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Strategies for Applying Electronic Health Records to Achieve Cost Saving Benefits

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This is to certify that the doctoral study by

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2018

Abstract

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by

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MBA, University of North Texas, 1999

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

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Abstract

The American Recovery and Reinvestment Act (ARRA) of 2009 authorized the

distribution of about $30 billion incentive funds to accelerate electronic health record

(EHR) applications to improve the quality of care, safety, privacy, care coordination, and

patients' involvement in healthcare. EHR use has the potential of saving $731 in costs for

hospitals per patient admission; however, most hospitals are not applying EHR to reach

the level at which cost savings are possible. The purpose of this single case study was to

explore strategies that IT leaders in hospitals can use to apply EHR to achieve the cost

saving benefits. The participants were IT leaders and EHR super users at a large hospital

in Texas with successful experience in applying EHR. Information systems success

model formed the conceptual framework for the study. I conducted face-to-face

interviews and analyzed organizational documents. I used qualitative textual data analysis

method to identify themes. Five themes emerged from this study, which are ensuring

information quality, ensuring system quality, assuring service quality, promoting

usability, and maximizing net benefits of the EHR system. The findings of this study

included four strategies to apply EHR; these strategies include engaging training staff,

documenting accurately and in a timely manner, protecting patient data, and enforcing

organizational best practice policies to maximize reimbursement and cost savings. The

findings of this study could contribute to positive social change for the communities

because EHR successful application includes lower cost for hospitals that may lead to the

provision of affordable care to more low-income patients.

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Dedication

I dedicate this study to my family for their unending support and encouragement.

I dedicate this degree to my wife, my two children, my mother-in-law, my parents, and

my brothers and sisters for supporting me in this endeavor.

Acknowledgments

Acknowledgments to Dr. Alexandre Lazo, Dr. Yvette Ghormley, Dr. Jorge Gaytan and the faculty at Walden University for supporting, encouraging, and guiding me throughout the doctoral journey.

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Section 1: Foundation of the Study

In this qualitative case study, I explored strategies that information technology (IT) leaders in hospitals can use to apply electronic health records (EHR) successfully. IT leaders and EHR super users from a large hospital in Texas participated in interviews for this study. The implications of this study may include the determination of effective strategies for using EHR.

Background of the Problem

The American Recovery and Reinvestment Act (ARRA) of 2009 authorized the distribution of incentive funds to accelerate EHR implementation through the Health Information Technology for Economic and Clinical Health (HITECH) provision (Gold & McLaughlin, 2016). The HITECH provision of ARRA includes incentives of about $30 billion to healthcare providers that adopted and used EHR (Franczak et al., 2014). To qualify for incentives, providers must implement certified EHR systems to meet meaningful use requirements (Thurston, 2014). Hospitals achieve meaningful use requirements by using EHR systems to improve the quality of care, safety, privacy, care coordination, and patients and families' involvement in healthcare (Thurston, 2014). Diana et al. (2014) found 38% of 4,683 hospitals met some level of meaningful use requirements; the rest did not qualify for the HITECH incentives. More than 50% of hospitals experienced EHR failure to achieve efficiency and cost-saving goal (Gleason & Farish-Hunt, 2014).

A vast knowledge exists from studies about EHR topics, such as implementation barriers (Jamoom, Patel, Furukawa, & King, 2014), implementation cost (Bullard, 2016),

and cost savings (Kazley, Simpson, Simpson, & Teufel, 2014). Kazley et al. posited that

majority of hospitals are yet to use EHR to reach the level where cost savings are

possible. Rudin, Jones, Shekelle, Hillestad, and Keeler (2014) argued that there is a

scarcity of studies on application strategies for health information technology for cost

savings, thereby leaving a knowledge gap. The findings of this study may function as a

reference for IT leaders in developing effective EHR application strategies for hospitals.

Problem Statement

Even though EHR use has the potential for $731 cost savings for hospitals per

patient admission, many IT leaders fail to apply EHR successfully (Kazley et al., 2014).

More than 50% of new EHR systems replace existing systems that fail to meet cost-

saving needs of the facilities (Gleason & Farish-Hunt, 2014). The general business

problem is that some IT leaders in hospitals fail to apply EHR successfully. The specific

business problem is that some IT leaders in hospitals lack strategies to use EHR to benefit

from cost savings.

Purpose Statement

The purpose of this qualitative exploratory single case study was to explore

strategies that IT leaders in hospitals can use to apply EHR to achieve a cost savings

benefit. The participants were IT leaders and EHR super users at a large hospital in Texas

with successful experience in applying EHR. Widespread proper EHR application may

lead to improved patient care and patient safety, thereby contributing to positive social

change. Positive social effects for EHR implementation include lower cost of healthcare

for patients (Ricciardi, Mostashari, Murphy, Daniel, & Siminerio, 2013).

Nature of the Study

Researchers use qualitative methods to study phenomena and processes, such as human perspectives, attitudes, and experiences from participants' perspective (Hazzan & Nutov, 2014). A qualitative method met the needs of this study because I intended to conduct an in-depth exploration of experiences to understand complex issues from the participants' perspective. In a quantitative study, researchers analyze numerical data to assess relationships between variables to test a hypothesis (McCusker & Gunaydin, 2015). A quantitative method did not meet the needs for this study because I did not use numerical data to test hypotheses. In mixed methods research, a researcher combines quantitative and qualitative research techniques, approaches, and concepts to achieve synergy benefits (Palinkas, 2014). Hypothesis testing and numerical analyses fell outside the scope of the study because I intended to explore non-quantifiable participants' experiences; therefore, a mixed methods approach remained unsuitable.

A case study design includes the ability to capture in-depth details from participants through interviews in a natural setting (Yin, 2014). A case study approach requires multiple sources of data collection multiple information sources to corroborate research conclusions such as archival records, direct observations, and interviews (Morse, 2015). I selected a single case study design to capture comprehensive details from participants in a natural setting and augment interview data with physical organizational documents to gain different perceptions and to validate data. Other research designs considered included phenomenological and ethnographic approaches. Researchers use a phenomenological design to explore participants lived experiences through extended

interviews as the only source of data, with only one to three questions to obtain in-depth data for reaching a state of epoché (Moustakas, 1994). The phenomenological design did not meet the needs for the study because I explored the participants lived experiences. Ethnographic research involves detailed observational and interview data about a shared culture of a group of people (Yin, 2014). Researchers in ethnography are concerned with people's life story conducted in social settings (Lane, 2014). Because I did not immerse in culture to address the research problem, an ethnographic design was not appropriate.

Research Question

The central research question for this study is: *What strategies can IT leaders in hospitals use to apply EHR successfully to achieve a cost savings benefit?*

Interview Questions:

1. What strategies do you use to ensure information quality such as accuracy, timely, improved access, and up-to-date patient information in your EHR?

2. How do you ensure system quality to address technical limitations of existing infrastructure for maximum EHR effectiveness?

3. What measures do you take to ensure privacy and security of patient health information to improve EHR system quality?

4. What strategies do you use for staff training to assure service quality in your EHR?

5. How do you improve EHR service quality using technical support from your IT department, and vendor technical support?

6. How do you cultivate a positive attitude toward EHR among clinicians and

patients?

7. How do you encourage users to use all available functions of the EHR system?

8. How do you promote the management, physicians, and staff willingness to change the organizational culture for maximum EHR net benefits?

9. What strategies do you use to assure administration efficiency and cost reduction to maximize net benefits for your EHR?

10. What more can you add to this study regarding cost-saving benefits of EHR systems?

Conceptual Framework

DeLone and McLean's (1992) information systems success model (DMISS) formed the conceptual framework for the study. DeLone and McLean developed DMISS for evaluating information systems success in promoting system quality, information quality, user satisfaction, and positive organizational effect. DeLone and McLean used information systems (IS) success as a dependent variable for IS research while independent variables included the characteristics of tasks, users, social, projects, and organizations (Petter, DeLone, & McLean, 2013). In 2003, DeLone and McLean updated the DMISS model to include seven interrelated success variables: information quality, system quality, service quality, use, intention to use, user satisfaction, and net benefits. DeLone and McLean recommended leaders to identify IS success outcomes critical for the IS and to focus on organizational capability, IT infrastructure, and user motivation to promote IS use.

Information quality dimension of DMISS refers to a quality attribute of data that a provider can use a system to store and retrieve such as accuracy, timely, improved access and up-to-date patient information (Petter et al., 2013). The information quality dimension also relates to EHR system's data storage and retrieval attributes. System quality of DMISS refers to an effect to deliver benefits attributable to technical limitations, privacy and security concerns (Nguyen, Bellucci, & Nguyen, 2014). System quality relates to EHR system's technical limitations, privacy and security attributes. Staff training and technical support provided by IT department teams and software vendors influence the service quality dimension (Bossen, Jensen, & Udsen, 2013). The commonly used system functions such as accessing, viewing, and documenting affect the system use dimension (Bossen et al., 2013). User satisfaction dimension refers to attitudes toward EHR by care providers and patients based on usability, reliability, and technical support provided (Nguyen et al., 2014). Net benefits comprise of organizational and individual influences such as the ability to change, the size of an organization and prior EHR experience (Nguyen et al., 2014).

In a study about EHR system after its implementation, Bossen et al. (2013) evaluated information system success based on the DMISS dimensions of information quality, system quality, service quality, intention to use, user satisfaction, and net benefits. Petter et al. (2013) used the DMISS dimensions to explore factors that influence information systems success. Nguyen et al. (2014) found a synthesis of DMISS dimensions together with contingent dimensions, such as systems development and implementation attributes to be useful to understand and evaluate EHR systems. I used

the DMISS conceptual framework as a lens for understanding strategies that IT leaders of hospitals use to apply EHR. I used the DMISS dimensions as a lens to review studies, synthesize the literature review, and analyze findings.

Operational Definitions

American Recovery and Reinvestment Act (ARRA). In 2009, the U.S. Congress passed the ARRA as a response to an economic crisis to create new jobs and saving existing jobs, stimulating economic growth, and imposing accountability and transparency in U.S. government spending (Cunningham et al., 2014).

Electronic Health Record (EHR). An electronic health record a digital version of a patient's paper chart that includes medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory test results. Healthcare providers create, manage and share EHRs among other providers and organizations such as laboratories, specialists, medical imaging facilities, pharmacies, emergency facilities, and school and workplace clinics (HealthIT, 2014).

Meaningful use. The meaningful use term refers to the use of certified EHR systems in ways that measurably improve healthcare quality, safety, and efficiency (HealthIT, 2014). To meet the meaningful use requirements, healthcare providers must use EHR systems to improve the quality of care, safety, privacy, and promote patients and families' involvement in healthcare decisions (Thurston, 2014).

Super user. A super user is a clinician with extensive training on an EHR system and can help the clinical end user to use the system (Penoyer et al., 2014). Super users act as liaisons between end users and IT specialists (Yuan, Bradley, & Nembhard, 2015).

The super users provide valuable input to the IT specialists when enhancing EHR systems (Yuan et al., 2015). The super users work alongside clinicians to provide impromptu training (Vockley, 2015).

Assumptions, Limitations, and Delimitations

Assumptions are concepts that a researcher assumes to be true without proof (Ellis, & Levy, 2009). Limitations are weaknesses in a study considered beyond the researchers' control (Rimando et al., 2015). Delimitations represent the researcher's detailed descriptions of the scope of a study (Svensson & Doumas, 2013). To maintain the integrity of a study, a researcher must address the assumptions and limitations (Lal, Suto, & Ungar, 2012).

Assumptions

Assumptions are facts that a researcher has not verified but accepts as true (Ellis, & Levy, 2009). Assumptions in research include an understanding that a researcher holds about the participants as possessing common knowledge based on experiences (Smythe & Spence, 2012). The primary assumption of this study was that participants understood the researched phenomena and could articulate their experience. The employer authorized participants to discuss the research topic. The participants were truthful, as well as thoughtful in their responses, and provided objective reports on their experiences. Based on an assumption of truthfulness, participants did not have agendas or other motivations to influence their answers to the interview questions. The researcher was capable of capturing, analyzing, and understanding the responses of the participants. Patterns and themes emerged from participant responses that the researcher identified and categorized.

Limitations

Limitations are weaknesses in a study beyond a researcher's control (Rimando et al., 2015). One limitation of the study was the purposeful sampling method used to acquire interview participants. Purposeful sampling aimed to select a small number of participants that can produce detailed information and in-depth understanding of a phenomenon under study (Yilmaz, 2013). A small sample size may limit the generalizability of findings to a larger population (Yilmaz, 2013). Because of a small sample size of five participants, the research finding may not generalize to a broader population.

The subjectivity of participants is another limitation of a study because qualitative interview data reflects participants' individual subjective perceptions and experiences (Cihelkova, 2013). The limitation emanates from limited representativeness of leaders with their different perceptions because of various points of view and job experiences. Limiting the research to the perspectives of IT leaders and super users may limit the research breadth. Further research may help to identify various perceptions of different groups involved in EHR implementation and application.

The skills and ability of the researcher as the primary instrument for data collection might limit the depth and richness of the data collected. A researcher's professional exposure to the study topic may influence research methods and data analysis. The use of a case study design limits the types of insights yielded from the study because of a narrow focus and limited representativeness.

Delimitations

Delimitations are situations within a researcher's control such as adjusting to participants' personality types and controlling the pace and the direction of the interview (Rimando et al., 2015). A researcher creates the bounds of the study by setting rules for a study (Svensson & Doumas, 2013). The population of this study was limited to one hospital in Texas. The research population was limited to only five IT leaders and EHR super users; however, some EHR materials discussed in the literature review are global. The use of interviews as the primary instrument for data gathering excludes useful information that I can gain through other means such as direct observation.

Significance of the Study

Contribution to Business Practice

In this study, I explored strategies that IT leaders in hospitals can use to apply EHR to achieve cost saving. The study may fill a gap in EHR literature and contribute to business practice regarding EHR application. Widespread proper EHR application might lead to cost savings for hospitals by increasing accuracy and ease of information access thereby increasing hospitals' profitability (Thurston, 2014). The benefits of EHR include reduced medical errors and patient safety violations (Hydari, Rahul, & Marella, 2015). EHR accuracy helps to mitigate liability from medical errors to lower litigation expenses (Goldstein, 2014).

Implication for Social Change

Healthcare providers use EHR systems to improve the quality of patient care at reduced costs of about $731 per patient admission (Kazley et al., 2014). EHR use also

results in lower cost to patients (Ricciardi et al., 2013). Healthcare providers use EHR systems to promote quality patient care, reduce medical errors, reduce cost, and promote patient safety (Ford, Silvera, Kazley, Diana, & Huerta, 2016). The reduction of healthcare costs for hospitals may lead to the provision of affordable care to more economically disadvantaged patients; thereby bringing about positive social change.

EHR systems can monitor patient care and trigger reminders to improve diagnoses, treatments, and disease preventions, resulting in improved patient care performance (Foldy, Grannis, Ross, & Smith, 2014). For example, improving EHR vaccination reminders to link to external data sources such as state vaccination registries could help to identify unvaccinated patients (Cowburn et al., 2014). Stockwell et al. (2014) noted a high probability for patient vaccination in facilities with EHR, which was attributable to EHR's automated text message reminders to patients. He et al. (2014) stated that EHR use contributed to an increase of children complete vaccination records from 15% to 33%. The reduction of preventable diseases through vaccination to the general population may bring about positive social change.

The findings of this study could contribute to positive social change by providing information to leaders in other hospitals that are reluctant to adopt EHR. Widespread EHR use may help reduce healthcare costs for patients and increase patient access to care. Another positive social change is the improvement in the diagnosis, treatment, and outcome of patient care because healthcare providers can access medical records from anywhere and anytime via EHR systems.

A Review of the Professional and Academic Literature

The purpose of this literature review was to provide context for the basis of the study's primary research question: *What strategies can IT leaders in hospitals use to apply EHR successfully to achieve a cost savings benefit?* A literature review includes a synthesis of relevant information for providing a foundation for a study (Boell, & Cecez-kecmanovic, 2015). A literature review helps in developing expertise in a study topic for informed interview questions (Qu & Dumay, 2011). After a thorough review of the articles on EHR, I developed interview questions grounded in literature. I investigated strategies that leaders use to apply EHR successfully through a qualitative exploratory case study by interviewing IT leaders and EHR super users in a large 600-bed hospital in Texas. The results of the study may inform future and current providers of best strategies for successful EHR application.

The literature review includes topics on incentives, benefits, barriers, and implementation stages, and rate of EHR adoption. The literature review includes a synthesis of DMISS dimensions to understand and evaluate EHR application. Researchers can use DMISS as a lens for understanding strategies that IT leaders of hospitals use to apply EHR successfully. The literature review concludes with rationale and potential effects of the study.

Literature Review Strategy

For this study, I used DMISS as a conceptual framework to formulate literature search strategies and evaluation, and to develop an approach for critical analysis and synthesis of the literature. The literature review themes included the availability and

characteristics of existing EHR efforts (e.g., inoperability, ROI, workflows disruptions),

organizational and patients acceptance, and their influence on healthcare providers'

ability to overcome perceived barriers of EHR. External stimuli influence healthcare

providers' ability to implement EHR successfully such as software vendors, government

agencies, and insurance companies (Jamoom et al., 2014).

Based on the DMISS conceptual framework dimensions, I developed literature

review strategies that included criteria for identifying potentially relevant articles, search

tactics to retrieve articles, and abstract review procedures. The articles cited were from

peer-reviewed journals, books, and government-sourced documents. The literature review

included analyses of 98 articles, accounting for 99% from peer-reviewed journals.

Government-sourced articles accounted for less than 1%. Ninety-five percent of the

articles referenced in the literature review contain relevant information published within

the last 5 years.

The goal of the search strategy was to find peer-reviewed articles on EHR

implementation and application. I used relevant keywords to find articles from five online

databases (ABI / INFORM Complete, Emerald Management, SAGE Premier, Science

Direct, and ProQuest Central). Search terms included *Electronic Health Records*, *EHR*,

electronic medical records, *EMR*, *meaningful use*, and *ARRA*.

Application to the Applied Business Problem

The purpose of this literature review was to provide a framework for addressing

the primary research question: *What strategies can IT leaders in hospitals use to apply*

EHR successfully to achieve a cost savings benefit? Gleason and Farish-Hunt (2014)

posited that more than half of new EHR implementations fail to meet facility's needs. The needs for EHR include lower costs and meaningful use achievement to avoid Medicare financial penalties in the form of payment reduction (Thurston, 2014). Researchers can use DMISS lenses to explore strategies to overcome unsuccessful EHR implementation and application (Nguyen et al., 2014). By exploring application strategies in a single case study at a hospital, the study may help to identify strategies that IT leaders can use to apply EHR successfully.

Information Systems Success Model

Nguyen et al. (2014) used the DeLone and McLean's (1992) information systems success model (DMISS) in a qualitative study to explore the benefits and problems associated with EHR systems. Nguyen et al. found a lack of socio-technical connectives among care providers, patients, and technology in developing and implementing patient-accessible EHR. For the study, the goal was to explore healthcare IT leaders' strategies to address attitudes, perceptions, and experiences regarding the adoption of EHR. DMISS was a framework for exploring the strategies to use EHR technology based on information quality, system quality, service quality, use, intention to use, user satisfaction, and, net benefits.

Information quality. The information quality dimension of DMISS refers to a quality attribute of data such as accuracy, timely, improved access and up-to-date patient information (Petter et al., 2013). Information quality denotes whether data in EHR are relevant, comprehensive, and accessible to care providers to portray an adequate overview of patients' clinical work (Bossen et al., 2013). EHR vendors promote

information quality by offering well-designed systems that increase efficiency and enhance users' performance (Yu, Zhang, Gong, & Zhang, 2013). McGeorge et al. (2014) argued that EHR system design should mirror clinical workflow when considering data entry and retrieval sequences avoid user frustrations. Developers should design EHR systems that have positive effects on workflow (McGeorge et al., 2014). The benefits from workflow restructuring promote information quality for data attributes that include accurate, fast, easy access and up-to-date patient information (Bossen et al., 2013).

System quality. System quality of DMISS refers to an effect to deliver benefits attributable to technical limitations, privacy and security concerns (Nguyen et al., 2014). System quality relates to EHR system's technical limitations that affect response time at login, during data saving and retrieval (Bossen et al., 2013). Technical limitations may affect system's stability thereby inhibit EHR proper application (Nguyen et al., 2014).

System quality also involves concerns over privacy and confidentiality (Nguyen et al., 2014). Certified EHR systems adhere to Health Insurance Portability and Accountability Act (HIPAA) security policies and procedures to ensure privacy and security of patient information (Jamoom et al., 2014). Authorized staff with appropriate login privileges gain secure access to EHR to promote privacy and confidentiality (Hawley, Jackson, Hepworth, & Wilkinson, 2014).

Service quality. The availability of staff training, system users' manual, and help functions promote the service quality (Bossen et al., 2013). Inadequate training results in clinicians entering information improperly, causing difficulties in data retrieval (Graetz et al., 2014). EHR vendors provide extensive training to super users that ultimately train

clinical end users to use the system (Penoyer et al., 2014). Stephenson et al. (2014) recommended hands-on individualized and specialized training in a simulation environment.

Technical support provided by IT department teams and software vendors influence the service quality dimension (Nguyen et al., 2014). Facility-owned IT department, EHR vendor, or outsourced providers provide technical support (Nguyen et al., 2014). The quality of technical support provided to EHR users affects the service quality (Bossen et al., 2013).

Use and intention to use. The commonly used system functions such as accessing, viewing, and documenting influence the system application and use dimension (Bossen et al., 2013). Technologically limited systems lack features that clinicians can use to complete their tasks successfully (Nguyen et al., 2014). Usability challenges hinder the proper application of EHR in addition to the risk of patient safety compromise (Walji et al., 2014).

The intention to use depends on users' perceived usefulness and ease of use (Alazzam et al., 2015). The intention to use is high when EHR supports user's work procedures and makes their job easier (Bossen et al., 2013). The intention to use also depends on individuals' perception of the existing of organizational and technical infrastructure that can promote the use of IT (Bezboruah et al., 2014).

User satisfaction. User satisfaction dimension refers to attitudes toward EHR by care providers and patients based on usability, reliability, and technical support provided (Nguyen et al., 2014). Well-designed EHR promotes users' ability to complete work

tasks successfully with a high degree of satisfaction (Walji et al., 2014). User satisfaction depends on the usability and reliability of the system and the availability of technical support when problems occur (Bossen et al., 2013).

Net benefits. Net benefits comprise of organizational and individual influences such as the ability to change, the size of an organization and prior EHR experience (Nguyen et al., 2014). The net benefits include staff acceptance of EHR for social benefits derived from EHR technology (Alazzam et al., 2015). Healthcare personnel can use EHR data for epidemiology analysis to identify areas of risk factors for timely healthcare interventions (Tomasallo et al., 2014). Healthcare providers use EHR data to identify patients linked to a local outbreak and used that information activate intervention measures (Foldy et al., 2014).

The net benefits of EHR include improved quality of documentation (Nguyen et al., 2014). Up-to-date documentation in EHR reduces clinicians' reliance on memory to retrieve patients' data and reduce written documentation (McGeorge et al., 2014). The improvement in the efficiency of administrative and billing tasks because of easy access to data increase productivity and cost reduction (Nguyen et al., 2014).

Additional Theory and Model Considered

The technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT) were additional theories I considered for the conceptual framework for this study. Bezboruah, Paulson, and Smith (2014) applied the perceived usefulness and perceived ease of use factors of TAM to model users acceptance and usage of technology. The TAM was not suitable for the study given that I did not focus

on modeling acceptance of EHR systems. Researchers use UTAUT to assess the success of new technology adoption and to understand the drivers of acceptance to design interventions targeted at users less likely to adopt and use new systems (Oye, Aiahad, & Abrahim, 2014). The UTAUT was not suitable for this study because the intent of the study was not to understand the acceptance of EHR after implementation but exploring application strategies.

Technology Acceptance Model. Researchers use TAM model to predict and explain the IT acceptance and use (Mortenson & Vidgen, 2016). TAM is an information systems model used to study users acceptance and usage of technology based on perceived usefulness and ease of use (Bezboruah et al., 2014). Davis (1989) developed TAM in 1989 to address concerns that workers were not using available IT because of low acceptance. TAM originated from the theory of reasoned action (TRA), a general social-psychological and behavioral theory developed by Ajzen and Fishbein in 1980 (Bezboruah et al., 2014).

The unified theory of acceptance and use of technology. Viswanath, Venkatesh, and Gordon Davis developed the UTAUT in 2003 with four principal determinants of intention to use new information technology that included performance expectancy, effort expectancy, social influence, and facilitating conditions (Oye et al., 2014). The performance expectancy is the degree users believe in the IT enhances performance (Alazzam et al., 2015). The effort expectancy refers to the level of ease of use of IT (Alazzam et al., 2015). The social influence is the effect of other's view of the use of the technology (Bezboruah et al., 2014). Facilitating conditions are the perception

of individuals of the existence of appropriate organizational and technical infrastructure that can promote technology acceptance and adoption (Bezboruah et al., 2014).

Rate of Electronic Health Records Implementation

Basic EHR systems have features for recording patient demographics, laboratory results, X-Ray imaging, and electronic prescribing. In 2008, 8% of U.S. hospitals had basic EHR systems (Lynch et al., 2014). Pedersen, Schneider, and Scheckelhoff (2014) explored EHR implementation levels for 2010, 2011, and 2012 from a sample of 4893 from American Society of Hospital Pharmacists national survey of 7053 hospitals. Pedersen et al. stated that EHR implementation for hospitals was at 58.6%, 66.7%, and 81.5 % for 2010, 2011, and 2012 respectively. By 2013, 92.6% of hospitals implemented various levels of EHR, 26.5% of which had complete systems with no paper records (Pedersen et al., 2014).

EHR industry grew by 15% in 2012 to about $20.7 billion (Schutzbank & Fernandopulle, 2014). In 2013, EHR adoption increased rapidly by 12% after the implementation of meaningful use incentives compared to 3% in 2010 (Adler-Milstein et al., 2014). Adler-Milstein and Jha (2014) conducted a study to determine if the increase in Medicare incentives resulted from hospitals using EHR systems to select higher paying billing codes to receive higher reimbursements. Adler-Milstein and Jha found no evidence that hospitals are using EHR systems to increase Medicare reimbursements.

Factors Affecting Electronic Health Records Implementation

Factors that affect EHR implementation includes financial penalties, access to referral networks, technical implementation assistance, meaningful use incentives,

availability of government-certified systems, assistance when selecting EHR systems, federal health IT policies, access to the Internet, and organizational culture (Jamoom et al., 2014). The U.S. federal government influences EHR implementation through the HITECH Act, which authorized Centers for Medicare and Medicaid Services to stimulate meaningful use of EHR technology by use of financial incentives (Franczak et al., 2014). The financial incentives accelerated the rate of EHR implementation (Cohen, 2016).

Financial penalties. Hospitals are subject to financial penalties beginning in 2015 for not meeting EHR meaningful use criteria (Franczak et al., 2014). The penalty for not adopting and successfully demonstrating the use of a certified EHR technology is lowered reimbursement rates (Helton, Wade, & Erhardt, 2017). The penalties are in the form of 1% reduction in Medicare payments (Adler-Milstein et al., 2015). Majority of small hospitals face penalties because of their high risk of missing the meaningful criteria as a result of low income levels, which is a result of low patient volume (Adler-Milstein et al., 2015).

Implementation technical assistance. The HITECH Act provides resources for helping providers achieve meaningful use by providing technical assistance for implementation and use of EHR (Thurston, 2014). Leaders in hospitals and rural healthcare centers experience disparate financial challenges of implementing EHRs (Sandefer, Marc, & Kleeberg, 2015). The rural healthcare centers tend to be small and financially poor (Boas, Bishop, Ryan, Shih, & Casalino, 2014). The U.S. Federal Regional Extension Centers (REC) program provides technical assistance mostly to rural areas, other areas with high poverty levels, and facilities with less than 10 physicians

(HealthIT, 2014). He et al. (2014) established that benefits of similar assistance programs exist for assisting hospitals in rural areas to use EHR. He et al. argued that EHR use in rural areas increase because of assistance in training and supervision of data entry, retrieval, policies, and benefits.

Meaningful use incentives. The American Recovery and Reinvestment Act (ARRA) of 2009, through the HITECH Act, includes $27 billion in incentives to increase implementation and use of EHR in U.S. hospitals and physicians' offices (Cunningham et al., 2014). Centers for Medicare and Medicaid Services (CMS) is making incentives payments up to $44,000 over 5 years through Medicare or $63,750 over 6 years through Medicaid per eligible healthcare provider (Lesley & Shmerling, 2015). To be eligible, healthcare providers in hospitals and physicians' offices must prove EHR meaningful use to receive incentive payments through Medicare and Medicaid (Bullard, 2016).

The goal of EHR government initiative was to achieve national healthcare quality improvements and cost reductions (Kazley et al., 2014). The financial incentives help hospitals and physicians' offices to overcome financial barriers to adopting EHR (Diana et al., 2014). The meaningful use incentive program provided funding to healthcare provider facilities to promote and support EHR systems implementation (Krishnaraj, Siddiqui, & Goldszal, 2014). Cohen (2016) conducted a study using national survey of physicians and founds that the HITECH financial incentives accelerated EHR adoption.

Meaningful use criteria have three stages that use a core and menu structure for objectives that providers must achieve to demonstrate meaningful use (Centers for Medicare & Medicaid Services, 2014a). For 2013, Stage 1 included 13 required core

objectives, a choice of five menu objectives from a list of 10, adding up to 18 objectives (Centers for Medicare & Medicaid Services, 2014a). Stage 2 took effect in the fiscal year 2014 with 17 required core objectives and a choice of three menu objectives from a list of six for a total of 20 objectives (Centers for Medicare & Medicaid Services, 2014a). Stage 2 requires physicians to develop searchable notes, quality reporting, exchange electronic records with other providers, and perform public health surveillance and reporting (Gold & McLaughlin, 2016). Stage 2 requirements for public health reporting enabled more standardized information exchange between healthcare provider facilities and government health departments (Foldy et al., 2014). CMS scheduled Stage 3 for implementation by 2017, which covers vaccine recommendations based on patients' age, gender and immunization history (Cunningham et al., 2014).

The meaningful use program provides incentive separately through Medicare and Medicaid (Thurston, 2014). CMS runs Medicare meaningful use incentive programs for doctors of medicine, dental surgery, podiatric, optometry, and chiropractors (Thurston, 2014). CMS makes payments over five consecutive years for a maximum of amount $44,000 per provider (Lesley & Shmerling, 2015). Incentive recipients must prove achievement of meaningful use standards every year (Thurston, 2014). Providers that do not meet meaningful use by 2015 face Medicare financial penalties in the form of payment reduction (Krishnaraj et al., 2014).

Medicaid incentives benefit physicians, dentists, nurse practitioners, certified nurse midwives, and physician assistants in charge of rural health clinics (Thurston, 2014). State Medicaid agencies run Medicaid meaningful use incentive programs to pay

incentives over 6 years to a maximum amount of $63,750 per provider (Lesley & Shmerling, 2015). In the first year, providers receive an incentive payment for implementing or upgrading certified EHR systems (Thurston, 2014). Healthcare facilities do not meet eligibility criteria eligible for incentives when they are within a hospital where they treat 90% of their patients in a hospital setting (Thurston, 2014).

As of April 2014, Medicare and Medicaid paid out more than $14 billion (Diana et al., 2014). By November 2015, Medicare and Medicaid incentive payment totaled $31.2 billion (Centers for Medicare & Medicaid Services, 2015). Through December 2015, the federal government had made $32 billion EHR incentive payments of which $19 billion went to eligible hospitals, and $13 billion to physicians and other eligible professionals (Cohen, 2016).

Availability of government-certified systems. In health IT marketplace, EHR-certified systems are available to hospitals and physician offices**.** The Office of National Coordinator for Health IT (ONC) oversees certification of EHR systems for compliance in meeting meaningful use requirements (HealthIT, 2014). The role of the ONC includes setting goals to facilitate health information exchange among unaffiliated providers and patients to promote better care coordination, improved patient care, and support meaningful use (Tierney et al., 2015). In collaboration with ONC, National Institute of Standards and Technology (NIST) develops functional, conformance, and interoperable testing requirements for EHR systems (Snelick, Ishikawa, Zwickl, & Taylor, 2014).

Assistance selecting electronic health records systems. Regional Extension Centers (REC) programs provided direct technical assistance for selection and

implementation of EHR to healthcare provider facilities with limited resources (Jung, Unruh, Kaushal, & Vest, 2015). The REC funding program ended in 2014 (Jung et al., 2015). REC helped their local area healthcare provider facilities adopt and achieve meaningful use of EHR systems (Jamoom et al., 2014). REC works in partnership with local healthcare provider facilities and EHR vendors to develop features that enhance EHR functionalities (Sebek et al., 2014).

Lynch et al. (2014) noted that REC programs achieved an initial goal of supporting over 100,000 healthcare provider facilities that had limited resources to achieve EHR's meaningful use. Lynch et al. established that REC assisted almost 134,000 primary care providers (PCPs) with EHR implementation, about 44% of U.S. PCPs. By June 2013, 48% of PCPs under REC program demonstrated meaningful use (Lynch et al., 2014). Healthcare leaders in small rural facilities used RECs as part of their EHR implementation strategies (Boas et al., 2014).

Federal health information technology policies. U.S. federal policies influence the rate of EHR implementation. In 2010, U.S. Department of Health and Human Services awarded $548 million to states to develop a nationwide health information network to link healthcare facilities (HealthIT, 2014). Federal agencies involved in assisting healthcare facilities with EHR implementation and meaningful use achievement includes Office of the National Coordinator for Health Information Technology (ONC), Centers for Medicare and Medicaid Services (CMS), and Office for Civil Rights (OCR) (HealthIT, 2014). The ONC helps to promote EHR conformance to interoperability standards (Snelick et al., 2014). Government programs through ONC provide technical

assistance to implement EHR systems to achieve meaning use by funding broadband services and telecom infrastructure (Heisey-Grove, 2016).

Organizational culture. The DMISS net benefits dimension comprises of organizational and individual influences such as the ability to change, the size of organizations and prior EHR experience (Nguyen et al., 2014). The management, physician, and staff willingness to change organizational culture influence EHR application (Ballaro & Washington, 2016). Physicians include a high likelihood to accept EHR technology when they perceive EHR as easy to use, relevant, acceptable by staff and patients, and able to produce positive results (Gagnon et al., 2014). Leaders' ability to sell EHR vision to physicians and staff affects the rate and level of EHR application. Healthcare providers can develop a culture of safety and shared responsibility by following U.S. Government Safety Assurance Factors for EHR Resilience (SAFER) guidelines to use EHRs safely (Collier, 2014).

Electronic Health Records Incentives

Medicare and Medicaid EHR financial incentive programs help providers with the implementation (Gold & McLaughlin, 2016). Eligible hospitals and critical access hospitals that meet certain criteria qualify for additional $2 million base payments (HealthIT, 2014). The incentive payments are part of $35 billion distribution for over 10 years created under the HITECH Act within the American Recovery and Reinvestment Act of 2009 (Franczak et al., 2014).

Medicare and Medicaid incentives programs. Eligible professionals receive up to $44,000 from Medicare for using certified EHR and demonstrating of meaningful use

over five consecutive years (HealthIT, 2014). To qualify for the incentive payments, healthcare providers have to show meaningful use of their EHRs to improve patient care and maintain privacy and security of the systems (Thurston, 2014). The providers needed to qualify for incentives by 2014 to receive incentive payments through 2016, the last incentive payment year (Centers for Medicare & Medicaid Services, 2014a).

Medicaid eligible professionals receive up to $63,750 during the implementation of certified EHR or demonstrate meaningful use over 6 years (HealthIT, 2014). To qualify for the incentive payments, healthcare providers must have 30% of their encounters with Medicaid patients (McQuade-Jones, Murphy, Novak, & Sarnowski, 2014). The providers needed to qualify for incentives by 2016 to receive incentive payments through 2021, the last incentive payment year (Centers for Medicare & Medicaid Services, 2014a).

Benefits of Electronic Health Records

Healthcare providers' primary goal for using EHR is to facilitate patient-centered care by availing clinical information regardless of the location or time of patient care provision (Pinho, Beirão, Patrício, & Fisk, 2014). EHR also facilitates delivery of evidence-based, prevention-oriented, efficient, and proper patient care (Ballaro & Washington, 2016). Other benefits of EHR application include reduced medical errors (Hydari et al., 2015). EHR use results in lower costs of providing patient care from increased efficiency and reduced duplicate testing (Kazley et al., 2014). Providers use EHRs for improved quality patient care, diagnosis accuracy, and care coordination (Jamoom et al., 2014). Providers use EHRs to increase patient participation in their care

Ricciardi et al., 2013). Functional and exchangeable EHRs offer more benefits than paper

records, such as easy and secure access (Hawley et al., 2014). Secure access to patient

records requires name and password authentication (Samadbeik, Gorzin, Khoshkam, &

Roudbari, 2015).

    Improve quality patient care. Use of EHR leads to improved patient care,

safety, and coordination of clinical care (Nguyen et al., 2014). Providers use EHR real-

time data to inform efficiency and resource utilization decisions (Samuels & Manworren,

2014). For example, providers calculate a pain management index score from EHR data

to quantify a relationship between pain management and nursing resources outcomes

(Samuels & Manworren, 2014). Nurse administrators may use pain management index to

vary nursing intensities to match needed levels, thereby minimizing nursing costs

(Samuels & Manworren, 2014).

    Other benefits include providers' quick access to patient records for more

coordinated, efficient care, and real-time quality reporting (Nguyen et al., 2014). EHR

offer more benefits than paper records, such as easy and secure access (Hawley et al.,

2014). Providers have access to electronic medical records on-site, off-site, and on-

demand to make informed decisions about patient care (Jamoom et al., 2014).

    EHR supports pharmacists' access to patient-care data shared with other members

of patient-care teams to improve the speed, quality, safety and cost of patient care (van

Bulck, 2016). Providers send prescriptions electronically to pharmacies for patients'

convenience (Pedersen et al., 2014). Electronically prescribing maintains a list of

medication for each patient thereby, improving the accuracy of active medication list

within EHR (Boncella, Sun, & Boncella, 2014). Prescriptions sent to pharmacies via EHR in 2013 accounted for 69.8 %, 16.5% by digital image capture, 8.5% by fax, and 5.2% for handwritten orders (Pedersen et al., 2014).

Diagnoses accuracy. EHRs have legible, accurate, and complete documentation for reliable prescribing, coding, and billing (Nguyen et al., 2014). EHR's improved accuracy and timeliness of data lead to accessibility to up to date critical patient data for physicians for making informed decisions during patient care (Deokar & Sarnikar, 2016). Elimination of handwritten documents eradicated illegibility problems in charts and prescriptions (McGeorge et al., 2014). Reducing medical errors improves patient safety, promotes patient satisfaction, and reduces costs for the hospital (Deokar & Sarnikar, 2016).

Medical errors account for about 45,000 to 98,000 deaths each year (Risko et al., 2014). Hydari et al. (2015) conducted a study about EHR and patient safety and found hospitals experienced 30% decline in medication safety events. A patient safety event occurs when a patient suffers harm or risks harm while under a medical facility's care (Hydari et al., 2015). Use of EHR may assist in reducing deaths caused by diagnosis and other medical errors through improved care quality and patient safety (Hydari et al., 2015). Medicare and Medicaid include penalties for hospital-acquired injuries and preventable hospital readmissions in the form of reduced payments (Dharmarajan, Kim, & Krumholz, 2015).

Franczak et al. (2014) suggested that additional clinical data available from EHR helped in improving patients' medical management. Nurses use EHR clinical dashboards

as visualization performance indicators to ensure patient safety and reduce medical errors (Skiba, 2014). Clinical dashboards enhance data comprehension by providing instant snapshots of patients' real-time status to facilitate timely clinical decision-making (Skiba, 2014). Hydari et al. (2015) conducted a study about EHR and patient safety and found hospitals experienced 27% decline in patient safety events.

EHR reminders effect in changing healthcare providers' behavior toward improved patient care (Foldy et al., 2014). EHR systems can monitor patient care and trigger reminders to improve diagnoses, treatments, and disease preventions (Foldy et al., 2014). In a study of 73 healthcare facilities, Kersting and Weltermann (2016) found 98.6% used EHR reminder feature to alert for allergies, adverse drug events, preventive measures, and upcoming vaccinations.

Care coordination. EHR use leads to enhanced communication with other providers, laboratories, insurance companies and government agencies (Jamoom et al., 2014). EHR results in reduced duplication by allowing multiple providers and insurance companies to rely on a single laboratory test result (Thurston, 2014). Providers' access to laboratory results enabled the use of a single test rather than testing for each provider (Thurston, 2014).

The exchange of clinical care notes enhances care coordination during transitions of care between healthcare facilities to promote patient safety and reduction of errors (Deokar & Sarnikar, 2016). Care coordination among specialty care providers, primary care providers, and hospitals remain a critical component of safe, efficient, and patient-centered care (Kim, Lucatorto, Hawthorne, Hersh, Myers, Elwy, & Graham, 2015).

Graetz et al. (2014) explored combined effect of EHR use and team cohesion on patient care coordination across delivery sites based on timely access to complete information. Graetz et al. established that EHR application resulted in improvements in timely information access to clinicians working in cohesive teams. Graetz et al. posited that clinicians in less cohesive teams might struggle to navigate EHR system caused by lack of shared knowledge.

Increase patient participation. Patient access to their health records promotes their involvement in healthcare decisions **(**Otte-Trojel, Rundall, De Bont, Van, & Reed, 2015). To achieve improved clinical outcomes, patients, and their families access their health information through EHR patient portals to participate in their healthcare decision-making (Otte-Trojel et al., 2015). EHR tools allow patients to take part in monitoring and controlling their health and healthcare through services such as e-mail, patient portal, and mobile health apps (Ranallo, Kilbourne, Whatley, & Pincus, 2016). Patients register online through patient portals prior a hospital visit and do not need to fill out same forms for each visit (Otte-Trojel et al., 2015). Patients record their over-the-counter medication to have a complete active medication list within EHR (Boncella et al., 2014). After a hospital visit, patients have access to their clinical charts from the comfort of their homes through EHR patient portal where they view charts and rate the quality of care (Ramsey, Lanzo, Huston-Paterson, Tomaszewski, & Trent, 2018). Patient portal improves care delivery by managing their care, enhancing disease management, and lowering environmental waste (Otte-Trojel et al., 2015).

When patients obtain access to their health information, they actively participate in their care by coordinating care across various providers and communicating with their direct caregivers; however, some healthcare providers cannot understand fully or realize the full potential of EHR patient access (Ricciardi et al., 2013). A 2012 Harris Poll survey of 2,311 U.S. adult patients showed that 65% favored online access to their health information, but only 17% had access (Ricciardi et al., 2013). Widespread EHR implementation created ideal conditions in which to expand patient involvement in decision-making about their care (Otte-Trojel et al., 2015). ONC strives to empower patients to improve their health and healthcare by accessing their medical information, taking action, and shifting attitudes so that patients and providers become partners (Ricciardi et al., 2013). ONC empowers patient access by sponsoring a Blue Button Pledge Program where a blue icon on provider websites allows patients to access their health data (Ricciardi et al., 2013). Patients' acceptance of EHR technology follows DMISS user satisfaction dimension where acceptance and use the system depend on perceived usefulness and ease of use (Alazzam et al., 2015).

Increase practice efficiencies. EHR application reduces patient-care average time because of increased efficiency (Epling, Mader, & Morley, 2014). EHR use leads to fast access to patient health history, faster treatments, and optimization of resources, which promote cost-savings and efficient patient care (Pinho et al., 2014). EHR facilitates efficient and convenient delivery of care by eliminating delays in exchange of paper records and eradicating unnecessary laboratory tests and procedures (Thurston, 2014). Implementation of new EHRs may cause an initial decrease in efficiency then adaptation

efficiency returns to surpass pre-implementation levels (Risko et al., 2014). Risko et al. posited that providers should take precautions to avoid decreased quality of patient care during the initial decreases in efficiency. Providers' increased use of EHR results in increased system familiarity and decreased processing times for increased efficiency (Risko et al., 2014).

Electronic prescribing saves time and reduces prescription errors from drug spelling and illegible handwriting (Aldosari, 2017). Healthcare providers send electronic prescriptions through EHR to pharmacies for patients' convenience and timely prescription filling (Pedersen et al., 2014). Electronic laboratory results reach recipients faster than paper format (Jamoom et al., 2014). Electronic laboratory results eliminate a need for multiple paper copies for various departments. Providers sometimes misplace paper-based medical records resulting in medical errors (Thurston, 2014). Providers experience delays when they inefficiently share paper-based health records among departments (Thurston, 2014).

EHR with mobile communication technology increases practice efficiencies in healthcare delivery and management as healthcare providers can remotely access patients' health information from anywhere anytime (Bajwa, 2014). Increased accessibility of patient data results in enhanced healthcare quality at reduced costs (Bajwa, 2014). EHR functions enable patients to participate in monitoring and controlling their health and healthcare through mobile health apps (Ricciardi et al., 2013). However, mobile health technology is prone to interception and hacking (Bajwa, 2014). Internet-

networked medical devices may be vulnerable to attacks by malware and computer viruses (Kotz, Fu, Gunter, & Rubin, 2015).

Cost savings. Physicians use EHR to determine the cost per patient visit and adjust supplies to minimize expenditure (Fitzgerald, 2015). Physicians have access to cost of supplies to allow for cost-effective alternative supply choices (Fitzgerald, 2015). Decision-makers use EHR data to adjust nursing care hours per patient visit to effect reductions in total hospitalization costs (Welton & Harper, 2015). To determine cost benefit, the healthcare providers perform baseline assessments on cost per visit prior and post EHR implementation (Fitzgerald, 2015). Decision-makers can determine the return on investment by analyzing the cost of implementing an EHR system and the projected cost savings per visit based on forecasted number patient visits.

EHR use leads to cost savings benefits for hospitals by reducing costs associated with maintaining paper medical records (Jamoom et al., 2014). Most healthcare providers shifted from paper record to EHR based on EHR's reliability, accuracy, and cost-saving (Kazley et al., 2014). EHR use results in fast access to patient health history, faster treatments, and optimization of time resources for cost savings (Pinho et al., 2014). Healthcare providers use EHR to improve patient data accuracy and completeness to bolster efficiency, lower costs and improve patient care (Tsai, Pancoast, Duguid, & Tsai, 2014).

EHR data for laboratory and radiology testing results help in reducing unnecessary tests, thereby saving costs for healthcare providers and patients (Thurston, 2014). In 2013, a survey of 173 accountable care organizations (ACO) that included

doctors, hospitals, and other healthcare providers, Wu, Rundall, Shortell, and Bloom (2016) found 49.7 percent had incorporated clinical lab test results within the EHR systems. However, for hospitals alone, Adler-Milstein et al. (2014) found 90% were able to use their EHR to record clinical lab test results.

Most health insurance companies require prior authorization (PA) before providing patient care services, thereby increasing administrative and financial burdens on healthcare providers (Epling et al., 2014). Administrative complexities result from the lack of coordinated patient information exchange between insurance companies and medical care providers when dealing with different health plans and obtaining procedure PA (Devoe, Angier, Burdick, & Gold, 2014). Epling et al. established that EHR implementation reduced PA average time because of increased efficiency to reduce costs of prior authorization activities.

Nursing costs constitute the single largest component of human capital in the healthcare industry, yet, the benefit nurses bring to patient care remain unknown from the existing healthcare financial models (Welton, & Harper, 2016). Nursing care accounts for a quarter of expenditures in the healthcare system (Welton & Harper, 2015). By comparison, healthcare costs account for 18.2% the United States Gross Domestic Product (GDP). Healthcare management uses EHR data to determine the patient-level nursing care quality and costs (Welton & Harper, 2015). Decision-makers use EHR data to adjust both nursing care hours and nurses' wages to effect reductions in total hospitalization costs (Welton & Harper, 2015). The reduction in healthcare overtime costs results in cost savings (Deokar & Sarnikar, 2016).

Enhanced privacy and security. Converting paper-based patient health records to electronic format enhances privacy (Jamoom et al., 2014). EHRs offer easy and secure access to authorized clinical staff with appropriate login privileges (Hawley et al., 2014). Certified EHR systems adhere to Health Insurance Portability and Accountability Act (HIPAA) security policies and procedures to ensure privacy and security of electronic health information (Jamoom et al., 2014).

Social benefits. Health departments use EHR data to improve public health chronic disease surveillance at the local level (Vogel, Brown, Land, Platt, & Klompas, 2014). Health department programs use EHR data for analysis of trends in human immunodeficiency virus (HIV) testing, influenza vaccination, and contraceptive coverage (Kaye, Singer, Newton-Dame, & Shih, 2014). Interoperability standards facilitate public health access to EHR systems using distributed data mining protocols to query data to supplement or substitute surveillance reports provided by care providers (Foldy et al., 2014). EHRs' detailed clinical data enhances public health agencies' capability to monitor the spread of diseases and to determine the effectiveness of public health interventions (Vogel et al., 2014). Health departments use EHR data to alert providers on drug recalls and to monitor prescription drug databases for evidence of substance abuse (Foldy et al., 2014). However, not many public health agencies have access to EHR data owing to healthcare providers' reluctance to share their data with government agencies (Vogel et al., 2014). Public health agencies also lack access because of inadequate interoperability of EHRs (Vogel et al., 2014).

Healthcare personnel may use EHR data for epidemiology analysis to identify areas of risk factors for timely healthcare interventions (Tomasallo et al., 2014). Healthcare providers use EHR data to signal for patients linked to a local outbreak (Foldy et al., 2014) and used that information to decide on proper intervention measures. Perlman et al. (2017) stated that potential contributions of EHR include a better understanding of the level and distribution of diseases and well-being within populations. DMISS net benefits dimension influence exemplifies healthcare personnel acceptance of EHR for social benefits derived from EHR technology (Alazzam et al., 2015).

Researchers use EHR data for studies on patients' wellbeing. Moody-Thomas et al. (2015) examined EHR data and determined that routine clinical interventions result in reductions in tobacco use and sustained quits. Cowburn et al. (2014) used EHR as a primary data source to study human papillomavirus vaccine (HPV) uptake in Oregon and California for uninsured patients. Heintzman et al. (2014) used EHR data to compare preventive service utilization between uninsured and insured patients. Heintzman et al. stated that insured patients received more preventive interventions than uninsured. Providers convert EHR data into clinical summaries for analysis to reveal gaps in preventive measures for target patients (Wills, 2014). Providers can use identified gaps to be proactive in a more cost-efficient way to avoid significant expenditures associated with uncontrolled illnesses (Wills, 2014).

Morris and Kho (2014) used EHR data to determine that a lack of standardized language hindered collection of data for patients' communication disabilities. To create disease prediction models, researchers use EHR laboratory test data (Pivovarov, Albers,

Sepulveda, & Elhadad, 2014). Providers and insurers use EHR data for past diagnoses and demographic details in predictive models to estimate individual patient costs (Wills, 2014). Predictive models identify high-risk and high-cost patients that contribute the majority of healthcare costs (Wills, 2014).

Researchers also use EHR data to feed into electronic data capture-based processes for Food and Drug Administration (FDA) to facilitate EHR data in clinical research systems (Kubick, 2016). Ovretveit et al. (2017) in a study of digital health technologies found improved patient safety during transitions of care from EHR medication reconciliation efforts. Other researchers use EHR data to study medical errors, patient care quality, healthcare cost, and alternative healthcare interventions (Kazley et al., 2014).

EHR's web-based patient portal may include appointment-scheduling feature, visit summaries and medications refill functions (Lyles, Fruchterman, Youdelman, & Schillinger, 2017). Through EHR portal, patients have access to their clinical charts to rate the quality of care and participate in their healthcare decision-making (Furukawa et al., 2014). Patients have access to clinical chart and laboratory reports anytime through EHR portals (Ramsey et al., 2018). The web portals enable healthcare providers to understand patients' health conditions better, collaborate with patients to create a plan of care, monitor the patients' treatment progress over time, and schedule follow-up visits (Wu et al., 2016).

Electronic Health Records Barriers

A barrier to EHR implementation is any factor that to hinders hospital IT leaders from purchasing, installing, and using EHR system to maximize expected benefits. EHR barriers include perceived organizational threats, financial limitations, and limited technological capabilities (Franczak et al., 2014). Other barriers include ROI uncertainty, standardization, and inoperability, and loss of productivity (Jamoom et al., 2014). Other obstacles include patient reluctance in accepting EHR to be more secure than paper records (Malhotra & Lassiter, 2014).

Factors associated with unsuccessful EHR implementations include high start-up cost, insufficient financial incentives, inferior technology, and resistance of users (Alazzam et al., 2015). EHR implementation requires significant financial investment and reorganization of workflows (Nguyen et al., 2014). EHR implementation success depends on characteristics of existing EHR efforts (e.g., inoperability, return on investment (ROI), workflows disruptions), and external influences (e.g., software vendors, government, and insurance) (Malhotra & Lassiter, 2014).

Perceived organizational threats. Providers perceived EHR as disrupting their workflow and hindering interaction with patients (Nguyen et al., 2014). Providers perceived EHR as requiring more time to plan, review, order, and document care (Jamoom et al., 2014). EHR systems hinder direct communication internally among staff because of diminished face-to-face interactions, thereby eroding a sense of teamwork (Yu et al., 2013). Some providers prefer the convenience of verbal communication for patient status updates instead of accessing the systems by themselves (Yu et al., 2013). Providers

simultaneously interact with both patients and EHR systems to retrieve and enter data, as a result, take away the attention needed to carry on a conversation (Street et al., 2014). Providers' interaction with EHRs may affect the quality of patient-centered communication and disrupt a flow of interactions (Street et al., 2014).

The use of EHR results in disruptions of pre-existing organizational workflows as clinicians shifts from paper to electronic documentation (McCullough, Zimmerman, Bell, & Rodriguez, 2014). EHR results in increased workload through charting, chronic, and preventive care tasks (Jamoom et al., 2014). Nguyen et al. (2014) noted that 64% of clinicians perceived EHR as contributing to an increased workload and negatively affecting their workflow and productivity. However, Yontz, Zinn, and Schumacher (2015) conducted a quantitative study and established the opposite: Nurses found EHR as beneficial and did not add to their workload.

McGeorge et al. (2014) studied changes to workflow caused by EHR implementation and established that work tasks changed based on the level of interoperability and user interface design. Improvements in interoperability result in decreased costs because of shared information between clinical settings, thereby eliminating manual data entry (McGeorge et al., 2014). To achieve a high quality of care improvements and cost reductions, McGeorge et al. posited that developers should design EHR systems that have positive effects on workflow, safety, and patient care. Appropriate EHR designs promote users' ability to complete work tasks with a high degree of satisfaction and success (Walji et al., 2014). Well-designed EHR software

conforms to the care providers' workflow rather than adjusting workflows around the dictates of the EHR system (Schutzbank & Fernandopulle, 2014).

Security risks and confidentiality concerns. Healthcare providers have security and confidentiality concerns and have a perception that EHR is less secure and is open to abuse than paper records (Boonstra, Versluis, & Vos, 2014). Healthcare providers remain concerned about a possibility of security breaches, privacy violations, and HIPAA violations (Jamoom et al., 2014). Healthcare providers also remain concerned about possible data exposure to their competitors (Vogel et al., 2014). Healthcare providers' objective for using EHR technology aligns with DMISS intention to use dimension where use depend on perceived usefulness and ease of use (Alazzam et al., 2015).

Healthcare providers remain concerned about security and privacy of EHR records whose disclosure may result in liability and fines (Walker, Mora, Demosthenidy, Menachemi, & Diana, 2016). Staff compromises EHR systems by downloading files infected by viruses or containing malicious software and allowing system access to unauthorized persons (Bidgoli, 2016). Boonstra et al. (2014) recommended training staff to protect confidential information of patients and organizations. Staff training should include learning to use login and screensaver passwords, and antivirus programs (Bidgoli, 2016).

Lack of high-speed Internet has resulted in a slow exchange of information (Jamoom et al., 2014). Clinicians access healthcare information through mobile communication technology where Internet service is unavailable; however, such systems include susceptibility to hacking (Bajwa, 2014; Burns & Johnson, 2015). Using personal

mobile devices for work purposes exposes work-related applications with insecure

applications and malware (Burns & Johnson, 2015). Another disadvantage of mobile

technology is that mobile devices tend to be small and likely to be misplaced or stolen

(Burns & Johnson, 2015).

Financial limitations. The cost of purchasing, installing and maintaining EHR

systems remains a significant barrier (Jamoom et al., 2014). Upfront capital expenditure

and high maintenance costs are primary barriers to EHR implementation (Franczak et al.,

2014). The financial incentives do not overcome upfront investment costs and on-going

costs such as maintenance and staff (Jung et al., 2015). Leaders of larger hospitals easily

implement EHR because of their significant financial resources unlike those from

resource-strapped small hospitals (Boonstra et al., 2014). Small facilities do not have

enough space to place an adequate number of computers in all point of care places (Yu et

al., 2013).

Limited technological capabilities. Difficulties in finding EHR systems that

meet providers' needs, inadequate training, and technical inadequacy create barriers to

EHR implementation (Jamoom et al., 2014). EHR design may be limited technologically

in offering features that promote usability (Nguyen et al., 2014). EHR usability refers to

users' ability to complete work tasks with a high degree of satisfaction and success (Walji

et al., 2014). Botta and Cutler (2014) found one of the key challenges in EHR adoption

included vendors' unwillingness to improve usability as they concentrated on features

driven by meaningful use requirements. Walji et al. assessed usability challenges for a

dental EHR and identified 187 usability violations. Usability challenges are barriers to EHR implementation that may compromise patient safety (Walji et al., 2014).

The number of EHR systems continues to grow; however, some physicians remain dissatisfied with the usability of their systems (Kreamer, Rosen, Susie-Lattner, & Baker, 2015). In a 2012 American EHR survey of 4,279 physicians, 39% would not recommend their EHR, up from 24% in 2010 (Schutzbank & Fernandopulle, 2014). Physicians dissatisfied with the usability of their EHR increased from 23% in 2010 to 37% in 2012 (Schutzbank & Fernandopulle, 2014). The National Institute of Standards and Technology EHR usability protocol requires software testing to ensure system design increases usefulness to intended users (Walji et al., 2014).

By 2014, EHR vendors build EHR systems designed to maximize coding, meet compliance and achieve meaning use standards to qualify for federal certification for incentives (Schutzbank & Fernandopulle, 2014). Schutzbank and Fernandopulle recommended integration of EHR systems with clinical operations workflow combined with proper training. Adequate EHR training needs to be at least 3 to 5 days, which in most cases, remains available (Stephenson, Gorsuch, Hersh, Mohan, & Gold, 2014). Inadequate training results in difficulties in data retrieval when clinicians enter information in miscellaneous sections of EHR (Graetz et al., 2014). Graetz et al. posited that formal classroom-style training is inadequate as the focus is on basic tasks such as documenting but little on the usage of the information EHR provides. Stephenson et al. conducted a study about training and found that participation in EHR-based simulations improves recognition of patient safety issues, leading to delivery of safe and effective

patient care. Simulation poses minimal risk to patients and provides training

environments standardization (Stephenson et al., 2014).

EHR systems may not provide a guarantee of completeness of information in

situations where systems' databases are not prepopulated and listed as selectable options

(Boncella et al., 2014). Nurses enter additional free text in clinical notes when EHR's

drop-down menu options do not fully describe a patient's clinical status (Penoyer et al.,

2014). Boncella et al. illustrated a situation where healthcare providers must have a full

list of medications taken by each patient in EHR, but a lack of a complete drug database

forces nurses to use free text fields. Use of free text fields could create inaccuracy in

occurrences of misspelled drug names and data retrieval (Hawley et al., 2014).

McGeorge et al. (2014) posited that vendors should design EHR systems to have

positive effects on workflow, safety, and patient care. User interface design on processes

to enter and retrieve data has significant effects on EHR efficiency and quality benefits

(McGeorge et al., 2014). The user interface problem is of most concern for EHR systems

followed by diagnostic terminology and workflow problems (Walji et al., 2014). Based

on DMISS information quality dimension, well-designed systems increase efficiency and

enhance users' performance (Yu et al., 2013). EHR design should mirror clinical

workflow when considering the required number of mouse clicks and a number of

screens to avoid user frustrations (McGeorge et al., 2014). Unintended consequences

include inconsistent placement of buttons and overuse of mouse button clicks for data

entry menus that lead to mouse click frustration (Blijleven et al., 2017). Other unintended

consequences result from poor EHR system design, such as alert fatigue from

overbearing reminders that cause providers to ignore them, rendering feature useless

(Blijleven et al., 2017). Unintended consequences depict DMISS system quality

dimension from technical limitations of existing infrastructure inhibiting EHR proper

application (Nguyen et al., 2014).

Return on investment uncertainty. Uncertainty about ROI is a barrier to EHR

implementation (Jamoom et al., 2014). Lesley and Shmerling (2015) noted the difficulties

in getting approval for funding for EHR systems because the return on investment is

uncertain. The Medicare and Medicaid monetary incentives do not meet the financial

needs to ensure a positive ROI from EHR implementation (Jung et al., 2015). McGeorge

et al. (2014) revealed that EHRs never consistently improved efficiency because of the

required additional process steps such scanning documents into the system, as opposed to

filing in paper charts. McGeorge et al. established that implementing EHR systems did

not eliminate the use of paper but eliminated a need for storage of paper records and

transfer of paper records between locations. Based on the DMISS information quality

dimension, healthcare providers may perceive EHR as not enhancing accuracy,

timeliness, and up-to-date patient information when providing patient care.

Standardization and inoperability. EHR benefits depend on systems'

standardization and interoperability to allow transfer of encrypted patient records over the

Internet between different information systems such as hospitals, laboratories,

government agencies and patients (Foldy et al., 2014). Standardization addressed the

processes that systems send and receive messages, data structure, data format, and syntax

to compile information into knowledge that a provider uses for decision making (Studeny

& Coustasse, 2014). Inoperability results from systems customization that hinders communication with other systems (Malhotra & Lassiter, 2014). Malhotra and Lassiter (2014) stated that inoperability resulted from a lack of interfaces between information systems that contain patient care data. Hospitals and physician's office EHR systems that do not integrate cause patient information duplications for patients referred to hospitals (Malhotra & Lassiter (2014). Healthcare leaders may use DMISS system quality dimension to assess existing technical infrastructure to determine a likelihood of EHR implementation success (Nguyen et al., 2014).

The EHR meaningful use guidelines require a capability to perform medication reconciliation by listing all prescribed medication for a patient (Thurston, 2014). Inoperability issues, such as intermittent network connectivity, hinder EHR capability for health information exchanges across systems when patients obtain medications from multiple pharmacies, hospitals, and physicians (Huang & Gramopadhye, 2016). Discrepancies result from drugs that appear in one data source but not others (Comer, Couto, Aguiar, Wu, & Elliott, 2014). Comer et al. observed 76% medication discrepancies among a sample of 609 patients between January 2011 and September 2012. Medication discrepancies may cause adverse drug events that happen when prescription drugs cause unexpected side effects (Casillas, Pérez, Oronoz, Gojenola, & Santiso, 2016). The adverse drug events are responsible for approximately 5% of hospital admissions that create financial burdens for patients and healthcare system (Henriksson, Kvist, Dalianis, & Duneld, 2015).

EHR user interface design should include useful and easy to use data entry screens for recording active medication list (Boncella et al., 2014). A user interface designed for a precise task allows smoother navigation and eliminates confusion and use of free text fields to document medication (Boncella et al., 2014). Free text documentation may lead to incomplete and misspelled medication (Hawley et al., 2014). Morris and Kho (2014) argued that EHR's lack of standardized language result in an insufficient recording of communication disabilities.

Loss of productivity. Researchers use service quality of DMISS to explain adverse consequences of interdependent factors such as human interaction and information technology. EHR systems are subject to service disruptions and downtimes that affect productivity, increase financial burdens, and inadequate patient care (Sittig, Gonzalez, & Singh, 2014). EHR's technical problems emanate from power outages, hardware failure, and loss of Internet access, thereby reducing productivity (Yu et al., 2013). In a study of 50 facilities, Sittig et al. found 95% had, at least, one unplanned downtime in the last 3 years, with 70% lasting more than 8 hours. Downtime events could result in delayed insurance and patient billing that can have an adverse effect on cash flow. Patient care suffers during EHR downtime, which may lead to patient injury caused by delays in testing and delivery of results, and dispensation of time-critical medication (Sittig et al., 2014). Shah, Murtaza, and Opara (2014) recommended for provisions such as backup paper copies of some records for quick reference in case of power outages and other disasters.

Walji et al. (2014) assessed the usability of EHR in dental clinics and identified productivity issues related to time used to enter diagnoses, accessing inconsistence ordered tasks screens, and unpredictable search results. McGeorge et al. (2014) established that workflow tasks changes depended on the EHR user interface design. User interface designs that include inconsistent naming and placement of fields and buttons tend to affect productivity negatively (Walji et al., 2014). Users struggle with entering data and retrieving information because of inadequate functionality and device non-portability of EHR systems (Yu et al., 2013). Restricted flexibility in user interface encourages the use of uncommon abbreviations and use of free text to circumvent structured data input (Walji et al., 2014). Restricted flexibility also prevents users from making changes to saved data to correct mistakes (Yu et al., 2013).

Loss of productivity result from increased documentation burden related to time-intensive nature of data entry and retrieval (Yu et al., 2013). The use of EHR resulted in increased care management processes resulting in doctors spending more time entering data than seeing patients (Kreamer et al., 2015). Physicians express concerns about using EHR for taking away the physicians' attention away from patients and reducing productivity (van Bulck, 2016).

EHRs have unintended consequences of being complex and difficult to use as a result of clinicians' multifaceted tasks such as data entry, reporting, decision support, messaging, alerts, and reminders (Blijleven, Koelemeijer, & Jaspers, 2017). Administrative complexities emanate from dealing with different health plans and obtaining procedures authorizations from insurance companies (Sherer, 2014). Yu et al.

(2013) noted that EHR in residential aged care homes resulted in increased complexity of information management such as data storage and managing both electronic and paper-based systems. The benefits of improved quality, increased efficiency, and reduced costs remain unverified because EHRs are complex and hard to use, requiring clinicians to balance attending to patients and data entry requirements (Balestra, 2017).

The EHR systems' inconvenience of slow login processes and strenuous documentation workflows not present in paper-based systems result in reduced productivity (Yu et al., 2013). Slow computer speeds lead to slow processes for users in accessing patients' records in EHR systems, so the clinicians prefer paper-based processes to provide timely patient care (Yu et al., 2013). Faster computer systems require upgraded memory and processors that cost more (Gleason & Farish-Hunt, 2014). Programming errors, as wells unreliable hardware and software platforms, lead to difficulties in accessing patient information (Blijleven et al., 2017).

Lack of adequate training. Boncella et al. (2014) conducted a study about the use of active medication list feature of EHR and noted half of the participants lacked appropriate training. Inadequate training results in difficulties in data retrieval when clinicians enter information improperly (Graetz et al., 2014). Adequate EHR training takes, at least, 3 to 5 days, with more usability improvements after a week of training (Stephenson et al., 2014). Stephenson et al. posited that most EHR training programs are general and not specific to providers' unique workflows. Stephenson et al. recommended hands-on instructions in a simulation environment for individualized and specialized

training. Healthcare leaders may use DMISS service quality dimension to explain that inadequate training hinders users from recognizing usefulness and ease of use of EHR.

Electronic Health Records Systems Implementation

McAlearney, Hefner, Sieck, Rizer, and Huerta (2014) identified best practices for EHR system implementation that included: Use of implementation facilitators from health information technology literature, focus on workflow and incorporating critical management factors. IT leaders study health IT literature and coordinate with EHR vendors to acquire necessary skills to manage EHR-driven organizational changes (Deokar & Sarnikar, 2016). The IT leaders direct and manage planning for a new EHR system, and installing hardware and software (Boonstra et al., 2014). Super users work with EHR vendors to obtain extensive training so that they can train the clinical end users to use the system (Penoyer et al., 2014). The super users act as liaisons between end users and IT leaders to provide valuable input on feedback and enhancements needs (Yuan et al., 2015). The super users work alongside end users to provide impromptu training (Vockley, 2015).

Readiness Assessment. Readiness for a transition from paper-based systems to EHR requires providers to determine whether they have the necessary knowledge, skills, and informatics competencies to capitalize on the shift (Boswell, 2013). Organizational readiness is a significant precursor to implementation and post-implementation success of EHR. Change management is an essential part of EHR implementation. EHR-associated changes affect workflow (Deokar & Sarnikar, 2016). Leaders must have necessary skills to manage EHR-driven organizational changes (Nguyen et al., 2014). When assessing for

EHR readiness, IT leaders can use DMISS system quality dimension to examine for appropriate technical infrastructure that promotes net benefits.

Five critical success factors that affect EHR implementation include project management, business process restructuring, system integration, staff readiness to change, and training (Boswell, 2013). Users capable of using IT such as computers tend to have a positive attitude toward EHR systems (Boonstra et al., 2014). Other readiness success factors include management support, qualified implementation team, and hardware and network optimization (Bossen et al., 2013).

Electronic health records implementation planning. Planners should approach EHR implementation as an organizational change rather than a technical project because of change magnitude needed to existing work practices to accommodate a new system (Boonstra et al., 2014). Planners should analyze and map out current workflow and processes to identify potential EHR-related new workflow patterns (Deokar & Sarnikar, 2016). Planners should determine the information from paper records to convert into EHR system (McAlearney et al., 2014).

Electronic health records systems selection. Successful EHR implementation requires selecting an established vendor committed to providing a system that meets provider's specific needs (Boonstra et al., 2014). Vendors meet providers' needs by identifying workflows and adapting a system accordingly (McGeorge et al., 2014). For providers needing help to identify certified vendors, Regional Extension Centers (REC) has programs that offer technical assistance when selecting EHR systems (Jamoom et al., 2014).

Electronic health records systems installation. Boswell (2013) identified managing system installation as a major success factor. EHR implementation involves installing hardware and interface software necessary to run a system (Boonstra et al., 2014). EHR implementation teams work with software vendors to ensure proper system installation and configuration (Fletcher & Payne, 2017). During systems installation phase, software vendors identify clinical workflows and configure the systems accordingly (McGeorge et al., 2014).

Electronic health records systems training. Training involves teaching end-user the new processes and explaining the effect of EHR on a facility (McAlearney et al., 2014). Trained staff should use a system with ease and apply system's functionality to provide quality patient care (Boonstra et al., 2014). The training begins with EHR vendors providing extensive training to super users that eventually in turn train clinical end users to use the system (Penoyer et al., 2014). EHR users benefit from initial training by gaining basic proficiency; however, additional training produces efficiency and mastery (Stephenson et al., 2014). Post-implementation training improves the use of medication lists and problem lists; two of EHR's most important features of the meaningful use criteria (Ford et al., 2016).

Electronic health records implementation success factors. Boswell (2013) identified four fundamental behavioral success factors that included support from the management and staff support, managing system installation and workflow changes, training, and collaboration. The behavioral success factors to overcome technical limitations and staff training relate to the system quality and service quality DMISS

model dimensions. Boswell listed five critical success factors that affect EHR implementation to include project management, business process restructuring, system integration, staff readiness to change, and training (Boswell, 2013). The workflow restructuring and the system integration critical success factors relate to the DMISS information quality dimension for data entry, storage, and prompt retrieval. McAlearney et al. (2014) identified five critical management factors that included commitment, credible communication, coordination, and change management. Other success factors include qualified implementation team, hardware and network optimization, end-user involvement, and EHR flexibility (Bossen et al., 2013).

Literature Review Summary

The rate of EHR implementation in hospitals continues to grow steadily. The rate increased from 8% in 2008 (Lynch et al., 2014), to 92.6% by 2013 (Pedersen et al., 2014). In 2013, EHR adoption increased rapidly by 12% after the implementation of meaningful use incentives compared to 3% in 2010 (Adler-Milstein et al., 2014). The financial incentives accelerated the rate of EHR implementation (Franczak et al., 2014). The U.S. federal health IT policies stimulate EHR implementation through the HITECH Act by offering $35 billion in financial incentives (Franczak et al., 2014).

Healthcare IT leaders make decisions about EHR implementation after considering factors such as financial incentives and penalties (Franczak et al., 2014), technical implementation assistance (Thurston, 2014), availability of government-certified systems (HealthIT, 2014), assistance when selecting EHR systems (Sebek et al., 2014), U. S. federal health IT policies and access to the Internet (Jamoom et al., 2014),

and organizational culture (Ballaro & Washington, 2016). Hospitals are subject to financial penalties by way of reduced Medicare payments for not meeting EHR meaningful use criteria (Franczak et al., 2014).

EHRs provide benefits not found in paper records that include easy and secure access (Hawley et al., 2014), improved quality patient care, diagnosis accuracy, and patient care coordination (Jamoom et al., 2014). EHRs enable patient participation in their care (Otte-Trojel et al., 2015), practice efficiencies (Epling et al., 2014), and cost savings (Ricciardi et al., 2013). Converting paper-based patient health records to electronic format enhances privacy (Jamoom et al., 2014) and secure access (Hawley et al., 2014). EHR's social benefits include improved public health chronic disease surveillance at a local level (Vogel et al., 2014).

Transition

Section 1 of the study included the background information, problem statement, purpose statement, nature of the study, research question, and interview questions. The study topic conceptions from literature support the conceptual framework. Section 1 included operational definitions, assumptions, limitations, and delimitations to enhance the readability and study transparency. Section 1 concluded with the significance of the study and synthesized literature review. Section 2 includes quality indicators such as study purpose statement, the role of the researcher and a description of study participants. Section 2 includes research method, design selection, and appropriateness justifications for addressing the research question.

Other topics in Section 2 include population description, sampling methods, and sample size. Research quality indicators include ethical research for addressing informed consent process, incentives, withdrawal procedures, and participants' confidentiality. Section 2 also includes discussions of data collection instruments and technique, organization technique, and analysis. Section 2 concludes with a description of processes for enhancing the study's reliability and validity. Section 3 is the presentation of findings, application to professional practice, implications for social change, recommendations for action and further research, and conclusions and reflections.

Section 2: The Project

This section includes quality indicators such as purpose statement, the role of a researcher, and a description of study participants. Section 2 includes discussions of the research method, design selection, and appropriateness of justifications for addressing the research question. Section 2 also comprises description and justification of population, sampling methods, and sample size. Research quality indicators include ethical research for addressing informed consent process, incentives, withdrawal procedures, and participants' confidentiality. Section 2 also includes discussions of data collection instruments and technique, organization technique, and analysis. Section 2 concludes with a description of processes for enhancing the study's reliability and validity through dependability, credibility, transferability, confirmability, and data saturation.

Purpose Statement

The purpose of this qualitative exploratory single case study was to explore strategies that IT leaders in hospitals can use to apply EHR to achieve a cost savings benefit. The participants were IT leaders and EHR super users at a large hospital in Texas with successful experience in applying EHR. Widespread proper EHR application may lead to improved patient care and patient safety, thereby contributing to positive social change. A positive social effect for EHR application is a lower cost of healthcare for patients (Ricciardi, Mostashari, Murphy, Daniel, & Siminerio, 2013).

Role of the Researcher

The role of a researcher is to collect data (Peredaryenko, & Krauss, 2013). Xu and Storr (2012) suggested that a qualitative researcher could assume the role of the main

data collector. I was the primary data collection instrument. In a case study, a researcher conducts interviews (Harrison, Birks, Franklin, & Mills, 2017). In addition, a researcher may perform data triangulation by using other sources of data (Yin, 2014). My role as a researcher during the data collection process included conducting interviews and analyzing company physical documentation that included EHR-related planning, installation, training and procedural documents.

I have a relationship with the study topic as a software analyst for EHR software. A researcher's relationship with a study topic, participants, or research area affects the researcher's data collection role and strategies (Yilmaz, 2013). Acknowledging the relationship between a researcher and the study attributes leads to the identification and avoidance of researcher bias and subjectivity (Mehra, 2002). To address the concept of a personal lens when collecting and interpreting data, the results of the study should represent perspectives of the participants and not researcher's experience (Berger, 2013). To avoid researcher bias and subjectivity from my experience as a software analyst for EHR informatics, I focused on participants' perspectives.

The Belmont Report consists of three principles including (a) respect for participants to decide voluntarily to take part in the study, (b) to cause no harm, and (c) to maintain equal treatment (Bromley, Mikesell, Jones, & Khodyakov, 2015). I completed the collaborative institutional training initiative (CITI) program course about the Belmont Report to ensure participants' protection from possible harm and to maximize potential benefits (see Appendix A). Throughout the research activities, I upheld the Belmont

Report's three ethical principles and encouraged potential participants to decide whether to participate based on informed possible risks and benefits of the study.

Bias results from researchers leaning toward preconceived positions, thereby, producing inaccurate results (Gesch-Karamanlidis, 2015). While bias and subjectivity might occur when a researcher selects a topic of personal interest, self-evaluation and bias acknowledgment may enhance objectivity and neutrality (Morse, 2015). My goal was to mitigate bias and subjectivity effects on planning and conducting the study. Berger (2013) recommended researchers to be aware of the effect of their assumptions, preconceptions, biases, beliefs, and personal experiences on research. I acknowledged and rescinded my preconceptions to focus on participants' perspective of EHR application using open-ended interview questions to ensure validity and objectivity.

To mitigate bias during data collection and analysis, a researcher alleviates effects of the personal lens by use of an interview protocol (Gesch-Karamanlidis, 2015). An interview protocol may help in providing consistency among interviews while allowing for probing questions (Webster, 2016). An interview protocol is a procedural guide for conducting an interview that includes reminders to acquire informed consent, interview questions, and talking points for before and after an interview (Gesch-Karamanlidis, 2015). A researcher should adhere to an interview protocol to evaluate logical ordering of questions and to identify wording issues (Fusch, & Ness, 2015). Jacob and Furgerson (2012) suggested arranging questions in an interview protocol from the least to the most difficult for slowly building confidence and trust with the participants. To mitigate effects

of personal lens and bias, I used an interview protocol (see Appendix B) to ensure consistency in all interviews by using same questions in the same wording and order.

Participants

The research included multiple participants from a single hospital. The participants were IT leaders and EHR super users at a large 600-bed hospital in Texas that uses an EHR system. A researcher may conduct a qualitative study of a single unit with multiple participants (Yin, 2014). The participants' characteristics must align with the research question (Michaelson, McKerron, & Davison, 2015). Researchers select participants that can enhance the understanding of a study topic and inform the research question (Gentles, Charles, Ploeg, & McKibbon, 2015).

The participants included IT leaders because of their involvement in EHR implementation and application. IT leaders in hospitals manage various phases of EHR implementation including information system infrastructure and security execution (Samadbeik et al., 2015). IT leaders make data-migration decisions when implementing EHR system (Samadbeik et al., 2015). The criteria for eligible participants were IT leaders with successful experience in applying EHR. IT leaders use their technical knowledge during EHR implementation and application to counterbalance the physicians' medical dominance and promote collaboration and teamwork among EHR end users (Boonstra et al., 2014). IT leaders work with end users to evaluate the performance of the system and to recommend enhancement to the EHR vendors (McGeorge et al., 2014). The IT leaders may best address the research question because

they manage EHR implementation and application, including planning, infrastructure construction, systems integration, security execution, and cost-benefit evaluations.

The participants included EHR super users because of their involvement in EHR implementation, training, and application. The super users undergo extensive training by EHR vendors to learn relevant system functionality that meets the facilities' needs (Penoyer et al., 2014). The super users train clinical end users to use the system to maximize systems' benefits (Penoyer et al., 2014). The super users work alongside clinical end users to provide on-going training (Vockley, 2015). The super users also act as liaisons between end users and IT leaders to provide valuable input on the system performance and to address training needs (Yuan et al., 2015). The super users discussed the research question by providing insight into the best EHR application strategies.

Healthcare Information and Management Systems Society (HIMSS) includes a searchable database of hospitals that have implemented EHR (Healthcare Information and Management Systems Society, 2017). A search for large hospitals with EHR in Texas from the HIMSS database revealed potential candidates for the study. I selected the hospital for achieving Stage 6 of EHR implementation. From the hospital's website, I identified the chief information officer (CIO) then introduce myself by email to gain access to the hospital (see Appendix C). The hospital IRB approved my research and issued a letter of cooperation (see Appendix D). I requested the management to provide a list of IT leaders and EHR super users for me to identify and gain access to the participants. Participants' contribution to research represents a significant motivation to participate in a study (Dennis, 2014). Qu and Dumay (2011) posited that ideal

participants in any study need to be experts in the study topic. The participant had to have expertise in the application of EHR systems, possess an interest in the research topic, and have a will to provide valuable information freely.

The relationship building process for the study included an email introduction of the study to potential participants (see Appendix E). A researcher's relationship with participants affects data collection strategies and the quality of data (Yilmaz, 2013). Developing a working relationship and building rapport with participants is essential in research (Easterling & Johnson, 2015). A researcher can enhance rapport by building trust and showing respect for the participant and the shared information (McDermid, Peters, Jackson, & Daly, 2014). Informing participants about a study ahead of time helps in building rapport (Easterling & Johnson, 2015). The preliminary interactions during participants' recruitment and interview arrangements have the potential for building rapport (Miller, 2017). After the initial email introduction to potential participants, I maintained a working relationship by continuing communication by email. The participants received detailed information about the topic of study, the consent process, and a list of interview questions (see Appendix F). Newton (2017) defined a relationship between the researcher and participants as a fiduciary, where the participants expect a researcher to act in their best interest by respecting participants' opinions and ensuring confidentiality. In that regard, I communicated my responsibility to the participants and upheld ethical principles.

Research Method and Design

Research Method

I used the qualitative method to explore strategies that IT leaders in hospitals can use to apply EHR successfully. Researchers use qualitative methods to study phenomena and processes such as human perspectives, attitudes, and experiences from participants' perspective (Hazzan & Nutov, 2014). Khan (2014) posited that when the goal of research is to explore a phenomenon, interpretivist view allows for subjective values. The subjectivity of participants in a qualitative study reflects participants' individual subjective perceptions and experiences (Cihelkova, 2013). The qualitative method met the needs of the study because I intended to conduct an in-depth exploration of experiences to understand complex issues from the participants' perspective.

In a quantitative study, researchers analyze numerical data to assess relationships between variables to test a hypothesis (McCusker & Gunaydin, 2015). Researchers use quantitative methods to understand the causal relationships between variables (Palinkas, 2014). Researchers use a quantitative method to analyze numerical data and generalize results to a larger population (Yilmaz, 2013). A quantitative method did not meet the needs for this study because I did not use numerical data to test hypotheses. In this study, I collected data and performed textual data analysis.

In mixed methods research, a researcher combines quantitative and qualitative research techniques, approaches, and concepts to achieve synergy (McCusker & Gunaydin, 2015). Researchers use mixed methods to overcome potential limitations of a single research method (Palinkas, 2014). A researcher uses a mixed method for

developing rich insights into several phenomena that a researcher may not fully understand, using only a quantitative or a qualitative method (Ivankova, 2014). Hypothesis testing and numerical analysis remain outside the scope of the study. A mixed method approach remained unsuitable because I did not require the synergy of qualitative and quantitative data collection and analysis methods to address the research question.

Research Design

A case study design includes the ability to capture in-depth details from a smaller sample of participants through interviews in a natural setting (Yin, 2014). Researchers use a case study design to answer research questions that require a deep understanding of organizational processes in a natural setting (Zainal, 2017). Benefits of using a case study design include the ability to capture more details through observations, documents review, and interviews methods (Baškarada, 2014). Documentation information adds rich data and allows for verification of collected data (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). I selected a single case study design to capture comprehensive details through documents analysis and interviews methods from a single organization.

Other research designs considered included phenomenological and ethnographic approaches. Researchers use phenomenological design to explore participants lived experiences through extended interviews as the only source of data, with only one to three questions to obtain in-depth data for reaching a state of epoché (Moustakas, 1994). Researchers use phenomenological research to focus on participants' perceptions and feelings, (Wilde, Feit, Harrawood, & Kleist, 2015). Researchers use phenomenological design to collect data from a sample at least 30 participants (Khan, 2014). The

phenomenological design did not meet the needs for the study because I did not explore participants lived experiences. I interviewed five participants for the study using the case study design.

Ethnographic research involves detailed observational and interview data about a shared culture of a group of people (Yin, 2014). An ethnographic research approach involves observing and interviewing participants over an extended period (Lane, 2014). Researchers use the ethnographic design for understanding unexpected results of clashes of culture and values after the implementation of new IT systems (Brown, 2014). An ethnographic design was not appropriate for this study because I did not immerse in culture to address the research problem.

Data saturation occurs when a researcher achieves data redundancy (Saunders et al., 2017). Data saturation means that additional interviews do not add new coding, relevant information, perspectives, or experiences to a study (Fusch, & Ness, 2015). Houghton, Casey, Shaw, and Murphy (2013) defined data saturation as a data collection situation where no new code emerges, and data analysis reveals no new themes. For the study, I interviewed five participants. I stopped recruiting new participants when the last interview did not yield new relevant information.

Population and Sampling

After the approval of the hospital IRB, the management provided contact information for IT leaders and EHR super users. I identified and gained access to the participants. I used a purposive sampling technique to identify participants that had successfully used strategies to use EHR at the hospital. Purposeful sampling involves

identifying research topic experts willing to participate, and possessing the ability to communicate experiences in an expressive and a reflective manner (Palinkas et al., 2013). Purposive sampling method proves beneficial in qualitative research, where there is a scarcity of appropriate participants based on a study topic (Guetterman, 2015). Researchers use purposive sampling when a study requires participants that possess a high degree of specialized knowledge of a study subject (Gentles et al., 2015). Purposive sampling involves identifying participants that can yield information that has the most effect in answering a research question (Guetterman, 2015). The justification for using purposive sampling was a need to identify participants possessing EHR specialized experience, and are willing and able to provide relevant information to address the research question.

Guetterman (2015) posited that a large sample might hinder in-depth and follow-up questions. A sample should be large enough for the researcher to achieve a sufficient level of depth (Guetterman, 2015). Researchers should choose an ideal and practical sample size, expressed in an approximate sample size range with a minimum and a maximum (Robinson, 2014). Malterud, Siersma, and Guassora (2015) recommended a sample of 6 to 10 despite acknowledging a lack of rules for determining sample sizes in qualitative studies. Guest, Bunce, and Johnson (2006) suggested a sample of 6 to 12 homogeneous participants for an exhaustive dataset because researchers use common criteria in purposive sampling, and as a result, the interviewees might have similar experiences. Purswell and Ray (2014) suggested starting with three to five participants

then adding more to reach saturation. For this study, the participants included five IT

leaders and EHR super users.

Data saturation occurs when a researcher achieves data redundancy (Saunders et

al., 2017). Data saturation means that additional interviews do not add new coding,

relevant information, perspectives, or experiences to a study (Houghton et al., 2013). By

asking interview questions in the same wording and order to each participant, a

researcher maintains a focus on a research topic and enhances data saturation (Fusch, &

Ness, 2015). For this study, I interviewed five participants and stopped adding more

participants when the last interview did not yield new relevant information. The study

included asking questions in the same manner to each participant. After the first four

interviews, I analyzed data into themes then reviewed each additional interview to

determine whether new data add new themes. In this study, interviewing ended upon the

achievement of data saturation when the fifth interview data did not add new themes.

I selected participants possessing expertise in the application of EHR systems,

having an interest in the research topic, and willing to provide in-depth information.

Researchers select participants that possess the knowledge and experience needed for a

study and the ability to reflect on the research topic (Moustakas, 1994). Researchers

select participants that possess a high degree of specialized knowledge of a study subject

(Gentles et al., 2015). Selecting participants involve identifying knowledgeable

individuals that demonstrate the will to participate, and the capacity to communicate

experiences in an expressive and reflective manner (Palinkas et al., 2013). The selected

participants should answer open-ended interview questions using thoughtful and detailed

responses (Webster, 2016). To select suitable participants, I used the following criteria: (a) high degree of specialized knowledge of EHR application, (b) an interest to understand the strategies for successful EHR application, (c) willingness to participate in an interview, and (d) demonstrate the ability to communicate in an articulate manner during the introduction.

Ethical Research

Providing sufficient research information to potential participants presents them an opportunity to consider whether to participate (Ghooi, 2014). Participants form opinions on the nature and validity of the study based on the information provided by the researcher as part of the informed consent (Fatigante & Orletti, 2014). Potential participants received an informed consent letter via email (see Appendix G). The informed consent included the following: (a) purpose of the study, (b) institution sponsoring the study, (c) anticipated interview duration, (d) interview questions, (e) voluntary nature of the study, (f) any expected benefits, (g) any anticipated risks, and (h) privacy statement. The participants signed the consent form by hand before the interviews.

Participants have a right to withdraw before and during interviews and their data deleted (Thorpe, 2014). Stacey and Stacey (2012) recommended that participants have a right to withdraw from a study before, during or after interviews but until the commencement of data analysis. I informed the participants about their right to end the interview, have their data discarded, and to exit the study up until the commencement of data analysis. To withdraw, the participants had to send the request via email. The

deletion of the recorded digital audio file would have taken place, as well as the destruction of any field notes for any participant that withdraws.

To overcome recruitment challenges, a researcher should understand the target population's sensitivity to study topic, education levels and economic standard (Namageyo-Funa et al., 2014). A researcher must decide whether to offer a financial incentive when recruiting participants (Robinson, 2014). Robinson (2014) posited that financial incentives might motivate participants to fabricate information to be eligible for a study. The participants did not receive financial payments for taking part in this study.

Researchers should abide by research principles of confidentiality by anonymizing participants' identity by use of pseudonyms (Saunders, Kitzinger, & Kitzinger, 2015). Researchers should protect participants' privacy and confidentiality throughout the study and in the written report (Duong, 2015). Researchers should adhere to research ethics protocols that address potentials for adverse consequences to human participants (Stacey & Stacey, 2012). To maintain confidentiality, I used alphanumeric codes to conceal participant identities and a pseudonym XHT to protect the hospital's identity. To abide by the respect principle, I was considerate of participants' values and beliefs to reduce the risk of harm from distress, embarrassment, intrusion, and anxiety.

Ethical research covers issues of confidentiality, informed consent, restricted use of data, and archiving of data as means of protecting rights of participants, and the integrity of researchers (Brewer, 2016). Pursuance of informed consent leads to protection of participants from covert observation or unconsented surveillance (Stacey &

Stacey, 2012). I informed participants about their rights to withdraw from the study through the informed consent form (see Appendix G).

Securely storing interview data will guarantee the confidentiality of the participants (Brewer, 2016). Sutton and Austin (2015) recommended securing audio recordings and interview transcripts to protect confidential information. Oswald (2017) recommended storing research data in password-secured computer-assisted qualitative data analysis software (CAQDAS) on a password-protected computer to ensure confidentiality. To protect the confidentiality of participants, I used password-secured CAQDAS on a password-protected computer. I password-protected digital files in a flash drive and stored in a bank safe deposit box and then delete all media after 5 years.

Anonymizing research creates challenges in deciding the details to reveal about participants' descriptions, and lives while maintaining data integrity (Stacey & Stacey, 2012). Promoting confidentiality by not revealing individulas involved in the research helps in boosting participants' confidence when discussing personal experiences (McDermid et al., 2014). Researchers use codes and pseudonyms to conceal participant identities, research locations, and companies' identities to ensure participants' confidentiality (Saunders, Kitzinger, & Kitzinger, 2015). I protected the identity of the participants and their organization by anonymizing their identification information. To maintain the confidentiality of the participants, I protected participants' names by removing identifying information and using pseudonyms such as P1, P2, and P3. The pseudonym for the hospital was the XHT.

Data Collection Instruments

I was the primary data collection instrument. Researchers in qualitative case study often use interviews to collect data (Yin, 2014). A qualitative researcher can assume the role of a central data collector (Xu & Storr, 2012). A qualitative researcher is a fundamental data collection instrument (Peredaryenko & Krauss, 2013).

I used semistructured interviews to prompt for information from the participants. Researchers use semistructured interviews to elicit in-depth subjective information from participants (Morse, 2015). Researchers use open-ended questions in semistructured interviews to encourage participants to reveal their perspectives through descriptions of their individual experiences and perceptions (McIntosh & Morse, 2015). New ideas emerge during semistructured interviews because participants are free to answer as they wish and the researcher can follow up with probing questions (Wilson, 2014). I conducted in-depth semistructured interviews with probing questions to provide participants opportunities to elaborate their responses.

Interview questions were open-ended (see Appendix F). An open-ended approach to interviewing includes asking participants semistructured questions with probing questions to elicit thoughtful and detailed responses (Webster, 2016). New ideas emerge during interviews when researchers use of open-ended questions and follow up with probing questions (Wilson, 2014). Brédart et al. (2014) posited that open-ended questions encourage participants to provide in-depth information on their meaning, experiences, and perspectives. The interview questions were open-ended to encourage participants in

their words to provide detailed information on their meaning, experiences, and perspectives.

A secondary collection method included company physical documents for data triangulation. I requested the management to provide training documentation, operating procedures, meeting minutes, and guidelines related to the application of EHR. In the documents, I looked for information that influences information quality, system quality, service quality, efficiency, and cost reduction dimensions of EHR. In a case study, a researcher supplements interview data with other sources of data such as document information, archival records, and observations (Yin, 2014). Multiple sources of information in a study enhance internal validity, the reliability of results, and achievement of data saturation (Fusch & Ness, 2015). Using multiple sources of data may contribute to a construct validity and the development of converging lines of inquiry from utilizing multiple measures of the same phenomenon (Baškarada, 2014). I augmented interview data with company physical documents to enhance the study validity, reliability, and achievement data saturation.

Researchers ask probing questions to acquire in-depth information (Wilson, 2014), without talking too much to encourage participants to disclose more details (Gesch-Karamanlidis, 2015). Researchers use probing questions to clarify a participant's response to enable a greater understanding of pertinent information (Palaganas, Sanchez, Molintas, & Caricativo, 2017). During the interview, I asked follow-up questions for in-depth information while refraining from dominating to avoid restricting the amount of data that participants may have wanted to disclose.

Researchers provide detailed research information to potential participants to consider before deciding whether to participate (Ghooi, 2014). After participants' withdraw, researchers should delete the data (Thorpe, 2014). Before asking interview questions, the goal was to share details about this study about EHR, the importance of the topic to the healthcare industry, and the potential for positive social change. I explained and reviewed a signed informed consent statement with each participant (see Appendix G), assured confidentiality, and the right to withdraw from the study until the commencement of data analysis.

An interview protocol is a procedural guide for conducting an interview that includes reminders to acquire informed consent, interview questions, and talking points for before and after an interview (Jacob & Furgerson, 2012). An interview protocol is a standardized open approach for ensuring consistency from one interview to the next, in addition to allowing for probing questions (Webster, 2016). The order of interview questions helps in building participants' confidence and trust (Fusch, & Ness, 2015). Jacob and Furgerson (2012) recommended arranging questions from the least demanding or antagonistic to the most challenging or revealing. Asking interview questions with the same wording and in the same order helps to maintain data reliability, integrity, and comparability (Arcimowicz, Cantarero, & Soroko, 2015). To ensure data reliability, integrity, and comparability, I applied the same thematic approach during the interviews by using an interview protocol (see Appendix B). To ensure proper order in the interview process, talking points in the interview protocol served as reminders (see Appendix B).

Researchers should make sure proper working condition for equipment used during interviews (Wilson, 2014). The process included recording the interviews with a SONY ICD-UX533 digital voice recorder and a laptop computer using a Fifine K668 external microphone for reliability, clarity, and contingency purposes. I tested to confirm the quality and the reliability of the recording equipment prior the interview.

A combination of interview recordings and field notes enhances the effectiveness, and efficiency of qualitative data management and identification of themes (Neal, Neal, VanDyke, & Kornbluh, 2014). Handwritten notes may include information about participants' personal expressions and interactions that a researcher uses during data analysis (Phoenix et al., 2016). Researchers use field notes to capture non-verbal elements of the interview (Oltmann, 2016). Brief field notes included information generated from participants' non-verbal expressions and key points for follow-up questions. I took brief handwritten field notes during the interview as new concepts emerge and writing notes when probing questions become necessary.

To enhance the reliability and validity of the data collection instruments, I used member checking. Through member checking, researchers verify the accuracy and completeness of interview data to enhance the validity of the study (Ang, Embi, & Yunus, 2016). Researchers perform member checking to promote the concept of validity by ensuring the study findings are accurate from the participants' point of view (Yilmaz, 2013). Member checking interviews help obtain in-depth data and reaching data saturation (Koelsch, 2013). At the end of each interview, participants received contact information to notify them about a member checking follow-up interviews. During the

follow-up interview, a printed copy of my succinct synthesis for each question was available for participants to check for accuracy. The study protocol includes the ability to provide each participant an interpretation for each question for corrections and additional information.

Researchers perform member checking at the conclusion of the study by sending data interpretation to the participants to verify for accuracy (Ang et al., 2016). Participants can make changes to interpretation reports to reflect their experiences and perspectives accurately (Thorpe, 2014). However, Thorpe (2014) warned that revised data might not match interview data. Deleted information may result in the loss of valuable data. Thorpe stated that for ethical reasons of protecting participants, data analysis should exclude deleted information. At the end of this study, the study protocols include the creation of a data interpretation report for participants to check for accuracy and set up a follow-up interview for corrections and additions. During member checking interviews, I provided a printed copy of my succinct synthesis of participants' answer for each question. The participants made changes to interpretation reports to reflect their experiences and perspectives accurately. The study does not include any deleted information by participants.

Data Collection Technique

I conducted face-to-face interviews in participants' offices and analyzed company physical documents. Qualitative interviews are the most common source of data (Yin, 2014). Qualitative interviews include opportunities for researchers to follow-up with probing questions (Wilson, 2014). Researchers use interviews to elicit in-depth subjective

information from participants (Morse, 2015). Through interview technique, researchers encourage participants to reveal their perspectives through descriptions of their individual experiences and perceptions (McIntosh & Morse, 2015). New ideas emerge during interviews when researchers use of open-ended questions and follow up with probing questions (Wilson, 2014).

Face-to-face interaction between a researcher and participants enhances the development of rapport and natural conversation (Wang, & Zhu, 2015). A natural conversion setting allows a researcher to ask open-ended questions and appropriate probing questions (McIntosh & Morse, 2015). Researchers use probing questions to maintain the flow of the interview, and to gain accurate and in-depth information (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). The interview technique was suitable for this study because of access to participants in a natural field setting. In addition, the setting affords elaboration opportunities through probing questions.

I collected data using an interview protocol as a guide to ensure proper order in the interview process (see Appendix B). Gesch-Karamanlidis (2015) stated the interview protocol includes (a) review of study purpose (b) reminders to acquire signed informed consent, (c) interview questions in logical order, and (d) talking points for before and after an interview. Jacob and Furgerson (2012) posited that an interview protocol to standardize a study ensure reliability. An interview protocol is a standardized approach for ensuring consistency among in all interviews in a study (Webster, 2016). I adhered to the interview protocol to ensure asking questions in a logical order and to maintain proper flow throughout the interview process.

Researchers begin interviews with an overview of interview purpose and format, informed consent reaffirmation, assurance of privacy, and confidentiality (Arcimowicz et al., 2015). A relaxed social conversation helps to create a trusting atmosphere (Yin, 2014). The beginning of this study included an introduction of the researcher, the university, and the research topic of the study. The study introduction included steps I will follow to acquire and use data, and the potential for this study to benefit the healthcare industry and effect positive social change. The participants had an opportunity to ask questions, express reservations, and to sign a consent form.

I conducted the interviews in a natural setting, in the participants' offices. Conducting interviews in natural setting enhances participants' sense of control (Zainal, 2017). Rimando et al. (2015) posited that conducting interviews in familiar surroundings help decrease participants' anxiety. To ensure participants' comfort, Arcimowicz et al. (2015) conducted interviews in secluded locations. For this study, the participants selected interview settings with minimal background noise and disruptions.

During the interview, an audio-recording device recorded the interviews into digital files. Researchers use audio recordings to generate interview transcriptions for analysis (Santha, Sudheer, Saxena, & Tiwari, 2015). Malagon-Maldonado (2014) argued that audio-recorded interviews enable researchers to immerse themselves in the data and become engrossed in the interview process. A combination of interview audio recordings and field notes enhance the effectiveness, and efficiency of qualitative data analysis (Sutton, & Austin, 2015). Wilson (2014) recommended researchers to ensure proper working condition for recording equipment used during interviews. I recorded the

interviews with a digital voice recorder and a laptop computer for reliability, clarity, and contingency purposes.

The length of the interviews was 45 minutes. In a study about data collection challenges encountered by doctoral students, Malagon-Maldonado (2014) found interview duration ranged between 30-60 minutes, an average of 45 minutes. Jacob and Furgerson (2012) posited that planning interviews too long might discourage potential participants from agreeing to participants.

After the interviews, I transcribed the dialog and analyzed the data. Member checking involves sending data interpretation to participants to confirm for accuracy (Koelsch, 2013). Participants may make changes to interpretation reports to reflect their intended meanings (Thorpe, 2014). This study includes the creation of a succinct synthesis of the interview data for each participant to verify and confirm for accuracy. The additional data from member checking added to the collected data.

In addition to interview data, I analyzed company documents as a secondary source of data. Other sources of data include field notes and observations, documents, video, and audio (Houghton et al., 2013). Researchers use other sources of data to achieve data triangulation (Yin, 2014). Data triangulation refers to data validation using multiple data sources (Carter et al., 2014). Researchers perform triangulation to ensure the validity of a study by exploring different levels and perspectives on a topic (Fusch, & Ness, 2015). Researchers use multiple information sources to corroborate research conclusions (Morse, 2015). I achieved data triangulation by analyzing company physical

documents. The company physical documents included EHR planning, installation, training and procedural materials.

The advantages of interview data collection include access to participants in a natural field setting (Malagon-Maldonado, 2014). Physical face-to-face contact between a researcher and participants enhances the development of rapport and natural conversation (Miller, 2017). Researchers conduct interviews in natural conversation to control question answering order and address incomplete answers with follow-up questions (Alshenqeeti, 2014). I observed participants' non-verbal communication as secondary data and signals to ask follow-up questions.

Other advantages of interview data collection technique include an ability to capture in-depth detail and flexibility to drill-down on new emergent codes during an interview (Malagon-Maldonado, 2014). Interview method promotes quality and reliability of data through researchers' use of extensive probes to obtain detailed information (Wilson, 2014). Malagon-Maldonado (2014) posited that a researcher controls the direction of questioning toward rich information. Another advantage includes the use interviews where researchers cannot observe a phenomenon. The interview technique meets the needs of a study where a researcher cannot utilize an observation technique to collect data in the actual situation under study (Malagon-Maldonado, 2014). The interviews include an effective way to perceive participant's experiences, meanings, opinions, and attitudes that a researcher has no access to observe a phenomenon (Wang, & Zhu, 2015). Malagon-Maldonado (2014) stated that researchers use interviews where safety, privacy, and intellectual property concerns prevent the observation of the

participants. For this study, the EHR application process involves safety, privacy, and intellectual property violation concerns by non-employee observers. The interview method meets the needs of this study because the phenomenon under study remained unobservable.

The disadvantages of interview data collection technique include a risk of simplifying interview technique based on the assumption that participants are truthful and experts in their field (Qu & Dumay, 2011). However, some participants mislead researchers by not telling the truth (Roulston, 2014). While researchers' goal is to focus on the accuracy of responses, participants might have other goals such as gaining sympathy from researchers, protecting themselves or justifying their behavior (Koelsch, 2013). Participants may give answers based on the expected perceptions rather than providing their perspectives (Wang, & Zhu, 2015).

Researchers use an interview technique as an instrument, thereby treating participants as passive vessels of knowledge rather than a way to explore the meaning of a study topic (Qu & Dumay, 2011). An interview technique provides indirect information based on each participant's perspective (Malagon-Maldonado, 2014). Malagon-Maldonado noted differences in each participant's expressivity and perceptivity, resulting in differences in data quality. Brédart et al. (2014) posited that a researcher should interview participants to capture participants' perspectives, attitudes, and meanings about a research topic in their words.

Another disadvantage of the interview technique is that some quantitative researchers regard empirical data from interview data collection technique as unreliable

and non-objective by (Qu & Dumay, 2011). Cihelkova (2013) stated that inadequate and

subjective interview questions lead to biased and subjective data. Mehra (2002) posited

that interviewer bias might be inevitable because a researcher takes an active role in

guiding an interview. I used open-ended questions followed by probing questions to

ensure validity and objectivity, and to mitigate bias.

Member checking is a process researchers use to ensure reliability and validity of

data collection technique by availing participants with opportunities to verify for

accuracy (Ang et al., 2016). Member checking is a process for enhancing the

trustworthiness of a study through checking with participants regarding the accuracy of

data and interpretations (Marshall & Rossman, 2016). Researchers perform member

checking during an interview process or at the conclusion of a study (Koelsch, 2013).

During interviews, I performed member checking by paraphrasing, clarifying, and

summarizing information for participants' accuracy confirmation. After the conclusion of

interviews, this study included the creation of a succinct synthesis of the interview data

for each participant's input to verify and confirm accuracy. The participants made

corrections and additions to ensure accuracy and completeness of the findings.

Data Organization Technique

Researchers should be aware of the effect of their assumptions, preconceptions,

biases, beliefs, and personal experiences on research (Berger, 2013). Berger (2013)

recommended the use of self-reflective study journals address reflexivity. Using

reflective journals enables researchers to address biases by setting aside their

preconceptions about a study topic (Morse, 2015). A reflexive practice allows researchers

to examine their role to understand the meaning from participants and identifying

mistakes that may influence the interviews (Gesch-Karamanlidis, 2015). Collins and

Cooper (2014) suggested that a researcher should be prepared to deal with feelings

evoked during a research process and handle them in a way that strengthens an ability to

interact with participants. To minimize researcher bias, I maintained a study journal to

record personal reflections and observations that might indicate researcher bias during the

data collection.

Oswald (2017) ensured confidentiality by storing all of the research documents in

a qualitative data analysis software that was secured with a password and installed on a

password-protected computer. The audio recordings and interview transcripts should be

stored securely because they contain sensitive information (Sutton, & Austin, 2015).

Cliggett (2013) recommended storing digital data with the anonymity of individuals and

key identifiers to ensure privacy and confidentiality. I scanned printed media into

password-protected electronic files and shred paper documents. To protect the

confidentiality of the participants, this study included password-protection for digital

audio files on a flash drive. I will store the files in a bank safe deposit box for 5 years and

then delete the records.

Data Analysis

Triangulation

Researchers use data triangulation for case studies by using multiple information

sources to corroborate research conclusions (Morse, 2015). Researchers use triangulation

to ensure the validity of a study by exploring different levels and perspectives on a topic

(Fusch, & Ness, 2015). Data triangulation involves the collection of data from multiple sources to gain different perceptions and to validate data (Carter et al., 2014). Achieving data triangulation enhances a realization of data saturation (Baškarada, 2014). In addition to interview data, I analyzed company physical documents to enhance the achievement of data saturation and ensure the validity of the study. Company physical documents included EHR-related planning, installation, and appraisal materials.

Data Analysis Process Sequence

Groenewald (2004) posited that data analysis process comprises of five phases: (a) reduction, (b) delineating, (c) clustering, (d) validating, and (e) extracting themes. A reduction phase helps in reducing researcher influence on data collection process. The reduction phase is a planned and decisive way to set aside researcher's presuppositions' to prevent researcher's meanings and interpretations from influencing participants' contribution (Groenewald, 2004). A researcher avoids bias by acknowledging own prejudices, assumptions, and preconceived ideas about a phenomenon under study then set them aside (Yin, 2014). I avoided bias by recognizing and setting aside my prejudices, assumptions, and preconceived ideas about a phenomenon.

In a delineating phase, a researcher identifies and extracts relevant information from each interview (Groenewald, 2004). Fielding, Fielding, and Hughes (2013) stated that the first task is a construction of a set of coding categories, which a researcher can apply to data. Initially, I organized collected data in categories related to EHR application. Noblin et al. (2012) conducted studies on a transition from paper to EHR systems. Noblin et al. identified themes regarding EHR application that included (a)

disrupting patient flow, (b) hindering staff communication, (c) improving communication after a patient visit, (d) improving tracking of patient care, (e) spending less time with patients, (f) requiring more training, (g) wanting more features, (h) diminishing productivity, (i) appreciating benefits of templates, and (j) enhancing internal communication.

I started with categories derived from a literature review such as planning, training, installation, feedback, and enhancements. For EHR application success measurement, categories included (a) patient record ease of access, (b) patient care quality, (c) diagnosis accuracy, (d) care coordination, (e) patient participation, (f) efficiencies, (g) cost savings, and (h) social benefits. For EHR implementation barriers, I used categories such as perceived organizational threats, financial limitations, technological limitations, ROI uncertainty, standardization, and inoperability, loss of productivity, and patient acceptance. The collected data determined the final categories as others emerged.

In a clustering phase, a researcher clusters unique units of meaning to form themes (Groenewald, 2004). A researcher identifies relevant topics into units of meaning. Grouping of units of meaning makes up clusters of themes (Ryan & Bernard 2003). Researchers can perform qualitative data analysis with the help of computer software packages for searching and analyzing text-based data, and line-by-line coding (Wood, Paulus, Atkins, & Macklin, 2015).

In a validating phase, a researcher performs a validity check by providing participants with a core synthesis of an interview for amendments (Groenewald, 2004).

To ensure the validity of theme identification, a researcher should make explicit and clear judgments during data analysis process (Ryan & Bernard, 2003). Fielding et al. (2013) stated that researchers could use qualitative software to assess reliability and validity of conclusions by going back to the context of extracts to determine changes made in data reduction and analysis. Researchers use research software to address conflicting findings and address biases by use of instant re-assignment of codes to show their effects (Fielding et al., 2013).

The last phase involves extracting themes from all interviews and making a holistic summary. Researchers generate ideas and theories from general and unique themes that emerge from analysis of all interviews (Craver, 2014). Allen (2015) suggested a researcher should present a list or a table of themes to illustrate interrelationships with figures. Fielding et al. (2013) stated that qualitative software could be used to find words and phrases frequency to generate units of meaning.

Qualitative Data Analysis Software

Wood et al. (2015) established that coding using computer-assisted qualitative data analysis (CAQDAS) included higher efficiency than paper-based techniques as the software allowed for different coding categories and groupings. Searches for words of similar meaning within CAQDAS helps to identify connections that enhance the ability to analyze the data in a systematic way (Rodik & Primorac, 2015). Researchers use CAQDAS to demonstrate analytical processes by using program outputs to illustrate the coding processes and research outputs (Wood et al., 2015). The CAQDAS software

packages, such as Atlas.ti and NVivo® 11, support qualitative data analysis (Rodik, &

Primorac, 2015).

Researchers use Atlas.ti to analyze unstructured data such as text, multimedia, and

geospatial (Mikacic, 2015). Thomas Muhr developed the Atlas.ti in1989 with inspiration

from the grounded theory approach (Evers & Silver, 2014). The Atlas.ti is appropriate for

the grounded theory approach (Evers & Silver, 2014). I did not use Atlas.ti because the

design of this study is a not grounded theory but a case study approach.

NVivo® includes a hierarchical organization of codes that allows for retrieval of

all data associated with a hierarchy (Kaefer, Roper, & Sinha, 2015). I used NVivo® 11

software to organize and analyze interview and secondary data from company

documents. This study included the use of NVivo® 11 query tools to discover emerging

themes. I used the NVivo® 11 automated analysis features to drill down into ideas and

concepts that emerge and to analyze data with words, charts, and models to reveal themes

and links.

NVivo® 11 provides a workspace for organizing, analyzing, sharing data, and

reporting findings (Kaefer et al., 2015). Researchers use NVivo® to cross-examine data to

reveal subtle connections not possible manually (Wiltshier, 2011). Fielding et al. (2013)

highlighted a researcher's ability to use CAQDAS to create visual representations of data

in the form of charts, graphs, and trees for easier analysis and interpretations.

Researchers use NVivo® 11 to processes data in various file formats, including

Microsoft Word®, PDF, audio, video, pictures, database tables, spreadsheets, and

Internet data (Wiltshier, 2011). Categories emerge during data coding from systematic

analysis strategy of line-by-line examination (Kaefer et al., 2015). NVivo® word-frequency tag cloud helps in identification of themes by displaying different font sizes for repeated words: Large font size represents high-frequency words (Fielding et al., 2013). I used NVivo® 11 software to process interview and secondary data from company documents to identify emerging themes.

In NVivo®, the first step is to load data, such as documents and audio files for coding into categories (Castleberry, 2014). A key advantage of using NVivo® software is the storage data in one file, which a researcher can edit, expand, reuse and share (Kaefer et al., 2015). In NVivo® research logs link to data codes. Researchers use a drag-and-drop feature to move a data segment to an existing related node (Castleberry, 2014). Tree nodes enable visualization of subcategories under umbrella codes, which reflect the perceptions of the participants (Houghton, Murphy, Shaw, & Casey, 2015). I created tree-clusters by word similarities to form tree nodes.

I took a bottom-up approach by analyzing data to create nodes for relevant information that informs research objective. Nodes represent relevant data groups for specific themes (Wiltshier, 2011). Coding efforts include using both free nodes in early stages then group nodes into a tree-node structure by moving nodes into similar groups (Woods et al., 2015). Kaefer et al. (2015) explained that a broader category denoted a higher level of hierarchy in a tree-node structure. After creating nodes, I developed hierarchical structures to illustrate interrelationships of categories, to represent emerging nodes.

Key Themes Correlation with Literature and Conceptual Framework

For a conceptual foundation that provides a framework for examining EHR application phenomena, I used DeLone and McLean's (1992) information systems success model (DMISS). Researchers use DMISS for evaluating information systems application success using seven dimensions: Information quality, system quality, service quality, use, intention to use, user satisfaction, and net benefits (Bossen et al., 2013). I used DMISS as conceptual frameworks to formulate interview questions and a basis to interpret results from theme characteristics of existing EHR application efforts. Theme characteristics include inoperability, ROI, workflows disruptions, staff and patients acceptance, and external influences from software vendors, government, and insurance industry. These theme characteristics influence providers' ability to overcome perceived barriers of EHR. Perceived barriers influence EHR implementation and use, as emphasized in the system use, and user satisfaction dimensions of the DeLone and McLean (1992) information systems success model. Overcoming barriers and successfully implementing EHR may lead to benefits such as reduced costs, increased profitability, high-quality patient care, and improved care coordination (Bajwa, 2014).

Discovering themes and subthemes in qualitative data involves techniques that range from computer-based to manual line-by-line analysis (Fielding et al., 2013). Ryan and Bernard (2003) stated that themes emerge from data based on their frequencies, and the degree of which specific contexts control their expression characteristics. Ryan and Bernard suggested a researcher identify themes from data into similar expressions. Researchers discover themes from the collected data and literature reviews of a

phenomenon under study (Allen, 2015). I identified EHR application concepts then categorized them into key themes, and correlated to the conceptual framework.

<div align="center">**Reliability and Validity**</div>

Reliability

The notion of reliability indicates that researchers can repeat the study to generate the same results using same data collection procedures under similar research settings (Yin, 2014). Researchers ensure reliability by using an interview protocol, which is a procedural guide for conducting an interview that includes interview questions and talking points for before and after an interview (Gesch-Karamanlidis, 2015). Asking a similar set of questions also helps in achieving exhaustive data set and enhancing comparability of answers (Arcimowicz et al., 2015). To ensure reliability, I asked interview questions using the same wording and order to each participant and standardized the study with an interview protocol (see Appendix B).

Dependability. Dependability refers to data stability enhanced by outlining the interpretative conclusions of the researcher (Houghton et al., 2013). Dependability criteria involve a consistency of research processes such as conceptualization, data collection and analysis, and findings dissemination (Morse, 2015). A researcher enhances dependability with a clear explanation of a rationale for selecting a research topic, design, and methods (Yilmaz, 2013). Moustakas (1994) posited that a precise description of the data collection process would enable other researchers to replicate the study in a similar setting. For this study, I stated and justified the selected design and method. I described the data collection process and instruments, organization, and analysis.

Researchers use NVivo® to enhance the dependability of research by providing a detailed trail of decisions made during data collection and analysis (Houghton et al., 2013). External auditors can review audit trail documentation for a study to determine the reliability and validity of the data collection (Carlson, 2010). Researchers ensure the stability of study processes used over time by avoiding mistakes in research conceptualization, data collection, findings interpretation, and results dissemination (Baškarada, 2014). I explained the logic and rationale for the sampling method, data collection techniques and instruments, and data analysis process. This study kept and maintained a comprehensive audit trail of decisions during the study within the CAQDAS.

Validity

Morse (2015) posited that a researcher enhances validity by taking a neutral role to minimize bias and researcher influences. Researchers use credibility, transferability, and confirmability to validate and demonstrate truthfulness to qualitative study (El Hussein, Jakubec, & Osuji, 2015). Validity relates to the trustworthiness of research that researchers enhance through triangulation (Marshall & Rossman, 2016). Triangulation refers to the cross-checking of data through the use of multiple data sources and methods such as documents, interviews, and observations (Marshall & Rossman, 2016). Member checking is another process of enhancing the trustworthiness of a study through checking with participants regarding the accuracy of data and interpretations (Koelsch, 2013; Marshall & Rossman, 2016).

Credibility. A researcher uses credibility criteria to establish that results of qualitative research are trustworthy from perspectives of participants (Yilmaz, 2013). For credibility, a researcher ensures same results under similar conditions (El Hussein et al., 2015). The credibility of a qualitative study depends on the rationality of data collection procedures, multiple data sources, triangulation, detailed description, and member checking (Houghton et al., 2013). In a case study, researchers ensure credibility through data triangulation, which involves collecting data from multiple sources such as interviews, questionnaires, observations, and archival data to validate findings (Houghton et al., 2013). Data triangulation comprises of data from different perspectives for validating data (Carter et al., 2014). In addition to interview data, I achieved data triangulation by analyzing data from interviews combined with concepts and ideas derived from company physical documents.

Member checking involves sending data interpretation to participants to confirm for accuracy (Marshall & Rossman, 2016). A researcher provides participants opportunities to review interview interpretation and themes results before a study conclusion (Koelsch, 2013). Participants may make changes to interpretation reports to reflect their intended meanings (Carlson, 2010). I conducted interviews, created a succinct synthesis for each question, and then sent a report to each participant for accuracy checking, corrections, and additions.

Transferability. A researcher uses transferability criteria to ensure results of qualitative research generalizability to other similar contexts (Yilmaz, 2013). A researcher enhances transferability through a comprehensive description of a central

research context and assumptions (Houghton et al., 2013). Future researchers

demonstrate transferability that findings of a study apply to another context (Marshall &

Rossman, 2016). The more similar the target context is to the study, the more likely the

findings will be transferable (Houghton et al., 2013). To ensure future research

transferability, I used detailed descriptions of the interview settings, context, participants,

activities, and events relevant to the research. Rich descriptions of this study ensure

accurate comparison with target research's context to identify similarities. Detailed

research context includes time spent, study phenomena, data collection and analysis, and

interpretation settings.

Confirmability. A researcher uses confirmability criteria to ensure others can

corroborate results (Yilmaz, 2013). A researcher ensures that study results emanate from

the analysis of collected data and logically grounded on data (Yilmaz, 2013). To enhance

confirmability, a researcher should focus on results from data and avoid manipulating

results (Berger, 2013). Data contradictions and illogical analysis reduce confirmability

(Morse, 2015). I ensured logical data collection and analysis procedures.

The researcher enhances confirmability through documenting procedures used for

collecting and examining data to ensure accuracy (Houghton et al., 2013). Houghton et

al. recommended researchers to keep an audit trail of methodological and interpretative

decisions and actions undertaken during a research process. Field notes taken during

interviews serve as an audit trail that external auditors can review to determine

objectivity and accuracy of data (Carlson, 2010). This study includes taking field notes

during the interview as new concepts emerged, observations, and key points for follow-up questions.

Data Saturation. Data saturation refers to a situation during qualitative interviews where additional interviews become counter-productive when new data does not add value to a study (Guest et al., 2006). Data saturation occurs when a researcher achieves data redundancy (Saunders et al., 2017). Houghton et al. (2013) defined a data collection situation where no new code emerges, and data analysis reveals no new themes. I continued interviewing additional participants until no new codes emerged, no new information developed, and the analyzed data revealed no new themes.

Transition and Summary

Section 2 of this study included a study purpose statement, the role of the researcher and a description of study participants. Section 2 comprised research method and design selection, and appropriateness justifications for addressing the research question. Other topics include a description and justification of population, sampling methods, and sample size. Research quality indicators include ethical research for addressing informed consent process, incentives, withdrawal procedures, and participants' confidentiality. Section 2 also included discussions of data collection instruments and technique, organization technique, and analysis. Section 2 concluded with a description of processes for enhancing this study's reliability and validity.

Section 3 begins with an introduction comprising of the purpose of the study and a summary of the findings. Presentation of findings begins with a research question and identification of each theme. A description follows to show the findings relationship to

the conceptual framework and the body of knowledge. A discussion includes the

application of findings in business practice and effect on social change. Section 3

concludes with recommendations for action and future research.

Section 3: Application to Professional Practice and Implications for Change

Section 3 includes the findings of the research study. I present the findings of the study by identifying main themes. Section 3 includes (a) an introduction, (b) presentation of the findings, (c) application to professional practice, (d) implications for social change, (e) recommendation for action, (f) recommendations for further study, (g) reflections, and (h) study conclusion.

Introduction

The purpose of this qualitative exploratory single case study was to explore strategies that IT leaders in hospitals can use to apply EHR to achieve a cost savings benefit. Interviews took place in a natural environment where participants provided detailed responses to 10 semistructured interview questions (see Appendix F). The findings of study indicated the strategies that IT leaders were using to apply EHR resulted in (a) improved accuracy, (b) improved timeliness, (c) improved access, (d) up-to-date information, (e) overcame technical limitations, (f) ensured privacy and security, (g) staff training, (h) superb technical support, (i) positive attitude, (j) maximized system use, (k) willingness to change, (l) administration efficiency, and (m) cost reduction. The findings of this study may function as a reference for IT leaders in developing effective EHR application strategies for hospitals.

Presentation of the Findings

The central research question for this study was: What strategies can IT leaders in hospitals use to apply EHR successfully to achieve a cost savings benefit? DeLone and McLean's (1992) information systems success model formed the conceptual framework

for the study. I used the information system success model to construct themes based on the EHR information quality, system quality, service quality, usability, and organizational net benefits. I used semistructured interviews to gain an understanding of strategies that IT leaders in hospitals use to apply EHR successfully to achieve a cost savings benefit. I used a purposeful sample of five participants to collect data using face-to-face interviews in a hospital. Table 1 includes a list of the participants' education, title, and years of experience. To triangulate and confirm interview data, I also reviewed the hospital's policy documents, user manual, and other external business records regarding the application of EHR.

Table 1

Participants' Education Level, Title, and Years of Experience

Participant	Degree	Title	Experience
P1	BS (Math)	Sr. VP and Chief Info. Officer	44
P2	BS (HealthCare Admin)	Director EMR Integration	28
P3	BS (Registered Nurse)	Manager Clinical Applications	10
P4	MS (Health Services)	Director Business Operations	13
P5	MD and Ph.D. (Genetics)	Chief Medical Information Officer	13

After transcribing the interviews and gathering company records, I imported the data collected into NVivo 11 qualitative data analysis software for coding and analysis. I identified 13 core emergent themes. I arranged the presentation of findings section by

these four themes: (a) information quality, (b) system quality, (c) service quality, (d) usability, and (e) organizational net benefits.

Theme 1: Strategies to Ensure Information Quality

The information quality theme consists of accuracy and timeliness of data subthemes. The information quality dimension of DMISS refers to the accuracy and timeliness attribute of data that a healthcare provider can enhance to store patient information (Petter et al., 2013). The data accuracy and timeliness subthemes emerged from the participants' strategies to improve EHR information quality.

Accuracy. EHR's improved accuracy and timeliness of data avail up-to-date information to physicians for making informed decisions during patient care (Deokar & Sarnikar, 2016). P1 and P4 stated that for accurate data, the health information management (HIM) department team checks patient records for incomplete documentation by reviewing charts before and after patient discharge. P2 asserted that IT system configuration settings promote accuracy such as the use of drop-down menus and best practice alerts to help providers make the right decisions. P3 shared that EHR built-in features help to identify inconsistent data such as comparing cities to zip codes, male to female codes and temperature ranges.

P4 indicated that the strategy for ensuring accurate data starts at the registration, by crosschecking patient identification information to avoid identity theft. A two-person team verifies patient identification during medication by using patient name and date of birth to ensure the accuracy. P4 added that a data integrity team identifies and resolves patient information duplicates, overlays, and inconsistencies. P5 stated that auditing

reports help in medical record deficiency and delinquency management by generating automated notifications to providers to rectify incomplete records. P5 described a multi-modal audit approach where automated audits highlight patterns of inconsistent documentation, and then manual audits confirm the deviation from documentation best practice.

I examined a *Patient Identification SAFER Guide* document that includes safety practices associated with the reliable identification of patients in the EHR by a two-person team, using patient's name, date of birth, and gender. The two-person verification strategy in the document confirmed the strategy that P4 described for the confirmation of patient identity based on patient name and date of birth. The document includes a strategy to use EHR auditing reports to identify duplicate patient records, which confirmed the strategy that P4 and P5 mentioned for identifying and merging duplicate records. In the document, a strategy for assigning each patient a permanent identification number to prevent duplicate records confirmed P4's strategy for preventing patient information duplicates and overlays.

Timeliness. Physicians access and update the EHR through secure software and hardware to ensure timeliness (Helton et al., 2017). For data timeliness, P1 stated that care providers have access to computers on wheels (COWS) that they wheel in and out of the patients' rooms to document in front of the patient. P1 added that physicians use their phones for dictation capability to document patients' encounter directly into the EHR system. P1 mentioned EHR's shorthand capability for recognizing smart phrases to populate full text helps the physicians to facilitate timely and complete documentation.

Real-time data entry of patient medical care results in up-to-date EHR (Colonias et al., 2017). For timely and up-to-date patient information, P4 reported that hospital policy requires the physicians to provide timely documentation in the EHR after a patient encounter. On the inpatient side, certain elements must be complete within 24 hours, while the outpatient providers have to document within 72 hours.

I examined a *General Policy for Documentation in EHR* document that lists data elements that must be accurate, relevant, timely, and complete. The policy in the document confirmed the strategy that P4 described for providers' timely and accurate documentation in the EHR after each patient encounter. The document includes a strategy to ensure health records contain patient identification, diagnoses, treatment, results of treatment, patient discharge status, and plan of follow-up care. The strategy confirmed the processes provided by P4 for ensuring complete health records.

The participants' interview testimonials are as follows: "When our clinical decisions people in the HIM department look at that data, they are looking for any gaps of what might not have been documented" (P1). "There are things within our system that we can configure to help with accuracy. IT team uses a lot of drop-down menus, so we are limiting what they can enter" (P2). "We allow our physicians to use their phone as a dictation device to indicate what is going on with the patient" (P1). "We generate automated notifications to the provider which create automated emails that state, 'You have documentation that is overdue'" (P5).

Table 2 includes the subthemes that emerged from the data analysis regarding the strategies to ensure information quality by improving data accuracy and timeliness. The

data accuracy and timeliness strategies that emerged from the data analysis were (a)
teams to verify data, (b) accurate documentation, (c) dictation capabilities, and (d) audit
for record completeness.

Table 2

Theme 1: Information Quality Coding Frequency

Word	Count
Accuracy	18
Timeliness	9

The information quality theme from the findings links to existing literature on
effective business practice. The information quality theme consists of accuracy and
timeliness of data subthemes. The accuracy and timeliness of data in EHR result in up-to-
date information that clinicians use for making informed decisions during patient care
(Deokar & Sarnikar, 2016). Healthcare providers rely on the accuracy and timeliness of
EHR data to bolster efficiency, improve patient care and lower costs (Tsai et al., 2014).
Accurate and timely data results in reduced medical errors, which improves patient
safety, promotes patient satisfaction, and reduces costs for the hospital (Deokar &
Sarnikar, 2016). The findings of this study included the IT leaders' strategy to ensure data
accuracy by checking patient records for incomplete documentation in patients' charts. In
addition, the clinicians enter data in real time from workstations, tablets, and smartphones
as a strategy for timely data.

The information quality dimension of DMISS conceptual framework refers to the
accuracy and timeliness attribute of data that a healthcare provider can enhance to store

patient information (Petter et al., 2013). The information quality theme from the findings links to the information quality dimension of the conceptual framework in that IT leaders use strategies to improve the accuracy and the timeliness of EHR data to ensure information quality. For accurate data, the IT staff checks for incomplete documentation by reviewing patient charts. For timely data, clinicians have access to EHR from workstations, tablets, and smartphones. The leaders enforce a timeliness policy for the physicians to complete documentation within 72 hours of a patient encounter.

Theme 2: Strategies to Ensure System Quality

The system quality theme consists of technical limitations and security of patient data subthemes. The system quality dimension of DMISS refers to an effect to deliver benefits attributable to technical limitations, privacy and security concerns (Nguyen et al., 2014). The technical limitations and the security of patient data subthemes emerged from the participants' strategies to ensure EHR system quality.

Overcoming technical limitations. Deokar & Sarnikar (2016) recommended planners to analyze and map out current workflow and processes to identify potential EHR-related new workflow patterns. P1, P2, and P3 stated that the IT department leaders address technical limitations by working with end users to work out the clinical workflow to determine the optimal placement of equipment. P2 added that the IT team placed computers in the patient rooms and provided computers on wheels. P4 asserted that leaders using the shared resources strategy allow users to share workstations in turns because not all users need EHR access at the same time.

I examined a *Workflow Process Mapping for EHR Implementation* document that includes recommendations to involve stakeholders in performing workflow analysis and redesigning to maximize office efficiencies and improve care coordination. The documented strategy for the inclusion of end users in the workflow analysis and redesign confirmed the strategy that P1, P2, and P3 described for collaborating with clinicians in the alignment of the clinical workflow to the EHR processes. The document includes a strategy to reduce waste in processes by rearranging EHR access points for continuous workflow, which confirmed the strategy that P2 mentioned for convenient placement of workstations.

EHR with mobile communication technology results in improved practice efficiencies in healthcare delivery and management (Bajwa, 2014). P3, P4, and P5 stated that the EHR includes capabilities for providers to access data securely on their encrypted personal phones and tablets. P5 added that the providers use encrypted applications, such as Haiku on smartphones and Canto on tablets. I examined a *Take Steps to Protect and Secure Information When Using a Mobile Device* document that includes recommendations to install encryption and use password authentication to protect health information stored or sent by mobile devices. The use of mobile device encryption strategy in the document confirmed the strategy that P3, P4, and P5 described for ensuring clinicians access data securely using encrypted phones and tablets. The document includes a strategy to install security applications to protect against viruses, spyware, and malware-based attacks.

Kurtzman (2015) posited that hospital leaders and staff should support suitable infrastructures to ensure implementation success. P2 stated that executive-level support to implement EHR provided funding to deploy appropriate technology infrastructure. P5 reported that the implementation team ensured the backbone of technology infrastructure is a reliable and stable platform that is dependable to the providers.

Ensuring privacy and security of patient health information. P2, P3, P4, and P5 stated that providers load the Air Watch application on their personal phones and tablets to allow secure access to EHR data. P5 admitted to the use of Air Watch to ensure that the policies on the phone match the organizational policies regarding having the right protection and ensuring a point-to-point encryption communication for patient health information (PHI). Haiku, the phone EHR version, has point-to-point encryption. The phone and tablet EHR applications do not store PHI on the devices.

The *Take Steps to Protect and Secure Information When Using a Mobile Device* document includes a recommendation to install a firewall to block unauthorized access. The use of a firewall strategy in the document confirmed the strategy that P2, P3, P4, and P5 described for installing the Air Watch application on their personal phones and tablets to prevent unauthorized access. The document includes recommendations for (a) installing capability for erasing data from stolen devices, (b) using passwords to unlock the devices, (c) researching mobile applications before downloading, and (d) maintaining physical control of the devices.

Bidgoli (2016) recommended staff training to include learning to use login and screensaver passwords. P1 mentioned the use of double login for sensitive areas such as

behavioral health to confirm user authorization for access to behavioral patient information. P2 and P3 asserted that all systems access have timeouts to log users out when left idle automatically. P4 stated that a tracer team goes out to trace an area to determine if users lock their computers before walking away. P5 stated that users follow basic cybersecurity principles, such as not sharing passwords and locking computers when not in use. P5 shared that users' passwords are complex and changed every 90 days in accordance with the National Institute of Standards and Technology (NIST) guidelines.

I examined a NIST's *Guide to Enterprise Password Management* document that includes recommendations to configure password mechanisms sufficiently complex and to enforce changing passwords periodically to prevent unauthorized access. The complex password strategy in the document confirmed the strategy that P5 described for enforcing complex passwords that expire every 90 days. The document includes a strategy to prevent password sharing which confirmed the strategy that P5 mentioned for prohibiting password sharing. In the document, a strategy for software's timeout feature after an idle period confirmed the strategy that P2 and P3 cited for automatic user logout from idle workstations. The document includes a strategy to lock out users account for a set duration after a number of consecutive failed authentication attempts.

Leaders use role-based access control mechanisms to grant system access to users based on their role within an organization (Parks, Xu, Chu, & Lowry, 2017). P1 described a strategy for securing patient health information by using software called MAIZE to verify if anyone that opened a record was a legitimate caregiver. P3 reiterated the importance of a strategy within the EHR for role-based security to provide access

based on the job user performs in the organization. Role-based access limits the information users can view and update. P2, P3, and P4 reported that the compliance department staff conducts audits to track adherence to privacy guidelines such as a policy prohibiting users from accessing their EHR records and those of their family members. P4 stated that the EHR system has reporting capabilities for auditing called *Break the Glass* to report inappropriate access, which create alerts to the supervisors for further review.

Harvey and Harvey (2014) recommended implementation of privacy and security engineering process through education and training. P3 and P4 indicated that users attend annual computer-based learning classes on HIPAA policies and the importance of security and privacy of patient information from culture and system perspectives. P4 asserted that the hospital does not release patient information until a patient or a designee signs a consent form.

The participants' interview testimonials are as follows: "We work with our end users as they work out the workflow to figure out where equipment needs to sit and how much it is. We have enough equipment" (P2). "Instead of giving everybody a piece of technology, we share workstations where that technology is made available to all the users because they are not using technology all at the same time" (P4). "We have an application that is built into EHR that allows providers to look at data securely on their phones and their iPads" (P3) "We follow kind of aggressive NIST guidelines, which is complex passwords, requiring password changes every 90 days" (P5).

Table 3 includes the subthemes that emerged from the data analysis regarding the strategies to ensure system quality by overcoming technical limitations and ensuring the privacy and security of PHI. The strategies that emerged from the data analysis were (a) deploying enough computers, (b) shared resources strategy, (c) use of phones and tablet devices, (d) point-to-point encryption, (e) role-based user access, and (f) use of frequently changed complex passwords.

Table 3

Theme 2: System Quality Coding Frequency

Word	Count
Security	20
Limitations	12
Protection	8
Privacy	8

The system quality theme from the findings links to existing literature on effective business practice. The system quality theme consists of technical limitations and security of patient data subthemes. The system quality relates to EHR system's technical limitations, and privacy and security attributes (Nguyen et al., 2014). The EHR system's technical limitations affect the response time during login, saving data, and retrieving data (Bossen et al., 2013). EHR system planners analyze and map out clinical workflows and processes to identify potential EHR-related new workflow patterns (Deokar & Sarnikar, 2016). The findings include strategies by the IT department leaders to address technical limitations by working with clinicians to evaluate clinical workflows to

determine the optimal placement of EHR access devices. The IT team placed computers at the clinicians' stations, inside patient rooms and provided computers on wheels for easy and timely access. The clinicians use password-protected and encrypted devices to protect the privacy and security of patient health information. To protect patient information from unauthorized access, users have role-based access to information that relates to their job functions.

The system quality dimension of DMISS conceptual framework refers to an effect to deliver benefits attributable to technical limitations, privacy and security concerns (Nguyen et al., 2014). The system quality theme from the findings links to the system quality dimension of the conceptual framework in that IT leaders use strategies to overcome technical limitations and protect patient data to ensure system quality. The IT leaders work with clinicians to determine optimal EHR process flow to match the clinical workflow. To promote privacy and confidentiality of patient information, clinicians use frequently changed and complex passwords.

Theme 3: Strategies to Assure Service Quality

The service quality theme consists of staff training and technical support subthemes. Staff training and technical support provided by IT department teams and software vendors influence the service quality dimension of the DMISS (Bossen et al., 2013). The staff training and technical support subthemes emerged from the participants' strategies to assure EHR service quality.

Staff training. Leaders use staff training to assure the EHR system service quality (Bossen et al., 2013). Formal classroom-style training is inadequate as the focus is

on basic tasks (Graetz et al., 2014). P5 stated that staff training is a combination of (a) initial foundational classroom training, (b) peer to peer training through super users and physician liaisons, and (c) on-going training on improvements and enhancements of the EHR system. P3 reported that an EHR training team, comprised of several nurses, builds and maintains a training environment that closely mirrors the production environment to ensure training the staff based on accurate information. P2 and P3 shared that the training team trains all functions of the EHR to every new employee before gaining access to the EHR. P4 added that the training for nurses on EHR occurs by matching nurses with preceptors.

EHR vendors train super users on all aspects of the system to become trainers to their peers (Penoyer et al., 2014). The super users work alongside clinicians to provide impromptu training (Vockley, 2015). P1, P2, P3, and P4 stated that physicians get one-on-one training from liaisons, a group of nurses trained during EHR implementation. Liaisons' training starts with the EHR vendor by learning the system structure, configurations, and functionality. The liaisons walk around the hospital with physicians to determine training needs and system changes needed to facilitate efficient and accurate data entry. P4 and P5 added that physicians have direct contact with liaison team through a dedicated phone number or using an EHR messaging feature called *Support Message* that sends the EHR screen capture where the provider needs assistance.

One of the unexpected findings is a strategy to use of physicians to build an EHR system. P4 and P5 stated that a group of physicians from multiple specialties trained in IT and leadership form a group called *Physician Informaticists* (PI) to help with EHR

governance. The PI group gets training from the EHR vendor to become certified physician builders to configure the system.

Leaders use ongoing staff training to maximize proficiency in EHR (Colonias et al., 2017). P2 noted that the IT department team provides tools and training for monitoring and assuring the quality of the data. P3 stated that the hospital IT staff offer training through computer-based learning classes. P3 mentioned that all employees must attend ten computer-based learning classes annually. P3 posited that computer-based learning provides a balance between efficiency and the effectiveness of training by offering short topics on various features of the EHR system. P3 added that the EHR vendor provides 90-second videos for underutilized functions.

Technical support from IT department, and vendor. Staff training and technical support provided by IT staff and software vendors influence the service quality dimension of the DMISS conceptual framework (Bossen et al., 2013). P3 stated that the strategies for forming the IT department were to not only hire information systems experts but also include nurses, pharmacists, and laboratory personnel that have interest and aptitude for IT. P1 added that a third of the IT specialists are clinicians with enough clinical knowledge to respond accurately to users' IT requests.

Super users serve as troubleshooters for EHR issues for the clinicians while the IT department team provides technical support to address EHR performance concerns (Bullard, 2016). P2, P3, and P5 reported that the IT helpdesk team resolves issues across all systems through a ticketing system where users can request help online or by calling a

support line. The EHR vendor provides technical support services for issues that go beyond the helpdesk staff's expertise and liaisons' knowledge.

The participants' interview testimonials are as follows: "Staff training is a combination of three things: one, good initial foundational training; two, peer to peer training through super users and physician champions; and then three, regular updates of training as improvements and enhancements go into the EMR" (P5). "We have liaisons whose sole job is to walk around the hospital with physicians, watch what they are doing, see if there is anything that we can do to facilitate easier entry or correct entry" (P1). "For the low-level technical resources, we do have the helpdesk. For more complicated issues with the EMR, we have a team of liaisons that work with the physicians" (P5).

Table 4 includes the subthemes that emerged from the data analysis regarding the strategies to assure service quality by training staff and using internal and external technical support. The strategies that emerged from the data analysis were (a) classroom training, (b) peer training by liaisons, (c) computer-based learning, and (d) local IT and vendor helpdesk support.

Table 4

Theme 3: Service Quality Coding Frequency

Word	Count
Training	51
Support	8
Technical	7

The service quality theme from the findings links to existing literature on effective business practice. The service quality theme consists of staff training and technical support subthemes. The quality of staff training influences the service quality of the EHR system (Bossen et al., 2013). The availability of staff training, system users' manual, and help functions promote the service quality (Bossen et al., 2013). Technical support provided by IT department teams and software vendors influences the service quality (Nguyen et al., 2014). The findings include strategies by the IT department leaders to improve EHR system service quality through staff training and providing technical support to clinicians. Staff training strategy includes the foundational classroom-training, peer-to-peer training by physician liaisons, and on-going training on improvements and enhancements of the EHR system.

The system quality dimension of DMISS conceptual framework refers to the responsiveness and reliability of the EHR system. Staff training and technical support provided by IT department teams and software vendors influence the service quality dimension (Bossen et al., 2013). The service quality theme from the findings links to the service quality dimension in that IT leaders use staff training and technical support strategies to assure service quality. The IT team, which comprises of both technical and clinical experts, provides staff training during new hire, one-on-one and through computer-based learning classes. The IT team provides technical support to the clinicians in various aspects of the EHR.

Theme 4: Strategies to Promote Usability

The usability theme consists of user attitude, usage level, and willingness to change subthemes. User satisfaction dimension of the DMISS refers to attitudes toward EHR by care providers and patients based on the system usability (Nguyen et al., 2014). The user attitude, usage level, and willingness to change subthemes emerged from the participants' strategies to promote EHR usability.

Positive attitude. User satisfaction depends on the attitude toward EHR by care providers and patients based on the acceptability, usability, and reliability of the system (Nguyen et al., 2014). P2 and P5 asserted that the strategy to promote acceptance was to engage users in the EHR building process to map the workflows that benefit all. P5 stated that physicians and clinicians undergo training on the workflow and the importance of EHR. P3 added that the providers develop a positive attitude when they recognize documentation requirements that emanate from outside of the organization, such as government regulations, Medicare, and Medicaid.

P1 stated that a group of physicians called *Ambulatory Physician Advisory Committee* (APAC) acts as an interface between the IT staff and the other physicians. The APAC group meets on a regular basis with the IT department team to discuss improvements and adjustment to the EHR system that are acceptable and beneficial to the users. P5 asserted that users develop a positive attitude toward EHR when they master and customize the system to meet their needs. P3 added that the peer-to-peer interactions with super users, physician liaisons, and PI group promote a positive attitude towards EHR. P3 and P5 reported that in 2017 the organization participated in an EHR

satisfaction survey administered by KLAS Research where physicians and nurses scored high satisfaction above 90th percentile across the board.

Patients access their clinical information from the comfort of their homes through EHR patient portal where they view charts and rate the quality of care (Ramsey et al., 2018). P2 and P4 stated that the EHR has a patient portal where patient access from their homes to view lab results, schedule appointments, and make payments. P5 added that patients use MyChart application on their smartphones to interact with the EHR. Patients like the EHR because they do not have to provide repeatedly their information besides updating their medication list to capture new changes in medication.

Encourage users to use all available functions. All five participants stated that training is the most effective way to encourage users to use EHR functions. P4 reported that the EHR vendor provides 30 to 60 seconds training videos called *It is Possible* that teach specific processes. The IT department leaders are planning to create training videos series to help providers learn to use specific EHR functions. P3 and P4 shared that weekly communications to providers help to highlight new EHR features and rationale for using them.

Super users provide one-on-one training and support to clinical end-users (Bullard, 2016). P1 and P5 stated that the liaisons work one-on-one with physicians and nurses to train them to use all the system functions that pertain to their job roles. The PI group works with other physicians to determine convenient and efficient techniques for documenting in EHR.

P4 asserted that the hospital has policies for specific aspects of patient health records that clinicians must document in EHR and not on paper. P4 stated that one of the strategies to encourage users to use EHR function is celebrating victories when providers successfully adopt specific areas of the EHR.

Willingness to change the organizational culture. Nguyen et al. 2014 posited that leaders must have necessary skills to manage EHR-driven organizational changes. P5 indicated that the hospital has the right leadership infrastructure to drive the adoption of the EHR because the leadership includes physicians that are also IT experts. P5 concluded that the physicians and nurses have representation at the leadership level and in the IT department. P1 and P5 stated that a third of IT department analysts are clinicians; therefore, they can map EHR process flow to match the clinical workflow.

P1 asserted that the most important driver for change is whether a process flow in EHR is more efficient or beneficial for patients. P3 stated that clinicians adopt changes when they recognize the necessity for data to respond to internal decision-making needs and external metrics for quality of care reporting. P4 asserted that the management team educates clinicians the value of EHR in population health because each patient's health record is readily available from any healthcare facility to ensure smooth continuity of patient care. The clinicians understand the value of the patient health record for care coordination to provide the best care to the patient.

The participants' interview testimonials are as follows: "What I think is really important with this is two-fold. One, end-user engagement in the build process. And secondly, to make sure that the software build is well vetted and goes through a thorough

governance process" (P5). "People do better with the EHR when they have, number one, learned to master it; and two, customize it" (P5). "We have some new initiatives, some super-useful physician groups forming that help with their peers" (P3). "We have physicians whose total job it is to be kind of the go-between between IT and the other physician." (P1). "And then sometimes you just have to bring in a policy to say, 'Yeah. We do not do that on paper anymore. It has to be done in the EMR'" (P4).

Table 5 includes the subthemes that emerged from the data analysis regarding the strategies to promote EHR usability by enhancing positive attitude, maximizing system use, and willingness to change organizational culture. The strategies that emerged from the data analysis were (a) engage users in system build process, (b) workflow training, (c) peer-to-peer liaison interactions, (d) adapt to external policy changes, (d) training videos, (e) role-based training, (f) organizational policies, and (g) capable leadership for change.

Table 5

Theme 4: Promoting Usability Coding Frequency

Word	Count
Change	23
Use	13
Attitude	7

The usability theme from the findings links to existing literature on effective business practice. The usability theme consists of user attitude, usage level, and willingness to change subthemes. The user attitude, usage level, and willingness to change influence the usability of EHR. The commonly used system functions such as

accessing, viewing, and documenting influence the system usability (Bossen et al., 2013). Training is the most effective way to encourage users to use all EHR functions. Leaders use ongoing staff training to maximize proficiency in EHR (Colonias et al., 2017). The availability of staff training, system users' manual, and help functions promote the system usability (Bossen et al., 2013). The findings include strategies by the IT leaders to promote a positive attitude, increase EHR usage level, and increase clinicians' willingness to change by engaging users in the EHR building process. The IT department team provides computer-based learning classes while the liaisons provide one-on-one training.

The intention to use information technology depends on users' perceived usefulness and ease of use (Alazzam et al., 2015). The usability dimension of DMISS conceptual framework refers to the attitudes toward EHR by care providers based on the usability and the reliability of the system (Nguyen et al., 2014). The usability theme from the findings links to the usability dimension in that IT leaders use strategies to increase user satisfaction and to promote a positive attitude towards EHR. To increase the usage level and willingness to change, the leaders promoted staff training and system customization to meet the clinicians' needs.

Theme 5: Strategies to Maximize Net Benefits

The net benefits theme consists of administration efficiency, reporting, and cost reduction subthemes. The net benefits include staff acceptance of EHR for social benefits derived from EHR technology (Alazzam et al., 2015). The administration efficiency, reporting, and cost reduction subthemes emerged from the participants' strategies to maximize EHR net benefits.

Administration efficiency. P3 stated that the IT department team is continually analyzing staffing to provide the right level of support to realize the investment in EHR. P1 asserted that the goal to implement EHR was to improve quality of care without the expectation of reducing cost. P3 added that the IT department team works with the operational revenue cycle leaders to emphasize documentation in EHR for revenue capture than cost savings. P4 stated that using EHR leads to financial incentives and avoidance of penalties by meeting certain regulatory standards and guidelines.

P1, P2, and P4 indicated that EHR efficiency in clinical documentation and coding medical charges results in timely and accurate reimbursement. P4 added that medical coders examine patient charts after discharge to ensure billing information meets payer requirements to avoid lost revenue through claim denials. P4 stated that the administration efficiency comes from the elimination of physical movement of paperwork that may get lost or not meet compliance and regulatory standards, such as missing patient and clinician signatures and dates.

Reporting. P4 and P5 reiterated the importance of a reporting function as one of the most significant attributes of EHR. Decision-makers use EHR reporting to determine appropriate nursing care levels when adjusting nursing care hours to effect reductions in total hospitalization costs (Welton & Harper, 2015). The reduction in healthcare overtime costs results in cost savings (Deokar & Sarnikar, 2016). P3 reported that the EHR has a function for capturing nursing hours needed based on the workload of patients to help determine the appropriate staffing. P4 stated that the administration efficiency comes

from reporting and auditing capabilities of the EHR for analyzing data to support the effective allocation of resources to various avenues of patient care.

Public health agencies and care providers require accurate and timely data on the frequency and occurrence of key health indicators to identify health disparities and initiate interventions (Klompas et al., 2017). The EHR reporting capabilities lead to population health management by tracking disease outbreaks. P3 added that EHR reporting capabilities function as cost avoidance tools when used to alert patients identified for annual checkups because earlier interventions cost less than treating illness.

Cost reduction. EHR use leads to cost savings benefits by reducing costs associated with maintaining less paper medical records (Jamoom et al., 2014). All participants stated that the hospital achieves cost saving from reduced paper documents and minimal need for scanning. Scanning and storing of scanned documents are costly. P4 added that the elimination of paper documents leads to the reduction workforce needed to locate and review paper charts.

The availability of laboratory and radiology test results in EHR leads to the eradication of unnecessary tests, thereby saving costs for healthcare providers and patients (Thurston, 2014). P2 indicated that to eliminate costs associated with duplicate laboratory and radiology testing, a clinical decision support feature in EHR assigns clinical indicator scores to help clinicians determine whether tests are necessary.

Physicians have access to cost of supplies in EHR to allow for cost-effective alternative supply choices (Fitzgerald, 2015). P3 asserted that the use of cost-effective medication lists limits the use of non-vetted high-cost medication thereby reducing cost.

P5 admitted to using EHR reporting tools on operational processes to evaluate the allocation of resources among providers to identify waste. P5 added that the hospital uses lean principles by eliminating waste without harming patient care process.

Kurtzman (2015) posited that hospital leaders should analyze patient readmission patterns to improve care transitions to reduce preventable readmissions within 30 days of discharge. P3 stated that EHR includes a function for assessing the risk for a patient's readmission then prompts case managers to follow up with the patient after discharge. P3 mentioned that readmissions are costly because of lost reimbursement from payers like Medicare that do not pay for patient readmission within 30 days for the same illness.

The participants' interview testimonials are as follows: "We do try very hard to work with the operational revenue cycle leaders to make sure that this is more about revenue capture than cost savings" (P3). "We are constantly analyzing our staffing levels" (P3). "We have totally reduced paper and scanning. It is expensive to scan, and it is expensive to store scanned documents" (P1). "We talked about duplicate lab testing and radiology testing, and there are all kinds of things you put in place to try and prevent that" (P3). "So you have to have an effective accounting mechanism so that you can let providers know what resources they are allocating and where they lie relative to their peers" (P5).

Table 6 includes the subthemes that emerged from the data analysis regarding the strategies to maximize net benefits by enhancing administration efficiency, auditing reports, and cost reduction. The strategies that emerged from the data analysis were (a) documentation for revenue capture, (b) avoid penalties, (c) timely medical record coding

for timely reimbursement, (d) adjust nursing hours levels, (d) reduce paper documents,

(e) reduce lab and radiology tests, (f) allocating cost-efficient supplies, and (g) reduction

of preventable patient readmissions.

Table 6

Theme 5: Net Benefits Coding Frequency

Word	Count
Costs	41
Reports	16
Efficiency	15

The net benefits theme links to existing literature on effective business practice.

The net benefits theme consists of administration efficiency, reporting, and cost reduction

subthemes. The EHR use results in cost savings benefits from reduced costs associated

with maintaining less paper medical records (Jamoom et al., 2014). The finding includes

a strategy for cost saving from reduced paper documents and minimal need for scanning.

The elimination of paper documents led to the reduction workforce needed to locate and

review paper charts. Physicians have access to cost of supplies in EHR to allow for cost-

effective alternative supply choices (Fitzgerald, 2015). Clinicians use EHR reporting

tools on the operational processes to evaluate the allocation of resources to identify high-

cost supplies and low-cost alternative. Clinicians use EHR reporting tools to identify

waste.

The net benefits dimension of DMISS conceptual framework includes the

clinician's acceptance of EHR technology for social benefits (Alazzam et al., 2015).

EHR's social benefits include improved public health chronic disease surveillance at a local level (Vogel et al., 2014). The management's ability to convey the EHR vision to the clinicians promoted the rate and level of EHR application. The hospital IT leaders use a strategy to maximize net benefits by enhancing administration efficiency to improve the quality of patient care at reduced costs.

Findings Extend Knowledge

The findings of this study extend the knowledge of EHR application strategies compared with other studies in EHR. Strategies from other studies included training. Staff training promotes the EHR system service quality (Bossen et al., 2013). EHR vendors train the super users on all aspects of the system to become trainers to their peers (Penoyer et al., 2014). The findings extend staff training strategy by subdividing into three initiatives; (a) initial new-hire training, (b) peer to peer training by super users, and (c) on-going training on system improvements and enhancements.

Bidgoli (2016) recommended a strategy to protect confidential information of patients and organizations by training staff to use login and screensaver passwords. The findings revealed that the hospital extended the password training by creating a tracer team to enforce locking unattended computers.

Application to Professional Practice

Through this study, I aim to add to the body of knowledge by identifying the strategies that IT leaders in hospitals can use to apply EHR systems successfully to achieve a cost savings benefit. The findings of this research study included the following strategies: (a) engage users in system build process to boost acceptance; (b) select

capable leadership for change; (c) deploying enough access devices; (d) utilize classroom, peer-to-peer and computer-based training; (e) verify data to ensure accurate documentation; (f) code medical records for timely reimbursement; (g) secure data with encryption and frequently changed complex passwords; (h) utilize hospital IT and vendor helpdesk support; (i) adapt to external EHR policy changes to maximize reimbursement and avoid penalties; (j) enforce organizational best practice policies; (k) adjust nursing hours levels to reduce costs; (l) reduce paper documents; (m) reduce lab and radiology tests; (n) allocate cost-efficient supplies; and (o) eliminate preventable patient readmissions. Healthcare providers may use the results of this study to overcome barriers to the application of EHR systems. Widespread proper EHR application might lead to cost savings for hospitals.

Staff training includes techniques to protect patient confidential information by using login passwords and antivirus programs (Bidgoli, 2016). Formal classroom-style training is inadequate as the focus is on basic tasks (Graetz et al., 2014). Leaders using peer-to-peer training with super users provides end users with relevant role-based impromptu training (Vockley, 2015). The hospital IT and vendor helpdesk support staff assists clinicians on subjects that surpass super users' level of expertise (Yuan et al., 2015).

EHR use has the potential for $731 cost savings for hospitals per patient admission (Kazley et al., 2014). Successful EHR application might lead to cost savings by promoting accuracy and timely information access (Thurston, 2014). Physicians use EHR to adjust supplies usage to minimize expenditure and to allocate cost-effective

alternative supply choices (Fitzgerald, 2015). Decision-makers use EHR data to adjust nursing care hours to match patient workloads to reduce hospitalization costs (Welton & Harper, 2015) and minimize overtime costs (Deokar & Sarnikar, 2016). Reduction in paper documents and unnecessary laboratory and radiology tests results in cost savings (Thurston, 2014).

Implications for Social Change

For the patients, positive social effects for EHR implementation include lower cost of healthcare (Ricciardi et al., 2013). Widespread proper EHR application may lead to improved patient care and patient safety (Hydari et al., 2015). Leaders using EHR enhance care coordination among healthcare facilities where patient health records become accessible to ensure continuity of patient care (Deokar & Sarnikar, 2016).

The findings of this study could contribute to positive social change for organizations by providing information to leaders in other hospitals that may be ineffective in EHR application. EHR's benefits of improved accuracy, care quality, and patient safety may lead to reduced injuries and deaths caused by misdiagnoses and medical errors (Hydari et al., 2015). The benefits of EHR include reduced medical errors and patient safety violations, alleviating liability from malpractice litigation expenses (Goldstein, 2014; Hydari et al., 2015).

For the communities, positive social effects of EHR successful application include lower cost for hospitals that may lead to the provision of affordable care to more low-income patients. EHR vaccination reminders linked to state vaccination registries could help to identify unvaccinated patients (Cowburn et al., 2014). The reduction of

preventable diseases through vaccination to the general population may bring about positive social change.

The potential contributions of EHR include a better understanding of the level and distribution of diseases and the well-being of community members (Perlman et al., 2017). EHR's social benefits include improved public health chronic disease surveillance at a local level (Vogel et al., 2014). EHR reporting capabilities lead to improved population health management by tracking disease outbreaks. Healthcare personnel may use EHR data for epidemiology analysis to identify areas of risk factors for timely healthcare interventions (Tomasallo et al., 2014). Healthcare providers use EHR data to signal for patients linked to a local outbreak and to decide on proper intervention measures (Foldy et al., 2014).

Recommendation for Action

Findings from this study included several strategies that IT leaders in hospitals can use to apply EHR to achieve a cost savings benefit. IT leaders may use the findings from this study to develop and deploy strategies to apply EHR successfully. Based on the study findings, I recommend the following actions for IT leaders:

1. Engage clinicians in the EHR system building process to map process workflows that match the clinical workflows to boost user acceptance.

2. Implement suitable EHR infrastructure to maximize the net benefits.

3. Implement holistic staff training that includes classroom, peer-to-peer, and ongoing computer-based training.

4. Create mechanisms to verify data to ensure accurate clinical and reimbursement documentation.

5. Secure data with encryption, antivirus, and frequently changed complex passwords to protect patient privacy.

6. Maximize internal and vendor helpdesk support to resolve barriers to EHR application.

7. Adapt to external EHR policy changes to maximize reimbursement, avoid penalties, and comply with government mandates.

8. Enforce organizational best practice policies to maximize reimbursement, cost savings, and meet regulatory compliance.

The recommendations may apply to various healthcare facilities and might assist with EHR application. Findings from this study could be valuable to researchers and IT leaders in the healthcare industry. I will distribute the findings of the study through business and scholarly journals. Additionally, I may share the results of this study through training, conferences, and seminars regarding the effective strategies that IT leaders can use to apply EHR.

Recommendations for Further Study

The focus of this qualitative study was the strategies that IT leaders in hospitals can use to apply EHR to achieve a cost savings benefit. Researchers may use each of the themes identified to conduct research studies. Following are my recommendations for further research:

- Strategies IT leaders can use for overcoming technical limitations to ensure EHR system quality.

- Strategies IT leaders can use for ensuring privacy and security of patient health information to ensure EHR system quality.

- Strategies to apply staff training to assure EHR service quality.

- Strategies IT leaders can use to promote EHR acceptance and usability.

Future researchers may address the small sample size limitations of this study by conducting a multi-case study that includes several hospitals. The small sample size may limit the generalizability of these findings to a larger population. Collecting data from a small homogeneous sample limited the research breadth because of limited representativeness of leaders with similar perceptions. Further research may help to identify various perceptions of different groups involved in EHR implementation and application.

Reflections

This doctoral study involved an opportunity to understand the application of EHR system from the perspective of IT leaders. I have worked in the healthcare IT industry for 18 years. I possess experience with the installation of interfaces for EHR systems for ambulatory surgery centers. I selected the EHR topic because I wanted to learn the processes and strategies IT leaders with successful experience in applying EHR systems use in large hospitals. I was concerned that my experience working with EHR would influence my perspective; however, the experiences acquired from ambulatory surgery centers were different from those shared by the participants. I used self-reflexivity before

beginning the data collection to mitigate biases. Morse (2015) recommended the use of

self-reflection to address biases by setting aside the researcher's preconceptions about a

study topic.

Additional concerns included gaining access to IT leaders in a large hospital

because of their limited availability. However, by going through the hospital's academic

and research department, I was able to gain access to the IT leaders and establish

mutually acceptable interview times. The participants provided positive experiences

regarding EHR application, which coincides with their clinicians' high EHR satisfaction

level in a 2017 national independent survey.

Study Conclusion

The HITECH Act includes incentives of about $30 billion to healthcare providers

that use EHR to improve the quality of care, safety, privacy, care coordination, and

patients and families' involvement in healthcare (Thurston, 2014). Even though EHR use

has the potential for $731 cost savings for hospitals per patient admission, the majority of

hospitals are yet to apply EHR to reach the level where cost savings are possible (Kazley

et al., 2014).

Five themes emerged in this study regarding the strategies IT leaders use to apply

EHR effectively to achieve cost savings: (a) training staff, (b) documenting accurately

and timely, (c) protecting patient health information, (d) adapting to external policy

changes, and (e) enforcing organizational best practice policies to maximize

reimbursement and cost savings. Leaders of other health organizations may use the

strategies that emerged from this study to implement and apply EHR systems effectively.

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Appendix A: CITI Course on Belmont Report

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Daniel Ngunyu (ID: 5265328)
- **Email:** daniel.ngunyu@waldenu.edu
- **Institution Affiliation:** Laureate International Universities (Walden) (ID: 2906)
- **Institution Unit:** DDBA

- **Curriculum Group:** Student Researchers
- **Course Learner Group:** Same as Curriculum Group
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 18210323
- **Report Date:** 12/30/2015
- **Current Score**:** 96

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	12/30/15	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	12/27/15	4/5 (80%)
Defining Research with Human Subjects - SBE (ID: 491)	12/29/15	5/5 (100%)
Belmont Report and CITI Course Introduction (ID: 1127)	12/27/15	3/3 (100%)
Records-Based Research (ID: 5)	12/30/15	3/3 (100%)
The Federal Regulations - SBE (ID: 502)	12/29/15	5/5 (100%)
Assessing Risk - SBE (ID: 503)	12/29/15	5/5 (100%)
Informed Consent - SBE (ID: 504)	12/29/15	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	12/29/15	4/5 (80%)
Research and HIPAA Privacy Protections (ID: 14)	12/30/15	5/5 (100%)
Vulnerable Subjects - Research Involving Workers/Employees (ID: 483)	12/30/15	4/4 (100%)
Unanticipated Problems and Reporting Requirements in Social and Behavioral Research (ID: 14928)	12/27/15	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
Email: citisupport@miami.edu
Phone: 305-243-7970
Web: https://www.citiprogram.org

Appendix B: Interview Protocol

Interview Protocol	
What you will do	**What you will say—script**
Introduce the interview and set the stage	My name is Daniel Ngunyu, and I am a doctoral candidate at Walden University. I am working on completing my Doctor of Business Administration degree. I am conducting doctoral research to explore strategies that IT leaders in hospitals can use to apply Electronic Health Records (EHR) successfully. The results of the study may help healthcare providers overcome barriers to the application of EHR systems. I will conduct face-to-face interviews that take approximately 45 minutes. I am inviting you to participate because you have deep knowledge in EHR application. Your expertise and experience will be essential to this research. If you give consent for me to record the interview, please sign the consent form. I guarantee confidentiality by protecting your identity and your organization by anonymizing the identification information.
• Watch for non-verbal cues • Paraphrase as needed • Ask follow-up probing questions to obtain more in-depth information	1. What strategies do you use to ensure information quality such as accuracy, timely, improved access, and up-to-date patient information in your EHR?
	2. How do you ensure system quality to address technical limitations of existing infrastructure for maximum EHR effectiveness?
	3. What measures do you take to ensure privacy and security of patient health information to improve EHR system quality?
	4. What strategies do you use for staff training to assure service quality in your EHR?
	5. How do you improve EHR service quality using technical support from your IT department, and vendor technical support?
	6. How do you cultivate a positive attitude toward EHR among clinicians and patients?
	7. How do you encourage users to use all available functions of the EHR system?
	8. How do you promote the management, physicians, and staff willingness to change the organizational culture for maximum EHR net benefits?
	9. What strategies do you use to assure administration

	efficiency and cost reduction to maximize net benefits for your EHR?
	10. What more can you add to this study regarding cost-saving benefits of EHR systems?
Wrap up interview thanking participant	I want to thank you very much for agreeing to participate and for providing very valuable information.
Schedule follow-up member checking interview	I would like to schedule a follow-up interview to go over the information from today's interview. At that time, you can change and add more information to represent your perspective accurately. I will email you the report then we can schedule for a convenient time for the interview.
Follow–up Member Checking Interview	
Introduce follow-up interview and set the stage	I want to thank you very much for agreeing to participate in a follow-up interview.
Share a copy of the succinct synthesis for each individual question Bring in probing questions related to other information that I may have found—note the information must be related so that I am probing and adhering to the IRB approval. Walk through each question, read the interpretation and ask: Did I miss anything? Or, What would you like to add?	Here is a copy of the brief summary of each individual question
	1. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	2. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	3. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	4. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	5. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	6. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	7. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	8. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	9. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed
	10. Question and succinct synthesis of the interpretation—perhaps one paragraph or as needed

Appendix C: Introduction Email

Dear (Business Leader),

I am a doctoral candidate in the Doctor of Business Administration program at Walden University studying strategies that IT leaders in hospitals can use to apply EHR successfully to achieve a cost savings benefit. Healthcare Information and Management Systems Society (HIMSS) recognized your hospital for successfully adopting electronic health records (EHR) technology and achieving Stage 6. Your company would be a good candidate for my study. I would like to have a short chat with you to discuss how this could be a win-win for both of us. Please see the brief overview of my proposal below.

Proposal

I would like to conduct a study at your company on strategies that your IT leaders use to apply EHR successfully. My case study approach will include interviewing IT leaders and EHR super users and looking at applicable written documents (implementation planning, adoption, and application).

Process—Time at Site

The data collection phase of my study will take place during a period of 3-4 weeks at a time that works for you. Each interview will take approximately 45 minutes. I would like to schedule 3 days per week to visit your workplace based on a schedule that works for both of us.

Outcomes—A Win-Win Opportunity

For the past 3 years, I have studied the literature and identified some of the most successful practices to improve EHR implementation and application. Upon completion of my study, I will share a summary of my study results and suggestions with you and your company IT leaders that may provide additional strategies to improve EHR application. I will also provide you with a copy of my complete study that will be a detailed non-partial third party overview of company's best practices—this will be free consulting services and suggestions via a comprehensive analysis of your company practices.
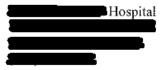
Ethical Considerations

As per my university's institutional review board (IRB) requirements, I will use pseudonyms in my study and any publications emerging out of my study to protect the company and employee identities and promote confidentiality.

I look forward to talking with you.

Thank you,

Daniel Ngunyu

Appendix D: Letter of Cooperation

███████████ Hospital
████████████████
████████████
███████

11/15/2017

Dear Daniel Ngunyu

Based on my review of your research proposal, I give permission for you to conduct the study entitled <u>Strategies for Applying Electronic Health Records to Achieve Cost Saving Benefits</u> within the ████████████ Hospital. As part of this study, I authorize you to contact IT leaders and EHR super users to conduct one-on-one interviews to collect data, conduct memberchecking interview and provide a copy of the research findings. Individuals' participation will be voluntary and at their own discretion.
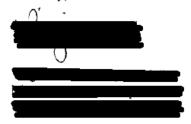
We understand that our organization's responsibilities include: provide access to IT leaders and EHR super users, interview, rooms, documentations resources such as training documentation, operating procedures, and guidelines related to the application of EHR. We reserve the right to withdraw from the study at any time if our circumstances change.

I understand that the student will not be naming our organization in the doctoral project report that is published in Proquest.

I confirm that I am authorized to approve research in this setting and that this plan complies with the organization's policies.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,

████████████████
████████████████
████████████████

Appendix E: Participant Invitation to Research

You are invited to take part in research on strategies that information technology leaders in hospitals use to apply electronic heath records (EHR) systems successfully. The purpose of this study is to explore strategies that IT leaders in hospitals can use to apply Electronic Health Records (EHR) successfully to achieve cost saving goals. The results of the study may help to determine the strategies that IT leaders in hospitals can use to apply EHR successfully.

The researcher is inviting IT leaders and EHR super users involved with EHR systems implementation and application to be interviewed. All participants will receive a copy of the research findings. This study is being conducted by a researcher named Daniel Ngunyu, who is a doctoral student at Walden University. Daniel can be reached at Daniel.ngunyu@waldenu.edu or phone XXX-XXX-XXXX.

Appendix F: Interview Questions

1. What strategies do you use to ensure information quality such as accuracy, timely, improved access, and up-to-date patient information in your EHR?

2. How do you ensure system quality to address technical limitations of existing infrastructure for maximum EHR effectiveness?

3. What measures do you take to ensure privacy and security of patient health information to improve EHR system quality?

4. What strategies do you use for staff training to assure service quality in your EHR?

5. How do you improve EHR service quality using technical support from your IT department, and vendor technical support?

6. How do you cultivate a positive attitude toward EHR among clinicians and patients?

7. How do you encourage users to use all available functions of the EHR system?

8. How do you promote the management, physicians, and staff willingness to change the organizational culture for maximum EHR net benefits?

9. What strategies do you use to assure administration efficiency and cost reduction to maximize net benefits for your EHR?

10. What more can you add to this study regarding cost-saving benefits of EHR systems?

Appendix G: Informed Consent Form

CONSENT FORM

You are invited to take part in research on strategies that information technology leaders in hospitals use to apply electronic health records (EHR) systems successfully. The researcher is inviting IT leaders and EHR super users involved with EHR systems implementation and application.

This form is part of a process called "informed consent" to provide you information about this study before deciding whether to participate.

This study is being conducted by a researcher named Daniel Ngunyu, who is a doctoral student at Walden University.

Background Information:
The purpose of this study is to explore strategies that IT leaders in hospitals can use to apply Electronic Health Records (EHR) successfully to achieve cost-saving goals. The results of the study may help to determine the strategies that IT leaders in hospitals can use to apply EHR successfully.

Procedures:
If you agree to participate in this study, you will be asked to:
- Be interviewed for about 45 minutes.
- Be interviewed on a time and day that will be mutually agreed.
- Allow the researcher to audio record all interviews.
- Allow the researcher to access the research data for the purpose of this specific study.
- Confirm the researcher's summary of the interview for accuracy.

Interview Questions:
Here are the interview questions:
1. What strategies do you use to ensure information quality such as accuracy, timely, improved access, and up-to-date patient information in your EHR?
2. How do you ensure system quality to address technical limitations of existing infrastructure for maximum EHR effectiveness?
3. What measures do you take to ensure privacy and security of patient health information to improve EHR system quality?
4. What strategies do you use for staff training to assure service quality in your EHR?
5. How do you improve EHR service quality using technical support from your IT department, and vendor technical support?
6. How do you cultivate a positive attitude toward EHR among clinicians and patients?
7. How do you encourage users to use all available functions of the EHR system?

8. How do you promote the management, physicians, and staff willingness to change the organizational culture for maximum EHR net benefits?
9. What strategies do you use to assure administration efficiency and cost reduction to maximize net benefits for your EHR?
10. What more can you add to this study regarding cost-saving benefits of EHR systems?

Voluntary Nature of the Study:
You have right to withdraw before and during the interview. You have the right not to answer questions and may move on to the next one or choose to end the interview at any time without penalty. You will have an opportunity to review, comment on, or withdraw information after the interview. If you decide to withdrawal from the study, I will delete the recorded digital audio file and destroy hardcopy data. If you withdraw from the study, you will still receive the research findings as promised during the recruitment process.
.

Risks and Benefits of Being in the Study:
Participating in this study may result in negligible risks in the form of minor discomforts such as normal daily life stress. Participating in this study will not be a risk to your safety or well-being. The results of this study, healthcare providers may benefit from understanding how to overcome the barriers to EHR application.

Payment:
There will be no payments to the participants. All participants will receive a copy of the research findings.

Privacy:
Any information you provide will be private and confidential. The researcher will protect your personal information. The researcher will not include your name or any other details that could identify you or your company in the study reports. The interview will be audio-recorded and transcribed. The data collected will be kept a secure locked safe for 5 years, and will only be accessible by the researcher for this specific study. After 5 years, the data will be destroyed.

Contacts and Questions:
You may ask any questions at any time during and after the study. You can reach me at daniel.ngunyu@waldenu.edu or my phone XXX-XXX-XXXX. If you want to reach a Walden University representative about this study, you can email irb@mail/waldenu.edu. Walden University's approval number for this study is 11-28-17-0381006 that expires on November 27th, 2018.

Statement of consent:
I have read the above information, and I feel that I understand the study well enough to make a decision about my involvement. By signing this consent form, I am agreeing to participate in the study based on the terms described above and will receive a copy of the signed consent form for my records.

Printed name of participant _____

Date of consent _____

Participant's written signature _____

Researcher's written signature _____