE -“Faster because you just have to check, check.” CNA -“Find out who they are, what they’re capable of doing that’s the most important function I believe.”
	Improved communication	DON -“Benefit um, follow through um, coordination of care to the physician, um, between physicians, um, monitoring of acute condition changes would be there in the system. Making sure that they can um be able to readily see a view of documentation so I think that is something that will benefit.” NURSE -“They (surveyors) can just go to the computer and view whatever they want to read.” CNA -“They can just punch it in, punch in that resident’s name and see what’s going on, you know, instead of going through some paper.”
	Modifications in work processes	DON -“I don’t think so” (typical day). NURSE -“The same thing’ (typical day). CNA -“Yes” [typical day has changed]. “I’m taking 45 minutes at one time to look at the kiosk instead of being with my patients, yes.”

Similarities and Differences

Similarities and differences with the benefits of using the EHR technology across the three groups at Site 3 are identified in table 3.29. All informants discussed how easy the system was to use with it being faster. The DON, nurses, and CNAs all identified that the EHR improved communication about the residents. Furthermore, each of these groups thought the EHR was helpful for the accreditation process.

The DON discussed the new features and functionality for the next phase of implementation. In contrast, the nurses and CNAs were not aware of these plans. The DON and nurses did not think their typical day had changed when using the EHR.

Certified Nurse Aides had various perceptions with some thinking that their day had changed and that they spent less time providing residents their care.

Table 3.29

Site 3 Benefits of Using the EHR Similarities and Differences Across the Three Groups (Research question 1b)

Major theme	Similarities	Differences
Benefits of Using the Electronic Health Record Technology	<ul style="list-style-type: none"> • System ease of use was discussed with it being quicker • EHR is helpful to use for accreditation visits • Communication has increased about the resident 	<ul style="list-style-type: none"> • CNAs and nurses are not aware of new features or functionality • CNAs had various perceptions about their typical day changing

Opportunities for Improvement of the EHR

The fifth major theme is opportunities for improvement of the EHR (see Table 3.30). An opportunity is described as something that is done with the EHR to create a more desirable condition that increases the value of the EHR to the nurses and CNAs. Each site discussed opportunities for improving their use of the EHR, which will be addressed next.

Site 1. Informants from the site offered two minor themes that reflected opportunities for improvement of the EHR. These themes include: (a) the EHR technology (software and hardware) and (b) changes in work processes.

Technology. Informants offered several opportunities to improve the EHR technology. These opportunities included computer and system reliability, the way in

which information is found, and ergonomics. They were also concerned that the system's safety alerts may cause increased errors.

Informants offered that computer equipment was a barrier. The computer were slow, froze up, and required rebooting with multiple logins. One CNA offered:

Glitches. Um, I don't know. Like some of our computers are so slow. It takes us forever to chart. It's frustrating. Yeah, especially when you have a busy day, you know, and you're sitting there and trying to chart on somebody.

A nurse reported "feeling tormented and frustrated" with the reliability of the computers. Another nurse said, "I have frustration with the slow computer." The DON did not comment that the computers were a barrier.

Another barrier was finding information as with the clinical information documents which were not always viewable in a timely manner such as scanned paper documents. The electronic documentation required the nurse to hunt for the information more than with the paper chart. One nurse said, "I get frustrated with the labs 'cause I can't find labs." CNAs provided similar responses. One CNA offered, "Being able to research the information that you were looking for and not being able to find it." The DON did not offer comments that finding information was a barrier.

Another opportunity for improvement was the software. Nurses and the DON highlighted that the technology software required a significant amount of time to initially load the paper documents (this referred to the scanning of resident nursing notes). The DON said the implementation team had to be cognizant of not letting the "ball drop" with the data entry continuing before the implementation. For example, medications needed to be updated throughout the month prior to implementation to ensure the MAR was accurate for "go live." The DON focused on the issue that the preparation for getting

data into the system was time-consuming. A nurse supported the notion of the amount of software preparation time with leadership taking a “hundred charts of paper and scan and put it all in.”

Users experienced glitches with data not flowing between modules and the timing of alerts. For example, immediately after administering a pain medication the nurse was alerted to document the effectiveness. Nurses offered that alerts pop-up too quickly to measure the effectiveness. A safety opportunity for improvement is addressing that the system alert lights are not illuminating. Another barrier is the system features being hard coded. The DON offered, “Request for changes is not possible because it’s stuff built into the system.”

Informants offered that they needed additional features to improve their use of the EHR. The DON highlighted that the electronic physician signature and care plans were not available. Nurses further supported the notion of needing physician order entry and that the orders eventually will be connected to the pharmacy system. One nurse offered, “My understanding, when we went through training was eventually; it was going to be connected to the pharmacy.”

Other opportunities for improving the user experience included addressing glitches and charting during updates. The DON was aware of a safety glitch with medications not being viewable on the EMAR during updates. Nurses emphasized that it is an issue when the system is not available during updates. A nurse offered:

The updates on the system there’s two hours when the computer is completely down [downtime]. So you have to try to make sure you get all of your MAR [medication administration record], and your TAR [treatment administration record] done. And some charting in if you want to do it before that system goes down for two hours, because you’re not going to be able to get back on it.

Finally, a CNA offered:

Issues with like it [computer] rebooting itself, or different residents names are not coming up in the system. Or different lights that were supposed to be lit to show that you had actually had to do work with that resident wouldn't be lit.

Another opportunity for improving the system was interfaces with other systems.

The data revealed that interfaces were needed to exchange information between the facility and pharmacies. This would increase communication between facilities as well as meet the resident safety requirements of verifying and validating orders. Nurses thought it would be beneficial if there was integration between the hospital and LTC systems. This integration would allow them to view laboratory (lab) results or review information on a resident's hospitalization. The DON commented, "It doesn't really interface with any other devices." The need for interfacing was further supported by nurses, with one nurse offering, "I think it should be a lot more intertwined." The CNAs were unsure about interfacing with other software. One CNA expressed, "I'm not sure."

Finally, informants raised ergonomic issues. Nurses and CNAs noted that kiosk computer stations were installed too high and users' forearms hurt. The nurses said that they did not use the kiosk workstations. One nurse expressed that it was "because they're [kiosks workstations] not at a good level." One CNA offered, "Physical stress for some people because some of the monitors were too high on the wall." It is interesting to note that the DON did not offer opportunities for improvement regarding ergonomics.

Work processes. The next minor theme was work processes. Work processes are described as the sequence of activities and technology to achieve quality patient care for the resident. Informants discussed work processes being hindered when they were using the system. The first work process concern raised by interviewees was workarounds. Workarounds were being used when glitches occurred in the system and

users reverted to paper documentation. Other workarounds involved seeking or providing information in a timely manner and ergonomics. A nurse said, "I had to send somebody out stat we've sent them with the bare minimum [documents] and then faxed the rest of it over." To address ergonomic barriers a workaround was provided by a CNA, "I grab a tray table, and I hook a mouse up. So it's level instead of reaching your arm because that tends to start hurting your forearm if you start if you're doing it [documenting] too long." A different workaround was calling the laboratory directly for results rather than reviewing multiple screens to locate the scanned documentation. Another workaround offered was initial admission documentation occurring on paper and then later entered into the electronic system. The DON offered:

So we had to go to a paper MAR and TAR during that time frame [glitch of medication time frames]. Because we had to be able to hand document that we were giving the medications because it wasn't coming over. And we had to, um, like basically check every person's meds to make sure that, you know, nothing got deleted that was supposed to be in all of that. So it was a lot of work.

An opportunity for improving the users' work process experience was addressing workflow. Workflow was frequently interrupted during electronic documentation. Users needed to adjust their electronic documentation around downtimes. Another work process barrier was care providers' (nurses and CNAs) workflow was interrupted with the system being slow delaying their data entry. A different workflow barrier was there were more steps to enter medication orders making this task time consuming. Nurses also offered that it took more time to complete the admission process because of all the required data. The DON suggested, "Additional steps of having an order in the system. Have to print the order, have to be signed by the physician, entered back in the system by scanning." Finally, workflow changed for CNAs. A CNA offered, "Change the way you work to discipline yourself to be attentive to the computer." Another example

provided by the CNAs was that they thought their work process had changed with increased documentation times. One CNA offered, "I'm taking forty-five minutes at one time to look at this kiosk [computer] instead of being with my patients, yes [typical day has changed]." Nurses' and CNAs' comments were in direct contrast to the previous discussion about benefits in which they had offered that their typical day had not changed.

Another work process opportunity for improvement was workload. Workload had increased with the duplication of work efforts, the multiple steps needed to complete a physician order, and not having enough time to complete documentation. A duplication of work was writing paper physician orders for the pharmacy and then electronically entering the physician orders into the EHR. Then as a result, the medication displayed on the EMAR. The DON discussed this barrier which increased workload and stated, "That actually would probably be the only barrier. I would not have implemented a system that did not have the capabilities of an electronic physician's signature because it's like duplicate work." Nurses supported the view that the workload had increased with "writing out all the meds and then we have to enter them into the computer." More redundancy of documentation occurred because the blood pressure measurement did not flow to all modules. The data not flowing required additional documentation. For instance, recording blood pressures had to be done both on the nurse's flow-sheet and MAR. Certified Nurse Aides articulated frustrations with completing their workload at the end of the day. One offered:

I had a really busy day and, um, I still had like half my people to chart on, and I'm, normally I'm not like that. But um, it was like five minutes to two o'clock, and I still had like two more people to chart on. And sometimes that can be frustrating when you know you have to get your charting done. But with the new system we can actually, they don't like to do it, but if we don't have, um, enough

time to chart we can go back the next day, and we can chart on, um, on the previous day that we worked.

Another opportunity was a work process involving at backup systems during system downtimes. For this site, a partial electronic backup system was deployed for EMAR and electronic treatment administration record (ETAR) documentation when the primary system was down. A nurse offered: "There is a backup system now. But I think the backup only gives us, like EMAR [electronic medication administration record] and ETAR [electronic treatment administration record], it doesn't give us previous nursing notes or progress notes." Other resident care documentation was done on paper and then scanned into the system or keypunched at a later time. The DON stated, "We had to go to a paper MAR [medication administration record] and TAR [treatment administration record] during that time-frame [glitch with information flowing]. Because we had to be able to hand document that we were giving the medications." A CNA offered, "A few times we had to do paper charting because the system was down."

Table 3.30

Site 1 Opportunities for Improvement of the EHR (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Opportunities for Improvement of the EHR	Technology-software & hardware (computer reliability, equipment, software, interfacing systems, navigation, ergonomics)	DON -“System implemented, umm, does not have the ability for electronic physician signature, which is huge.” NURSE - “The computers tend to freeze up a lot.” CNA -“Computers aren’t moving as fast as I’d like them to.”
	Work processes (workarounds, workflow, workload, downtime)	DON - “The only barrier is I, I would not have implemented a system that did not have the capabilities of an electronic physician’s signature because it’s like duplicate work.” NURSE - “The updates on the system there’s two hours when the computer is completely down. So you have to try to make sure you get all of your MAR and your TAR done and some charting in if you want to do it before that system goes down for two hours because you’re not going to be able to get back on it.” CNA -“A few times we had to do paper charting because the system was done and that, umm, being able to go back and chart”.

Similarities and Differences

Discussed next are similarities and differences with opportunities for improvement of the EHR technology across the three groups at Site 1 (see table 3.31). First, the nurses and CNAs identified problems with the computers being slow, frequently freezing, and booting them out. They also felt that not enough computers were available. The DON did not identify the computers as a factor that could improve the EHR use experience.

Second, the nurses and CNAs reported that finding information was a frustration. Some examples were: information not flowing between the modules, scanned

documents not being entered into the system in a timely manner, and locating information was difficult. The electronic documentation required the nurse to hunt for the information more than with the paper chart. The DON did not note this issue.

Third, the software had multiple glitches. Alerts were not illuminating, medications were not displaying correctly, and button scenario documentation options were not as accurate as typing the description of the actual resident event. Other examples included resident names not viewable or dropped from the system and physician orders requiring multiple steps. These are just a few of the many examples given. Nurses were also aware that the CNAs' module had glitches. In contrast, the DON focused on the problem that preparation of getting data into the system was time-consuming. The DON highlighted the issues that electronic physician signature and care plans were not available; both these were opportunities for improvement of the EHR. The DON was aware of the glitch of medications not being viewable on the EMAR.

Fourth, nurses and the DON highlighted the view that to have interfacing systems was an opportunity for improving the system. For example, they needed the EHR to communicate with the pharmacy system for safer medication practices, such as a pharmacist first viewing all orders before a medication was given to a resident. Additionally, this would eliminate faxing orders to the pharmacy. Another area for improvement was having electronic physician signatures available so that orders were not required to be hand written by the nurse followed by the entry of the order into the electronic system. CNAs were not aware of a need for interfacing systems.

Fifth, ergonomics of the kiosk workstations was an opportunity to improve the use of the system. Ergonomic themes were identified by nurses and CNAs as a problem due to the kiosks being installed at too high a level resulting in the physical hurting of their forearms. The DON did note this as an issue.

Sixth, the DON was aware, although less knowledgeable, about the extent of the use of system workarounds. She highlighted that a formal workaround was devised to use paper during the glitch with medications not displaying correctly. Whereas nurses brought forward several workarounds such as calling the laboratory versus finding the scanned lab value, copy paste of previous charting, and still having paper records (shadow record) in a drawer for quick review. Next, CNAs discussed using a mouse, bedside table, and chair when documenting. They also documented on paper and later transcribed the information into the electronic record. Seventh, all groups discussed the issue that increased workload had occurred with the use of the EHR.

Table 3.31

Site 1 Opportunities for Improvement of the EHR Similarities and Differences Across the Three Groups (Research Question 1b)

Major theme	Similarities	Differences
Opportunities for Improvement of the EHR Technology	<ul style="list-style-type: none"> • All informants aware of glitches • All informants aware of workarounds being used • All informants highlighted that workflow with their typical day was changing • All informants discussed that the workload has increased with using the EHR • Backup processes are used for downtimes 	<ul style="list-style-type: none"> • DON did not offer comments on equipment reliability • DON did not offer comments on the difficulty finding information • System readiness- Nurses and DON aware of the significant amount of time entering in the scanned documents • CNAs not sure about interfacing systems • DON did not identify ergonomics as a problem • CNAs not aware of alerts • CNAs not aware of any new features or functionality

Site 2. Informants from this site offered two minor themes for the fifth major theme of opportunities for improvement of the EHR technology: (a) EHR technology (software and hardware) and (b) changes in work processes (see Table 3.32).

Technology. Informants offered that computer equipment was an area for improvement. Computers were going down and there was a need for more computers. A nurse expressed, “I usually write them (documentation notes) on paper and then I come back because we don’t have computers that we can bring into the room.” A CNA offered, “They could have had more computers.” It was noteworthy that the DON did not point out this as an opportunity for improvement.

Another opportunity for improving the technology was how users found information. Nurse informants discussed that finding information from scanned

documents was a struggle due to the need to sort through multiple documents. Another barrier was finding the correct inventory supply item because the supply list had multi-facility supplies. A nurse said, “I get frustrated with the labs cause I can’t find labs.” A CNA said an issue was “being able to research the information that you were looking for and not being able to find it.” The DON did not offer a comment regarding the finding of information as an opportunity to improve the EHR.

The technology software was another opportunity to improve the user experience. The software had glitches, for example, the census was reflected incorrectly, which negatively impacts reimbursement. The users experienced the software freezing up frequently and booting them out. A nurse offered: “Freezing, it freezes up. If you click save, it will say error blah, blah, blah, and then you lose your work. Oh, yah it is awful.” Others had experienced the system to be slow. Also, documentation that had previously been entered was only available for a specified window of time for viewing. They wanted to be able to review previous charting for a much longer period of time. The DON offered:

There were a few snafu’s with census; if you don’t do it just right it can throw off all the numbers in the building which snowballs into reimbursement; going in and cleaning that up and making it right so initially we had some frustrations surrounding um those types of things.

A CNA offered:

So when you’re having a really busy day not turning out the way you’re supposed and then at the end of the day you are charting at a certain time it turns off and it goes to the next shift. And, I mean, ah I have to go back to the other shift you know but so that can be frustrating, you know.

Informants also discussed the need for interfacing systems. Interfaces were needed to exchange information for patient laboratory results and pharmacy orders.

The DON offered:

Well, that is a bit of a disappointment with this particular software is um it's probably difficult given all the XXX [facilities] um are fed by different hospitals. And here in XXX [city name] we have the 2 big XXX [name of the hospitals] but it would be nice if XXX of hospital and us had the same where it interchanged and it does not. Um, so basically um, they [care providers] have to come here login and do you know the busy work. Um, so no it feels very stand-alone-ish.

Nurses were aware of new interface features on the horizon. One nurse explained, "As we go into the medicines, I believe the plan is then the physician will put the orders directly into the computer and will go directly into the pharmacy system. We are not at that place yet." CNAs did not offer comments regarding interfaces being needed to improve the EHR.

Informants offered comments stating that technology ergonomics was an opportunity to improve use of the EHR. Informants suggested the kiosk computers were placed too high and the user's shoulders cramp from using them. A nurse offered:

The ergonomics of it; um especially for our kiosks where they're mounted on the wall you get a cramp in your shoulder trying to (inaudible). I still do hands-on patient care, and I take credit for that when I chart. I kinda feel what the CNAs feeling when you know we are all different heights so reaching up to that kiosk you know it's really not a comfortable thing. So, a lot of times when I have to do that I will go in and log into my computer and do it. But, I know my CNAs that's not an option.

Both the DON and CNAs did not mention ergonomics as an opportunity for improvement.

Work processes. In the sequence of activities and technology which is work processes, workflow was another opportunity to improve the EHR use. Workflow challenges included system problems, policies, and interruptions. Informants provided comments about interference of workflow occurring because the system was slow and slowed down the users' progress in caring for their residents. Certified Nurse Aide users did not find it practical to electronically chart after each resident care event as

other immediate resident care requirements took precedence. The DON discussed another workflow issue: “The number of interruptions, the follow-up to each of those interruptions” hinders the workflow using the EHR. Next, a nurse offered:

We need the creatinine for the antibiotic thing we have to go back to the attachment and look through it, it is kind of like not friendly I mean. It is kind of slow. Yeah, it slows down your flow.

CNAs discussed the difficulty of finding the correct supply slowing them down. One said, “So you order supplies for each of your patients as you need them and so finding that inventory listing, finding the right stock piece, or article is difficult.”

Another opportunity to improve the system was workload. Informants discussed the problem of the increased workload. For example, multiple steps were required to enter a scanned document. The DON offered:

Every day they're [unit clerks/CNAs] rounding in the building making sure everything is scanned. Um, that needs to be scanned, and that is a slow process, very slow. And then once you scan it [document] you have to attach it somewhere in XXX [name of the system] and then it has to be validated. So it is not just scanning and walk away from it. It is really laborious.

Nurses mentioned the workload increased when re-entering lost data after the system booted the user out. A nurse explained, “If you click save...and then you lose your work. Oh, yah it is awful. So then you have to retype it in.” The CNAs found that the workload increased with using the EHR. One CNA said, “Way more steps to do electronic care.”

Another opportunity to improve the experience of the EHR use was downtime processes. Certified Nurse Aides needed a backup process for when the system was down. Certified Nurse Aide informants offered a backup process of using paper to document and then having the paper documents scanned when the system became available. Only the CNAs mentioned that the backup systems were critical. One CNA

explained, “The computers go down and then you can’t put anything in and you have to backtrack. You have to do paper charting and then go about finding those.”

Table 3.32

Site 2 Opportunities for Improvement of the EHR (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Opportunities for Improvement of the EHR Technology	Technology- software & hardware (computer reliability, equipment, software, interfacing systems, ergonomics)	DON -“Scanned and that is a slow process, very slow. And then once you scan it you have to attach it somewhere in EHR and then it has to be validated. So it is not just scanning and walk away from it. It is really laborious.” NURSE -“Computer which is slow.” CNA -“Computer is too slow.”
	Work processes (workarounds, workflow, workload, downtime)	DON -“Paper prescribing by the clinicians.” NURSE - “We also charge our supplies out on, through the Vision system and that was kind of a struggle to change. Because every time like yesterday I had to do a procedure and I had like ten items that had to be charged to that patient so instead like pulling off the sticker and sticking it on the sheet or just scanning it in. I had to go in individually & look each item the only thing that has made it easier is there is the search you can put in the number but I have had a couple of products that don’t have numbers on them and you have to try and guess what they are called in the system.” CNA -“Supplies we don’t even use are in the computer that is a lot to thumb through.”

Similarities and Differences

Similarities and differences between informant groups regarding opportunities for improvement of the EHR technology are listed in Table 3.33. All informants addressed that the software had glitches, there were workarounds being used, their typical workflow had changed, and workload had increased.

Nurses and CNAs mentioned computer equipment as another issue. Computers and software were slow and frequently down or had freezing screens. Locations of the

workstations were not convenient, and they needed more workstations as well as mobile devices. It is interesting that the DON did not mention that computer equipment was an area for opportunities to improve the EHR system.

The DON also did not mention the difficulty of finding information. However, a nurse suggested “stumbled at first clicking through and finding information.” Scanned documents were difficult to find with “a lot of sifting through and trying to find the information.” Both nurses and CNAs mentioned that finding the correct supply to order was difficult. The supply inventory list was inclusive of all facilities in the corporation and many of the supplies listed were not used by this LTC home. The CNAs need an ordering list unique to the supplies they were actually using.

CNAs did not mention interfacing systems as being important. In contrast, the DON and nurses suggested that interfacing with other systems was needed. The nurses highlighted a need for the laboratory system to send information right into their program. The DON felt that the system was very “stand-alone-ish” and needed both e-prescribing and interchange of information with the local hospital systems.

At this site, only the nurses mentioned addressing ergonomic barriers as a way to improve the experience of the system. For example, the kiosk locations were mounted too high on the wall causing them to get cramps in their shoulders.

The final difference mentioned was from the CNA group, which discussed the backup process for when the system was down. They described going back to paper documentation during downtime. Going back to paper documents required them to find the documents made for use during downtime, document on these, and then place them

in the “boss’s” box. The manager ensured the scanning of these documents into the electronic system.

Table 3.33

Site 2 Opportunities for Improvement of the EHR Similarities and Differences Across the Three Groups (Research question 1b)

Major theme	Similarities	Differences
Opportunities for Improvement of the EHR Technology	<ul style="list-style-type: none"> • All informants were aware of software glitches • Workarounds were being used • Workflow has changed • Workload has increased 	<ul style="list-style-type: none"> • Nurses and CNAs needed more computer equipment • DON did not offer a theme of finding information • CNAs didn't offer interfacing systems or new features as being important • Nurses only offered ergonomic themes with kiosks use • CNAs only mentioned backup processes

Site 3. The informants at this site offered two minor themes for opportunities for improvement of the EHR technology: (a) technology software and hardware, and (b) changes in work processes (see Table 3.34).

Technology. Informants at this site said that opportunities to improve their use of the EHR included issues with the reliability of computers, finding information, software not being user–friendly, ergonomics, and the need for interfaces.

Nurse and CNA informants offered that computer equipment was a barrier. The computers were not reliable and frequently crashed, their placement was inconvenient, and multiple logins were required. A nurse said, “The ones [kiosks] in the hallway, they’re always down.” CNAs further supported that computers were an area for

opportunities for improving the EHR experience. One said, “They always break down; breaking down and then starting it up.” The DON did not provide statements that computer reliability was area for improvement.

Another opportunity for improvement was finding information. Users expressed that it was difficult to locate scanned documents which required scrolling through multiple documents to find the correct record. A nurse said, “For us to retrieve the information is just not, it’s, I mean it is not user-friendly.” Identifying the correct note category for scanned documentation was difficult. When a nurse wanted to write a progress note this function was only available in the nursing notes and not in the progress note category. The nurse indicated it would be more intuitive to go to the progress note not the nursing note. The DON and CNAs did not mention that finding information was an opportunity for improvement.

Opportunities for improvement of the EHR software where also offered. A nurse user noted that the “software, that we’re using, is really is clunky and counterintuitive.” The software was frequently down and not accessible, thereby requiring redundant charting. The number of alerts was another area that was an opportunity for improvement. The DON offered:

The alert is up in that corner. Like if someone has something like if XXX [name] wanted to say that the payor source changed or personal things went down. And, because I don’t know if everybody else but being a DON I get all those alerts, and I have to follow through on all those alerts. It’s my role to do so. I have to clear those alerts out of the system every day.

CNAs offered that the software caused repetitious charting. One expressed:

Charting it’s the same thing that’s going on with the same person, so it’s really repetitious. We need if this person is walking today, they’re walking tomorrow we don’t have to keep pressing this button. Now if there’s a change in their behavior or anything that’s when we should go in and let them know something instead of just keep typing these same buttons.

Interfacing systems was another opportunity for improvement. The system was not integrated with other systems at the time of the study. The DON said, "It is not integrated with any software right now." A nurse who said, "It's not integrated" further supported the interfacing barrier. One CNA agreed, "No, it is not interfaced."

Informants said that ergonomics was an opportunity for improvement because the kiosk workstations were placed too high. Users experienced arms, hands, and back of the neck hurting when standing for 30 minutes or longer documenting at a kiosk workstation. A nurse offered:

The CNA, but sometimes they always complain that they cannot do it [document] because it takes too much of their time. And I think it's for the location too. Like not everybody is tall and like they said it hurts their hands, or they need to have something to sit on, but they don't have anything.

A CNA said, "Your arms hurting, your back hurting, your neck hurting and then it's [kiosk workstation] too high up on the wall." The DON did not comment that ergonomics was an opportunity to improve the EHR experience.

Work processes. The second minor theme was the view that daily work processes were affected by the EHR. First, informants discussed how work processes had changed requiring them to use workarounds. A workaround is used when a caregiver bypasses the system when they recognize a barrier. An example of a workaround was when staff members used paper when the system was down. The DON said, "We went back to the ADL backup systems for paper just to make sure we don't lose any data documentation for residents. There is a lot of downtimes almost every other day seems like to me." Nurses and CNAs did not comment on downtime processes.

Another example was that nursing staff were not familiar with where to chart information. A nurse offered:

I don't really remember how to do it, and I looked through the book. And I still can't figure it out. So I just put the, I just put the update, but it's not in the right place, but I just say, well whatever. They'll see I tried to it. And if they say anything I'll say, well I got it in there, but wasn't sure. So that's my workaround. I just put it in there, it's not right, but I don't know how to do it.

CNAs discussed that they went back and charted on previous days. One said, "XXX told, told me because I inquired about it, and she showed me that I can go back two days. And then we still had to do that charting and the charting for the day."

Informants offered the view that workflow had changed. Nurses highlighted that the steps of completing the admission assessment form increased. When the nurse saved the document and moved to the next section, the system took the user back to the beginning of the document requiring scrolling back down to the next section for data entry. The DON offered:

I don't think so" [typical day]. It's not fewer steps. Because the system, um, you have to get into the system have to go through each section differently. If you wrote it on paper you, grabbed it out and wrote it down. It takes a little longer.

A nurse offered these steps with her typical day:

We pass meds, um, we have to chart on any antibiotics, any falls, Medicare charting we have to do daily on certain days if you can get to the system, uh, then you have so many Medicare charts it's almost like you rush, rush, rush.

Another change in work processes discussed was how caregiver workload increased. For instance, charting requirements had changed with more detail being required for data entry. For example: how did the patient turn - with total assistance or by themselves? There were reports of double documentation increasing the user's workload. Another workload issue was deletion of EHR resident alert messages that were not pertinent to their assignment. A nurse stated, "I would open mine, my

message box is filled with messages because so and so two units away didn't pee, and I don't care, you know (laughs). So now I have to go through and delete all that."

CNAs also discussed that their workload increased with the EHR. One CNA offered:

I mean, with the workload that we do have and with, say for instance, I have seventeen residents on afternoons I have to chart on seventeen people and also do my job. I don't think that's realistic. I think that's too much for just one person. But unless you say you can't go, you don't have to do them all right then. But why you're doing this charting you can be with your resident, you can be doing something that this resident really actually needs.

The DON stated that there had been no changes in staffing levels despite users indicating that the system had increased their workload.

Table 3.34

Site 3 Opportunities for Improvement of the EHR (Research question 1a)

Major	Minor	Quotes DON, Nurses (RN/LPN), CNAs
Opportunities for Improvement of the EHR Technology	Technology-software & hardware (computer reliability, equipment, software, interfacing systems, ergonomics)	DON - "Lot of downtime." NURSE - "Transfer form when you print it it's printed in the smallest print letters. I don't know and they were trying to fix it, make it bigger; it doesn't (laughs). It's good the hospital is not calling back and, umm, cursing at us." CNA - "It's (kiosk) a little taller, you know, higher up then you are and that kind of hurts your arm, the back of your neck."
	Work processes (workarounds, workflow, workload, downtime)	DON - "Backup paper system." NURSE - "Well it takes more steps to do one thing." CNA - "Time consuming" (to electronic chart).

Similarities and Differences

Several similarities and differences among nurses and CNAs regarding the improvement of the experience of EHR use emerged from the data (found in Table

3.35). Nurses and CNAs raised computer equipment as an issue which needed improvement to enrich their use of the EHR system. They offered that the computers crashed and were not conveniently located. Also, they needed more electrical plugs so they could plug in the mobile devices. There was only one computer connected to a printer, which slowed down the discharge process. Certified Nurse Aides offered that their system frequently broke down requiring them to start it back up. A hindrance for the CNAs was that nurses were the only individuals on the unit who were allowed to reboot computers. The CNAs wanted the ability to perform rebooting procedures. The DON did not offer comments about equipment as an opportunity to improve the EHR use. However, the DON indicated the need of formal downtime processes.

Nurses discussed difficulty finding information because the nomenclature of documents was misleading. Finding patients was a slow process. The DON offered that scanned information was difficult to find and was a cumbersome, slow process. If a nurse user did not “know the full name” of the document, the process of locating the information was “challenging.”

Many technology software elements were brought forth as needing improvement by all groups. An example was that the software system was counter-intuitive and needed prompts such as for scheduled blood pressures. Another CNA offered that the system was not able to be flexible to adapt to the patient. For example, if a patient was bedridden the nurse and CNA needed to address ambulation each day. This was not a required resident activity. Another factor was that the software time stamped on the record which increased the users’ documentation requirements. Staff must now document at the actual time they completed each patient care event rather than wait to

do an overall resident summary. It is interesting to note that the nurses were aware that the CNA system (POC) had the problem of the care alert lights not illuminating. The DON did not discuss the illuminating alerts as a focus for improvement the EHR experience.

The next area, which nurses and CNAs addressed as a need for improvement, was that the placement of the kiosk workstations was too high. Their arms, back, and neck would hurt after charting when using the kiosk. The DON did not address ergonomic issues as an area for improvement.

Nurses and CNAs focused on the need for improvement of their workflow. There were more steps needed to complete the documentation and the process took them longer with the EHR than with the traditional way of charting. It is noteworthy to mention that some nurses indicated that their typical day did not change and they found electronic documentation to be a benefit. The DON did not raise workflow as an area in which to improve the experience of EHR use.

The DON, nurses, and CNAs identified the use of workarounds. For example, nurses were using each other's password to sign into the program. Another nurse offered not knowing the correct location to enter data so she would place it in the most appropriate area and hoped that other staff could find the information. The DON identified paper documents being used as workarounds when the system was down. Certified Nurse Aides would go back to information from previous days to complete their charting.

The final factor identified to improve a user's experience was workload, which was addressed by both nurses and CNAs. For example, the CNAs found it difficult to

balance the workload of their care assignments with completion of charting. Electronic charting was time-consuming and a stressor for them. The nurses offered that deleting alert messages added more work. Other activities which were slow included entering the data into the face sheet with the resident's demographics, tracking and entering data for Minimal Data set, and having to duplicate documentation. These added to their workload. In contrast, the DON did not mention workload as a factor to be evaluated for enriching a user's EHR experience even though she was aware of staff indicating that the workload has increased.

Table 3.35

Site 3 Opportunities for Improvement of the EHR Similarities and Differences Across the Three Groups (Research question 1b)

Major theme	Similarities	Differences
Opportunities for Improvement of the EHR Technology	<ul style="list-style-type: none"> • All informants were aware the system was not integrated • Software had glitches and needed improvements to enhance the user experience • Workarounds were being used 	<ul style="list-style-type: none"> • DON did not identify equipment as an opportunity to improve the user experience • CNAs did not mention finding information as an opportunity for improvement • DON did not identify ergonomics as an opportunity for improvement • Nurses had various perceptions about their workflow changing • CNAs and nurses did not discuss downtime processes as opportunities

In summary, the analysis of the data from the three sites revealed five major themes and various minor themes that were all consistent across the sites. These major themes were motivation and EHR adoption decisions, factors that influenced the implementation of the EHR, users and leadership are informed by audit and bi-directional feedback, benefits of using the EHR technology, and opportunities for

improvement of the EHR. The next step was to analyze the differences between the stakeholders across the sites.

Findings by Informant Group Across Sites

The second research question focused on the similarities and differences of the DON, the nurses (RNs, LPNs) and CNAs perceptions with the implementation of the EHR across the three facilities? The presentation of data is by informant type (DON, nurses, and CNAs) across the sites by major themes and summarized in Tables 3.36, 3.37, and 3.38. The site matrices and original transcripts were compared and contrasted for each informant type to arrive at similarities and differences by informant type across the three sites.

DON Experiences

The first major theme was motivation and EHR adoption decisions. The DONs offered a variety of reasons to implement the system such as trends in healthcare, laws, standardization, increasing efficiencies, and meeting compliance requirements. All the DONs agreed that the corporate office made the decision to purchase and implement the EHR (organizational activity). The DONs were similar in that they had a limited understanding of financial extra-organizational determinants. Two DONs believed that implementing the EHR was meeting a government standard.

The second major theme was factors that influenced the implementation of the EHR. The DONs had frequent telephone meetings with the corporate office to discuss the progress of the implementation. Only one DON participated with vendor selection. Two DONs believed the vendor played more of a background role. Two DONs were able to identify that the vendor services included converting paper documents into

electronic forms, setting up computer equipment, and software. The DONs were able to identify facility preparation readily with a variety of activities. All identified the scanning of paper documents as necessary for implementation. Other activities included policy updates and identification of key personnel including super-users. Another strategy was providing education and the DONs agreed that more education was required. They provided reference materials and recognized the importance of these materials as a communication strategy. Support was provided by leadership being available 24/7. Two sites identified that good teamwork was essential to the implementation.

Another factor that influenced the implementation was the users' perceptions and skills. There was a variety of perceptions about the implementation among the three DONs. The DONs at two of the three sites thought the implementation went well. The other site believed the implementation did not go as well and the timelines were too fast. The first site DON said, "Well ran, it was very well organized, it was very well communicated." She was disappointed because the administrator was hands-off but felt the implementation went well. This DON was part of the original team that worked closely with the corporate office during the initial vendor selection. Another DON offered that that it was not "poorly introduced. Time was a barrier, but they did a good job with preparing." This DON highlighted that education could have been better and the implementation plan needed to be more thought-out. Finally, all DONs identified another factor that influenced the implementation was the computer literacy skills of the user which varied among staff.

Users and leadership were informed by audit and bi-directional feedback; the third major theme. The DONs believed both strategies were being used to inform users

about the system and that they readily got and gave feedback. Even though the DONs believed that they received and acted upon feedback, the nurses and CNAs at one site did not believe feedback was always acted upon.

The fourth major theme was benefits of using the EHR technology. The DONs identified that the system was easy to use. All DONs recognized that new features were being planned for deployment that would enhance the use of the system, for example, physician order entry. Additionally, the DONs believed the EHR was a benefit to the accreditation process. Two sites had already used the system and they found it helpful when the surveyors needed to find information. All the DONs found that the system increased the communication about the resident and that a caregiver's (nurses and CNAs) typical day had not changed.

The fifth major theme was opportunities for improvement of the EHR. All of the DONs experienced the system to have glitches. They all identified the need to have interfaces for sharing information. They all indicated that workarounds were being used. Workflow changes had occurred; for example, more steps were required for documentation. Another issue was that workload had increased with duplicate documentation. Finally, two DONs discussed the need to have a backup process of paper documentation for downtimes.

Table 3.36

Similarities and Differences of the DON Group Across the Facilities (Research Question 2)

	DON-site 1	DON-site 2	DON-site 3
Motivation & EHR Adoption Decisions			
Decisions	Made at corporate office/involved with vendor selection	Made at corporate office	Made at corporate office
Motivation	Trends	Laws, trends, share information	Standardization, increase efficiencies, better care, compliance
Extra-organizational determinants	Government standard	Healthcare Reform	No understanding
Factors that Influence the Implementation of the EHR			
Organization	Funding approved; vendor selection; corporate meetings/calls	Weekly corporate calls	Calls with implementation team; policy and process changes such as regulatory bodies accessing the record
Vendor selection & contracted services	Multi-disciplinary team evaluated vendors; vendor converted paper documents to electronic forms	Obscure friend	Vendor played more of a background role; set up equipment; provided education; wants staff more involved to make the system better
Facility preparation	Data entry into the system; policy changes; process changes; incentives; use of key personnel; super-users	Scheduling of staff; scanning paper documents into the system; communicate the changes; schedule & provide training, policy changes;	Scanning paper document into the record; policies changed; regulatory bodies access process developed; super-

		process changes with ancillary staff accessing the system; key personnel identified; super-user role developed	user role developed, key personnel were a team
Education	More education is needed	More education is needed	Needed more education
Communication strategies	Manuals	Emails, manuals & news letters	Reference resources such as manuals
Support	Leadership used positive communication; good teamwork	Leadership made themselves available; good teamwork with peers	Leadership available 24/7
User perceptions & skills	Implementation was positive; a lot of teamwork; computer skills varied among staff	Implementation time frames too tight negative; user skills varied	Implementation was positive; skill levels varied among staff
Users and Leadership are Informed by Audit and Bi-directional Feedback	Auditing & bidirectional feedback is occurring	Auditing & bidirectional feedback is occurring	Auditing & bidirectional feedback is occurring
Benefits of Using the EHR Technology Increased efficiencies	Ease of use was positive; Aware of new features to be deployed	Ease of use positive; Aware of new features to be deployed	Ease of use positive; aware of new features
Improved communication	Increases communication between care providers	Increased communication	Increased communication about the resident
Modifications in work processes	Accreditation surveyors can easily find information; typical day has not changed	EHR will be helpful with the accreditation process about the resident; typical day is the same	EHR will be helpful with the accreditation process; typical day is the same
Opportunities for Improvement of the EHR			
Technology (software & hardware)	Software had glitches for example meds not viewable; Time consuming to	Software had snafu with census not pulling correctly; needs interfaces	The number of alerts that are required to be addressed; system

	load paper documents through the scanning process and keep the information current before implementation; software was hard-coded and changes are not possible; needs additional features with physician signatures; no interfaces		goes down; no interfacing
Work processes	Workarounds are being used; workflow has changed with more steps to documentation; workload increase with duplicate documentation; work processes changed with using a paper backup system	Workarounds are being used; workflow changes with multiple interruptions when using the system; workload increased with scanning documents	Workarounds are being used; workflow has changed with more steps, is aware that users believe that the workload has increased; no changes in staffing; backup processes are paper documentation

Nurses (RNs and LPNs) Experiences

The nurses' report about EHR documentation across sites is in Table 3.37. For the first major theme, motivation and EHR adoption decisions, nurses at all sites indicated that the corporate office made the decision to implement the system. The data revealed a variety of reasons among nurses that motivated the change. For example, motivators for nursing were interest in the technology, benefits to residents, laws, and that it was mandatory for them to use and learn. At each site, the nurses had little understanding of any extra-organizational determinants that promoted the adoption.

For the second major theme, factors that influenced the implementation of the EHR, nurses at two sites had some understanding about the organizational activities from the home office whereas those at the third site were not aware of any

organizational initiatives. Nurses at one site had no understanding of the vendor selection and services they provided. Those at the other two sites were aware that the vendor provided education. Informants at one of these sites were aware that the vendor provided services for setting up equipment. The other site wanted to work with the vendor to make the system better.

All nurses were aware of many activities done at the facility level, such as preparing the system for data, policy and process changes, providing education, identifying key personnel, and developing the super-user role. One site found the super-user selection to be secretive and wanted a more open process. It is noteworthy to mention that all nurse informants indicated they needed more education and training.

Each site discussed communication strategies that were used. One site reported that leadership used positive communication while another site found communication was negative, and information was fragmented about the implementation and system. In contrast, all sites indicated that they had leadership support during the implementation and after the deployment. The nurses at each site discussed having good teamwork with peers, which was another type of support.

There was a variety of user implementation experiences offered. Overall, positive responses about implementation experiences were from two sites. However, there was an emphasis that education could have been better. A nurse at one site offered “really well supported and I would say it was a pretty good transition.” Another nurse from a different site said, “It was implemented well, transition went well.” In contrast, nurses from the third site conveyed that the implementation was rushed and worried about the next phase being a “hot mess.” Another nurse at this site said the

implementation of the system was “rushed”. At this site, the nurses also said that the communication was never official regarding the implementation and users got bits of information. Their perception was that information was presented in a negative, threatening manner that created animosity about the EHR system.

Nurses also discussed another factor that influenced the implementation, which was user characteristics with computer skills varying among staff. One site also presented that nurses worried about the resident’s perception when charting on the hallway kiosk workstations and their preference was not to use this equipment.

The third major theme was users and leadership are informed by audit and bi-directional feedback. Nurses at each site indicated that auditing was occurring with one site stating it was done behind the scenes. Each site noted that leadership received feedback. One site said they gave feedback, but it was not acted upon which caused frustration.

The fourth major theme was benefits of using the EHR technology with all nurses highlighting that the system was easy to use. Two sites were aware of new features that were in the planning stages for deployment, such as physician signatures. The third site was not aware of any plans for deployments of new features. All nurses indicated that their typical day had not changed when using the EHR. They also found that the EHR increased communication between care providers regarding the resident. They all discussed how the EHR would be helpful for accreditation surveyors.

For the fifth major theme, opportunities for improvement of the EHR, nurses raised concerns about the actual technology. All nurses explained that the computer equipment was not reliable and frequently broke down. They explained that the

software was slow, and they needed more computer equipment. They described the software as being clunky and cumbersome during the process of scanning paper documents. They could not always find information and safety alerts popped up too quickly. Each site discussed the hallway kiosk workstations as being too high which caused ergonomic problems. Each site explained that they needed additional features such as interfacing with pharmacy and hospital systems. The final aspect the data revealed was how work processes changed such as increased workflow with more steps needed to complete documentation or find information. Each site was using workarounds such as writing on paper and later transcribing the information into the EHR. Nurses noted that workload had increased with redundancy in charting, the addressing of multiple alerts, and re-entering data when the system unexpectedly went down resulting in lost data. Nurses at one site discussed that they had an electronic backup system for MARs and TARs whereas nurses from the other sites did not address these systems.

Table 3.37

Similarities and Differences of Nurse Group Perceptions Across the facilities (Research Question 2)

	Nurses-site 1	Nurses-site 2	Nurses-site 3
Motivation & EHR Adoption Decisions			
Decisions	Corporate	Corporate	Corporate
Motivation	To do a good job; trends; peers are using	Interests them; laws; mandatory to use	Trends; intriguing to learn; mandatory to use
Extra-organizational determinants	Don't know	Lack of understanding of monetary funding extra-organizational	Lack of knowledge

Factors that Influence the Implementation of the EHR		determinants; laws	
Organization	Corporate communicated the changes; coordinated vendor activities	Training	Not aware of organization initiatives
Vendor selection & contracted services	Not sure of vendor activities	Provided education; wants to work with vendor to make the system better	Not aware of vendor selection; activities included equipment set up and education
Facility preparation	Imported data into the EHR; policies were changed; processes were changed; key personnel were identified; super-user role was developed	Scanning of paper documents; provided training; equipment was changed; process changes were made; key personnel identified as the Director of Education; super-user role was used	Equipment was deployed; education was provided; policies & work processes were changed; key personnel were the clinical care coordinators; super-users were used but the process of selection was secretive
Education	Needed more education	Needed more education; competency testing; didactic classes	Needed more education
Communication strategies	Handouts; used positive communication	Manuals	Negative communication; information trickled out; manuals
Support	Administrative leaders; good teamwork	Leadership were available; good teamwork with peers	Leadership was available 24/7; needed more information in support resources; good teamwork
User perceptions & skills	Implementation was positive; computer skills varied; concerns about resident perceptions when using the hallway kiosk workstations	Implementation was positive; skills varied	Implementation was positive and negative; Skills varied
Users and Leadership are Informed by Audit and Bi-directional	Auditing & bi-directional feedback is occurring	Thinks auditing is done behind the scenes but would get feedback; bi-	Various understanding that auditing is

Feedback		directional feedback is occurring	occurring; feedback experiences have been that it is not acted upon; not listened to
Benefits of Using the EHR Technology			
Increased efficiencies	Ease of use was positive; ergonomics positive; aware of new features being deployed	Ease of use was positive; aware of new features being deployed	Ease of use was positive; not aware of new features
Improved communication	Increases communication between care providers (multi-disciplinary)	Increases multi-disciplinary communication about residents	Increases communication
Modifications in work processes	The record was more streamlined for surveyors; typical day has not changed	Helpful for regulatory staff, not aware of regulators using the system; no changes with typical day	Helpful for regulatory staff; typical day is the same
Opportunities for Improvement of the EHR			
Technology (software & hardware)	Computer reliability issues such as slowness; difficult to find information; time consuming to load paper documents with scanning; safety alerts pop up too quickly; needs new features with physician signatures; system is not available during downtimes; no interfaces; ergonomic issues with kiosks too high	Need more computer equipment; can't find information; software freezes up; needs interfaces; kiosk workstations are too high	Computer equipment is not reliable-always down; can't find information; software is clunky and cumbersome; no interfacing; ergonomic issues with kiosk workstations too high
Work processes	Workarounds are being used; workflow has increased with more steps to document; workload increased with redundancy charting; backup system is only partially electronic with MARs and TARs requiring paper documentation	Workarounds are being used; workflow has changed with finding laboratory results in the scanned documents; workload has increased with re-entering data when the system goes down	Workarounds are being used; workflow has changed with more steps with documentation; workload has increased with addressing the multiple alerts

Certified Nurse Aides (CNAs) Experiences

Similarities and differences of CNAs perceptions across the facilities are identified in Table 3.38. For the first major theme, motivation and EHR adoption decisions, CNAs at two sites indicated that the corporate level made the decisions. Certified Nurse Aides at the other site discussed not being involved with decisions and did not discuss who was. Across sites, CNAs were motivated to learn the system because they were curious and recognized changing healthcare trends. At two sites they indicated that it was mandatory to learn the EHR. Certified Nurse Aides had limited to no understanding of extra-organizational determinants that promoted the site to implement the EHR. At one site, the CNAs indicated the system would provide more accuracy, which could affect insurance payments.

For the second major theme, factors that influenced the implementation of the EHR, all CNAs had some understanding about the organizational efforts such as communicating the change, making policy changes, and coordinating education of staff by the vendor. CNAs were not aware of how the vendor selection process took place. Certified Nurse Aides from two sites indicated the vendor provided services which included education, ensuring passwords worked, and setting up equipment. All CNAs indicated that policy changes were part of the facility preparation. A common theme reported by CNAs was the need for more training. All CNAs indicated that the communication strategies used were informal approaches with word of mouth and nurses providing them information. At one site, the CNAs found that the communication was not open and often had a negative tone. Across sites, CNAs indicated that they had good teamwork. Additionally, they were able to identify other support personnel

such as the Director of Education. At two sites, CNAs indicated they were not aware of other support strategies other than the Director of Education.

When comparing CNA responses across facilities, the overall responses were positive about their perception with implementation. At one site a CNA said, "It went pretty well." At the second site, a CNA conveyed "I can't say poorly...too quick." At the third site, a CNA offered it was "Well introduced." Another suggested, "I think it went pretty well. There were, um, some confusion and some glitches with the system, but pretty much I think it was solid."

For the third major theme, audit and bi-directional feedback, the CNAs indicated that audit and feedback was occurring. However, CNAs at two sites highlighted that follow-up with bi-directional feedback for problem solving from leadership did not always occur. At one site, the CNAs felt not listened to and believed repercussions took place when feedback from them to facility leadership was given.

Regarding the benefits of using the EHR technology, the fourth major theme, CNAs indicated that the system was easy to use. They were not aware of any new features that would benefit them. CNAs, from two sites thought the EHR would benefit the accreditation process enabling surveyors to find information more easily. The third site worried that data would not be available to the surveyor. All CNA informants thought the system increased communication among nurses and CNAs. At two sites, the CNAs thought their typical day had not changed.

The fifth major theme, opportunities for improvement of the EHR, focused on the actual technology and work processes. Across the sites, the CNAs found the EHR system had glitches such as frequently booting users off and screens changing too

quickly to the next shift. They found it was difficult to find information. At one site, the CNAs indicated they needed more computer equipment. Two sites found the kiosk workstations were placed too high (ergonomics). Across sites, CNAs indicated that work processes were changed such as documenting after each resident care delivery event. One site reported that their typical day had changed with more steps and time required to complete electronic documentation. Certified Nurse Aides from this site said they minimized their workflow by going back and only charting once per shift. Certified Nurse Aides from all sites reported using workarounds such as writing paper notes and recording these later into the EHR. Certified Nurse Aides from two sites discussed that they used paper documentation for backup processes during downtimes.

Table 3.38

Similarities and Differences of CNA Groups Perceptions Across the facilities (Research Question 2)

	CNAs-site 1	CNAs-site 2	CNAs-site 3
Motivation & EHR Adoption Decisions			
Decisions	Not involved	Corporate	Corporate
Motivation	Laws (HIPPA); trends	Laws	Trends
Extra-organizational determinants	More accuracy	Lack of understanding-thinks funding	No knowledge
Factors that Influence the Implementation of the EHR			
Organization	Corporate communicated the change	Policy changes	Brought vendor in for education
Vendor selection & contracted	Not sure of vendor activities	Ensured passwords worked	Not aware of vendor selection;

services			set up equipment; provided education
Facility preparation	Communication of changes; policy changes; key personnel were identified; super- user role was developed	No incentives; equipment was changed; policies were changed; key personnel was only the Director of Education; needed super-users	Equipment deployed; education was provided; policy changes; key personnel was only the Director of Education; super-user role was used
Education	Needed more education	Needed more education; competency testing; didactic classes	Needed more education
Communication strategies	Word of mouth	Nurses provided information	Communication was not open; negative
Support	Director of Education was the go to person; less knowledgeable of support strategies; good team work	Leadership was available; good teamwork	Director of Education available 24/7; need more information on support resources; team work
User perceptions & skills	Implementation was positive; easy transition because of already having computer skills	Implementation was too quick (negative); skills varied	Implementation was positive; skills varied
Users and Leadership are Informed by Audit and Bi-directional Feedback	Auditing & bidirectional feedback is occurring	Auditing is occurring; follow-up with feedback does not occur	Auditing is occurring; feedback has repercussions; they are not listened to
Benefits of Using the EHR Technology			
Increased efficiencies	Ease of use (positive); not aware of new features being deployed	Ease of use (positive); not aware of new features	Ease of use (positive); not aware of new features
Improved communications	Increases communication with nurses	Increases communication	Increases communication

Work processes	Helpful for regulators finding information; typical day has not changed	Worried about data not being available for regulators; no changes with typical day	Positive for the regulators
Opportunities for Improvement of the EHR			
Technology (software & hardware)	Computer glitches with the system being slow; difficult to find information; software glitches such as booting user out/missing resident names/alert lights not illuminating; ergonomic issues with kiosks too high	Needs more computer equipment; can't find information; software changes to next shift too quickly	Computers are not reliable; software requires repetition of charting; no interfaces; ergonomic issues with kiosks too high
Work processes	Workarounds are being used; workflow has changed with users needing to be disciplined to be attentive to the computers; workload has increased with electronic documentation; backup processes are paper	Workarounds are being used; workflow has changed with documenting after each resident event; workload has increased with more steps to documentation; backup process is paper documents	Workarounds are being used; workflow has been minimized with only charting once; workload has increased with number of residents requiring documentation; typical day has changed with more steps and time required for charting

Similarities and Differences With implementation Across Three Facilities

The third research question was what were the similarities and differences with implementation of the EHR across the facilities for each major theme. This analysis was done to understand the data and to determine if major themes were consistent across the facilities. Using the major themes as an organizing framework, findings

across sites are discussed. The matrices for each informant type and the original transcripts were compared and contrasted to arrive at the similarities and differences about implementation across the three facilities (see Table 3.39).

Motivation and EHR Adoption Decisions

For the major theme motivation and EHR adoption decisions, a consistent response across sites included the belief that corporate leaders made the decision to implement the EHR system. There was little involvement by the nurses and CNAs. At one site the DON participated in off site visits to evaluate the system and brought this information back to corporate leadership. Themes varied across the sites about the motivating factors to implement the EHR system. These factors included healthcare reform, the ability to share information with other sites, the EHR was in use at other LTC facilities, and having the technology offered the LTC facility a competitive edge. A difference was that at one site, the CNAs experienced negative consequences to motivate them to use the system. Across sites there was a minimal understanding of the extra-organizational determinants such as funding the system.

Factors that Influence the Implementation of the EHR

For the major theme, factors that influenced the implementation of the EHR, there were eight minor themes. The minor themes that influenced the implementation included organizational factors, vendor selection and contracted services, facility preparation, key personnel, support strategies, communication strategies, education and training, and user perceptions and skills (characteristics).

First, across sites, the corporate office was involved with assisting the leadership at each site with coordination and support for the implementation. At one site nurses

were not aware of the corporate office involvement. Across the sites, informants offered that the vendor selection and contracted service decisions were made at the corporate level. At two sites nurses and CNAs had less understanding of vendor activities. Another difference is that at one site the DON participated in the vendor selection.

The next minor themes were facility preparation and identification of key personnel. Policy changes and scanning of paper documents occurred as part of implementation at all sites. All groups were aware of facility activities. Support strategies were available for implementation at all sites. All sites discussed that support included good team work during and after the implementation. All sites reported leadership was available for support. One site identified having a key person to coordinate and complete major EHR implementation duties such as scanning paper documents. This role allowed leadership to focus on other areas of the implementation. It is noteworthy to mention that all sites indicated some roles assumed additional responsibilities such as unit clerks having to scan paper documents. All sites offered another key role, which was the development of the super-user role. The super-user was the person who was most knowledgeable about the system. This super-user was available to assist with troubleshooting users' calls and questions. Some nurses and CNAs at one site were not even aware of this role. This site's CNAs identified a need to have a CNA super-user support available to them.

Another factor that influenced the implementation was communication strategies with a variety used. Leadership communication strategies about the implementation were mostly positive and supportive to the user. In contrast, at one site there was a consistent user perception about leaders being negative. Threats of disciplinary action

were a frequent strategy used with problem solving as opposed to finding the cause of the concern. A range of other communication strategies used at the sites included manuals, direct communication, emails, cheat sheets, and auditing. One site reported providing incentives to recognize a job well done as a strategy. At another site, the CNAs wanted raises to acknowledge their work. The remaining groups did not comment that incentives were important.

Education and training was used by all sites. A few examples were discussed such as education provided in formal classroom settings, competency testing, and a playground environment available for practice. Barriers to training were brought forward as inconsistent training between sessions, the educator was not a nurse and did not understand the workflow, and users needed real resident scenarios with training. There was a consensus across sites that there was not enough training provided.

Users' perceptions and skills had some differences and variations across sites. Some sites believed the implementation went well while other users thought it could have been better. Skills ranged from younger staff wanting to use features not authorized for use while older staff were not able to use the system as efficiently. Each site found variation in users' skills, requiring multiple strategies for training. A major difference for one site was nurses' concerns with the residents' perception that they were not delivering resident care when using the kiosk workstations, which were located in hallways, for documenting. Finally, all informants highlighted that teamwork was essential to the success of adopting the technology. All sites reported teamwork was important for completing implementation tasks and as a support with learning the

system. It is important to note that differences in user perceptions and skills did not have an adverse effect on teamwork.

Users and Leadership are informed by Audit and Bi-Directional Feedback

Across sites, auditing was occurring for missed documentation. There were differences between sites with how feedback was given and received. For some sites, feedback was bi-directional by seeking it in staff meetings, using email, and having an open door policy with staff going directly to the DON. Feedback enhanced problem solving when the facility leadership communicated the outcome of the feedback. At one site, some nurses and CNAs reported less effective approaches with negative overtones and leadership not acting upon users' feedback to resolve issues.

Benefits Using the EHR Technology

Next, the benefits of using the EHR are discussed. These benefits focused on the actual use of the technology and changes in work processes. First, across sites the informants discussed the ease of using the system. The DONs and nurses were looking forward to new features being added such as physician order entry. CNAs at all sites were not aware of any new functionality being planned for deployment. One site identified ergonomics as beneficial because the nurse's hand no longer was sore from writing notes. Work processes enhancements occurred with the use of the EHR. Another benefit was how the EHR could improve the accreditation process with ease of finding information. Other benefits acknowledged by all sites and users included increased communication due to resident information being readily available. Additionally, the overall response was that their typical day of delivering care to residents had not changed with using the EHR system. In contrast, at one site the

CNAs indicated that their typical day had changed requiring additional time to complete data entry into the system.

Opportunities for Improvement of the EHR

In the discussion for similarities and differences across the sites the next major theme was opportunities for improvement of the EHR. Across sites, users of the EHR system noted opportunities for improvement including ergonomics, technology hardware and software, interfaces to the primary system, work processes, workarounds, workflow with workload, and backup processes.

First, the nurses and CNAs experienced ergonomic discomforts when using the kiosk workstations. However, the DONs did not address ergonomics as an opportunity to improve the user experience. Other opportunities raised by all nurses and CNAs for improvement across sites was the actual computer reliability. It is noteworthy to mention that DONs did not address hardware reliability issues that could affect the adoption of the EHR. All groups (DON, nurses, and CNAs) highlighted technology barriers that impacted the experience. Some of these barriers were the process to enter the census, the system moving to the next shift too early, the large number of alerts, and downtimes. Another issue was the navigation process required to find information; this was a common theme among nurses at two sites. DONs did not raise this as a barrier. All nurses and DONs acknowledged that having the EHR interface with other systems such as the pharmacy and laboratory would enhance their experience when using the system.

Next, there were opportunities for improvement with work processes. All informants discussed using workarounds to facilitate their work activities. For example,

a paper document workaround was a frequent solution when the electronic system went down. Data entry or the scanning of the paper documents occurred when the system became available. Certified Nurse Aides highlighted using a mouse, bedside tables, and chair when documenting using kiosk workstations rather than using the touchscreen without an assist. However, the DONs did not address nurses and CNAs using workarounds with the kiosk workstations.

Regarding workflow, all sites experienced frequent interruptions from other care providers, having the system being unexpectedly unavailable, and not having access during official downtimes. These all affected the users' workflow. For example, an area for improvement was the number of interruptions the users experience during resident care. These interruptions impacted their workflow when using the EHR system. Across sites, CNAs were frustrated with their workflow of stopping care events to complete POC documentation, as opposed to waiting for a more convenient time to do this activity. Across all sites, all DONs, nurses and CNAs identified that workload had increased; however, there were no additional staff positions added. Additionally, all users from the three sites discussed that there were more steps to complete the electronic documentation and that it required more time. Finally, there were differences with formal backup processes at each site. One site had implemented an electronic solution for MAR and TAR documentation as a backup process. Other sites discussed their solution was using paper documents which were scanned into the system at a later time.

In summary, the major themes were consistent across facilities. These major themes include motivation and adoption decisions, factors that influence the

implementation of the EHR, users and leaders are informed by audit and bi-directional feedback, benefits of using the EHR technology, and opportunities for improvement of the EHR. There were more similarities between facilities than differences.

Table 3.39

Similarities and Differences with Implementation Across Three Facilities (Research question 3)

Similarities	Differences
Motivation & EHR Adoption Decisions	
<ul style="list-style-type: none"> Corporate made the decision about purchasing the EHR All sites motivated (for different factors) Informants had little understanding of extra-organizational determinants regarding funding 	<ul style="list-style-type: none"> One site: DON participated with vendor selection by participating in site visits and bringing this information back to the corporate administrators One site used negative consequences for motivation
Factors that Influence the Implementation of the EHR	
<ul style="list-style-type: none"> Organizational factors included corporate worked with facility leadership Policy changes and scanning of paper documents occurred at all sites All sites indicated some roles assumed additional responsibilities All sites had super-users Corporate made the decision with vendor selection & contracted services Not enough education/training Support strategies were available at all sites Variable user perceptions and skills; good teamwork Variety of communication strategies were used 	<ul style="list-style-type: none"> Various experiences with vendors One site discussed the importance of a key person to organize the scanning process Knowledge about the super-user role and who they were one site Non-monetary incentives offered at one site Communication strategies were less effective at one site Nurses were not aware of the organizational (corporate) activities at one site The nurses were worried about the perceptions of residents when they charted at the hallway kiosk workstations (one site) Selection and understanding of vendor not consistent across the sites One site user perceptions was that leadership communicated negatively
Users & Leadership are Informed by Audit & Bi-directional Feedback	
<ul style="list-style-type: none"> All sites were using audit and feedback 	<ul style="list-style-type: none"> Negative approach to auditing and feedback at one site
Benefits Using the EHR Technology	
<ul style="list-style-type: none"> Technology system is easy to use Communication improved regarding the residents care 	<ul style="list-style-type: none"> One site reported ergonomics were better and the users hands didn't hurt from all the writing

-
- Use of the EHR for accreditation was easier for finding information
 - All nurses and DONs were aware of new features
 - CNAs not aware of new functionality being planned
 - One site indicated their typical day changed with taking more time to electronic chart

Opportunities for Improvement of the EHR

- Technology software had barriers
- Interfacing systems would enhance the experience
- Work process changes were discussed with workarounds being developed
- Workflow was affected
- Workload increased
- Workarounds being used
- Nurses and CNAs reported computers were not reliable
- Ergonomics (with kiosk workstations being too high)
- All sites had back up processes
- Finding information (navigation) was difficult
- One site had a partial electronic system for MARs and TARs

Note. Major themes=Bold; Minor themes=bullet points.

Major and Minor Themes Mapped to the Integrated Implementation Model

The fourth research question was what major, and minor themes map to the Integrated Technology Implementation Model (ITIM) concepts and what major and minor themes are missing in the model (see Table 3.40). The ITIM examines individual and organizational elements that address the multifaceted implementation strategies needed to promote technology adoption (see Chapter 2). Implementation science and technology adoption models informed the development of the ITIM (Greenhalgh, Robert, Bate, Macfarlane, & Kyriakidou, 2005; Rogers, 2003; Rycroft-Malone, 2010; Titler & Everett, 2001). The concepts of technology/innovation adoption, implementation, workflow, interfacing systems, technology, leadership, users and communication compose and make up the concepts of the inner context of the organization. The concepts of accreditation agencies and regulations, economic

environment, and vendor make up the outer context. The concept of facilitator is illustrated as key personnel and can be a component of the inner or outer context.

All matrices were compared and contrasted to arrive at mapping the major and minor themes to the ITIM (see Table 3.40). The major themes did not directly map to concepts in the ITIM. Thus, the next step was mapping minor themes, within each major theme, to concepts in the inner and outer context of the ITIM. When minor themes did not match any ITIM concepts, they were temporarily depicted outside the model (see figure 3.1). Using the major themes as an organizing framework, the mapping of each minor theme to the ITIM is discussed. The ITIM was revised to incorporate the minor themes (work processes, workarounds, workload, and downtime) that did not map to the original model.

Table 3.40

Major and Minor Themes Mapping to the ITIM across the Facilities (Research Question 4)

Major theme	Minor themes	ITIM concepts	
		Inner context	Outer context
<p>Motivation and EHR Adoption Decisions- The motivating forces that influenced the organization to adopt the technology, the process of how decisions are made, and awareness of financial incentives.</p>	<ul style="list-style-type: none"> • Decisions • Motivation • Extra-organizational determinants 	<p>Leadership Leadership</p>	<p>Economic Environment</p>
<p>Factors that Influence the Implementation of the EHR- Multi-faceted approaches are needed that guide the implementation activities. The organization sets a goal to implement, vendors are selected, key personnel are identified to assist with the implementation, and the facility must prepare to deploy the technology.</p>	<ul style="list-style-type: none"> • Organizational involvement • Facility preparation- set up equipment; set up software; process/policy changes; development of incentives • Support strategies • Key personnel • Education/training • Communication strategies • User characteristics- perceptions; skills; teamwork • Vendor selection • Vendor contracted services 	<p>Leadership Leadership</p> <p>Leadership</p> <p>Facilitator</p> <p>Communication Communication</p> <p>Users</p>	<p>Facilitator</p> <p>Vendor Vendor</p>
<p>Users and Leadership are informed by Audit and Bi-directional Feedback- Auditing is systematic with examination of EHR performance metrics to determine the reliability of the system. Bi-directional feedback is an informal process used by both employees and manager to determine how</p>	<ul style="list-style-type: none"> • Purpose of auditing • Who is involved with auditing & feedback activities • Strategies 	<p>Communication Communication</p> <p>Communication</p>	

well the system is performing.

Benefits of Using the Electronic Health Record Technology-

A benefit is described as something that promotes or enhances the user experience when using the EHR system with patient care.

- Increased efficiencies
- Increased communication
- Modifications in work processes-
 Use for accreditation;
 Workflow;
 Workload

Technology
 Technology

Workflow

Accreditation/Regulations

Opportunities for Improvement of the EHR-

An opportunity is described as something that is done to bring using the EHR into a more desirable condition that increases value to the nurses and CNAs.

Technology (software & hardware)

- Reliability of equipment
- Finding information
- Interfacing systems
- Ergonomics

Technology
 Technology
 Interfacing Systems
 Technology

Work process

- Workarounds
- Workflow
- Workload
- Downtime (backup systems)

Workflow

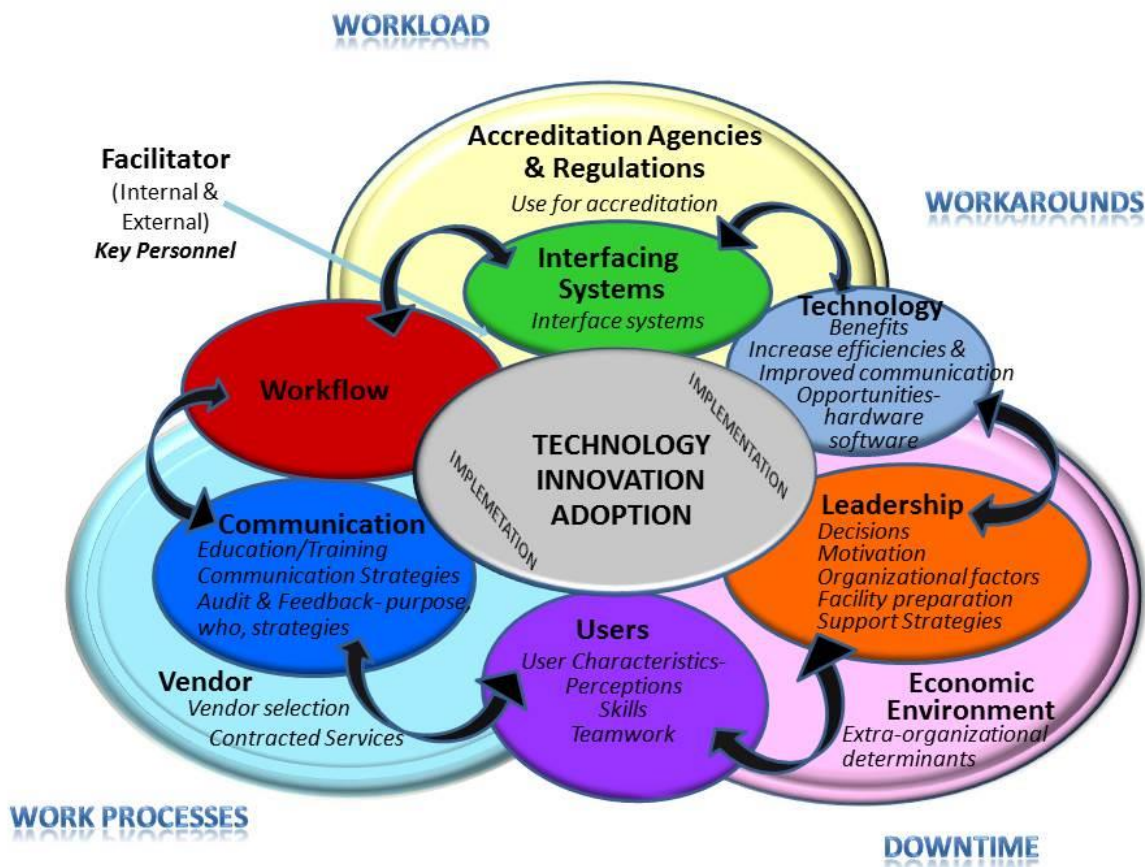


Figure 3.1. Minor Themes Mapping to the Integrated Technology Implementation Model.

Motivation and EHR Adoption Decisions

The major theme, motivation and EHR adoption decisions had three minor themes that emerged from the data that were mapped to the ITIM: decisions, motivation, and extra-organizational determinants. The first two, decisions and motivation, mapped to the ITIM inner context concept of leadership. Leadership is defined in the ITIM as roles with specific responsibilities and required activities that promote technology adoption. The study first demonstrated the decision to purchase the EHR was made at the corporate level. The motivations to implement the EHR included health care reform, the ability to share information with other facilities, and

wanting to be part of the innovative future of LTC. Other motivators were the goals of standardizing documentation for their facilities, increasing efficiencies, improving accuracy with billing, providing better care, and using the EHR as a tool for recruiting staff and residents.

The third minor theme, extra-organizational determinants, mapped to the ITIM outer context concept of economic environment defined as factors outside the organization that affect the organization's innovativeness; such as the changing economic and political environment, a government-sponsored program, and business competition. Front-line leadership and staff had minimal understanding of how extra-organizational determinants may drive a decision to implement the EHR. Informants noted that the EHR provided the ability to chart extensively resulting in better reimbursement. Others noted that government standards and federal regulations drove the decision to implement. However, they were unsure of funding sources. This concept was not well understood by informants, but they felt the extra-organizational environment was a motivating factor for implementation of the EHR.

Factors that Influenced the Implementation of the EHR

The second major theme was factors that influenced the implementation of the EHR supported by the following minor themes: organizational involvement, facility preparation, support, key personnel, education and training, communication strategies, user characteristics, vendor selection, and contracted services.

Three minor themes (organizational involvement, facility preparation, and support strategies) were mapped to the ITIM inner context concept of leadership (see Table 3.40). Organizational involvement included the corporate office setting the direction for

implementation, establishing timelines, working with the vendor to develop training and competency, developing of resource materials, conducting site needs assessments for equipment, and making provisions for support with the development of a central HELP desk. Support strategies included the corporate office having weekly conference calls with the facilities to address questions and issues with implementation. At all three facilities nurses and CNAs were supported by having the vendor, administrators, DONs, and super-users on site 24/7 for the first week of go live. The leadership provided support by being positive and pointing out this is the “new age” and we are “working for a cutting edge company.” Facility preparation included activities to assure that the site was ready for the technology deployment. These activities included pulling wires, deploying new workstations, completing system set up activities, and entering initial data. Additional facility preparation included leadership scheduling of staff for education and ensuring the availability of support staff during preparation and go live. A number of changes were made in policies and procedures such as correct use of the EHR (e.g. no pre-charting before an activity has been completed and CNAs charting immediately after completing a patient care event), scanning of paper documents, downtime procedures, and access of the EHR by regulatory personnel and students. New organizational policies were developed for EHR password changes and maintaining confidentiality while using the system.

The minor theme of key personnel mapped to the ITIM concept of facilitator defined as a person who assists, directly or indirectly, by providing guidance for implementation. The facilitator can be internal or external to the organization. A variety of key personnel facilitated the implementation. These included Administrators, DONs,

Director of Education, Clinical Care Coordinators, staff scheduler, and super-users, all internal to the facility. Other key personnel included corporate nurses, corporate administrators, and vendor representatives, all external to the agency.

Two minor themes, education/training and communication strategies, mapped to the ITIM inner context of communication defined as the process of sharing information within a targeted social system using a variety of strategies.

Education and training varied among the different work groups who used the system. Nurses attended several 4-6 hour sessions and used laptops while CNAs had a single one-hour, off-site training session. Competency testing occurred after the initial training using return demonstrations. Other methods were emailing on new functionality, on-line teaching modules, practice environments, and review sessions. Communication strategies included newsletters, cheat sheets, a resource manual, posters, and super-users. The super-user provided supervision during go live, assisted with logging in, helped with troubleshooting and answered questions.

The minor theme of user characteristics mapped to the ITIM inner context concept of users defined as a social system (LTC) that the technology is targeted toward. These users may include RNs, LPNs, CNAs, physicians, pharmacists, administrators, Directors of Nursing, and clerks. User characteristics include a user's education, preparation, work environment, perceptions, and experience with using technology (Table 3.5). This study focused on DONs, nurses (RNs and LPNs) and CNAs. A variety of education levels and technology experiences were noted across sites. Users' perceptions varied about how well the implementation went. Nurses and CNAs were reluctant to use the kiosk workstations because of concerns about residents

thinking that they were not working. All users agreed that teamwork was essential, and they demonstrated teamwork by coaching one another and learning together.

The next minor themes vendor selection and contracted services mapped to the ITIM outer context concept of vendor defined as the entity that represents, sells, and services the technology. Vendor activities included formal education, initial set up of the system, and development of EHR forms. Additional activities included support during the implementation such as being available during the go-live phase and providing ongoing technical support. The informants were not well aware of the process of vendor selection and were not familiar with the contracted services of the vendor.

Users and Leadership are informed by Audit and Bi-directional Feedback

The third major theme, users and leadership are informed by audit and bi-directional feedback was supported by the following minor themes: purpose of auditing, who is involved with auditing, and auditing/feedback strategies. These minor themes mapped to the ITIM inner context concept communication. All sites were participating in auditing for missed documentation, documentation accuracy, and system functioning. They then evaluated opportunities for education from the results. Auditing was multidisciplinary and was being completed by leadership staff such as Administrators, DON, Director of Education, and the Infection Control Nurse. Auditing strategies included following up with individuals on the audit results and posting results. Bi-directional feedback included nurses and CNAs notifying leadership of issues for problem-solving and requesting follow-up communication about problem resolution. Feedback was not always given by staff because of fears of repercussions or the belief that their feedback would not be acted upon. Strategies for obtaining feedback included

using emails, having staff attend monthly corporate calls to explain problems they encountered, and by soliciting feedback at staff meetings.

Benefits Using the EHR Technology

The major theme of benefits using the EHR technology was supported by the following minor themes: increased efficiencies, increased communication, and modification of work processes. Increased efficiencies and increased communication mapped to the ITIM inner context concept of technology.

The EHR technology was perceived as more efficient. Examples given included: not needing to decipher handwriting, not having to locate paper charts, and the ability to document from various locations. Alerts were helpful to decipher charting completion and physician orders could be entered directly into the EHR.

The EHR technology increased communication. This was done by providing ease of finding information, being multidisciplinary, and making available reports to view documentation of care delivered on the previous shift.

The minor theme, modifications in the work processes mapped to the ITIM outer context concept of accreditation agencies and regulations, as well as the ITIM inner context concept of workflow. The ITIM concept of accreditation agencies and regulations is defined as official agencies (external forces) that identify criteria to meet established standards for care delivery. Informants shared that the EHR helped streamline the survey process. Another work process change was a decrease in workload. Workload was another minor theme. Work process and workload were user benefits of the EHR. The minor theme workload did not map to any of the ITIM concepts.

The ITIM inner context concept of workflow is defined as the systematic steps of accomplishing a patient care task when using a technical process or device to achieve the desired outcome. Workflow had minimally changed with the nurses' and CNAs' typical day being essentially unaffected by the use of the EHR.

Opportunities for Improvement of the EHR

The major theme opportunities for improvement of the EHR was supported by the minor themes of technology (software and hardware), interfacing systems, and work processes. The minor theme of technology mapped to the ITIM inner context concept of technology. Technology interfacing systems minor theme mapped to the ITIM inner concept of interfacing systems. The workflow component of work processes mapped to the ITIM inner context concept of workflow. The work processes of workarounds, workload, and downtime (backup systems) did not map to any ITIM concepts.

The EHR technology was perceived to have problems with computer software and hardware reliability. The software problems included: medications not displaying correctly, alerts not illuminating when care was due, data not flowing between modules, difficulty with finding information due to unclear nomenclature for scanned documents, and inability to go back and review previous data entry. Hardware problems included: computers were slow and would freeze up, computers often are not working, workstations are not conveniently located, and laptops that took up too much room.

The next minor theme was interfacing systems. In the ITIM interfacing systems are defined as a supplementary technology that interfaces or communicates with the new primary technology (innovation). All facilities recognized the need to have the EHR interface with other programs. The corporate office was working on an interface for

physician signatures so orders would immediately be entered into the EHR versus a paper order being faxed to the pharmacy. Users would like the system to interface with hospital systems so they could share resident information.

The minor theme of workflow mapped to the ITIM inner context concept of workflow defined as the systematic steps of accomplishing a patient care task (when using a technical process or device) to achieve a desired outcome. The study found work processes included workarounds, workflow, workload, and downtime (backup systems). Nurses found their workflow, using the EHR, was hindered due to the interruptions caused by the system sometimes not being available throughout the day. They found it difficult to balance providing safe care with immediately completing the required documentation. Nurses reported they must alter their typical workflow to ensure documentation completion before scheduled downtimes or updates of the program which is a contradiction from previous statements offered for benefits. The concepts of workarounds, workload, and downtime (backup systems) did not map to the ITIM.

To summarize, the ITIM inner concepts were well supported with minor themes that were discussed by informants at the study sites. One example was leadership minor themes that included: decisions, motivation, organizational factors, facility preparation, and support strategies. There was one exception that was interfacing systems with only one minor theme mapping to this concept. In comparison, the outer concepts of accreditation agencies and regulations, economic environment, and vendor were not discussed as much by the informants resulting in fewer minor themes to support the outer context concepts of the ITIM. For example, the vendor concept only

had two minor themes which were vendor selection and contracted services. The ITIM represents the facilitator with linkages between the internal and external context, as boundary spanners to facilitate implementation. The facilitator concept had one minor theme that was key personnel. The themes that did not map to the ITIM were workarounds, workload, downtime, and work processes. These themes were used to revise the ITIM.

New Concepts in the ITIM

Four minor themes did not map to the ITIM which included workarounds, workload, downtime, and work processes. From the data analysis, the researcher determined that workflow was not a comprehensive enough concept to incorporate the minor themes of workarounds, workload, downtime, and work processes, described below. It was apparent that the most encompassing concept of work processes was a better choice to include workarounds, workflow, workload, and downtime which were all interrelated within the informants work processes. From the data analysis, these minor themes were integrated into a new concept called work processes. The new work process concept is described as the sequence of activities and use of technology to achieve quality patient care for residents.

The first minor theme was workarounds. Workarounds were characterized by using paper documents, nurses calling the pharmacy or the laboratory for results, use of a copy paste function, and the use of paper shadow records. The second minor theme was workload which was characterized by additional electronic charting requirements, the need for transcribing vital signs to the medication administration record, nurses having to enter data into the resident face sheet that housed demographics, and the

number of safety alerts that must be acknowledged. The third minor theme was downtime which was characterized by the system frequently being unavailable, nurses adjusting their documentation around scheduled downtimes, the use of paper backup processes, and one site using a partial electronic system for documenting medication and treatment administrations during downtimes. The final minor theme was changes in work processes characterized by using paper documentation and then scanning when the system became available, delayed charting, required changes for surveyors to access the EHR, and a need for formal backup systems and processes for downtimes.

Based on the findings from this chapter, the ITIM changed from that described in Chapter 2. The ITIM inner context workflow concept was changed to a broader concept of work process. The new concept of work processes is described as the sequence of and the amount of activities with the use of technology to achieve quality patient care for the resident. See Figure 3.2 for the updated ITIM. See Table 3.41 for the ITIM definitions.

In conclusion, no major themes mapped directly to the ITIM. Thus minor themes within each major theme were mapped to the ITIM. The theme vendor selection and vendor contracted services had some overlap with leadership responsibilities. The study revealed new minor themes of workarounds, workload, work processes, and downtime. The ITIM was revised to reflect these new minor themes that were used to broaden the concept of workflow in the original ITIM (see Figure 3.1) to work processes in the revised model (Figure 3.2). All concepts in the ITIM were supported by minor themes. The ITIM concepts of technology, leadership, users, communication, work

processes, had more supporting evidence than interfacing systems, accreditation agencies and regulations, economic environment, vendor, and facilitator.

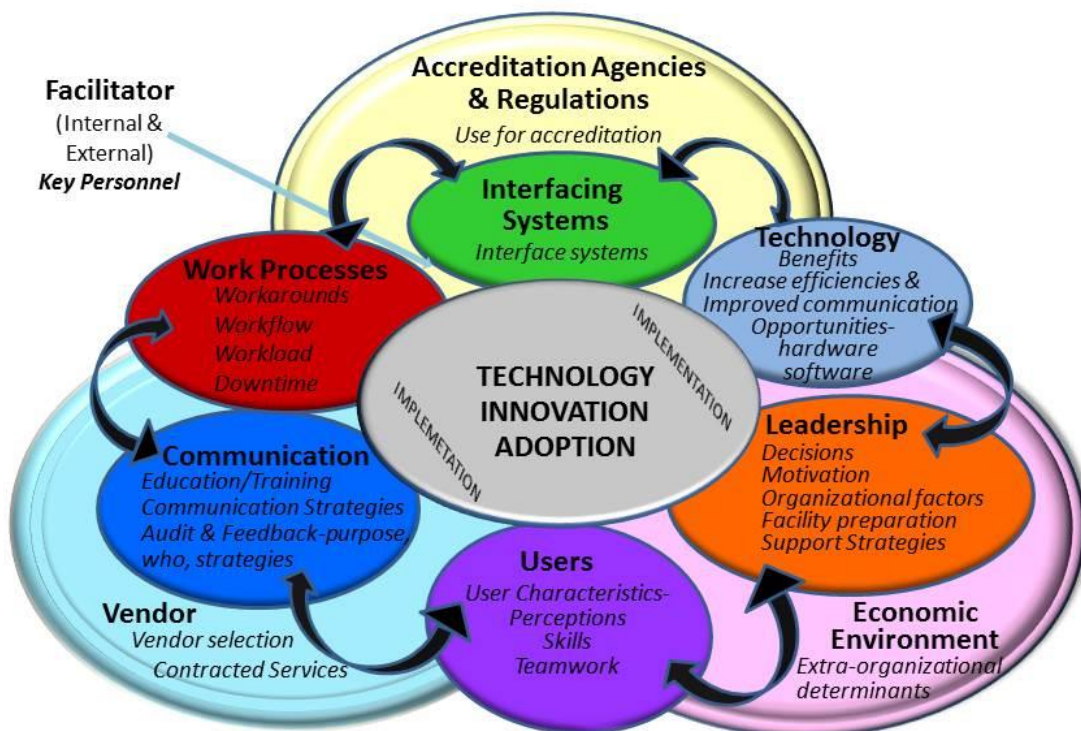


Figure 3.2. Final Integrated Technology Implementation Model.

Discussion

This study found major themes that were consistent among the three facilities: motivation and adoption decisions, factors that influenced the implementation of the EHR, users and leadership are informed by audit and bi-directional feedback, benefits using the EHR, and opportunities for improvement of the EHR. These findings were the same as found from previous LTC studies regarding EHR implementation (Alexander et al., 2007; Brandeis, Hogan, Murphy, & Murray, 2007; Cherry, Ford, & Peterson, 2009;

Mohamoud, Byrne, & Samarth, 2009; Vogelsmeier et al., 2008). There were several major findings to support the implementation process leading to adoption. These major findings include leadership engagement, communication strategies, education and training, and the actual EHR technology.

Leadership Engagement

Strong, active leadership was an important element of the implementation process. This leadership included shared decision making with nurses and CNAs, policy and process changes, and identifying super-users. Positive nursing leadership was exemplified by being visible and actively involved with implementation. This involvement led to a greater understanding of the nurses' and CNAs' experiences with the EHR allowing leadership to address any barriers to the implementation. These findings are similar to those reported by Cherry et al. (2009) who found that leaders with a clear vision of health systems workflow, and observed the systems in use, contributed to making a positive EHR technology adoption decision and facilitated the EHR implementation.

There were shortcomings across facilities. For example, kiosk height was not comfortable at two facilities and computer performance was less than desirable at all facilities. Nurses and CNAs discussed these barriers frequently and openly; however, leadership never discussed them. This led to the continuation of poor kiosk height and poor computer performance from the first to the third site's implementation. Some of the DONs' perceptions of the implementation were inconsistent with those of the nurses and CNAs. Studies have shown the importance of leadership being aware of and knowledgeable about the impact of the implementation on users' workflow as important,

so that they can support users (Aarts, Ash, & Berg, 2007; Harrison, Koppel, & Bar-Lev, 2007).

Communication

Rogers (2003) discusses the importance of communication and sharing information to reach a mutual understanding of the EHR implementation. Interpersonal channels that involve a face-to-face exchange of information are effective for persuasion to make the change. He further discusses that mass media strategies are the fastest approach to create awareness of the change (e.g. posters). This study found communication strategies were perceived as helpful to inform nurses and CNAs of changes and to prepare them for when upcoming implementation events occur. These strategies included direct 1:1 communication, staff meetings, manuals, posters, audit with feedback, and the super-user role.

Education and Training

Education and training were consistently reported as important for implementation. de Veer, Fleuren, Bekkema, and Francke. (2011) had a similar finding of education as being the most important factor associated with the successful introduction of a technological innovation. This dissertation study found education and training included formal classroom training, competencies, and a practice environment. Staff perceptions about their education were that they needed more scenario-based training and more practice. Nurses and CNAs reported that EHR technology implementation requires formal education and training by someone who is well qualified. They felt education needs to focus on how the EHR technology is helpful in everyday practice. Nurses felt that education should include the nurse's scope of practice. The

focus should highlight the nurse's role and his/her responsibilities associated with delegation and providing safe quality care when using the EHR technology. This dissertation study found training brought challenges such as the timing of the education, learning styles of older versus the younger nurses and CNAs, teaching methods, and trainer's qualifications. Finally, nurses and CNAs agreed that education should be ongoing and needed to focus on changing policies and process changes. Cherry et al. (2009) discovered similar findings with staff wanting more education from experts, so they were using the system to the fullest. Their study found that prior to training new staff a skills assessment is required to determine their use of the mouse and keyboard. They also found the use of basic computer equipment was a significant challenge. Finally, at one site they studied the lack of training might have contributed to the failure of adoption and removal of the EHR system.

The EHR Technology

Consistently across the sites, most informants talked positively about their use of the EHR functions of data entry that included resident activities of daily living, vital signs, assessments, care plans, immunizations, and nursing documentation. The nature of the technology including the maturity of the innovation influences how readily the innovation is adopted. Mohamoud et al. (2009) found that software used in LTC was not user-friendly and does not meet the workflow processes of nursing homes. If the nurses and CNAs experienced frequent EHR technology problems which interfered with their care delivery workflow, they then perceived that the EHR increased their workload. When the EHR technology is not easy to use the adoption may be delayed or may not even occur (Cherry et al., 2009). It is important that organizations evaluate

work processes to ensure that the technology supports the work of the nurses and CNAs. Interfaces of other systems to the primary technology are necessary to improve the nurses' work. For example, the nurses found the pharmacy interface helpful. The care providers (nurses and CNAs) should not have an EHR technology that competes with the work of caring for the residents. That is, the demands of the system for correct entry of documentation should not interfere with caring for the resident.

The EHR technology had many barriers inherent in the hardware and software. It was reported as "clunky", "counterintuitive," and having problems with navigation when searching for information. Also, there were several problems with the system being slow, data are not flowing between modules, and alerts being too fast or not illuminating. If the technology is not easy to use, it may result in the nurses and CNAs not adopting the technology. Alexander et al. (2007) found job performance was hindered with an EHR that nurses and CNAs were unhappy with (e.g. slowness, terminology did not match what they intended to chart, and multiple screens) which led to poor documentation. The nurses and CNAs identified workarounds to facilitate their workflow and use of the EHR technology. Cherry et al. (2009) discussed one LTC facility that removed an EHR system. This facility found several problems with the system such as difficulties with maintaining Internet access throughout the facility, the EHR did not have required functions (e.g. care plans); the medication administration record did not consistently present the medications correctly.

The Future of Nursing: Leading Change, Advancing Health (Institute of Medicine, 2011) recommends that front-line staff be involved in the design, development, purchase, implementation, and evaluation of devices and technology

products. Organization leadership and vendors should work closely with nurses and CNAs so that technology meets their needs for ease of use, causes minimal disruptions with workflow, and captures resident care correctly.

Other Findings

There were several other less prominent findings regarding the implementation process. These findings included key personnel, economic environment, and the vendor. For example, this study found that key personnel were important to the implementation. These key personnel included Administrators, DONs, Directors of Education, Clinical Care Coordinators, staff schedulers, and super-users. Other key individuals that were outside the facility included corporate nurses, corporate administrators, surveyors, and the vendor. These findings support the importance of the facilitator role in implementation demonstrated by other investigators (Greenhalgh et al., 2005; Helfrich et al., 2010).

Although the science in this field suggests that factors outside the organization can affect the implementation this dissertation study found these factors were less prominent (Greenhalgh et al., 2005.) Examples of factors outside the organization include the economic environment and vendors (Mohamoud et al., 2009). Study informants were not readily aware of the financing for the EHR and the implementation. This finding is not a surprise since there is no LTC federal incentive offered through the Affordable Care Act to purchase and implement an EHR system (Centers for Medicare and Medicaid Services, 2015).

This study found that nurses and CNAs were unfamiliar with the vendor and their role in implementation of the EHR. The vendor selection and contracted services are

factors that can affect the initial deployment and ongoing use of the system. Rochon et al. (2005) discussed the need to have a vendor committed to the product so that modifications can be made to meet the workflow of the users. Piscotty and Tzeng (2011) found similar results in their qualitative study. Ensuring vendor support is an important strategy for clinical information system implementation readiness, which must include supporting nursing practice. Organizations must outline their expectations for the vendors to ensure proper readiness and that the technology supports the users (Goddard, 2000; Koppel & Kreda, 2009; Ranz et al., 2011). Vendor selection and contracted services are areas for further investigation because this study revealed little information from nurses and CNAs about vendor selection and there are limited studies evaluating vendor relationships and their impact on the implementation of technologies.

The concept of accreditation and regulations is less studied. Investigators have found that EHRs and information systems are implemented for administrative and financial functions (Mohamoud et al., 2009; Teigland, Gardiner, Li, & Byrne, 2005). These implementations are driven by State and Federal regulatory and reimbursement policies. These studies did not discuss how LTC facilities used the systems during accreditation visits. This dissertation study found that using the EHR facilitates accreditation visits by providing easy access to information. Accreditation agencies and regulators used the EHR for facility accreditation. Leadership was well aware of EHR use for accreditation activities while nurses and CNAs were less aware.

This study found that the majority of the ITIM inner context concepts were well supported as evidenced by several minor themes for each inner concept. There was one exception which was interfacing systems. The minor themes included user

perceptions, workload, technology, education/training, and leadership. These themes were common to those found by other long-term care studies (Armer, Harris, & Dusold, 2004; Alexander et al., 2007; Bryne, 2005; Cherry et al., 2009; de Veer & Francke, 2010; Greenhalgh et al., 2005; Newman, Gaines, & Snare, 2005). In contrast, most of the outer context concepts had some but less support. These major concepts included the economic environment, accreditation agencies and regulations, and vendor. The ITIM represents the facilitator concept, with linkages between the internal and external context, as boundary spanners to facilitate implementation. The facilitator concept only had one minor theme that was key personnel. There is not a mandate for long-term care facilities to implement EHRs. However, the social-political environment is that these facilities are beginning to implement these systems (which have the ability to share information with other organizations) as a competitive marketing strategy and for clinical and operational benefits (Mohamoud et al., 2009). Mohamoud et al. (2009) found that communication improved which is a positive benefit with meeting regulatory requirements. Although no long-term care studies were found that discussed facilitators (individuals who are internal or external to the facility that help guide the implementation), many implementation studies use facilitators to promote adoption of innovations (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Helfrich et al., 2010). Vendor is another external concept with the nurses and CNAs not being aware of vendor selection or contracted services. Long-term care studies found that the vendor provided education (Alexander et al., 2007; Mohamoud et al., 2009).

The findings of this study can be generalizable to other technology implementations in LTC facilities and other healthcare settings by illustrating the need

for leadership involvement, the use of multiple communication strategies, providing training, and the nature of the EHR technology. This study found that these are essential components to the implementation process. The actual workflow and user requirements of the technology may change with different user groups and different technologies. For example, the technology used by a physical therapist in their workday may be different from that of a nurse. This will impact workflow and user requirements.

Implications

Implementation of EHR technology is a complex process with numerous factors that may promote or hinder successful implementation and use of the technology. To promote technology adoption nursing leaders and staff should be involved from the beginning of the implementation, appropriate education must be provided, and evaluation of the implementation and adoption is required. Nurse leaders must be aware of the complexity of the technology and the multiple strategies that are required to be used with complex technology implementations. They must seek and recognize barriers to provide appropriate problem solving. Having nurses and CNAs involved in the process of implementation such as assisting with screen designs and developing new work processes is imperative. Staff members who are engaged with the implementation have ownership of the project and more easily adopt the system into their daily practices. Technology implementation requires ongoing education and auditing to ensure the system is being used accurately. Nurse Administrators must be sure that administrative policies do not hinder the full use of the technology. Evaluating the use of the technology needs to be ongoing to avoid unsafe workarounds. The ITIM

is a tool that can guide the process of technology implementation to maximize the benefits offered by the technology.

Nursing Research

This study has implications for future research about implementation and adoption of technologies in healthcare. Studies are needed to validate the concepts in the inner and outer context of the ITIM. This could be done by studies on technology implementation and adoption in other types of healthcare facilities such as acute and ambulatory care facilities. Future research is needed to address empirically the vendor's role and participation in implementation, and the residents' perceptions of EHR technology and how it affects their care. Additionally, studies should be conducted using other technologies such as communication devices. Finally, policy implications include the need to lobby for economic support for LTC facilities so they can adopt the EHR technology.

While the study is exploratory, it is the first step in building the science related to implementation of technology leading to adoption in the LTC environment. The knowledge gained provided a foundation for future studies of technology implementation in LTC and other types of healthcare settings.

Strengths and Limitations

The primary strength of the study was the use of qualitative methods to understand the users' perspective of the factors that influenced EHR technology implementation. Another strength of the study was the variation in site characteristics and stage of implementation of an EHR. A further strength of the study was the data analysis with the identification of the overall implementation factors as well as

comparing and contrasting perceptions about implementation across sites, and by types of informants. Mapping the findings (minor themes) to the concepts in the ITIM provided beginning support for this model.

One limitation of the study is that the three LTC agencies were from one geographic region of the United States. Future studies need to include LTC facilities in more diverse geographic regions and to deepen our understanding of EHR technology implementation. A second limitation is that the study did not include residents and thus it is not possible to make inferences about how residents perceive implementation of technology in their care environment. Studies are needed to understand residents' perceptions of implementing new technology and how it affects care expectations.

Strategies to Enhance Scientific Integrity

In this study, the following strategies were used to ensure credibility and relevance of the data. The first being identification of facilities that had recently implemented EHR technology and then identification of selected participants. Constant comparison of the data throughout data collection and analysis occurred. This analysis included examination for consistency of the data, identification of implementation strategies, the pursuit of any unexpected findings, and detection of any misrepresentation of the data. Additionally, the saturation of the data, selected sampling, and validation from key informants were techniques used. Furthermore, the researcher consulted colleagues and faculty who were experts in implementation research and informatics to help avoid biases, seek understanding, enhance the use of theoretical elements and to collaborate on the analysis. Thick, rich descriptions are

used to convey findings and prevent potential biases brought to the study by the investigator.

Summary

The purpose of this study was to contribute to and clarify factors related to technology implementation in LTC. Major findings from this study of 30 key stakeholders from three long-term care facilities demonstrated the implementation of EHR technology as a complex organizational change, with clear responsibilities at the organizational and individual level. Each of these facilities was at a different point in their implementation. Five major themes, supported by a variety of minor themes, were revealed across sites and included: (1) motivation and EHR adoption decisions, (2) factors that influence the implementation of the EHR, (3) users and leadership are informed by audit and bi-directional feedback, (4) benefits of using the EHR technology, and (5) opportunities for improvement of the EHR. Some differences were found in the minor themes by type of informants (DON, nurses, and CNAs) such as the provision of incentives for implementation, ergonomic issues, and concerns with equipment. Leadership communication styles were mostly positive, but one site shared that leadership communication was less effective.

The ITIM focuses on the organization and care-providers as the primary users and adopters of the innovation. Findings supported the ITIM concepts with minor themes mapping to the ITIM. The study data also supported the revision of the model. The major theme of workflow concept was broadened to work processes to include workarounds, workflow, workload, and downtime. The findings of this study have

deepened the understanding and add to implementation science with respect to technology implementation and adoption.

Table 3.41

Revised Integrated Technology Implementation Model (ITIM)

Concepts	Definition
<i>Inner Context (context)</i>	Organizational context that influences the adoption, spread, and sustainability of the technology innovation through active implementation strategies
Technology/Innovation Adoption (D)	When a user is introduced to a new technology and begins to use it routinely and fully when delivering patient care
Implementation	The path to identify specifications, creations, and installation of technology, organizational readiness and active implementation strategies including: users' attitudes are changed, skills are built, policies/procedures for each of the components are defined and executed
Technology	Technology innovation is a device that is used when delivering patient care and usually has two components: <i>Hardware</i> -tool that embodies the technology as material or physical object <i>Software</i> -provides information & knowledge <i>Characteristics</i> include the relative advantage, complexity, compatibility with norms, values, perceived need, trialability
Interfacing Systems	Supplementary technology that interfaces or communicates with the new primary technology (innovation)
Work Processes	The sequence of and the amount of activities with use of technology to achieve quality patient care for the resident
Users (Adopters)	Individuals that are in a social system (i.e., LTC) that the technology is targeted to be used by for delivering care may include RNs, LPNs, aides, physicians, pharmacists, administrators, Directors of Nursing, clerks, and patients Characteristics include users' education

	preparation, profession, context of the work environment, experience with using technology
Leadership	Roles, specific responsibilities, and required activities (executives, managers, consultants) that promote technology adoption
Communication	Is the process of sharing information in with a targeted social system using a variety of strategies that include interactive education programs, written communication, communication roles & networks, audit & feedback
<i>Outer Context (context)</i>	Processes and factors external to the organization that have a synergetic relationship to the internal factors affecting a successful technology implementation. These include: accreditation standards, the economic environment, regulatory requirements, vendor, technical environment changes
Accreditation/Regulation	An official agency (external force) that identifies criteria to meet established standards that influence the adoption of the technology
Economic Environment	The extra-organizational economic determinants that affect the organizations innovativeness such as the changing economic and political environment; government sponsored program, business competition, etc.
Facilitators (Boundary Spanner)	A person who assists, directly or indirectly, by providing guidance to the implementation of technology; this person can be internal or external to the organization
Vendor	Any person or company which represents, sells and services the technology which may/or may not be the innovator; commitment of the vendor to assist and support the facility operations (quality, knowledge, resources, costs); experience with implementing the technology; etc.

Note: D=dependent variable; LTC=long-term care.

Appendix 3A

Focus Group (Aim 1)

To Explore the Experience of Staff in LTC Settings Regarding Strategies Used to Promote Adoption of EHR technology: A Qualitative Investigation.

Semi-Structured Focus Group Guide

SECTION 1: Gaining Informed Consent

Thank you for support in this EHR technology implementation research. This focus group is going to be focused on your recent experience with the electronic health record EHR technology implementation. The focus group will take approximately 60-90 minutes.

Your participation and responses will be kept confidential and all of our findings will be reported anonymously. This focus group interview will be recorded for later data analysis and publishing the results in an aggregated format. You may choose not to answer any discussion question and you can stop your participation in the focus group at any time. You may tell others that you were in a focus group and the general topic of the discussion, but actual names and stories of other participants should not be repeated.

Next, I would like to review the informed consent document. I will first give you time to read the consent form and then I can answer questions. If you agree to participate in this study, you will need to sign two copies. One copy will be for your records and one for mine. [Hand out the consent form and respond to questions.] If the participant signs the consent form the interview will begin. If the form is not signed, the participant will be thanked for their time and will be asked to leave the focus group. The following is the focus group script.

SECTION II: Introduction (15 minutes) & Demographics

Researcher: There are a few ground rules we will be following today so that everyone can share their experiences and opinions. There is no right, or wrong answers. Because of taping please speak up so we can hear you on the tape **(emphasize)**. One speaker at a time so that it makes sense on the tape **(emphasize)**. Be comfortable as I hope you will find the session interesting and enjoyable. Let's go around room. Tell me your name, age, level of education, your position, how long have you worked in this type of position, how long you worked in long-term care.

Implementation

Researcher: When thinking about the EHR implementation compared to other technology implementations was it well (or poorly) introduced to you.

Respondents: Possible responses

Probes: Now, describe how you would evaluate the way the EHR technology was introduced into the facility.

Researcher: What organizational factors facilitated transition from paper charting to the EHR.

Respondent: Possible responses.

Researcher: What factors posed barriers to the transition from paper to the EHR documentation

Respondents: Possible responses

Researcher: What other things (strategies) could have been done to support you during the implementation?

Respondents: Possible responses.

Researcher: Describe how your LTC facility prepared for implementing the EHR.

Respondents: Possible responses

Probes: Please tell me what strategies were used for example a project plan, others.

Researcher: Please describe any barriers to get ready to use the EHR technology at your facility

Respondents: Possible responses

Probes: Please tell me if there were any barriers to set up the EHR technology preventing an easy roll out. Are there individuals not using the EHR, please describe.

Nature of the EHR Technology

Researcher: Describe to me what things (factors) helped you to decide to use the EHR System.

Respondents: Possible response.

Probes: For example, was it easier to complete documentation? Tell me if there was a need to use this EHR technology to complete patient care?

Researcher: Please tell me all the ways you use the (functions or parts) EHR.

Respondents: Possible responses

Researcher: What functions are most helpful?

Respondents: Possible responses.

Researcher: Have there been any problems that cause you to experience frustration, anger or anxiety with the EHR, if so please describe.

Respondents: Possible responses

Probes: What is the most difficult task for you to do with the EHR? Please tell me if you have stopped using any feature because it was too hard to figure out. Do you have problems with navigating the EHR; experienced the EHR being unavailable; system not being accurate.

Researcher: Tell me how these problems were resolved.

Respondents: Possible responses

Probes: Who helps you with the EHR when you are having trouble? Describe any workarounds that may have been developed.

Adoption

Researcher: Describe the functions currently being used with this EHR technology.

Respondents: Possible responses

Probes: Please describe the different functions that are being used.

Tell me how these functions are helpful (Nursing Documentation, assessments, orders).

Researcher: Describe the available functions currently not being used.

Respondents: Possible responses

Researcher: Tell me why you are not using these functions.

Interfacing EHR technology

Researcher: Describe how the EHR works with other devices (or software) to delivery patient care.

Respondents: Possible responses

Probes: For example, describe how orders feed into the pharmacy system (i.e., not getting medications). Tell me if you have experienced the EHR system being unavailable, or experience connectivity problems, how often?

Workflow

Researcher: Tell me how using this EHR technology has impacted how you delivery patient care.

Respondents: Possible responses

Probes: Describe to me if there are fewer steps to complete this task. Are these steps chronological and make functional sense (or do you have to repeat many steps).

Researcher: What strategies were used to understand the actual steps of completing the work using the EHR technology?

Respondents: Possible responses

Researcher: Tell me about a typical day using the EHR technology

Respondents: Possible responses

Researcher: Tell me how your typical day has changed from the previous process

Respondents: Possible responses

Probes: Please describe the steps before implementation. Now describe the steps after implementing the EHR technology.

Users (Adopters)

Researcher: What motivates you to learn something new?

Respondents: Possible responses

Probes: Such as watching others; written instructions; listening to others; trying it.

Researcher: Tell me about what individual factors posed barriers to transitioning from paper to the EHR.

Respondent: Possible responses

Researcher: Describe any sources of stress, strain, or conflict you experienced in the transition from paper documentation to electronic documentation.

Respondent: Possible responses.

Researcher: Describe what types of technology you use at home or work.

Respondents: Possible responses.

Researcher: Please describe the amount of experience you have with using technology to provide patient care.

Respondents: Possible responses

Probes: Tell me the type of technology and how often it has been used.

Researcher: Please describe how your peers were supportive when using the EHR.

Respondents: Possible responses

Probes: Tell me how your peers assisted with helping you to learn the new EHR.

Leadership

Researcher: Tell me about the decision to use the EHR technology at your facility.

Respondents: Possible responses

Probes: For example, who made the decision? Did you participate in making the decision and if so how?

Researcher: Describe how the leadership has been involved with the implementation of the EHR.

Respondents: Possible responses

Probes: What organizational structures influenced your transition, for example, was the mission and vision statement changed? Describe the resources leadership provided for this change (role, money, etc.). Describe any policies or procedures that have been revised.

Communication

Researcher: I want to ask how you learned to use this EHR.

Respondents: Possible responses

Probes: Tell me how you learned about the benefits. Describe what the leadership communication was to promote you to use the EHR.

Researcher: Describe what the barriers were to learning the EHR.

Respondents: Possible responses

Researcher: Tell me how barriers were resolved.

Respondents: Possible responses

Researcher: Next, tell me about the ongoing support available to you to help you use the EHR technology.

Respondents: Possible responses

Probes: Tell me more about the support during the implementation. Now tell me about the support after implementation (vendor, HELP desk, others). Tell me about how you learned of any policies that changed since the EHR technology started being used.

- Researcher:** Describe strategies (or actions) that were used to train on how to use the EHR technology.
- Respondents:** Possible responses
- Probes:** For example, emails, posters, hands-on experiences, etc.
- Researcher:** Describe any new roles that may have been developed.
- Respondents:** Possible responses
- Probes:** For example, describe any roles such as super-users,
- Researcher:** Describe what these roles have done to assist with the EHR technology implementation.
- Respondents:** Possible responses
- Probes:** Now, describe what strategies that they may have used.
- Researcher:** How are these roles being used now?
- Respondents:** Possible responses
- Researcher:** Tell me how feedback about the system is given and received.
- Respondents:** Possible responses
- Researcher:** Tell me what is done with this information.
- Probes:** Please describe any user feedback review sessions after the EHR technology was implemented. What was done with the information from the review sessions? Tell me about any auditing of patient care using the EHR technology. How was this information addressed with you?
- Respondents:** Possible responses

Facilitators (Boundary Spanner)

- Researcher:** Describe who took lead in (implementing) helping you use this new EHR technology.
- Respondents:** Possible responses
- Researcher:** Now tell me what they did.
- Respondents:** Possible responses
- Researcher:** Tell me if anyone came on site that helped with implementing the EHR technology. Tell me what they did.
- Respondents:** Possible responses

Accreditation/Regulation

- Researcher:** Can you describe how this EHR technology will impact your site survey.
- Respondents:** Possible responses
- Probes:** For example, does this EHR technology assist with meeting patient care standards for the Centers for Medicare and Medicaid services? Describe how the MDS is more or not accurate.
- Respondents:** Possible responses

Economic Environment

- Researcher:** Given the economic environment describe any other things that helped you (and the LTC facility) to decide to use this EHR technology.
- Respondents:** Possible responses
- Probes:** For example, was there any funding/money given to your LTC facility (economic incentives) to use to purchase this EHR technology?
- Respondents:** Possible responses
- Researcher:** Describe if any cost efficiencies (productivity) have been realized, for example using less staff.
- Respondents:** Possible responses
- Probes:** Please describe any changes in staffing with using the EHR technology.
- Respondents:** Possible responses

Vendor

- Researcher:** Describe what activities the EHR technology vendor did before implementation.

Respondents: Possible responses

Probes: For example, did the vendor complete testing of equipment? Tell me how. Now describe what other activities the vendor completed for example they provided education, others?

Respondents: Possible responses

Researcher: Describe how the EHR technology vendor guaranteed the EHR technology to ensure:

- stability
- accuracy
- and, security
- Working

Respondents: Possible responses

Probes: Tell me how the vendor responds to equipment needing maintenance (i.e., broken parts).

Respondents: Possible responses

Researcher: Now tell me what they did after implementation.

Respondents: Possible responses

Researcher: I want to ask about if the EHR technology vendor still continues to come on site to provide support in the use of this new EHR technology. If yes, tell me how.

Respondents: Possible responses (no, or yes)

Wrap Up

Researcher: To wrap up, what other things (strategies or actions) would you like me to know about that we have not covered.

Respondents: Possible responses

Researcher: *Thank you very much for participating in the study. Before we finish, do you have any questions or concerns or anything else you would like to share about the EHR technology implementation?*

Appendix 3B

Leadership Interview Guide (Aim 1)

Semi-Structured: 1:1 Interview Guide

SECTION 1: Gaining Informed Consent

Thank you for support in this EHR technology implementation research. This interview is going to be focused on your recent experience with an EHR technology implementation. The interview will take approximately 60-90 minutes.

Your participation and responses will be kept confidential and all of our findings will be reported anonymously. The interview will be audio recorded for later data analysis and publishing the results in an aggregated format. You may choose not to answer any discussion question and you can stop your participation in the interview at any time.

Next, I would like to review the informed consent document. I will first give you time to read the consent form and then I can answer questions. If you agree to participate in this study, you will need to sign two copies. One copy will be for your records and one for mine. Hand out the Consent Form and respond to questions. If the participant signs the consent form the interview will begin. If the form is not signed, the participant will be thanked for their time and will be asked to leave the interview room. The following is the interview script.

SECTION I: Introduction (15 minutes) & Demographics

Researcher: **There is no right or wrong answers.** Because of taping please speak up so we can hear you on the tape. Be comfortable as I hope you will find the session interesting and enjoyable.

Tell me your name, age, level of education, your position, how long have you worked in this type of position, how long you have worked in long-term care.

Implementation

Researcher: When thinking about the EHR implementation, compared to other technology implementations, describe if it was well (or poorly) introduced to you.

Respondent: Possible responses.

Probes: Now, describe how you would evaluate the way the EHR technology was introduced into the facility.

Researcher: What organizational factors facilitated transition from paper charting to the EHR.

Respondent: Possible responses.

Researcher: What factors posed barriers to the transition from paper to the EHR documentation

Respondents: Possible responses

Researcher: What other things (strategies) could have been done to support you/or the staff during the implementation?

Researcher: Describe how your LTC facility prepared for implementing the EHR.

Respondent: Possible answer.

Probes: Please tell me what strategies were used for example a project plan, others.

Researcher: Please describe any barriers to get ready to use the EHR at your facility.

Respondent: Possible responses
Probes: Please tell me if there were any barriers to install the EHR technology preventing an easy deployment. Are there any individuals not using the EHR, please describe why.

Nature of the Innovation/EHR technology

Researcher: Describe to me what EHR technology factors helped you to decide to implement the EHR technology into your facility.

Respondent: Possible response.

Probes: For example, was it easier to complete documentation. Tell me if there was a need to use this EHR technology to complete patient care? Tell me if it was easier to complete patient care.

Researcher: Please tell me all the ways the staff use the (functions or parts) of the EHR.

Respondent: Possible responses.

Researcher: Please describe which functions (or parts) of the new EHR technology were most helpful.

Respondent: Possible responses

Researcher: Have there been any problems that cause the staff to experience frustration, anger or anxiety with the EHR, if so please describe.

Respondent: Possible responses

Probes: What is the most difficult task for staff to do with the EHR? Tell me if staff has stopped using any feature because it was too hard to figure out. Do they have any problems navigating the EHR; experienced the EHR system being unavailable; the system accuracy?

Researcher: Tell me how these problems were resolved.

Respondent: Possible responses

Probes: Who helps the staff with the EHR when they are having trouble? Describe any workarounds.

Adoption

Researcher: Describe all the functions currently being used with the EHR.

Respondent: Possible responses

Probes: For example nursing documentation, orders, assessments, etc.

Researcher: Describe the available EHR functions currently not being used.

Respondent: Possible responses

Researcher: Tell me why staff is not using these functions.

Respondents: Possible responses

Researcher: Tell me how you know that staff is using the EHR technology as intended (such as all features).

Respondent: Possible responses

Interfacing EHR technology

Researcher: Describe how the EHR works with other devices (or software) to delivery patient care.

Respondent: Possible responses

Probes: For example, describe how orders feed into the pharmacy system (i.e., not getting medications). Tell me if you have experienced the EHR system being unavailable, or experience connectivity problems, how often?

Workflow

Researcher: Tell me how using this EHR technology has impacted how staff delivery patient care.

Respondent: Possible responses

Probes: Describe to me if there are fewer steps to complete this work. Are the steps chronological and make functional sense (or do staff have to repeat many steps).

Researcher: What strategies were used to help staff understand the actual steps of completing their work using the EHR technology?

Respondent: Possible responses

Researcher: Tell me about a typical day using the EHR technology

Respondent: Possible responses
Researcher: Tell me how staff's typical day has changed from the previous process
Respondent: Possible responses
Probes: Please describe the steps before implementation. Now describe the steps after implementing the EHR technology.

Users (Adopters)

Researcher: What motivates staff to learn something new?
Respondent: Possible responses
Probes: Watching others, written instructions, listening to others, trying it out.
Researcher: Tell me about what individual staff factors posed barriers to transitioning from paper to the EHR.
Respondent: Possible responses
Researcher: Describe any sources of stress, strain, or conflict staff experienced in the transition from paper documentation to electronic documentation.
Respondent: Possible responses.
Researcher: Please describe your role with the EHR.
Respondent: Possible responses
Researcher: Please describe your staff's experience with technology implementation.
Respondent: Possible responses
Probes: For example, the type of technology implemented at your facility? Now, tell me the frequency it is used: monthly, weekly, and daily?
Researcher: Tell me how the staff's peers supported them during the EHR technology implementation.
Respondent: Possible responses

Leadership

Researcher: Describe what your organization was trying to achieve with implementing the EHR technology?
Respondent: Possible responses
Probes: For example, an increase in quality of care (such as less medication errors), please describe.
Researcher: Tell me who was involved with making the decision to use the EHR technology
Respondent: Possible responses
Probes: Describe what the staff's role was.
Researcher: Describe how leadership has been involved with the implementation of the EHR.
Respondent: Possible responses
Probes: For example, what organizational structures influenced your transition, for example, was the mission and vision statement changed? Describe the resources leadership provided for this change (role, money, etc.). Describe any policies or procedures that have been revised.

Communication

Researcher: Describe how leadership has encouraged employees to lead Nurse about the new EHR technology.
Respondent: Possible responses
Probes: Describe what the leadership communication was to promote the use of the EHR technology. Tell me what strategies were used to communicate to the Nurse about the EHR technology such as benefits (and any barriers). Describe how barriers were resolved.
Researcher: Please describe how leadership has persuaded the employees to follow the EHR technology implementation plan.
Respondent: Possible responses
Researcher: Describe strategies (or actions) that were used to train on how to use the EHR.
Respondent: Possible responses.
Probes: For example emails, posters, hands-on experiences, etc.
Researcher: Next, tell me about the ongoing support available for staff to help them use and learn new features of the EHR.

- Probes:** Support before and after (vendor, HELP desk, policy changes, others).
Respondent: Possible responses.
Researcher: Describe any new roles that may have been developed to assist with the EHR implementation.
Respondent: Possible responses
Probes: For example, describe any roles such as super-users,
Researcher: Describe what these roles have done to assist with the EHR technology implementation.
Respondent: Possible responses
Probes: Now, describe what strategies that they may have used.
Researcher: How are these roles being used now?
Respondent: Possible responses
Researcher: Tell me how feedback about the system use is given and received.
Respondent: Possible responses
Probes: Please describe any user feedback review sessions after the EHR technology was implemented. What was done with this information from the review sessions? Tell me about any auditing of patient care using the EHR technology. How was this information been addressed with users?
Respondent: Possible responses

Facilitators (Boundary Spanner)

- Researcher:** Describe who took lead in (implementing) helping users with this new EHR technology.
Respondent: Possible responses
Researcher: Now tell me what they did.
Respondent: Possible responses
Researcher: Now, tell me if anyone came on site that helped with implementing the EHR technology and describe what they did.
Respondent: Possible responses

Accreditation/Regulation

- Researcher:** Can you describe how this EHR technology will impact your site survey.
Respondent: Possible responses
Probes: For example, does this EHR technology assist with meeting patient care standards for the Centers for Medicare and Medicaid services? Describe how the MDS is more or not accurate when using the EHR technology.

Economic Environment

- Researcher:** Given the economic environment describe any other things that helped your LTC facility to decide to use this EHR technology.
Respondent: Possible responses
Probes: For example, was there any funding/money given to your LTC facility (economic incentives) to use to purchase this EHR technology?
Researcher: Describe if any cost efficiencies (productivity) have been realized, for example using less staff.
Respondent: Possible responses
Probes: Please describe any changes in staffing with using the EHR technology.

Vendor

- Researcher:** Describe what activities the EHR technology vendor did before implementation.
Respondent: Possible responses
Probes: For example, did the vendor complete testing of equipment? Tell me how. Tell me what other activities the vendor completed for example they provided staff education.
Researcher: Now tell me what they did after implementation.

Respondent: Possible responses

Researcher: Describe how the EHR technology vendor guaranteed the EHR technology to ensure:

- stability
- accuracy
- security
- working

Respondent: Possible responses

Probes: Tell me how the vendor responds to equipment needing maintenance (i.e., broken parts).

Respondent: Possible responses

Researcher: I want to ask about if the EHR technology vendor still continues to come on site to provide support in the use of this new EHR technology. If yes, tell me how.

Respondent: Possible responses (no, or yes)

Wrap Up

Researcher: To wrap up, what other things (strategies or actions) would you like me to know about that we have not covered.

Respondent: Possible responses

Researcher: *Thank you very much for participating in the study. Before we finish, do you have any questions or concerns Nurses or anything else you would like to share about the EHR technology implementation?*

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CHAPTER 4

A Case Study of Technology Adoption in one Long-term care Facility

Healthcare organizations are dynamic systems that influence adoption of technology in care delivery. To understand from a systems perspective, the dynamics of implementation of a new technology, it is important to understand the components of the system and how they are integrated to promote adoption of a specified technology. This study extends study 1 (Chapter 3) by eliciting data from three sources (staff interviews, observations, and leadership meetings) and integrating this data to describe, from a systems perspective, implementation leading to the adoption of an electronic health record in one long-term care setting.

Although the use of technology is common in acute care hospitals, use of technology is not prominent in long-term care (LTC) facilities. Technology vendors have recognized this gap in the market and are beginning to focus their development efforts on LTC facilities. For example, several tracking devices are currently offered that allow caregivers to locate easily active residents with dementia. If a technology system is not implemented successfully, nurses may develop workarounds or even refuse to use the technology (Rogers, 2003; Schoville, 2009; Vogelsmeier, Halbesleben, & Scott-Cawiezell, 2008). Workarounds may result in unintended consequences for patients such as when data is not being entered in promptly after the use of a paper backup system.

These paper systems can cause patient care to be delayed or the omission of necessary care (Ash et al., 2007; Harrison, Koppel, & Bar-Lev, 2007). Thus, understanding implementation which leads to the adoption of technology in LTC is important to maximize the use of technology in the delivery of care.

Long-term care facilities provide direct nursing care for basic activities of daily living and socialization of elderly residents. Different types of LTC facilities employ different types of staff. For example, LTC facilities may rely primarily on nurse aides while skilled nursing homes may employ more registered and licensed practical nurses.

Background and Significance

Only a few LTC studies have examined technology implementation and these studies discussed a limited number of factors that influence adoption of the technology (Alexander, Rantz, Flesner, Diekemper & Siem, 2007; Brandeis, Hogan, Murphy & Murray, 2007; Cherry, Ford & Peterson, 2009; Cherry, Ford & Peterson, 2011; de Veer, Fleuren, Bekkema & Francke, 2011; de Veer & Francke, 2010; Mohamoud, Byrne & Samarth, 2009; Rantz et al., 2011; Rochon et al., 2005; Scott-Cawiezell et al., 2009; Vogelsmeier et al., 2008; Wilt & Muthig, 2008; Yeh et al., 2009). No studies used a case study approach to discover, from a system perspective, implementation strategies to promote adoption of the technology. The majority of these studies were qualitative in nature. It is not surprising that the majority used a qualitative approach since little is known about technology implementation within LTC facilities; this is a new area of research. The majority of the studies did not use a model or framework to guide their work. Most recently, a systematic review of health information technology that focused on meaningful use of electronic health records found insufficient reporting of system

factors, which made it impossible to determine why use of the health information technology failed or succeeded (Jones, Rudlin, Perry, & Shekelle, 2014). Thus, the purpose of this case study was to describe from a systems perspective implementation leading to the adoption of a specific EHR technology.

Study Aim

The aim of the investigation was to examine the implementation and adoption of an EHR technology in one LTC facility using an in-depth case study approach. One proposition of the study was that many implementation factors influence adoption of a technology such as an EHR by a healthcare agency. The second proposition was that certain aspects of the technology - an EHR- lead users who work in an agency to fully adopt the technology. Case study is defined for purposes of this investigation as detailed analyses of a “group” (i.e., one LTC facility) in relation to a specified phenomenon (i.e., adoption of EHR implementation) (Yin, 2009, Yin 2014). Case studies are often done in the real-world context, which gives an understanding of the dynamics present within a single setting (Yin, 2009, Yin, 2014). Documents, observations, and interviews can be sources of information for a case study. The research question for this case study was: What is one LTC facility’s implementation and overall adoption of the EHR?

Conceptual Framework

The Integrated Technology Implementation Model (ITIM) that guided the study is found in Figure 3.2 and Table 4.1. The center point of the ITIM, technology adoption, is the dependent variable. Adoption is defined as the use of a new technology routinely and fully (all features) in delivery of patient care. The ITIM addresses the key concepts

associated with the technology adoption. In the ITIM, these concepts are organized into two major environments: an inner and an outer context (Greenhalgh, Robert, Bate, Macfarlane, & Kyriakidou, 2005; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Schoville & Titler, 2015). The inner context is defined as the organizational factors (e.g. decision making, rules and procedures, and technical knowledge), the culture, and the ways of working during implementation that leads to adoption of the technology. The outer context is defined as factors external to the organization that influence the implementation and adoption of a technology. These factors include regulatory agency standards, the health care economic and political environment, and vendors. Lastly, facilitators, as noted in Table 4.1 (outer context), can be external or internal to the organization. The ITIM was used in this case study to guide development of interview questions and observation data collection forms.

Table 4.1

Revised Integrated Technology Implementation Model (ITIM) Definitions

Concepts	Definition
<i>Inner Context (context)</i>	Organizational context that influences the adoption, spread, and sustainability of the technology innovation through active implementation strategies
Technology/Innovation Adoption (D)	When a user is introduced to a new technology and begins to use it routinely and fully when delivering patient care
Implementation	The path to identify specifications, creations, and installation of technology, organizational readiness and active implementation strategies including: users' attitudes are changed, skills are built, policies/procedures for each of the components are defined and executed
Technology	Technology innovation is a device that is used when delivering patient care and usually has two components: <i>Hardware</i> -tool that embodies the technology as material or physical object

	<p><i>Software</i>-provides information & knowledge</p> <p><i>Characteristics</i> include the relative advantage, complexity, compatibility with norms, values, perceived need, trialability</p>
Interfacing Systems	Supplementary technology that interfaces or communicates with the new primary technology (innovation)
Work Processes	The sequence of and the amount of activities with use of technology to achieve quality patient care for the resident
Users (Adopters)	<p>Individuals that are in a social system (i.e., LTC) that the technology is targeted to be used by for delivering care may include RNs, LPNs, aides, physicians, pharmacists, administrators, Directors of Nursing, clerks, and patients</p> <p>Characteristics include users' education preparation, profession, context of the work environment, experience with using technology</p>
Leadership	Roles, specific responsibilities, and required activities (executives, managers, consultants) that promote technology adoption
Communication	Is the process of sharing information in with a targeted social system using a variety of strategies that include interactive education programs, written communication, communication roles & networks, audit & feedback
<i>Outer Context (context)</i>	Processes and factors external to the organization that have a synergetic relationship to the internal factors affecting a successful technology implementation. These include: accreditation standards, the economic environment, regulatory requirements, vendor, technical environment changes
Accreditation/Regulation	An official agency (external force) that identifies criteria to meet established standards that influence the adoption of the technology
Economic Environment	The extra-organizational economic determinants that affect the organizations innovativeness such as the changing economic and political environment; government sponsored program, business competition, etc.
Facilitators (Boundary Spanner)	A person who assists, directly or indirectly, by providing guidance to the implementation of technology; this person can be <i>internal or external</i> to the organization
Vendor	Any person or company which represents, sells and services the technology which may/or may not be the innovator; commitment of the vendor to assist and support the facility operations (quality, knowledge,

resources, costs); experience with implementing the technology; etc.

Note: D=dependent variable; LTC=long-term care.

Research Design

A case study approach was used for this investigation. Using a case study approach is useful to gain in-depth information about the overall organizational adoption of an EHR for a specified case, the designated LTC facility (Burns & Grove, 2009. p 519; Denzin & Lincoln, 1994; Rowley, 2002). The data were collected after the initial system had been implemented and in use for eight months, which is consistent with implementation of similar technologies (Vogelsmeier et al., 2008; Yeh et al., 2009). To understand the implementation process for the adoption of the EHR, data were collected from three perspectives: the users of the technology via semi-structured interviews, observations of staff using the technology in practice, and field notes of spontaneous and planned leadership activities. These three perspectives were integrated for an overall summary of the level of an EHR adoption at this one LTC facility.

Setting

The selected LTC setting was identified and used as the study setting because it provided variation from sites in study 1 (Chapter 3). The inclusion criteria for selecting a site where it differed from the corporation of LTC facilities used in study 1, was located in an inner city rather than a rural or urban area, that characterized the facilities in Study 1, and had recently deployed an EHR system that differed from those used by sites for Study 1 (Chapter 3).

The study setting was one inner city 124 bed LTC nursing home that had 85% occupancy. The data collection started and finished during September 2014. This LTC

facility is part of a multiple nursing home ownership group and is a for-profit nursing home. The corporate office made organizational decisions while the individual LTC sites made decisions regarding the daily operation of their facilities. Twenty-four hour nursing care is provided to residents. These patients do not require treatment of active or complex medical conditions or technically complex medical treatments. The primary providers of resident care are Certified Nurse Aides (CNAs) who provide the direct care of bathing, dressing, toileting, meals, and socialization. The Registered Nurse (RN) focuses on decision making, critical thinking, medication and treatment administration, and leadership with the supervision of the other care providers. This facility uses Licensed Practical Nurses (LPNs) who support the work of the RN by also passing medications, completing treatments, and supporting CNAs. Leadership shares relevant information with nurses and CNAs and includes them in problem solving and decision making. Measures of staffing for this facility are described in Table 4.2.

Table 4.2

Average Staffing Minutes per 24 per hours

Position	Site average	State average	Federal average
RN	21	51	60
LPN	62	47	60
Total nurse	84	98	120
CNAs	119	154	120

Note. Information found at <http://www.ucomparehealthcare.com/nhs>. Averages are in minutes per 24 hours. CMS quality score was 2 out of 5.

Data Sources

Data sources for this study were interviews of staff (RNs, LPNs, and CNAs), observations, and field notes from leadership meetings. Observations were done during use of the EHR for medication administration, nursing documentation of resident care, and point-of-care (POC) documentation of resident care by CNAs. A medication administration event is defined as completing medication activities for administering all medications for one resident. A nursing documentation event is defined as documenting activities involved with the delivery of care by the nurse for one resident. A point-of-care documentation event is defined as documentation of the care required to meet a resident's needs of daily living delivered by a CNA. Recruitment and sample size for each of these data sources are described below.

Subject Recruitment

The Corporate Director of Nursing (DON) was contacted, to explain the study and seek permission to have one facility participate in the study. The corporate DON informed the site of the research and requested that the facility be involved, to which they agreed. A letter was required from this LTC site, which was submitted to the University of Michigan Institutional Review Board (IRB). Once IRB approval was obtained, arrangements were made to visit the site for introductions, answer any questions, tour the facility, and complete an EHR orientation. Next, the researcher made arrangements to be at the site for five, eight-hour weekdays for data collection. The interviews, observation, and leadership meeting attendance were done in September 2014.

Inclusion Criteria for Interviews and Observations

Registered nurses (RNs), Licensed Practical Nurses (LPNs), and CNAs at the site were recruited for interviews and observations. The DON had discussed the study with staff before the researcher came on site. The staff was eager to participate in the study. The DON gave the researcher a list of staff each day which was available for interviews and observations. Random selection from these lists identified the participants. Inclusion criteria were English speaking, permanent employees of the LTC setting, and working at least 20 hours per week. Exclusion criteria were per-diem or agency staff, and staff working less than 20 hours per week. See Table 4.3 for the number of interviews per stakeholder type and length of time for each type of observation.

Observations included the use of the EHR for medication administration documentation, nursing documentation, and point of care documentation by CNAs. These three functions of the EHR were selected for observation because they are frequently used, include both nurses and CNAs, and provided multiple perspectives on EHR use.

Leadership meetings were formal and spontaneous. The Director of Nursing identified formal meetings each morning for the researcher to attend. The criteria for the types of meeting the researcher would attend included meetings that discussed the EHR used by nurses and CNAs. The second criteria were that different types of leadership were involved in the meetings (e.g. Administrator, DON, ancillary department managers, and unit managers). The researcher also was present for several spontaneous leadership meetings.

Sample Size for Interviews and Observations

A total of 15 participants (five from each staff type) were targeted for interviews and observations. Each person was observed for 1.5 hours during one of the following care events: five participants for medication administration (RNs and LPNs); five participants for nursing documentation (RNs and LPNs); five CNAs for POC documentation; for a total of 22.5 hours. One hundred fifty observed care events focused on the detailed use of the actual EHR technology. A total of 22 care providers participated in the study with 14 individuals participating in only one data collection activity (interview or documentation) and eight individuals participating in two data collection activities (interview and documentation or two documentation events). The unit of analysis for observations was the number of events (e.g. number of medication passes) for each observed function.

Table 4.3

Number of Interviews per Stakeholder Type; Observation Time by Function

Clinician type	Number of interviews
RNs	5
LPNs	5
CNAs	5
Observation types	Total observation time
MAR documentation	7.5 hours
Nursing documentation	7.5 hours
POC documentation	7.5 hours

Note. MAR=medication administration record; POC=point-of-care.

Leadership Meetings

Data collection for leadership meetings were field notes which were taken at spontaneous and planned leadership meetings. This data collection occurred during

morning breaks ($N=5$ days), informal meetings ($N=5$) with different leaders (DON, Director of Education, unit managers, Administrator), and attendance at one scheduled daily multidisciplinary leadership meeting.

Instrumentation

This study used several instruments including an interview guide, three observation tools, and field notes. These instruments are described below.

Interview Guide

An interview guide using semi-structured, open-ended questions was developed specifically for the study. The ITIM guided the development of the questions, which focused on implementation strategies for technology adoption/use. Other questions were designed to elicit information that may not be guided by the ITIM and use of the EHR but sought to understand other possible factors that affected the implementation process. Questions were also designed to elicit information concerning interviewees' perceptions regarding (a) residents' thoughts about nurses or CNAs using the EHR to document their care, and (b) physicians and other healthcare providers' thoughts about nurses and CNAs using the EHR to document resident care. In summary, questions were designed to provide understanding of the complex nature and systematic approach to implementing the EHR. Major questions can be found in Table 4.4. Appendix 4A contains the complete interview guide.

The interview guide was reviewed by a team of nursing informatics and implementation science experts with experience in deployment of technology. Feedback provided refinement of the questions. The interview guide was then piloted on a rehabilitation unit that had employee job categories similar to the study site.

Revisions from the pilot included changing the word implementation to “when use of the technology began.” Conversational probes (questions) were added for assessing the reasons that the LTC facility decided to use the technology and how technology impacted resident care.

Use of a semi-structured interview guide provided flexibility to adapt wording and sequencing of questions to the actual context of the interview, increased the consistency of the data collection, and provided a systematic approach for the interview of each informant (Patton, 1990). Additional conversational probes were used to obtain further clarification during interviews. Probes were also used to increase the understanding of the interviewees’ responses.

Table 4.4

Major Interview Questions

Major questions

Tell me how the EHR implementation went.
 Describe all the functions of the EHR you are currently using.
 Please describe how your peers were supportive when using the EHR.
 Tell me what residents (other Healthcare providers) think about nurses using the EHR to document their medications.
 Describe to me what things (factors) helped you or the organization to decide to use the EHR. What factors influenced implementing the EHR here at [site name].
 Given the economic environment describe any other things that helped you (and the LTC facility) to decide to use this EHR.
 Tell me about how the decision to use the EHR was made at your facility.
 Describe who took lead in (implementing) helping you use this new EHR.
 Tell me if anyone came on site that helped with implementing the EHR. Tell me what they did.
 Describe how your LTC facility prepared for implementing the EHR.
 Describe how the leadership has been involved with the implementation of the EHR.
 Describe any new roles that may have been developed.
 I want to ask how you learned to use this EHR?
 Next, tell me about the ongoing support available to you to help you use and learn new features of the EHR.
 Tell me how feedback about the system use is given and received.
 Please tell me all the ways you use the (functions or parts/meds/assessments/POC) new EHR.
 Tell me how using the EHR has impacted how you deliver care to the patient.
 Describe what activities the EHR vendor did before implementation.
 Describe how the EHR works with other devices (or software).
 Can you describe how this EHR will impact your site survey?

Observation Tools

Three observation tools were developed for this study that focused on the behavior of the care providers in their natural care delivery environment. See Appendices 4B, 4C, and 4D. Each tool focused on a particular care process which included: (1) medication administration using the electronic medication administration record (MAR), (2) nursing (RN, LPN) care documentation, and (3) CNAs POC documentation. The tools had check boxes for documenting when pre-determined data categories were viewed and entered by the EHR user. There was a comment section for documenting what the researcher noted and comments made by staff.

The observation data collection tools were derived from the ITIM and validated with a medication administration nurse-specialist, and two implementation science nurse experts. Their feedback was integrated into the tools. The second approach was to test the tools using the actual EHR system. The testing included using the tool during actual observations. Revisions were made to the tools highlighting specific functions used by the care providers at this LTC facility. After revisions, these observation data collection tools provided a systematic and comprehensive approach for observing the features to be explored. Space was also available to write comments about observations that may not have been noted specifically on the observation tool such as types of workarounds, barriers, patient safety concerns, and comments made by the participant.

Field Notes

Field notes were written in a notebook during spontaneous and formal leadership meetings. Information gathered included leadership comments, researcher perceptions, and observations. This information was later transcribed into a database.

Ethical Considerations

Non-regulated status approval of this study was obtained from the Health Sciences Institutional Review Board at the University of Michigan prior to data collection. All participants signed informed consent documents (interviews and observations) prior to taking part in the study, including consent for audio recording of the interview. All data were stored in a locked file.

Data Collection

The three sources of data collection were interviews, observations, and leadership meetings. The primary data collection process for this study was in-depth interviews, structured observations (Garwood, 2006) of the EHR use during care delivery, and field notes from leadership meetings.

Interviews and Observations

Each morning the unit manager provided to the researcher a list of staff who were available for interviews (including RNs, LPNs, and CNAs working that day) and for MAR, POC and nursing documentation observations. Nurses (RNs, LPNs) and CNAs were randomly selected from the staff list to reduce manager or peer- pressure to participate in the study. The researcher would approach these individuals to explain the study and obtain consent. Interviews were conducted in private locations (office, library, and conference room). There were no refusals for interviews.

Observations occurred in the care environments excluding resident rooms. This approach provided information from the actual use of the EHR in the care delivery setting. The three functions of the EHR (medication administration, nursing and POC documentation) were selected for observation because they are frequently used, include both nurses and CNAs, and provide multiple perspectives of use. Observing more than one EHR function also provides breadth for understanding implementation leading to adoption of the EHR in this organization. No individual was observed for more than one session of completing the same care delivery activity. For example, the same nurse was only observed once completing medication administration activities.

There was one refusal for observation during the five days of data collection. This refusal came from a new nurse who was struggling with medication delivery due to multiple sick calls. She was then required to pick-up additional work duties along with her responsibilities involved with medication delivery. She was having trouble balancing direct care and medication administration responsibilities.

Data collection bias was minimized by testing the collection tools before using them to determine if they produced unbiased information. The researcher would ask questions during observation sessions when uncertain of the activity being observed, and there were multiple days of data collection to validate the findings.

Leadership Meetings

Each morning the Director of Nursing or Nurse Managers would suggest formal meetings for the researcher to attend. These meetings included a daily administrative meeting and an education meeting. Spontaneous meetings that were attended often occurred during managers' coffee and lunch breaks. Field notes were completed after

each meeting to document the researcher's observations and discussions during these meetings.

Data Analysis

Yin (2012) indicates, "case study analysis takes many forms, but none yet follow any routine procedures as may exist for other research methods" (p. 150). This study collected multiple sources of data providing several measures of the implementation of the EHR (Yin, 1999; 2003). Initially, the multiple data sources were analyzed separately. Next, the data were analyzed across events (interviews, observation, and leadership meetings) to determine events or facts supported by more than a single source of evidence, to arrive at an understanding of the EHR implementation and adoption in one LTC facility, which is called data integration.

Interviews

Descriptive statistics were used to calculate the demographic characteristics of those participating in interviews. A systematic approach to analyzing interview data was used to find patterns and salient categories of meaning and relationships among the categories of themes. Data analysis using the constant comparative method was used, allowing for themes and patterns to emerge from the interviews. This method of constant comparative is an iterative and inductive process of reducing the data through constant recoding (Glaser & Strauss, 1967). The use of thematic analysis is an excellent approach to investigating a phenomenon for which very little data exist (Denzin & Lincoln, 1994). First, the researcher read interview transcripts twice from start to finish, obtaining a gestalt view of the data. Initial minor themes were made in the margins of the transcripts. Reviews of minor themes were categorized into major

themes. Both minor and major themes were entered into a database by case number and category. Additionally, to validate the interpretation of the findings, an experienced Ph.D. nurse and an informatics nurse specialist independently coded major and minor themes for twenty-five percent of the transcripts. There was a reliability of 93% between all the coders.

Observations

Observation data were analyzed using descriptive statistics (frequency and percentages) and content analysis of comments for each observed event. There were three different types of observations which included medication administration, nursing documentation, and POC documentation. A medication administration observed event is defined as completing medication activities for administering all medications for one resident before moving to the next resident (e.g. checks allergies, acknowledges alerts, gives medication). A nursing documentation observed event is defined as documenting care delivered by the nurse for one resident before moving to the next resident record (e.g. writing a nurses note). A POC documentation observed event is defined as documentation of care delivered by a CNA for one resident before moving to the next resident (e.g. vital signs). Definitions of observed events and types of activities for each observed event are in Table 4.5. Data were analyzed by calculating the percent of each type of observed activity (e.g. documents outcome) divided by (1) the total number of activities for a specified observed event (e.g. medication administration) and (2) the total number of observed events during the observations.

Comment themes were identified for each of the events by reviewing the researcher's written notes and comments made by the participants (nurses and CNAs). Data

analysis using the constant comparative method was used, allowing for themes and patterns to emerge from the written notes and comments. This method allowed for reducing the data through constant recording (Glaser & Strauss, 1967). First the researcher reviewed the documentation from each observed event to obtain a gestalt view of the data. Initial minor themes were identified on the data collection tool followed by a second review to identify major themes. To validate the findings, a nurse informatics expert reviewed the coding of themes for further refinement. The percentage of agreement between the researcher and the nurse informatics expert was 98% agreement. Data including themes was entered into an Excel spreadsheet by day of observation. Data were further evaluated by calculating the percentage of total comments for each category type.

Table 4.5

Definitions of Observed Events and Types of Activities for Each Observed Event

Definitions of observed events	Types of activities for observed events	Researcher comments	Comments from staff
A medication administration observed event is defined as completing medication activities for administering all medications for one resident before moving to the next resident.	Acknowledges Alerts Documents outcome (pain relief) Not given-reason documented Logs in/out Allergies Given (administered) Identifies Resident Verifies orders Due Reviews medication administration record	Notes written by the investigator in the comments section of the data collection tool during observation	Comments shared by staff during observation and noted in the comments section of the data collection tool
A nursing documentation observed event is defined as documenting care delivered by the nurse (e.g. writing a nursing note on a change in a patient's behavior) for one resident before moving to the next resident record.	Weights Reviews UDA (undefined assessment) Reviews dashboard Vital signs Logs in/out Nursing notes Assessments drop downs Progress notes Identifies resident	Notes written by the investigator in the comments section of the data collection tool during observation	Comments shared by staff during observation and noted in the comments section of the data collection tool
A POC documentation observed event is defined as documentation of care (e.g. writing a note on how the patient ambulated in the hallway requiring two assist) delivered by a Certified Nurse Aide for one resident before moving to the next resident.	Behavior Screens (LOC & plans) Vital signs Log ins Transfers Bed Mobility Shower/bathing Toileting Eating Ambulation Identifies Resident	Notes written by the investigator in the comments section of the data collection tool during observation	Comments shared by staff during observation and noted in the comments section of the data collection tool

Note. POC=point-of-care

Leadership Meetings

Field notes from the spontaneous and planned leadership meetings were entered into a database. Initial themes were identified by the researcher followed by a second review of the data to identify minor themes that were then clustered into major themes. Both minor and major themes were entered into a spreadsheet. Minor and major themes were reviewed and validated by a nurse informatics expert. The percentage of

agreement between the researcher and the nurse informatics expert was 98% agreement.

Data Integration

The final step was to bring together the themes from the interviews, observations, and leadership meetings to illustrate the dynamics of implementing the EHR and overall EHR adoption. Yin (2012) calls this data triangulation when events and facts have been supported by more than a single source of evidence. The use of triangulation results in greater understanding of the implementation process and EHR adoption at this facility. The integration of data was done by entering results of each type of data collection into a table, and cross comparing the data to determine if information converged on more than one data collection source. The convergence of the data was then given a theme name that reflected the nature of the major and minor themes of the each of the three data sources (interviews, observations, and leadership meetings).

Results

Results are reported by each of the three data sources: interviews, observations, and leadership meetings. These findings are followed by integration of the three data sources which broadened the understanding of the implementation at this LTC facility.

Interview Findings

The demographics of informants are in Table 4.6. Themes about implementation factors that influenced the staff to adopt the EHR in their daily practice are in Table 4.7. Five major themes influenced the adoption of the EHR: (1) factors that influenced implementation, (2) users and leadership informed by bi-directional feedback, (3) user

perceptions, (4) benefits of using the EHR, and (5) barriers to using the EHR. Below, these five major themes and corresponding minor themes are presented.

Table 4.6

Informant Demographics

Role	Average age	Level of education	LTC experience (average years)
RN (N=5)	40	100% Associates degree	10
LPN (N=5)	39	80% Some College 20% Associates degree	12
CNA (N=5)	30	60% Some College 40% High School	8

Note. RN=Registered Nurse; LPN=Licensed Practical Nurse; CNA=Certified nursing assistant; Female participants=14; Male participants=1.

Table 4.7

Key Thematic Findings Based on RNs, LPNs, and CNAs Interviews

Implementation themes that influenced the user to adopt the EHR	Exemplary quotes
Factors that Influenced Implementation	
*Leadership responsibilities	My leadership was right there with us. She worked hard like us. She input stuff like us, if not more. She made sure that we learned well. Training was good because you could always call [name], which was the trainer. I would say, "Oh, I forgot how to do this. Or, this got jammed up can you help me?" And, she would help you."
*Communication strategies	"The in-service director put up boards by the time clock, almost like cheat sheets to a degree. Like, "If you're having trouble doing this, then do this." It broke everything down step-by-step so you could navigate through more easily."
*Support & problem solving	"If anything needs to be known, she'll tell you. She'll show you. She'll even show you more than once."
*Teamwork	"We all helped each other out. If anybody had a question, they all knew that they could go to anybody that they wanted. They felt free to ask because we were all learning it at the same time."
*Training	"The DON gave in-services and my unit manager is very helpful. And our in-service director. All of them came together and they all were very helpful. If you didn't get it during in-service time, you could come up here and they

	would help you.”
Users & Leadership Informed by Audit and Bi-directional Feedback	“She (DON) was talking about auditing yesterday. Every morning when they go in and look. Then they call people and say, “You didn’t chart on so-and-so.”
Users Perceptions	“Most everybody is excited to learn the computer.”
Benefits	
*Ease of use	“It’s easy to access.”
*Increase efficiencies	“I like charting electronically way better because I couldn’t imagine doing what I do on a computer as fast manually.”
*Increase communication	“I didn’t know he had an indwelling catheter [reviewing chart].”
Barriers	
*Finding information	“Trying to change the times when you enter in a new prescription so that it matches your facility’s time and not the time that was in the computer.”
*Workarounds	Make a note [paper] and call pharmacy.”
*Reliability of equipment	“The computers shut down and we have to call the help desk. They figure it out.”
*Alerts	“There are alerts for everything. Then they ask you trick questions.”

Note. *=minor themes

Factors that influenced implementation. Five minor themes supported this major theme of factors that influenced implementation: (1) leadership responsibilities, (2) communication strategies, (3) support and problem solving, (4) teamwork, and (5) training.

Leadership responsibilities. Factors that influenced the implementation included: decision making, deployment activities, motivation of staff, providing enough equipment, and facility preparation. A variety of leadership responsibilities were noted by the RNs and CNAs. The first responsibility was making the decision to implement the EHR with a phased implementation approach. A variety of reasons were given for implementing an EHR system, including that it was a state mandate, the facility wanted to keep up with technology, to share health information data with other facilities, to

eliminate waste and save money, and to standardize documentation at this location with other LTC facilities. A nurse stated:

I think Medicare has a guideline that you have to be computerized by a certain date if you want your claims paid." Another offered: "One, the laws are changing, saying that you gotta be on [EHR] by a specific time, then they extended the time.

The consensus by the nurses and CNAs was that the corporate office made the decision to implement an EHR system.

Managing deployment of the EHR was a second leadership responsibility. Most facilities use a phased approach to implementation allowing each phase to be provider and module specific (Cherry et al., 2009). This phased approach allows for demonstrating system success to users. This LTC facility used a phased EHR implementation by first having CNAs use the POC documentation system, which had been in use for eight months. This was followed by implementing nursing assessments and nursing documentation, which had been in use for seven months. The implementation of the MAR was last and had been in use for three months.

Motivating staff for an EHR implementation and corresponding changes was a third leadership responsibility. Chen and Lou (2001) found that users are highly motivated when they perceive the technology will be useful and improves their care delivery performance. The leadership used the EHR and pointed out to staff the reasons for implementation and how easy it was to use. The overall users' perception of the implementation and EHR was positive. This facility had staff that was highly motivated to participate in the implementation. A nurse reported how participating with data entry before the going live with the system was helpful. She also stated: "I would

say nothing [negative about the implementation] because, by us helping to put records in, it helped us learn our skills.”

Another leadership responsibility was to oversee the preparation of the facility for the EHR. Facility preparation activities included pulling wires for the kiosk machines, setting up the computers, and mounting computers on the medication carts and hallway kiosks. Additional facility preparation activities included ensuring that the system was ready to use, making revisions in policies and procedures, involving staff with facility preparation, ensuring critical information was available the first day of go-live, working with the vendor to guarantee that documentation forms were changed to meet the needs of their LTC facility, and updating policy and procedures to reflect the EHR system. Facility preparation is illustrated by the following quote: “Leadership guaranteed that there was enough computer equipment available, was involved with training by conducting formal classroom by using the system themselves, and being a super-user.”

Communication strategies. The second minor theme was communication strategies. The multitude of strategies used to communicate included a corporate meeting with staff to explain the upcoming changes and implementation process, provision of information by the DON and Administrator at staff meetings, information regarding the implementation was posted at the time clock and was in letters included with the employee paychecks, and cheat sheets were provided for how to complete different functions. A nurse offered: “We do get posters. We do have to sign off that we know we’re supposed to document this, that, and the other. They keep up with the in-services.” A CNA offered: “She (Director of Education) gave a handout that had the

different codes, the green, the pink (which they call red), the yellow, and the white.” Communication was also achieved by sharing the results of auditing with staff. An LPN said: “She [DON] was talking about auditing yesterday; every morning when they go in and look. Then they call people and say, you didn’t chart on so-and-so.” A CNA stated: “It was embedded in my head about what’s happening with this electronic record and how this thing is gonna work.”

Support and Problem Solving was the third minor theme that influenced implementation. An LPN said:

I credit the DON. She was just there for us. She was there for all the meetings. She was there to answer questions for us. She was there even after her hours were up. She was like, “Come in any time that you want and I’ll teach you personally.” She was really, really great.

An RN further discussed how leadership was supportive “once we went live if you needed assistant, there was somebody [leadership] here to help you.”

Support and problem solving. Support and problem-solving strategies included an information technology help desk which was available 24/7. What was unique at this site was the maintenance staff took on the responsibility to be the first line of computer technical support. The nursing staff would call the maintenance department for initial support followed by contacting the HELP desk if this department could not resolve the problem. Leadership was accessible 24/7 for support and problem solving. An LPN voiced: “Managers; they don’t mind helping. If anything is wrong, they don’t mind helping you or showing you.” The leadership guaranteed enough staff was available for go live and were on site for immediate problem solving. One more strategy for support and problem solving was having the role of super-user, which was not a formal role, but rather this was the person to go to with questions and

for support. The DON, Director of Education, various RNs, LPNs, and CNAs served in this role. A nurse offered: "It worked out that there was a super user (nurse) on each shift; so, any time that someone was having an issue, there was a super user there."

Teamwork. Teamwork was the fourth minor theme. Informants commented that they learned together by showing each other functions. One CNA said:

When I started, my peers were actually my trainers. You know, to be honest, they helped me out. I had never been a CNA before. The facility actually brought me in as a new CNA and I had a trainer, which was a veteran CNA and she trained me on the system; on how to input the data into the system and how to use the equipment. So, my peers were great.

An LPN offered another example of teamwork.

I don't think any of us would have gotten through it without each other! I think some of us were stronger with some things and some of us were not. Together we got through it very, very well. We used each other to get through it.

Training. Training, the fifth minor theme, included multiple strategies such as didactic, hands-on training, and a practice module. A practice environment was designed to encourage nurses and CNAs to experience the EHR documentation before using it with an actual resident. An LPN offered: "They (leadership) invited us to go in at any time and practice" using the practice environment. Informants stated that scenario-based education was necessary so that they could apply skills to actual events they would encounter. They also indicated that adequate training time with small class size was the optimal learning environment. Informants indicated that they had enough time to learn to use the technology, with multiple learning opportunities provided. A nurse stated: "Yes, we had training with a big book that told you how to do different things. We had practice, and we had a class. We did have hands-on training." An LPN offered: "there was a lot of education." A CNA said "basically, once you got the training, you got it. You know? It was easy."

Audit and bi-directional feedback. The second major theme was audit and bi-directional feedback. There were three minor themes which were: (1) who is involved with auditing and feedback activities, (2) purpose of auditing and feedback, and (3) auditing and feedback strategies. Auditing and bi-directional feedback occurred between nurses, CNAs and leadership (who is involved) regarding questions, potential issues, and use of the EHR functions (purpose of audit and feedback). If users had questions, they felt free to ask the leadership directly or with texts or emails (strategies). Nurses and CNAs reported that the DON or Director of Education (DOE) got back to the users (strategy) with information regarding their questions or resolutions to problems. One nurse said when encountering problems with the system she “sends the DON a text or email, she will get back to us with the resolution.” An LPN noted that formal auditing occurred with feedback given to the user. She said, “each morning [the] DON audits the previous day and gives feedback to users” for them to make corrections or update their charting.

Users’ perceptions. The third major theme was users’ perceptions. Nurses and CNAs were excited about the EHR because they liked to learn something new that will help them with resident care. A CNA stated: “It’s exciting to learn things new. I love the kiosks. We have so much paperwork. Most everybody is excited to learn on the computer. It’s very easy and fast.” An LPN offered: “I just like learning new things. I get bored with repetitive things, so learning new things is something I like to do.” These statements reflect the minor themes of user characteristics (i.e. desire to learn something new) and positive perceptions (i.e. excited about decreasing the amount of paperwork).

Benefits of using the EHR. The fourth major theme was benefits of using the EHR supported by the three minor themes: ease of use, increased efficiencies, and increased communication.

Ease of use. All informants noted that the EHR was easy to learn, well organized and made it easy to find information. A CNA offered: “Most everybody is excited to learn on the computer. It’s very easy and fast.” A nurse stated: “I was excited [about the EHR].” One nurse voiced the ease of documenting a progress note directly from the electronic medication administration record (EMAR):

Progress note was the easiest function to use. If you’re doing a medication and you want to type it, they have an adverse reaction; you can go right into that tab and type the progress note and be done. It’s a lot easier than having to go back out and type a progress note.

Increased efficiencies. Some informants indicated that there were fewer steps to document. However, one CNA said, “There are actually more steps. It’s faster, but you have to get more in-depth about everything....” A nurse offered: “It’s easier access. It doesn’t matter what floor you’re on; you can pull it up. You don’t have to go to paper.” An LPN offered the EHR increased efficiencies by “being faster is easier. It’s right there at the click of a button; instead of having to go search for this and that.”

Increased communication. Nurses and CNAs liked the system because it was multidisciplinary, increased the communication among clinicians and other disciplines, and made it easier to find information for accreditation and regulatory agency personnel.

An RN offered:

We had a recent survey, and they were pretty impressed by the fact that we had gone electronic and were no longer using paper. It made it easier for them to find what they needed. So, they appreciated it. It cut down on time for them.

One nurse offered, “I can electronically enter orders and it goes directly to the pharmacy, so I don’t have to call as much. It’s really great to have.” A CNA noted:

It [EHR] lets you see all the different points of care that you can give them or something that you may have missed. You’re looking at it like, oh, oh, this type of feeding, you know. Oh, I didn’t know he had an indwelling catheter.

Barriers. The fifth major theme was barriers in using the EHR; supported by four minor themes: finding information, workarounds, the reliability of equipment, and alerts.

Finding information. Informants noted that it was difficult to find some resident information in the EHR. A nurse expressed:

Yes, it is except for your discontinued meds. We should be able to look back in the history because say, if they were to stop one medication and change it to another, once they DC [discontinued] it, you can’t see if anymore. You can’t see what medication they were on, how long they were on it. I don’t like that part. You should be able to see all their chart because you might have a new resident and a new person who is working and maybe they just want to read up on this person. A few days aren’t really good enough for you to get to know that person. So, I think there should be more information available as far as your nurse’s notes and DC meds.

A CNA noted: “You can look back to the history, but this particular system only lets you look back so far.” Nurses perceived that entering physician orders was a barrier. A LPN offered:

I think the majority of us would probably say the physician’s orders. Only because, with certain function they don’t have the particular wording that we’re used to, so when it says to give something four times a day, but the doctor says every three hours, it doesn’t really let you do that, so you have to find a way to maneuver the wording and make it fit for your schedule in the computer. So, that can be rough sometimes.

Workarounds. Informants reported using workarounds - use of informal substitute methods to accomplish the work rather than using the EHR as intended. For example, one nurse reported that she writes down physician telephone orders on a piece of paper and then enters them in the system. It was faster for her to enter the

order after completing the call. Another nurse reported using workarounds during medication delivery. She said,

If I'm really, really behind, I write all the room numbers down, because it takes so long to click on everything and acknowledge everything, then I write down that I gave them all the medications, then I go back and put it in the computer. That way I can hurry up and get my meds done. The only thing that you can't work around is that you can't sign off on your meds (medications) until they're actually due.

An LPN reported that she called the pharmacy to follow-up on a resident medication versus sending a note to the pharmacy through the EHR system. She found this was a faster approach to get the work done. Finally, a CNA reported that it was faster for her to write down vital signs on a piece of paper and then later enter the data into the EHR.

Reliability of equipment. The third minor theme, reliability of computer equipment, was a barrier. Nurses and CNAs encountered frequent system errors or downtimes. A CNA offered:

Oh, yes, when it boots you out in the middle of your work. It does that a lot. You can be doing something else, and you come back to the computer and it's gone. You did everything, but you didn't save it, so it's all gone.

A nurse voiced:

Yes, sometimes we have connectivity problems. But, we have so many computers that, if one doesn't work, I can drag another one of these (computer on wheels) with me. Sometimes if my initial (password) don't work on a certain computer or something else don't work, so sometimes you do have stupid little problems. But, you can get through it because we have quite a few computers on the floor.

Alerts. Alerts, the fourth minor theme, were often too quick. For example, pain assessment alerts illuminated immediately after giving the pain medication. The nurse reported they might overlook and forget to go back and chart the follow-up response to the pain intervention because of the quickness with which the alerts were displayed. An LPN offered: "Yes, with pain management, I didn't like how that was set up at all [alert

sent immediately]. I don't like having to give a pain medication and then alert myself [write on a piece of paper] to follow-up on it myself."

Findings from Observations of Three Major EHR Functions

The researcher evaluated the current extent of the adoption of the EHR through observations of three key functions: medication administration for a resident by a nurse (RN or LPN); documentation of care delivered to a resident by a nurse (RN or LPN); and documentation of care delivered to a resident by a CNA (point-of-care documentation). Definitions of observed events and types of activities for each observed event are in Table 4.5. First, the medication administration observations will be discussed followed by nursing documentation, and then POC documentation.

Medication Administration Observations

Five nurses (1 RN, 4 LPNs) were observed during medication delivery. Observations were on five separate days, for a total of 364 minutes. A medication administration event was defined as completing medication activities for administering all medications for one resident before moving to the next resident. Types of activities during medication administration included acknowledging alerts, identifying the resident, and documenting administered medications. The average number of minutes per event was six and the average number of events observed per day was 12.

For medication administration, there were 60 observation events and across those observation events there were 349 observed medication administration activities that were categorized into ten types. Table 4.8 summarizes the types of medication activities observed. Percentages for each type of activity were calculated based on the

total number of observed activities (349) and based on the total number of observation events (60).

Table 4.8

Frequency of Observed Activities of the 60 Medication Observed Events

Types of Activities	Number of observed activities (N=349)	Percent of observed activities (N=349)	Percent of observed events (N=60)
Acknowledges alerts	3	1	5
Documents outcome (pain relief)	3	1	5
Not given-reason documented	3	1	5
Logs in/out	31	9	52
Allergies	36	11	60
Given (administered)	50	14	83
Identifies resident	54	15	90
Verifies orders	55	16	92
Medications due	57	16	95
Reviews MAR	57	16	95

Note. Not observed vital signs, intake & output, laboratory results, self-administered drugs, dual-sign-off this is a signature by two nurses.

Medication administration comments. Multiple themes emerged from the researcher notes and comments made by staff. From the 130 comments noted in the comment section of the data collection tool seven themes emerged: ergonomics (1% of comments), workflow (3% of comments), system alerts (12% of comments), workarounds (15% of comments), breaks in confidentiality (20% of comments), ease of use (24% of comments), and barriers (25% of comments). Table 4.9 summarizes data from the written comments made during these observations. The themes are discussed next.

Table 4.9

Comments from Medication Administration Observations

Types of comments	N (%) of comments (N=130)
Ergonomics	1 (1)
Workflow	4 (3)
System alerts	15 (12)
Workarounds	19 (15)
Breaks in confidentiality	26 (20)
Ease of Use	32 (24)
Barriers	33 (25)

Ergonomics. Ergonomic issues were evidenced by a nurse's need to position the workstation screen at a higher location. Adjusting the screen provided more room to prepare the medications on the medication cart.

Workflow. Several comments regarding workflow were noted. The nurses started the administration of medications in the activity room. This was done because most residents were already in the activity room at the time medications were to be given. This was the room where the medications and the EHR workstations were located.

A nurse offered that there were fewer steps when documenting medications with the EHR. Another nurse offered that she had concerns because she had to work between two carts. One cart had the EHR records for half the residents, and the other cart had the remaining resident's records that added steps to her workflow.

System alerts. A variety of system alerts were used. One of the alerts notified the nurse that an ordered drug was available to be given. The nurse would go to the order portal, click accepts, and then the medication was displayed on the EMAR as available to be given. Several safety alerts were observed. The first safety alert notified the nurses if they were behind in passing the medications. This alert turned the EMAR

medication yellow, which helped the nurses stay focused when giving their medications. Another alert was a warning that indicated that another resident's name was close to the name of a resident that the medications were being pulled and prepared for. An additional alert had the nurse review side effects of medications before delivering them to the patient. Finally, another alerted the nurse if the medication dose was too high according to standards and therefore she (he) must acknowledge that she (he) was aware of the dose level before giving the medication

Workarounds. Workarounds were noted. The nurses made paper notes as reminders for re-ordering medications or for missing medications. Paper notes allowed the nurses to continue their work and come back later to address these issues in the EHR. Another example of a workaround was when a nurse was observed to be withdrawing medications from a drawer in the cart, and then removing the medications from the blister packs that they were contained in, and placing them into a medication cup. She then discovered that the resident was asleep and put the medications back in the drawer unlabeled. The nurse stated, "I will give these later." The nurse did not document that the medications were not given. This workaround was used so that the nurse did not need to document that the patient was asleep and, therefore, the medication would need to be given later. This practice is a safety concern. The medications could be potentially given to the wrong patient, or duplicate doses could be given. Another workaround observed was a nurse using a colleague's password because she could not remember her own. In general nurses were using the available functionality with only 19 researcher comments written about the use of workarounds.

Breaks in confidentiality. Overall, resident confidentiality was maintained but an occasional break in resident confidentiality was observed. A nurse left the computer screen up when walking away from the computer workstation. The screen was visible to other providers, residents, and family members. Some nurses minimized the screen before they walked away from the computer instead of logging out as required. This practice allowed unauthorized individuals to access the system under that nurse's sign-in (password).

Ease of use. Observations verified that the EMAR was easy to use. The ease of use promoted the adoption of the technology. The workflow steps to keep track of pulled and verified medications were simple. All that was needed was to check the "yes" radial button. A "next" button was used to review the subsequent pages of the EMAR. The sequence continued with the nurse giving the medication, followed by saving the data entry, which would indicate that the medication had been given. The process was completed by submitting an electronic signature.

Nurses' and LPNs' perceptions were positive and supported how easy the system was to use. One nurse offered that she liked the system because "I don't have to write." Another stated it was "way easier than paper; paper gets lost." Another nurse said, "The computer is my friend; I like it. It keeps me on queue. It is better communication. I am very fast with passing medications."

Many other examples were observed of the system as not being difficult to use. For example, nurses were able to use an ordering portal for notifying the pharmacy of needed medications as well as for new orders which were located on the EMAR. Nursing documentation notes could be made on the EMAR, which also placed these

notes on the nursing documentation module. Progress notes were easily written from the EMAR to document follow-up assessments including pain medication interventions. A copy-paste function was used when medications were held. This copy-paste feature eased the process of documentation of held medications. Nurses found the system to be very helpful when documenting insulin sites.

Barriers. There were several barriers observed with the use of the EHR for medication administration. First, the reliability of the system was a concern. Frequently the system was observed to go down and then data entry was lost. The loss of data caused the duplicate work of re-entry of information. Each medication that was held needed to be signed off individually, causing the process to be slow. Another observed barrier was that the system did not have an application through which the nurse could review medication actions, side effects, and contraindications. The nurse had to stop her workflow of administering medications to find the Physician Drug Reference manual when she/he needed to look up the medications. A nurse stated, "I just downloaded an application on my smartphone. It is much quicker."

In summary, there was a total of 10 medication administration activities that were observed and seven themes that emerged from the researcher notes and comments made by staff. These comment themes focused on the actual use of the medication administration function of the EHR system. The most reported comment themes were ease of use and barriers.

Observations on Documentation of Care Delivered by a Nurse

Five nurses (2 RNs, 3 LPNs) were observed completing their documentation about care delivered to the resident which occurred throughout the day. A nursing

documentation observed event is defined as the documentation of care delivered by the nurse for one resident before proceeding to the next resident. Types of activities observed included writing progress or assessment notes. The nurses were observed for 268 minutes with an average of 7.24 minutes per observation event. The average number of events observed per day was 7.4.

For nursing documentation, there were 37 observation events and across those observation events, there were 97 activities which were categorized into nine types. Table 4.10 summarizes the types of nursing documentation activities observed. Percentages for each type of activity were calculated based on the total number of observed activities (97) and based on the total number of observation events (37).

Table 4.10

Frequency of Observed Activities of the 37 Nursing Documentation Observed Events

Types of activities	Number of observed activities (N=97)	Percent of observed activities (N=97)	Percent of observed events (N=37)
Weights	1	1	3
Reviews UDA	2	2	5
Reviews dashboard	4	4	11
Vital signs	4	4	11
Logs in/out	8	8	22
Nursing notes	11	11	30
Assessments drop downs	13	13	35
Progress notes	17	19	46
Identifies resident	37	38	100

Note. Not observed new admit, height, MAR & TAR reconciliation, inventory sheet, care plans.

Documentation of care delivered by a nurse comments. Multiple themes emerged from the researcher notes and comments made by staff. There were 86 comments that clustered into nine themes (see Table 4.11): teamwork (1% of comments), workflow (1% of comments), interruptions (2% of comments), system alerts (6% of comments), user skills (7% of comments), break in confidentiality (7% of comments), workarounds (19% of comments), barriers (23% of comments), and ease of

use (34% of comments). The themes described in the following section are those that were 5% or greater of all comments.

Table 4.11

Comments from Nursing Documentation Observations

Types of comments from researcher	N (%) of comments (N=86)
Teamwork	1 (1)
Workflow	1 (1)
Interruptions	2 (2)
System alerts	5 (6)
User skills	6 (7)
Break in confidentiality	6 (7)
Workarounds	16 (19)
Barriers	20 (23)
Ease of use	29 (34)

System alerts. The first theme was alerts that notified the nurse of safety concerns. The first alert observed was to review a drug interaction. The nurse entered an e-signature to acknowledge this alert for a safety concern. Another alert indicated two errors in the documentation that required the nurse to review and complete the charting on the pain assessment. An alert was also visible when a supply which had been ordered for a patient became available. The nurse acknowledged that the supply had arrived and was available.

User skills. The next theme was variation in user skills. Many nurses were able to type quickly while watching only the screens. Several nurses typed slowly. They used and watched their two index fingers while typing. They would then review their data entry and correct errors from their typing.

Confidentiality. The next theme was confidentiality. Breaks in confidentiality happened when nurses did not log off the system when walking away from the workstation. The resident information was then viewable by others that may not have been allowed or needed access to this information. One example was a nurse who left

the workstation to answer the phone. She pulled the laptop screen down. Another nurse came to the workstation, pulled up the laptop screen and viewed the record. Once she was done, she pulled the screen back down. The first nurse came back, charted, and logged out. She was not aware that the other nurse had used the system with her password.

Workarounds. Workarounds were being used to ease the process of documentation. In one observation, the nurse was using paper notes and then later recording the information from her notes. Facility administrators required that the end-of-shift report be entered into a report book. This documentation was a duplication of data that were entered in the EHR (dual systems). One nurse stated, “We use this book here to identify when Medicare charting is required.” He further went on to describe that the EHR has the functionality to run reports to determine when Medicare charting is needed, but the administration wanted them to use a designated manual instead. The nurses will be using the EHR system for shift report and were being oriented to this function. The nurses are looking forward to using the EHR for shift report. Physician orders were written on paper, and the nurses would then transcribe the orders into the EHR. Physicians at a later point in time completed an e-signature. Paper logs were being used for identifying which patients needed their seven-day documentation. Lastly, an ulcer paper log was used to identify residents who needed wound documentation rather than available EHR reports.

Barriers. Barriers were observed that inhibited the EHR adoption process at this facility. One was the cumbersome process requiring multiple steps when entering a physician order. Another barrier was encountered when a nurse found it difficult to

locate the right additive in the EHR for a one-time intravenous fluid order. The difficulty of finding the correct medication dose added to her frustration. Another nurse commented, "It [the order] is like a puzzle to try and figure out to put it in here (EHR system)." Another nurse said,

The only time I get anxiety is when a lot of things are going on and, for some reason; you just can't get this order right. It's a simple order, but you're frustrated and trying to hurry up. So, that's the only time that you have emotions.

There were multiple steps when documenting, which included typing in free text in the nursing note, then choosing the radial button so that the documentation would be on the shift and daily reports. Next a spell check was completed; then the nurse saved the document; and finally, completed the documentation with an e-signature. One nurse commented, "It takes a lot of time." The amount of time it required for documents to be saved was another barrier. It was observed that when a nurse used the save function it took several seconds for the saving process to complete before allowing the nurse to go to the next screen.

Ease of use. The next theme was ease of use of the system. First, an order summary function allowed the nurse to review all medication orders. One nurse offered that this order screen "saves her a lot of time." Nurses could hover over an order to do a final review of the data entry before saving. Medicare assessment documentation screens offered radial button choices, which nurses reported as being fast.

The system had an image of the resident. The nurses liked the pictures for identification of the resident. One nurse commented, "I like the EHR it is quicker, don't need to look and flip through papers."

Another feature is that a transfer note could be made from the EMAR. A patient was being transferred for a procedure which required a nurse to document medication

administration, a wound dressing change, and an injection site prior to transfer. All of these activities were completed more efficiently with the EMAR.

Another benefit was the ease of finding resident charts that required a nursing note. Nurses no longer needed to search for a paper chart, which could be located anywhere in the facility.

A daily census report was used at the facility to identify residents that required documentation. The EHR illuminated the resident's name yellow on the report if charting was required. This replaced the nurse having to review each resident record to determine if charting had already been completed.

In summary, there was a total of nine nursing documentation activities that were observed and nine themes that emerged from the researcher notes and comments made by staff. Similar to medication administration the highest reported comment themes were ease of use and barriers.

Observations of Point-of-Care Documentation

Point-of-care (POC) documentation is defined as documenting care close to where resident services are delivered. A POC documentation event is defined as documentation of care delivered by a CNA for one resident before moving to the next resident. This documentation was done using large wall-mounted touch screens located throughout the hallways. The kiosk software had large icons that the CNAs used to document daily care such as food intake, skin condition, vital signs, and ambulation. The icons provided standardization of the information that was documented for each resident.

Five CNAs were observed for 90 minutes each while they completed their point-of-care documentation. Certified Nurse Aides spent about one minute per resident record to complete POC documentation. The average number of resident POC documentation events observed per day was 17.6.

There were 88 observation events and across those observations, there were 466 observed activities categorized into ten types of activities. Table 4.12 summarizes the types of POC documentation activities observed. Percentages for each type of activity were calculated based on the total number of observed activities (466) and based on the total number of observation events (88).

Table 4.12

Frequency of Observed Activities of the 88 Certified Nurse Aide Documentation Observed Events

Types of activities	Number of observed activities (N=466)	Percent of observed activities (N=466)	Percent of observed events (N=88)
Behavior screens (LOC & plans)	3	1%	3%
Vital signs	4	1%	5%
Log ins	6	1%	7%
Transfers	22	5%	25%
Bed mobility	24	5%	27%
Shower/ bathing	74	16%	84%
Toileting	74	16%	84%
Eating	85	18%	97%
Ambulation	86	18%	98%
Identifies resident	88	19%	100%

Note. Not observed weights, snacks, restorative rehabilitation, kardex, LOC=level of consciousness.

Point-of-care documentation comments. Five themes emerged from 109 comments on the observation data collection tool (See Table 4.13): ergonomics (2% of comments), workarounds (3% of comments), barriers (5% of comments), system alerts (5% of comments), and ease of use (85% of comments). These themes are described in the following sections.

Table 4.13

Comments from Certified Nurse Aide Documentation Observations

Types of comments from researcher	N (%) of comments (N=109)
Ergonomics	2 (2)
Workarounds	4 (3)
Barriers	5 (5)
System alerts	5 (5)
Ease of use	93 (85)

Ergonomics. CNAs were observed bringing a chair, bedside table, and mouse to assist when using the hallway kiosk machines for charting. One CNA indicated that it was “easier, I don’t get tired” when documenting while being able to sit down. Another CNA commented that her “arm got tired with standing” during data entry.

Workarounds. Certified Nurse Aides used paper cheat sheets during care delivery. The data from the paper cheat sheets was transferred later into the EHR. The CNAs also used the eraser tip of a pencil to touch the care delivery icons. The intended purpose of the icons was for easy finger touch entry. The height of the monitor screens prevented the appropriate use of the touchscreen icons.

Barriers. The system was observed to slow down with long pauses before the next screen displayed. A CNA signed out of the computer and moved to another computer to complete her charting when this happened. Another event occurred when the kiosk had an alert that computer service was unavailable. The user stated, “Never seen this.” This alert caused the user to go to another kiosk location to use the EHR system, choose the resident record, and enter data from where she left off at a previous kiosk location. In another instance, the user was booted out of the system which required logging back in and reviewing previous charting to ensure that data were not lost.

System alerts. An alert indicated that charting was late by the illumination of the resident's name in red that notified the CNA to complete data entry. Once charting was completed, the screen turned green, and the resident face sheet became white.

Ease of use. The final theme was the ease of use when using the point-of-care EHR function. It was observed that the CNAs could quickly move between resident screens and used care delivery icons. The system made it easy to view when and what was documented for the residents' care. A dashboard screen increased communication. This screen allowed the CNAs to view and enter data for the entire hallway of residents versus having to go into each resident record. The dashboard screen permitted the CNAs to use a pick-list of resident names for quick data entry versus using the resident screen, which listed each resident individually. Another positive function was that the data entered on that screen saved automatically when the user moved to the next resident data entry screen. They used this pick-list screen because it was faster. The intake screen allowed the CNA to enter the amount of food and fluid intake by percentages or enter text describing the amount. The CNAs found this screen helpful. An e-signature was done once data entry was completed for all residents cared for by the CNA. The system did not require a signature for each resident's data entry, which was a time-saver.

In summary, there was a total of 10 POC activities that were observed and five themes that emerged from the researcher notes and comments made by staff. These comment themes focused on the actual use of the EHR system. The highest reported comment themes were ease of use and barriers.

Leadership Meetings

Analysis of field notes from spontaneous and formal interactions during leadership meetings revealed five major themes. These themes included leadership activities and characteristics, the use of audit and feedback to provide improvement, the need for continuing education, system interfaces, and further opportunities for improvement. A description of each of these themes is in the following section.

Leadership Activities and Characteristics

The first major theme was the leadership activities and characteristics. The leadership was positive about the electronic documentation change and engaged with nurses in their daily practice in using the EHR. The Director of Nursing (DON) and managers were proficient when using the EHR. The DON reviewed with the researcher the functionality of the EHR, demonstrated each feature and how it was used by the providers, and demonstrated her use of the EHR with auditing.

The leadership described how the system's ease of use was beneficial. For example, the DON discussed how easy it was to find information "everything is just right there." The Director of Education further supported the perception of how easy it was to use. She stated, "as far as having everything there and not having to search. You just go to the section that you need. If you wanna look at their [resident] history, it's there." The DON also discussed the regulators' requirements and how these could be met with the use of the EHR.

Another leadership activity was the multidisciplinary problem solving that occurred at the facility. The Director of Education discussed the progression of the process of problem-solving. "If I can't do it, I go to the Director of Nursing. If she can't

figure it out, she comes to me. If neither of us can figure it out, we'll go to corporate, [name] and then [name]." She further discussed that the maintenance man had taken it upon himself to be the first person to problem solve the system before escalating the issue to corporate. Another example of multidisciplinary problem solving was a facility daily leadership meeting which lasted 30 minutes. The purpose of these meetings was to have operational leadership identify problems. They then developed and shared plans for resolution further promoting adoption of the system at this facility.

Use of Audit and Feedback for Improvement

The second major theme was the use of audit and feedback for improvement. A major topic of one meeting was reporting of EHR audit results by the Administrator and Nursing Director. The attendees identified plans for improvement. For example, it was noted that care plans were not being completed. A plan was determined by the Director of Education to educate the nurses. Nurses were also not completing the dialysis form when residents returned to the LTC facility after dialysis. There was a plan made for nurses to be further educated regarding completing this form (which included the site assessment) prior to the scanning of it into the EHR. Other items of discussion were that the elder abuse documentation was not being completed, and the significant decline in restorative orders and referrals. The managers of the unit followed up with the nurses on these items. The administrator identified a formal catheter audit which was occurring house-wide; it took about three minutes to complete per resident. A finding from the EHR catheter audits was that the documentation portion was missing. There was a plan established for CNAs to be educated on what written documentation was required, along with the use of the radial button to indicate that the resident had a

catheter. Another example of auditing was the DON reviewing the resident records weekly for missing physician signatures. After her review, she contacted the physicians individually to discuss the missing documentation and their plan for completion of this requirement. It was evident at this facility that auditing was occurring to improve documentation of the care delivered to the residents.

Education

The Director of Education stressed the need for continuous training. She offered:

The system is new, so it's constantly updating things. I'm doing an education on Thursday with the CNAs on behaviors because now we have the behavior tab in there. So, as the new stuff comes up, I do educate on it.

She highlighted using a variety of strategies for training. Formal training was done initially with the development of a new nurse orientation, posters, cheat sheets, and manuals. Review sessions were also conducted. The researcher observed her during a new nurse orientation which included didactic classroom work and the new nurse using the EHR on the unit. Finally, the Director of Education discussed her involvement in training regulators for the yearly survey.

For our survey this year, they did have to go on the computer. They had to learn how to navigate through the system, so I know next year they'll probably like it better. But, this was new for them too, so we had to help them navigate through the system.

System Interface

The fourth theme was the interface with the pharmacy systems. The DON offered,

It is great that the system interfaces with the pharmacy system we get our medications faster. Getting medications is difficult because we use a local pharmacy during the week. On weekends, we use a pharmacy in Ohio because the local pharmacy is not open. It has greatly increased our ability to get medications faster.

Opportunities for Improvement

The fifth theme was opportunities for improvement. The only comment offered by the leadership was from the DON. She discussed that the physicians are only entering electronic signatures. The nurses had to take verbal and telephone orders and then enter these into the EHR. The physician would provide an electronic signature for the order at a later time. The DON was anxious to have the physicians learn the function of EHR physician order entry.

In summary, there were five themes offered which included leadership activities and characteristics, use of audit and feedback for improvement, education, system interface, and opportunities for improvement. Leadership was positive and engaged in the daily practice of using the system. They were able to discuss benefits of the system such as the ease of use and the interface with the pharmacy system. Leadership highlighted opportunities for improvement that included increasing physician use of the system.

Findings from Integration of Data from Three Sources

A case study hallmark is using multiple data sources, which broadens the breadth of understanding of the implementation at this LTC facility. Yin (1999) indicates that using multiple sources of evidence is actually using multiple perspectives of the same phenomenon. The process of convergence of the data sources provides cross checking for consistency with the data. The case study used observations, interviews of 15 care providers, and attendance at formal and spontaneous leadership meetings. Methods for converging the data from the three sources is described on page 261 - Data Integration. The convergence of the data illustrates the dynamic nature of the

implementation leading the facility to adopt the EHR. See figure 4.1 for an illustration of the convergence of evidence.

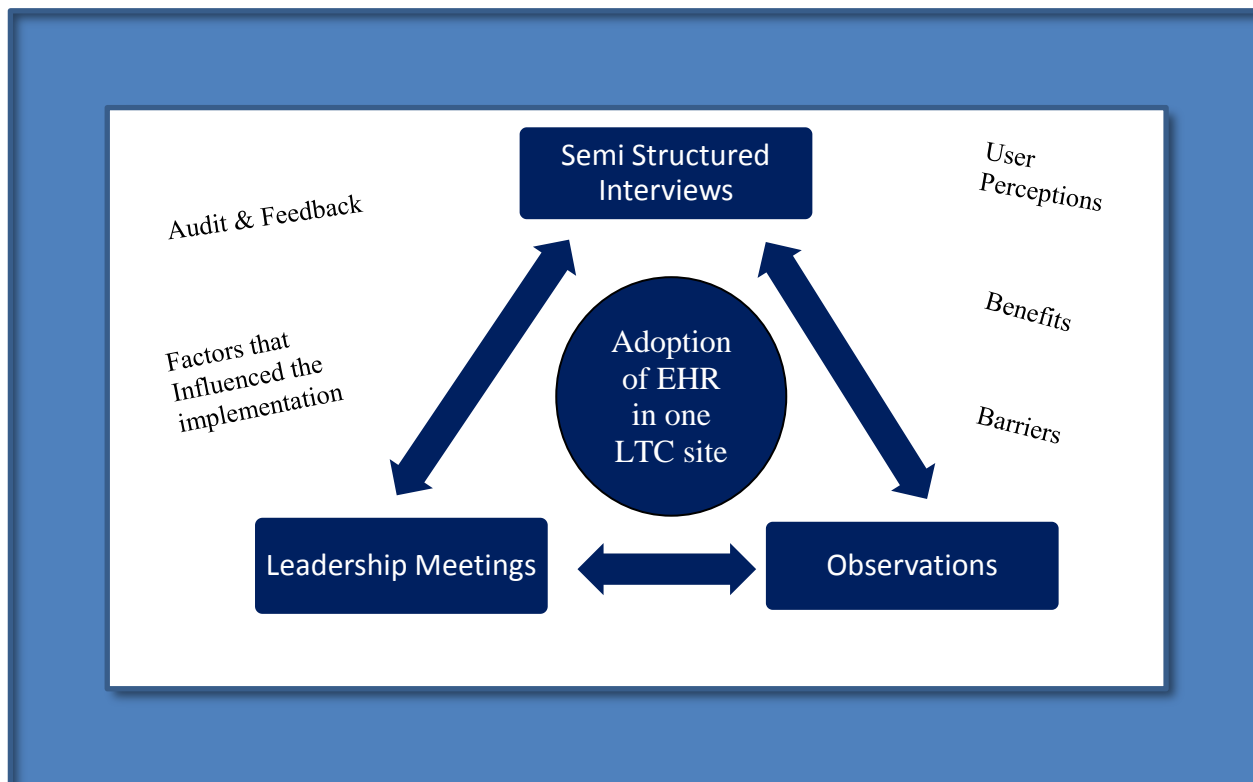


Figure 4.1. Conversion of Evidence with Emerging Themes.

Four themes were found from the convergence of data from three sources (interviews, observations, and leadership meetings). These themes were benefits, barriers, factors that influenced the implementation, and user perceptions. Another theme was found from the convergence of data from two sources (interviews and leadership meetings). This theme was audit and bi-directional feedback. These five themes from the convergence of the data are discussed in the following sections.

Benefits

The first theme was benefits. The system was easy to use with multiple examples given during the interviews, leadership meetings, and observations.

Examples of benefits from interviews included increased communication, the ease of finding information, legibility, the helpfulness of alerts, faster data entry, and that it was easier for physicians to view and change orders. The leadership identified that the system was easy to use because everything was right there for them.

Examples from observation data supported the perception that the EHR system was easy to use. The EHR alerts notified the staff that care was required, resident identification was made easy with pictures, and the nurses were able to write notes from the medication administration record that directly fed into the progress notes. Other benefits were that fewer steps were necessary to complete required documentation, there were summary sheets for an overall review of the resident status, data entry was quick when using icons and radial buttons, and EHR features included spell check.

The primary EHR technology interfaced with the pharmacy. Nurses reported that this interface was helpful. They could communicate with pharmacy by using electronic notifications for refilling medications. It was observed that nurses also used this feature for clarifying resident medication information. The leadership offered that the interface with pharmacy provided faster turnaround with medication delivery.

Barriers

The next major theme was about barriers that staff encountered when using the system. Nurses discussed that order entry was cumbersome, slow and required multiple steps. To send medication orders to the pharmacy with the EHR additional steps were required. Medication order entry included the need to acknowledge alerts, provide an electronic signature, review the order for accuracy, and to scan the paper order into the EHR system.

Another barrier was the reliability of the computers and system (inconsistent performance, slowness of the network, and the system not being available at all times). During the interviews and observations, the inadequate reliability caused frustration for the users. Leadership and staff indicated that the computers were slow and broke down. Frequently nurses and CNAs were “booted out” of the system, and data were lost requiring data re-entry. The researcher observed that there was an excessive amount of time needed for the entered data to be saved and for the ability to move the screen to the next patient. Leadership meetings found no solution for this barrier. Therefore, these barriers appeared to become second nature and accepted as routine by the staff.

Ergonomic challenges were noted during observations. The nurses adjusted computer screens from their original placement. This action moved the monitor screen to a better level and allowed for more room to prepare medications. When using the kiosks, CNAs used a keyboard and mouse. These changes allowed the CNAs to be seated during documentation instead of standing.

Staff did some workarounds when using the EHR. The researcher observed blocks in the technology which prevented obtaining information quickly from the EHR screens. This resulted in the caregiver writing critical information on paper. Staff reported that workarounds were used, so they did not forget to chart information at a later point in time. Paper notes were used to collect key resident information that was entered later into the EHR. Nurses used a pink manual to identify when required documentation was needed versus viewing the actual electronic record. Other workarounds included writing notes to remind the nurse when documentation was

required when alerts were illuminating too quickly. Other paper notes included reminders for medication renewals and critical information such as vital signs.

During interviews, nurses indicated that the system promoted the confidentiality of resident information. However, during medication administration and nursing documentation, there were some observations of breaks in patient confidentiality. For example, resident care screens were left unattended and viewable by other individuals by the failure of the user to log out. This was done to avoid taking the time to log back in after being away from the screen.

Factors that Influenced the Implementation

A number of factors influenced implementation of the EHR. Communication strategies, training, and problem-solving were consistently found across three data sources as major factors that influenced implementation and thus the adoption of the EHR. Communication strategies discussed by informants during the interviews included auditing, fliers, manuals, posters, cheat sheets, meetings, and letters in paychecks. During attendance at an administrative meeting, a discussion involving central audits on care plans, a decline in restorative orders, and absence of referrals was witnessed. Managers developed plans for improvement during the meeting which included following-up by sharing this information with nurses.

During interviews, training strategies were identified as being important. Multiple methods for training were used such as didactic classroom sessions, hands-on practice, and scenario-based sessions. Training was ongoing at this site and was discussed in the daily administrative meeting. The facility administrator raised the concern that care plans were not being completed correctly and elder abuse documentation was not

occurring with further education discussed as a means to get this information to the staff. The Administrator had completed a facility-wide catheter care audit. The managers and nurse educator discussed an education plan for reinforcing the need for this care. They included the required electronic documentation as a component of the education.

Another factor was the support and problem solving that occurred. In interviews, staff discussed leadership as being supportive during go live. They also said they could approach leadership for assistance. Additionally, they discussed how the team assisted each other by showing each other the functions. Team members would even write out the steps so that their peers could have a reference. Teamwork was observed during nursing documentation with one nurse showing another how to more quickly complete entry of a physician order. Finally, a manager came to the unit to support the staff by completing Medicare charting.

Users' Perceptions

The next theme was users' perceptions about the benefits of the technology. These perceptions were shared during interviews, leadership meetings, and observation sessions. During interviews participants stated the system was "easier, convenient, likes it, nothing wrong with the system!" Leaders discussed how staff "likes the system." Leaders shared how they found the system was easy to use when seeking information. During observations, similar comments were offered. When observing a nurse during medication administration, she offered that the system was "easier than paper, keeps the nurse "on queue" during medication delivery. Certified Nurse Aides' perceptions

were that the POC system is fast. Additionally, there was faster communication with the nurses because they could review the CNAs' charting immediately.

Audits and Bi-directional Feedback

One theme that converged from two data sources (interviews and leadership meetings) was that nurses, CNAs, and leadership were being informed by audits and bi-directional feedback. Informants discussed that auditing occurred each morning by the DON who gave them feedback on how to improve their documentation. Additionally, it was observed that as the DON did the audit she called the unit immediately when she found missing documentation. The DON also discussed that she audited physician signatures, called the physicians weekly to ask for signatures when they were missing, and asked when signature documentation would be completed.

Key Findings from Case Study

This study describes the implementation and overall adoption of the EHR technology at one LTC facility. The study revealed that the system was being used for documenting the residents' daily care including necessary orders for their care. The care providers were positive about the technology and found it easy to use. Based on the integration of data across three data sources (interviews, observations, and leadership meetings) the EHR was not fully adopted by this LTC facility. For example, some functionality was not frequently used (e.g. undefined assessments). Informants discussed workarounds during interviews and observations of workarounds. Workarounds were used because some functions were not easy to use. A nurse reported it was faster if she writes down physician telephone orders on a piece of paper. She then enters them in the system. During observations, it was noted that staff used

workarounds during medication administration (3% of comments), nursing documentation of resident care (19% of comments), and CNAs documentation of resident care (3% of comments). Other studies have found the use of workarounds to try and solve a problem when using the EHR. The workaround was used to overcome a workflow block (Rogers, 2003; Schoville, 2009; Vogelsmeier et al., 2008).

Nurses and CNAs identified several barriers to the system. These barriers were: system reliability, ergonomic challenges, workarounds in some areas (such as the use of paper for critical resident information), and use of paper ulcer logs to remind staff to complete these assessments. Confidentiality breaches were noted during some of the observations. Resident confidentiality is an important item to include with EHR training during the initial implementation and should continue to be a focus.

At this facility, a variety of communication strategies were used to promote implementation and use of the EHR including staff meetings, posters, manuals, and cheat sheets. Continuing communication is critical to the successful implementation and the adoption. To provide continuing education this facility used formal auditing, training programs, and feedback to improve quality and safety. The importance of communication strategies has also been discussed in technology implementation studies (Armer, Harris, & Dusold, 2004; Brandeis et al., 2007; Cherry et al., 2009). In conclusion, adopting a complex EHR technology occurs over several months or even longer. Leadership must continually reinforce the proper use of the system along the journey to total adoption.

Discussion of Findings

The implementation of healthcare technology in a LTC facility is a complex process with many synergistic variables that lead to adoption. This study supported the first proposition that there are many implementation factors influencing adoption of a complex technology like an EHR. Some of these factors included communication strategies, leadership responsibilities, teamwork, training, support, and problem solving, benefits, and barriers.

This study revealed that a variety of communication strategies were utilized at all levels of nursing staff. These strategies included corporate and staff meetings, cheat sheets, posters, and letters in staff paychecks. Ongoing communication with auditing and follow-up was necessary to let the nurses and CNAs know how they were doing. These are similar findings to those of other LTC technology implementation studies (Armer et al., 2004; Brandeis et al., 2007, Cherry et al., 2009).

It is important that leadership is committed to the adoption process and has actual experience using the system. Several leadership strategies were utilized at this facility. They were policy and procedure changes, visibility, positive attitude, willingness to help with training, offering assistance with entering data, and providing on the spot teaching. Discussion of the EHR at leadership and staff meetings was ongoing. Documentation forms were changed when necessary. Equipment needs were determined. Other studies have found the importance of leadership involvement for the system to be assimilated into the LTC facility (Greenhalgh et al., 2005; Jarvis-Selinger, Chan, Payne, Plohman, & Ho, 2008; Newman, Gaines, & Snare, 2005; Scott-Cawiezell et al., 2009).

Another factor was that at this facility there was a high degree of teamwork. Team members would show each other functionality and easier processes to use. They helped each other to complete EHR function. Graetz (2012) found that the teams with strong relationships were able to leverage the EHR to achieve greater improvements in care. Team functioning is an important factor of the effect of EHR use. Another study found team functioning had the greatest impact on the effective use of a technology innovation (Gosling, Westbrook, & Braithwaite, 2003).

Initial and on-going education influenced adoption. Strategies included using scenario-based instruction, hands-on instruction, providing a practice environment, and small classroom sizes. Sufficient time to learn the system before implementation was provided at this facility. The staff believed they had adequate time for learning. Cherry et al. (2009) found the importance of providing hands-on scenario-based education. The importance of hands-on scenario-based education was also identified in this study.

The second proposition was that certain aspects of the EHR led the nurses and CNAs to adopt the technology. The study revealed that adoption is affected by benefits and barriers when using the EHR. The study illustrated multiple system benefits. First, the system was easy to learn and use. Mohamoud et al. (2009) found that systems must be easy to learn and use or the complexities will lead to underutilization of the system. The system was multidisciplinary, information was easy to find, and fewer steps were needed to complete electronic documentation. Other benefits were that the system was organized and increased communication between providers (Cherry et al., 2009). Brandeis et al. (2007) had similar findings of improved communication between providers when using the EHR.

There were several key barriers when using the EHR, which were identified in this study. These barriers affected nursing practice by slowing down care delivery. The barriers included the poor reliability of computers as evidenced by frequent slowness or the system being unavailable. Many long-term care facilities use EHR systems that are accessed over the internet with the vendor managing the daily database utilities (Cherry et al., 2009). Facilities often choose this type of system, which is less costly than maintaining a system requiring a technical infrastructure and staff to be available on site (Cherry et al., 2009). Corporate LTC facilities might need to consider that the drop in productivity and the use of unsafe workarounds may outweigh the cost of bringing a stand-alone system into their facilities. The facility leadership should initially work with the vendor to determine signal strength on the wireless web-based system as this affects speed and connectivity, which may require hardware equipment adjustments (Brandeis et al., 2007). Alexander et al. (2007) found when a facility did not have the on-site technology support it led to slow response times and increased downtimes. The availability of equipment affected staff perceptions negatively and distrust with the response of the system caused worry about lost data.

Kiosk workstations were strategically placed throughout the hallways. Facilities should consider having workstations outside each resident room to enable immediate documentation. Alexander et al. (2007) found that equipment availability issues contributed to staff working overtime which increases expenses to facilities. These workstations must be put in ergonomically acceptable positions to promote the use of touchscreen icons. Cherry et al. (2009) found similar findings with CNAs reporting that

they had to stand to use the kiosk which was tiring, and not enough kiosks were available.

A workaround theme emerged from the data. Workarounds included writing notes on paper and transcribing them electronically later. This researcher believes that access to conveniently located workstations may promote immediate documentation with less use of paper workarounds. Vogelsmeier et al. (2008) had similar findings with the utilization of paper workarounds by staff.

A further challenge was placing physician medication orders electronically. The facility needs to work with the pharmacy vendors to identify key drop down menu options to decrease the number of steps and ease the process of placing orders in the system. Other researchers have found similar barriers with software design, navigation problems, lack of interoperability and workflow barriers (Ash & Bates, 2005; Cherry et al., 2009; Smith, Smith, Krugman & Oman, 2005; Valdes, Kibbe, Tolleson, Kunik, & Petersen, 2004). In summary, this study demonstrated that there are many implementation factors, and the actual benefits and barriers of the technology will influence the adoption of the EHR system.

Implications

Long-term care is a growing field within healthcare due to the population changes in the United States. The numbers of aging people requiring LTC is steadily growing thereby increasing the importance of LTC services. With the increase in demand for these services, there is a national interest in improving the cost and quality of care for the aging population. The importance of implementing an EHR is to improve healthcare practices, improve patient care, increase communication among providers, and reduce

errors. Additionally, there is an interest in integrating LTC facilities to other types of healthcare facilities via communication through technology such as the EHR.

The study highlights important strategies to use with technology implementation to promote successful adoption. Understanding technology adoption is central to designing resident safety efforts to meet national healthcare priorities. Future nursing research should focus on additional technology implementation studies to increase our understanding of all factors that can influence a successful adoption. Resident outcomes should be used to determine if the technology is adopted to its full potential.

Study Strengths and Limitations

Few studies have investigated technology implementation from a comprehensive approach considering the internal and external factors of an organization. This dissertation study used an in-depth case study approach to understanding the adoption of one type of technology, the EHR at one LTC facility. A variety of groups using the system were interviewed which added strength to the study. Providing further strength was that there were multiple data sources used in the study with multiple days of observations of three key EHR functions. Also contributing were observations from formal and spontaneous leadership meetings. These multiple sources of data broaden the depth of understanding of factors that influence implementation in LTC facilities. Long-term care facilities are increasingly using technology, and this new knowledge can impact future technology implementations.

Constraints in the generalizability of findings exist due to the study being based on one inner-city LTC facility and the reliance on English-speaking participants. The act of observation may have influenced the nurses' and CNAs' behavior when using the

EHR. The study design did not provide the opportunity for residents and other types of clinicians (e.g. physicians, pharmacists) to offer their perspective.

Conclusion

This is the first case study, to the author's knowledge, that examined the adoption of an EHR technology in one LTC facility. Electronic health record implementation is a complex process with many synergistic variables which may or may not result in the nurses and CNAs adopting the technology. The study focused on the implementation factors and the use of the EHR system to understand what led the facility to adopt the technology. Although this case study is a snapshot in time, it provides administrators, educators, policy makers, implementers, and EHR developers information for future technology development and implementation strategies. The study will assist informatics nurses to analyze factors that may impede or enhance the introduction of technology to in health systems and the people who will be using it. It is imperative that the EHR functions be easy to use to support the nurses and CNAs in their adoption of the system. Future research is needed to validate key themes and to ensure that other themes are not present.

Appendix 4A

Electronic Health Record Interview Guide

Implementation Factors that influence the Nurse's Adoption of an EHR Technology: A Qualitative Investigation

Semi-Structured 1:1 EHR Interview Guide

SECTION 1: Gaining Informed Consent

Thank you for support in this Electronic Health Record implementation research (EHR). This 1:1 interview is going to be focused on your recent experience with the EHR implementation. The 1:1 interview will take approximately 60-90 minutes.

Your participation and responses will be kept confidential and all of our findings will be reported anonymously. This 1:1 interview will be audio recorded for later data analysis and publishing the results in an aggregated format. You may choose not to answer any discussion question and you can stop your participation in the 1:1 interview at any time.

Next, I would like to review the informed consent document. I will first give you time to read the consent form and then I can answer questions. If you agree to participate in this study, you will need to sign two copies. One copy will be for your records and one for mine. [Hand out the consent form and respond to questions.] If the participant signs the consent form the interview will begin. If the form is not signed, the participant will be thanked for their time and will be asked to leave the interview. The following is the 1:1 interview script.

SECTION II: Introduction

- Researcher:** There is no right, or wrong answers. The interview will be audio taped so be sure to speak up so that we can hear you on the tape. I hope you will find the session interesting and enjoyable.
Tell me your name, age, level of education, your position, how long have you worked in this type of position, how long you worked in long-term care, how long you have worked here?
- Respondent:** Possible responses
- Researcher:** Describe what types of technology you use at home or work.
- Respondent:** Possible responses.
- Researcher:** Please describe the amount of experience you have with using technology to provide patient care.
- Respondent:** Possible responses
- Probes:** Tell me the type of technology and how often it has been used.
- Researcher:** What motivates you to learn something new?
- Respondent:** Possible responses
- Probes:** Such as watching others; written instructions; listening to others; trying it.
- Researcher:** What do you see or experience as benefits of using the EHR?
- Respondent:** Possible responses
- Researcher:** Tell me about what individual factors posed barriers to transitioning from paper to the EHR.
- Respondent:** Possible responses
- Researcher:** Describe any emotions (sources of stress, strain, or conflict) you experienced in the transition from paper to the EHR.

- Respondent:** Possible responses.
- Researcher:** Describe all the functions of the EHR you are currently using.
- Respondent:** Possible responses
- Researcher:** Describe the available functions that you do not use
- Respondent:** Possible responses
- Researcher:** Help me understand reasons for not using these functions.
- Respondent:** Possible responses
- Researcher:** Please describe how your peers were supportive when using the EHR.
- Respondent:** Possible responses
- Probes:** Tell me how your peers assisted with helping you to learn the new EHR
- Researcher:** Tell me what residents think about nurses using the EHR to document their care.
- Respondent:** Possible responses
- Researcher:** Tell me what physicians (other Healthcare providers) think about nurses using the EHR to document resident care.
- Respondent:** Possible responses
- Researcher:** Describe to me what things (factors) helped you or the organization to decide to use the EHR. What factors influenced implementing the EHR here at XXX.
- Respondent:** Possible response.
- Researcher:** Given the economic environment describe any other things that helped you (and the LTC facility) to decide to use this EHR.
- Respondent:** Possible responses
- Probes:** For example, was there any funding/money given to your LTC facility (economic incentives) to use to purchase this EHR?
- Researcher:** Tell me about how the decision to use the EHR was made at your facility?
- Respondent:** Possible responses
- Probes:** For example, who made the decision? Did you participate in making the decision and if so how?
- Researcher:** Tell me how the EHR implementation went.
- Respondent:** Possible responses
- Probes:** Tell me more about what you mean by xxx? What about implementation of the EHR worked well or went well.
- Researcher:** Describe who took lead in (implementing) helping you use this new EHR.
- Respondent:** Possible responses
- Researcher:** Now, tell me what they did.
- Respondent:** Possible responses
- Researcher:** Tell me if anyone came on site that helped with implementing the EHR? Tell me what they did.
- Respondent:** Possible responses
- Researcher:** What other things (strategies) could have been done to support you during the implementation?
- Respondent:** Possible responses.
- Researcher:** Describe how your LTC facility prepared for implementing the EHR.
- Respondent:** Possible responses
- Probes:** Please tell me what strategies were used for implementing the EHR.
- Researcher:** Describe how the leadership has been involved with the implementation of the EHR.
- Respondent:** Possible responses
- Probes:** For example, what organizational structures influenced your transition, for example, was the mission and vision statement changed? Describe the resources leadership provided for this change (role, money, etc.). Describe any policies or procedures that have been revised.
- Researcher:** Describe any new roles that may have been developed.
- Respondent:** Possible responses

Probes: For example, describe any roles such as super-users,
Researcher: Describe what these roles have done to assist with the EHR implementation.
Respondent: Possible responses
Researcher: Now, describe what strategies that they may have used.
Respondent: Possible Responses.
Researcher: How are these roles being used now?
Respondent: Possible responses
Researcher: I want to ask how you learned to use this EHR.
Respondent: Possible responses
Probes: Tell me how you learned about the benefits. Describe what the leadership communication was to promote you to use the EHR.
Researcher: Describe strategies (or actions) that were used to train on how to use the EHR.
Respondent: Possible responses
Probes: For example, emails, posters, hands-on experiences, etc.
Researcher: Describe what the barriers were to learning the EHR.
Respondent: Possible responses.
Researcher: Tell me how barriers were resolved.
Respondent: Possible responses.
Researcher: Next, tell me about the ongoing support available to you to help you use and learn new features of the EHR.
Respondent: Possible responses
Probes: Tell me more about the support during the implementation. Now tell me about the support after implementation (vendor, HELP desk, others). Tell me what support is available on off shifts. Tell me about how you learned of any policies that changed since the EHR being used.
Researcher: Tell me how feedback about the system use is given and received.
Respondent: Possible responses
Researcher: Tell me what is done with this information.
Respondent: Possible responses
Probes: Please describe any user feedback review sessions after the EHR was implemented. What was done with the information from the review sessions? Tell me about any auditing of patient care using the EHR. How was this information been addressed with you?
Researcher: Please tell me all the ways you use the (functions or parts/meds/assessments/POC) new EHR.
Respondent: Possible responses
Researcher: Tell me how using EHR has impacted how you delivery care to the patient.
Respondent: Possible responses
Probes: Describe to me if there are fewer steps to complete this task. Are these steps chronological and make functional sense (or do you have to repeat many steps).
Researcher: What strategies were used to understand the actual steps of completing the work using the EHR?
Respondent: Possible responses
Researcher: Tell me about a typical day using the EHR and how this has changed from using the paper documentation.
Respondent: Possible responses
Probes: Please describe the steps before implementation. Now describe the steps after implementing the EHR.
Researcher: What functions are easy to use?
Respondent: Possible responses.
Researcher: Which functions are not easy to use?
Respondent: Possible responses.
Researcher: Please describe areas of the EHR that cause you to experience emotions (frustration, anger or anxiety) when trying to use them.
Respondent: Possible responses
Researcher: What is the most difficult task for you to do with the EHR?

- Respondent:** Possible responses.
- Researcher:** Please tell me if you have stopped using any feature because it was too hard to figure out.
- Respondent:** Possible responses
- Researcher:** Tell me about if the resident information is readily available and easy to find (navigation).
- Respondent:** Possible responses
- Researcher:** Tell me how EHR problems are resolved.
- Respondent:** Possible responses
- Probes:** Who helps you with the EHR when you are having trouble?
- Researcher:** Describe any workarounds that may have been developed.
- Respondent:** Possible responses
- Researcher:** Describe what activities the EHR vendor did before implementation.
- Respondent:** Possible responses
- Probes:** For example, did the vendor complete testing of equipment? Tell me how. Tell me what other activities the vendor completed for example they provided education. Others?
- Researcher:** Describe how the EHR vendor guaranteed the EHR to ensure:
- stability
 - accuracy
 - and, security
 - Working
- Respondent:** Possible responses
- Probes:** Tell me how the vendor responds to equipment needing maintenance (i.e., broken parts).
- Researcher:** Now tell me what they (vendor) did after implementation.
- Respondent:** Possible responses
- Researcher:** I want to ask about if the EHR vendor still continues to come on site to provide support in the use of this new EHR If yes, tell me how.
- Respondent:** Possible responses (no, or yes)
- Researcher:** Describe how the EHR works with other devices (or software).
- Respondent:** Possible responses
- Probes:** For example tell me if you have experienced the EHR not being unavailable, or experience connectivity problems with pharmacy, how often?
- Researcher:** Can you describe how this EHR will impact your site survey.
- Respondent:** Possible responses
- Probes:** For example, does this EHR assist with meeting patient care standards for the Centers of Medicare and Medicaid services? Describe how the MDS is more or not accurate.
- Researcher:** Describe if any cost efficiencies (productivity) have been realized, for example using less staff.
- Respondent:** Possible responses
- Probes:** Please describe any changes in staffing with using the EHR.
- Researcher:** To wrap up, what other things (strategies or actions) would you like me to know about the EHR implementation that we have not covered.
- Respondent:** Possible responses
- Researcher:** *Thank you very much for participating in the study. Before we finish, do you have any questions or concerns or anything else you would like to share about the EHR implementation?*

Appendix 4B
Medication Administration Record Observation Data Collection Tool

Date				Comments: Document workflow (operational use) and identify themes and significant points such as what works well and what needs improvement (i.e., barriers, ease of use, workarounds, patient safety)
Event:		MAR		
Start Time		How are direct-care nursing users (RNs, LPNs) using the EHR technology during delivery of resident care when administering medications?		
End Time	View		Input	
User Type (RN; LPN)		Logs in and out		
		Identifies resident		
		Order		
		Labs		
		Vitals/In-put/Output		
		Allergies		
		Medications-		
		Reviews MAR		
		Verifies Order		
		Due		
		Given		
		Not Given – reason documented		
		Self-administered drugs		
		Dual signoff (if appropriate)		
		Documents outcome (pain relief)		
		Views electronic resources (Micromedex)		
		Acknowledges Alerts/notifications		
		Other:		

Notes. Function alerts are indicated by colors which are Green means completed; Yellow means due; Red means late; White means PRN; Workaround examples include using someone else’s sign-on, not checking patient ID, over-riding alerts, preparing more than one patients meds, not using the MAR at the bedside.

Appendix 4C Nursing Documentation Observation Data Collection Tool

Date:				Comments: Document workflow (operational use) and identify themes and significant points such as what works well and what needs improvement (i.e., barriers, ease of use, workarounds, patient safety)
Event: Start Time End Time	View	How are direct-care nursing users (RNs, LPNs) using the EHR technology to document nursing care including assessments?	Input	
		Logs in and out		
		Identifies resident		
		Reviews dash board		
		New Admit -Nursing Evaluation completed		
		Height		
		Weight		
		Vital signs		
		MAR & TAR reconciliation from the hospital (i.e. ,flu and pneumonia immunizations)		
		Inventory sheet (dentures, hearing aids, resident money)		
		Admission care plans on new admits (skin, fall, pain, ADLs, Bowel & bladder)		
		Nursing note is generated every shift x 72 hours than according to acuity and scheduled (NH=weekly, Acute Rehab daily)		
		Uses appropriate assessment drop down*		
		Reviews UDA on the unit (Undefined Assessment that are due for that day)		
		Care plans		
		Progress notes entered per patient type (some data is pulled from other areas of the record i.e., MAR)		

Notes. *Assessment: Pain, head to toe, devices, restraints, ROM for restorative, Edu & family education, SBAR, smoking, wound and healing records, elopement); Function alerts are indicated by colors which are Green means completed; Yellow means due; Red means late; White means PRN; Example of workarounds using someone else’s sign on, uses an UDA versus the appropriate assessment.

Appendix 4D Point-of-Care Observation Data Collection Tool

Date Event: Start Time End Time	View	How are direct-care nursing users (NA) using the EHR technology to document point- of-care activities of daily living?	Input	Comments: Document workflow (operational use) and identify themes and significant points such as what works well and what needs improvement (i.e., barriers, ease of use, workarounds, patient safety)
User-NA		Logs in and out		
		Identifies resident		
		Point-of-Care		
		Weights		
		Transfers		
		Vital signs		
		Shower/bathing (scheduled 2x/week)		
		Ambulation		
		Eating (amount)		
		Toilet use (continuance)		
		Snacks		
		Restorative Rehab (activities-walking)		
		Bed mobility (turning)		
		Kardex (Demonstration of finding information they use)		
		Other:		

Notes: Function alerts are indicated by colors which are Green means completed; Yellow means due; Red means late; White means PRN. Workarounds may include using someone else's log-in, charting at the end of the shift, not checking kardex for new patients just starts delivery of care.

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CHAPTER 5

Summary, Conclusions and Recommendations

There is little understanding of how long-term care (LTC) facilities select, implement, and adopt a technology. The purpose of this dissertation was to explore and gain insights into the perceptions and experiences of LTC facility nurses (RNs and LPNs), Certified Nurse Aides (CNAs), and nursing directors who were involved with the implementation of a specific technology – the electronic health record (EHR). There were two ultimate goals for this dissertation. The first goal was to discover the individual's perceptions about the implementation strategies that were used to promote adoption of an EHR (Chapter 3). The second goal was to describe from a systems perspective, using a case study approach with data from three sources (staff interviews, observations, and leadership meetings), perspectives about implementation and adoption of an electronic health record at one LTC facility (Chapter 4).

Based on the synthesis of technology adoption and implementation science models and associated studies, the Integrated Technology Implementation Model (ITIM) was developed and described in Chapter 2. The model integrates a variety of factors internal to a healthcare setting and in the environment external to the setting to promote technology adoption in healthcare. A paper describing this model, derived from this dissertation, is published in *Computer, Informatics, Nursing Journal* (Schoville & Titler, 2015).

Chapter 3 describes the initial exploration, at three long-term care facilities, of factors that contributed to the implementation of a specific technology – the electronic health record. An exploratory study used grounded theory methods to analyze the implementation strategies perceived by 30 stakeholders shared during focus groups and interviews.

Grounded theory methods were used to enhance the understanding of the real world of implementation based upon the perceptions of nurses, certified nursing assistants, and directors of nursing working in these three LTC facilities. The study found five major themes that were each supported by several minor themes. These major themes were: (1) motivation and adoption decisions, (2) factors that influence the implementation, (3) users and leadership are informed by auditing and bi-directional feedback, (4) benefits of using the technology, and (5) opportunities for improvement of the EHR. Major themes did not directly map to the ITIM concepts. However, minor themes within each major theme were mapped to the ITIM concepts. Findings from this study supported the factors in the ITIM with the exception of one concept in the ITIM - workflow. Based on the findings from this study the concept of workflow was broadened to the concept of work processes in the ITIM to include workarounds, workflow, workload, and downtime (see Figure 5.1 and Table 5.1). Mapping of the minor themes resulted in good support for the majority of ITIM internal concepts except interfacing systems. Support is evidenced by multiple minor themes mapping to these concepts and only one minor theme mapping to the concept of interfacing systems. The support of the external concepts in the model is less robust as evidenced by only one or two minor themes mapping to these concepts (accreditation agencies & regulations,

economic environment, vendor). The ITIM represents the facilitator, with linkages between the internal and external context, as boundary spanners to facilitate implementation. The facilitator concept only had one minor theme that was key personnel. Further research is needed to support the internal concept of interfacing systems and the outer context concepts of the ITIM.

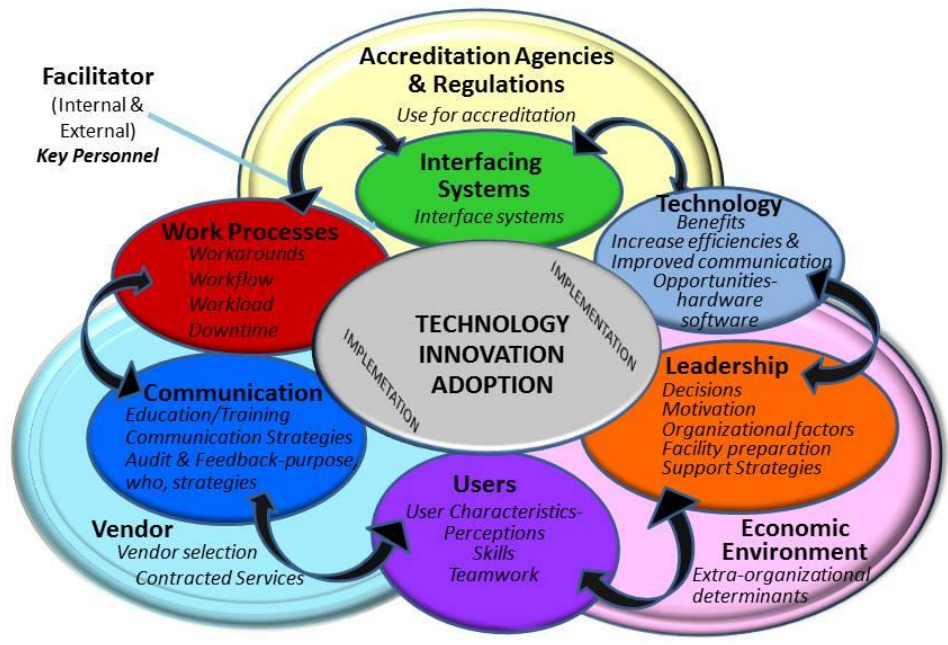


Figure 5.1. Final Integrated Technology Implementation Model.

Table 5.1

Final Integrated Technology Implementation Model (ITIM)

Concepts	Definition
Inner Context (context)	Organizational context that influences the adoption, spread, and sustainability of the technology innovation through active implementation strategies
Technology/Innovation Adoption (D)	When a user is introduced to a new technology and begins to use it routinely and fully when delivering patient care

Implementation	The path to identify specifications, creations, and installation of technology, organizational readiness and active implementation strategies including: users' attitudes are changed, skills are built, policies/procedures for each of the components are defined and executed
Technology	<p>Technology innovation is a device that is used when delivering patient care and usually has two components:</p> <p><i>Hardware</i>-tool that embodies the technology as material or physical object</p> <p><i>Software</i>-provides information & knowledge</p> <p><i>Characteristics</i> include the relative advantage, complexity, compatibility with norms, values, perceived need, trialability</p>
Interfacing Systems	Supplementary technology that interfaces or communicates with the new primary technology (innovation)
Work Processes	The sequence of and the amount of activities with use of technology to achieve quality patient care for the resident
Users (Adopters)	<p>Individuals that are in a social system (i.e., LTC) that the technology is targeted to be used by for delivering care may include RNs, LPNs, aides, physicians, pharmacists, administrators, Directors of Nursing, clerks, and patients</p> <p>Characteristics include users' education preparation, profession, context of the work environment, experience with using technology</p>
Leadership	Roles, specific responsibilities, and required activities (executives, managers, consultants) that promote technology adoption
Communication	Is the process of sharing information in with a targeted social system using a variety of strategies that include interactive education programs, written communication, communication roles & networks, audit & feedback
<i>Outer Context (context)</i>	Processes and factors external to the organization that have a synergetic relationship to the internal factors affecting a successful technology implementation. These include: accreditation standards, the economic environment, regulatory requirements, vendor, technical environment changes
Accreditation/Regulation	An official agency (external force) that identifies criteria to meet established standards that influence the adoption of the technology
Economic Environment	The extra-organizational economic determinants that affect the organizations innovativeness such as the changing economic and political

	environment; government sponsored program, business competition, etc.
Facilitators (Boundary Spanner)	A person who assists, directly or indirectly, by providing guidance to the implementation of technology; this person can be internal or external to the organization
Vendor	Any person or company which represents, sells and services the technology which may/or may not be the innovator; commitment of the vendor to assist and support the facility operations (quality, knowledge, resources, costs); experience with implementing the technology; etc.

Note: D=dependent variable; LTC=long-term care.

Chapter 4 examined the adoption of an EHR technology in one LTC facility. An in-depth case study approach was used to gain information about implementation leading to adoption of the EHR. The study used three sources of data: staff interviews (RNs, LPNs, and CNAs), observations of major documentation functions (documentation of medication administration, nursing documentation, and CNAs point of care documentation), and attendance at formal and spontaneous leadership meetings. Integration of the data sources provided an in-depth understanding of implementation of the EHR at this facility (Yin, 1999). Four major themes converged on three data sources (interviews, observations, leadership meetings) which included benefits of the EHR, factors that influenced the implementation, users' perceptions, and barriers. The major theme of audit and bi-directional feedback converged on the two data sources of interviews and leadership meetings. Based on the integration of the three data sources, it was concluded that the EHR was not fully adopted. Some of the functionalities were infrequently used (e.g. undefined assessments) while other functions were not easy to use resulting in workarounds. During observations, staff using workarounds were noted during medication administration (3% of comments), nursing documentation of resident care (19% of comments), and CNAs' documentation of resident care (3% of comments).

Similar workarounds were noted in Study 1. Study 2 demonstrated that multiple factors influenced implementation and the subsequent adoption of the EHR into daily practice.

Discussion of Findings

What was unique about this dissertation is that the study investigated organizational and individual factors to understand how LTC facilities and staff adopt a new EHR technology. The study reviewed technology adoption and implementation models and relevant LTC science. From this review, a new Integrated Technology Implementation Model (ITIM) was developed.

This investigation and previous long-term care studies have found that overall, participants are positive about EHR implementations and the technology (Alexander, Rantz, Flesner, Diekemper, & Siem, 2007; Cherry, Ford, & Peterson, 2009; Cherry, Ford, & Peterson, 2011; de Veer, & Francke, 2010). Participants in both Studies 1 (Chapter 3) and 2 (Chapter 4) of this dissertation discussed the EHR systems were easy to use. However, they identified improvements that could enhance their experience. For example, some nurses and CNAs felt the system was not reliable. These findings are similar to other LTC studies (Alexander et al., 2007; Cherry et al., 2011).

Cherry et al. (2009) found that interoperability was linked to better coordination of care leading to improved quality outcomes. This dissertation study found that a benefit of the system was the interface with pharmacies that nurses found helpful for coordinating resident medications. Some participants wanted the EHR system to be integrated with the local hospitals so that they could review a resident's hospitalization information.

Several previous LTC studies discussed increased workload (Alexander et al., 2007; Bryne, 2005; de Veer & Francke, 2010) and others discussed changes in workflow when using the EHR (Byrne, 2005; Cherry et al., 2009; Vogelsmeier, Halbesleben, & Scott-Cawiezell, 2008). Some participants in this study discussed that workload increased; all discussed the use of workarounds and downtime processes for when the system was not available. This dissertation study found that overall workflow did not change. The ITIM was revised from the findings of this dissertation to reflect an internal context concept of work processes that encompasses workarounds, workflow, workload, and downtime.

Another factor this dissertation study discovered was that leadership was committed to the adoption decision and regularly used the system for auditing to provide feedback. Multiple LTC studies have found the importance of leadership involvement including auditing and feedback for the success of integration of the EHR into organizational processes (Greenhalgh, Robert, Bate, Macfarlane, & Kyriakidou, 2005; Jarvis-Selinger, Chan, Payne, Plohman, & Ho, 2008; Newman, Gaines, & Snare, 2005; Scott-Cawiezell et al., 2009; Teigland, Gardiner, Li, & Byrne, 2005).

Several LTC studies discuss the importance of education and training (Armer, Harris, & Dusold, 2004; Brandeis, Hogan, Murphy, & Murray, 2007; Cherry et al., 2009). This dissertation study found that communication about implementation was done in a variety of ways through staff meetings, posters, manuals, cheat sheets, in-services, education, and ongoing training. This dissertation study found that the DONs thought communication was being adequately provided while some nurses (RNs and LPNs) and CNAs reported communication was negative, and information was fragmented. Another

negative finding of this dissertation study was that all participants offered that training was not adequate, and they needed more. Also reported in this study was that having hands-on training was most useful to learn the system as opposed to just classroom presentations. Cherry et al. (2009) reported that facilities that provide sufficient education reported lower turnover among staff.

This dissertation found that the ITIM external context concepts (accreditation agencies and regulations, economic environment, and vendor) had less support as evidenced by fewer minor themes as compared to concepts in the internal context of the ITIM. Mohamoud, Byrne, and Samarth (2009) found that the EHR improved communication which was a positive benefit to meet regulatory compliance. This dissertation study found that only some participants were aware of the regulators using the EHR system during their survey. All participants thought the system would make it easy for regulators to find information. With respect to the economic environment concept, Mohamoud et al. (2009) found that there is insufficient funding which is an impediment to the adoption of the EHR. This dissertation study found that participants had little understanding of how the facility chose or funded the technology. With respect to vendor (the company that represents, sells, and services the technology), LTC studies have found that facilities underestimate the need to critically review the product maturity, available functions, and the ability for customization of screens. The product set up, hardware, and technical issues are also considerations that LTC facilities need to address fully (Cherry et al., 2009; Mohamoud et al., 2009). Some studies found that the vendor provided support with education (Alexander et al., 2007; Mohamoud et al., 2009). This dissertation study found that participants were less informed about vendor

selection and ongoing services. Some were aware that the vendor provided education; completed equipment set up and changed the system's electronic forms.

Of particular note in the ITIM is the concept of a facilitator that can be a person internal or external to the facility that helps guide the implementation of the EHR technology. Based on findings from this dissertation, a facilitator is an important concept that impacts implementation and adoption. Prior LTC studies have not investigated facilitators. However, implementation studies have (Greenhalgh et al., 2005). In this dissertation, findings demonstrated that key personnel facilitated the implementation. Facilitators were both internal and external to the LTC facilities. These individuals included the corporate and facility administrators, Directors of Nursing, Directors of Education, Clinical Care Coordinators, super users, and vendors.

Findings from this dissertation support factors important for implementation found in other LTC studies (Alexander et al., 2007; Brandeis et al., 2007; Cherry et al., 2009; de Veer & Francke, 2010; Greenhalgh et al., 2005; Mohamoud et al., 2009; Vogelsmeier et al., 2008). Findings also contributed to the concept of work processes not included in the original ITIM.

This dissertation focused on LTC facilities but does not preclude generalization of findings to other health care settings. Similar findings could be generalized to other healthcare providers within the LTC facility such as frustration with the system being slow or not available. Generalizations cannot be made to their workflow. For example, a social worker would need different types of information to deliver care effectively. This would require screens to be designed for the needs of social workers and the types of services they provide.

In summary, findings from the studies in this dissertation contributed to the knowledge of LTC facility EHR technology implementation and adoption. It was a unique study, as it was guided by and found support for the Integrated Technology Implementation Model. The study provided understanding regarding important organizational and individual factors when implementing technology in healthcare. This dissertation study of complex EHR technology implementations allows for generalizations to implementation of other technologies. The commonality of LTC facilities is that the actual care of residents and documentation requirements are essentially the same. Therefore, the ITIM should serve as a successful framework for implementation leading to the successful adoption of an EHR in any LTC facility. The strategies identified in the study will be transferable to other healthcare settings as all healthcare settings incorporate technology into the provision of patient care. Therefore, the ITIM should also be beneficial for implementation of technology in healthcare settings other than LTC.

Strengths and Limitations

This dissertation was an exploratory study and is a step toward building the science related to technology implementation leading to adoption in healthcare. A strength of the study was the use of grounded theory methodology in three LTC facilities to elucidate perceptions of the implementation of an EHR system. Using three LTC facilities with different types of informants (DONs, nurses, and CNAs) provided the ability to compare and contrast perceptions and related themes among and across informant types as well as the three different facilities. The use of an in-depth case study at one LTC facility with integration of data from three sources (semi-structured

interviews, observations, and leadership meetings) illustrated the implementation and adoption of an EHR technology from an organizational perspective (Patton, 1990).

Study limitations include: (1) a focus on LTC which limits generalization of findings to other types of healthcare settings such as hospitals and ambulatory care; and (2) the case study of only one LTC setting. It is unknown if the findings of this case study will be supported by case studies in other LTC settings or types of healthcare systems. Furthermore, this dissertation did not address technology implementation or adoption as perceived by the residents receiving care in LTC settings.

Recommendations for Practice

There are several practice implications from these dissertation findings. First, leadership being positive and having a clear vision along with being knowledgeable about the technology leads to a more successful implementation (Cherry et al., 2009). The second lesson is that the actual technology must be reliable, the appropriate placement of equipment is important, and the software needs to be intuitive and not cumbersome for use with daily work processes to prevent the use of unsafe workarounds or increasing the workload of the nurses and CNAs (Ash & Bates, 2005; Cherry et al., 2009; Vogelsmeier et al., 2008). Long-term care facilities must develop formal downtime procedures to ensure that data is captured while systems are unavailable. Also, procedures must be developed for regulators to access the system. The software needs to interface with other systems to enhance communication of resident care needs among those internal and external to the facility. Use of a variety of communication strategies is necessary at the beginning and throughout implementation. Comprehensive education is needed using real world scenarios. In addition, ongoing

education is needed to reinforce the appropriate use of the technology and must be provided when the systems are upgraded.

This dissertation's data revealed that care providers wanted to be involved with the software developers to develop technology that integrates with work processes and is easy to use. They also would appreciate the opportunity to recommend enhancements to the technology and software. This is an important lesson for vendors and software engineers. Involving direct-line care providers meets the recommendation of the Institute of Medicine report, *The Future of Nursing: Leading Change, Advancing Health* (2011). The study revealed that designers of healthcare technology should consider workflow and the problem to be addressed before designing the solution. Working with the direct caregivers will give them insight into the problem to be solved.

The technology must be simple without unnecessary complexity requiring a number of steps to complete a function or adding functionality that is nice but will not be used in every day practice (Alexander et al., 2007). For example, a nurse described her experience of using the EHR system as frustrating when trying to find the correct intravenous solution because of the multiple ways the solutions were displayed in the system. Another consideration is that the technology must interface with other systems and be tailored to the user (Cherry et al., 2009). For example, the EHR system could interface with a phone to notify a nurse of an urgent medication or critical blood value both of which would require immediate action by the nurse. Auditing is a critical function for leadership to measure technology adoption and resident outcomes. Reporting functions must be a basic component of healthcare technology. Another recommendation for designers is that the systems must be reliable before they are

marketed and used by facilities. A good example of the EHR system in this study as not being reliable was the frequent unplanned downtime experienced by the staff.

Unplanned downtime was an ongoing frustration. Finally, vendors and designers must provide a technology that is cost effective and focuses on patient safety.

Healthcare facilities need to recognize the importance of nurses being involved with technology deployments and in the ongoing work directed at technology adoption. Nurses' involvement can be achieved through formal ongoing super-user roles and the hiring of informatics nurses. Finally, professional organizations must recognize this important technology implementation work and include education sessions at their regional and national conferences.

Recommendations for Education

Graduate studies in healthcare need to build a broader curriculum that focuses on complex technology implementation for those in nursing leadership roles as well as informatics nurses. The curriculum must be inclusive of the discussion of complex changes within an organization that needs to occur as demanded by technology implementation involving multiple interrelated system variables. Graduate programs must address the development of leadership skills for planning and executing the implementation of technology in a variety of healthcare settings. Skill building can be achieved through course assignments or project management courses. These assignments or courses should explore how the technology will be used to deliver safe care and include an evaluation of the technology (Westra & Delaney, 2008).

Nurses and information technology personnel must have a common language and interpretation of terms to create a mutual understanding and vision of technology in

healthcare. This commonality will enhance the ability to evaluate easily, deploy, and maintain technologies in the practice environment. These curriculums must include internships with informatics leaders for the learner to develop these skills. Core competencies developed by organizations such as the American Nurses Informatics Association need to be integrated into the nursing curriculums for the education of nurses and CNAs in facilities deploying and using the technology.

Graduate and undergraduate programs must address the use of EHR systems in simulation. The EHR is rapidly emerging as a basic tool for delivering patient care throughout the United States. Educational goals should include exploring emerging technology implementation methods and approaches to studying this phenomenon with a focus on quality, safety, and policy development. Graduate and undergraduate curricula should foster the dissemination of relevant technology implementation research findings through education, practice, and consultation.

Recommendations for Future Research

This dissertation has demonstrated the support for the ITIM as a framework for research about technology implementation and adoption in LTC settings. As a result of the increased understanding, experiences, and knowledge from this study, several recommendations for future research are apparent. Additional research is needed to examine the usefulness of this model in other types of healthcare settings such as hospitals, clinics, and home health care agencies. Future research is also needed to test this model in studies that are designed prospectively to promote adoption of a specified technology. For example, the concepts of the ITIM can be utilized as a framework to address all potential factors involved in introducing a new technology

within a given facility. This proposed research would be the testing of the ITIM concepts to determine if their use promotes a more successful technology implementation leading to adoption. Individual concepts of the outer context of the ITIM should be further evaluated such as vendor selection and ongoing services (Piscotty & Tzeng, 2011). Other types of users should be studied such as corporate and facility administrators, pharmacists, physicians, technicians, and patients to further explore their perceptions about technology implementation and use. These perceptions need to be examined and explicated to determine if they are similar or differ from findings demonstrated in this dissertation. Future research should incorporate other types of data in studies that address EHR implementation such as comparing medication errors and comprehensiveness of documentation pre and post implementation.

Policy Implications

As reimbursement changes in health care facilities, it is critical to understand the extra-organizational determinants that affect an organization's innovativeness. It is important for organizations and policy makers to understand how care providers adopt a technology and how this adoption affects patient care. Understanding the impact of extra-organizational determinants will help inform policy makers of how organizations implement and adopt a technology and how the result can impact patient safety and outcomes. Policymakers need to understand that additional support is needed such as government funding for technology implementation. The Institute of Medicine (2011) recommends exploring advanced technology in long-term care to transform nursing practice and improvements in care. This transformation can be more quickly achieved with government policy and funding that focuses on this recommendation.

Conclusion

This dissertation made a significant contribution to the science of technology implementation in healthcare. Using the new ITIM to guide research on technology implementation and adoption in healthcare provides an important understanding of the explicating factors that impacted technology use in long-term care facilities which can be applied to other settings. This empirical understanding is essential to maximize technology applications to improve processes and outcomes of care delivery.

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