WALDEN UNIVERSITY
A higher degree. A higher purpose.

Walden University
ScholarWorks

Walden Dissertations and Doctoral Studies

Walden Dissertations and Doctoral Studies Collection

2018

Strategies to Mitigate Information Technology Discrepancies in Health Care Organizations

Oluwatosin Tolulope Oluokun
Walden University

Follow this and additional works at: https://scholarworks.waldenu.edu/dissertations

 Part of the Business Commons, and the Health and Medical Administration Commons

This Dissertation is brought to you for free and open access by the Walden Dissertations and Doctoral Studies Collection at ScholarWorks. It has been accepted for inclusion in Walden Dissertations and Doctoral Studies by an authorized administrator of ScholarWorks. For more information, please contact ScholarWorks@waldenu.edu.

Walden University

College of Management and Technology

This is to certify that the doctoral study by

Oluwatosin Oluokun

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Carol-Anne Faint, Committee Chairperson, Doctor of Business Administration Faculty

Dr. David Moody, Committee Member, Doctor of Business Administration Faculty

Dr. Judith Blando, University Reviewer, Doctor of Business Administration Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

Strategies to Mitigate Information Technology Discrepancies in Health Care Organizations

by

Oluwatosin T. Oluokun

MS, University of Maryland University College, 2013

BS, The Ohio State University, 2008

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

December 2018

Abstract

Medication errors increased 64.4% from 2015 to 2018 in the United States due to the use of computerized physician order entry (CPOE) systems and the inability to exchange information among health care facilities. Healthcare information exchange (HIE) and subsequent discrepancies resulted in significant medical errors due to the lack of exchangeable health care information using technology software. The purpose of this qualitative multiple case study was to explore the strategies health care business managers used to manage computerized physician order entry systems within health care facilities to reduce medication errors and increase profitability. The population of the study was 8 clinical business managers in 2 successful small health care clinics located in the mid-Atlantic region of the United States. Data were collected from semistructured interviews with health care leaders and documents from the health care organization as a resource. Inductive analysis was guided by the Donabedian theory and sociotechnical system theory, and trustworthiness of interpretations was confirmed through member checking. Three themes emerged: standardizing data formats reduced medication errors and increased profits, adopting user-friendly HIE reduced medication errors and increase profits, and efficient communication reduced medication errors and increased profits. The findings of this study contribute to positive change through improved health care delivery to patients resulting in healthier communities.

Strategies to Mitigate Information Technology Discrepancies in Health Care Organizations

by

Oluwatosin T. Oluokun

MS, University of Maryland University College, 2013

BS, The Ohio State University, 2008

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

Walden University

December 2018

Dedication

I dedicate this doctoral study to my loving husband Ayobami for always believing in me, my daughter Jonelle for inspiring me to be a role model to her, my brother Gbenga for his endless prayers, and God for never leaving nor forsaking me.

Acknowledgments

I would like to thank Dr. Carol-Anne Faint, Dr. David L. Moody, Dr. Al Endres, Dr. Judy Blando and all my instructors and classmates at Walden University throughout the duration of the doctoral study for your guidance and support in successfully completing this program. My success in this program is from your mentorship and guidance. I would also like to thank the program director, Susan Davis for an amazing experience and your leadership in the Doctor of Business Administration program.

Table of Contents

List of Tables

Section 1: Foundation of the Study

The discrepancies of health information exchange (HIE) are a reoccurring problem for some health care organizations implementing new technology within their organization (Hillestad et al., 2014). A major issue is HIE, which led to subsequent discrepancies in health care organizations and resulted in significant medical errors due to the lack of exchangeable information using new technology software among organizations (Vest & Gamm, 2015). The need for CPOE systems in the United States is expected to increase as HIE evolved substantially over the past year of 2017, and the industry is poised to fully put its solutions into action. In 2017, health care leaders effectively leveraged technology and data sharing to measurably improve both financial and patient outcomes (Choi et al., 2016). Leaders in health care have influence regarding the successful implementation of HIE within health care organizations (Lavan, Gallagher, & O'Mahony, 2016). A HIE discrepancy is a costly issue experienced by some health care organizations (Choi et al., 2016). The increased rate of medical errors in health care organizations led to new methods of exchanging patient medical information (Zheng et al., 2016). Also, the increased rate of medical errors in health care organizations results in poor business models for exchanging patient health records electronically (Lee & Garvin, 2013). Leaders in health care organizations need to understand how medical errors produced due to the implementation of CPOE systems can have an effect on the health care organization.

Background of the Problem

Regardless of where a patient receives care, HIE enables patients' records to be in the same location as the patient. The process of HIE is an interoperable and reliable way of sharing electronic health information between health care organizations among nurses, doctors, patients from different health care institutions, pharmacists, and settings (Hillestad et al., 2014). In health care organizations, HIE allows patients and health care professionals access to securely shared medical information (Hillestad et al., 2014).

The benefits of HIE allowed health care providers to share electronic health records (EHRs) with multiple health care organizations. EHRs are a technology that facilitates the process of multiple health care facilities sharing and storing patient information. Confidentiality and access to share vital medical history of patients regardless of where the patient received care were beneficial. This form of technology provided an effective and safer strategy of care tailored to the unique medical needs of a patient (Cresswell et al., 2015). Organizational, strategic, and social factors could make or break implementations on technology where the need to develop tools to support future developments including the involvement of the patient, contribution, and access to shared records are optimized for effectiveness and minimize the possibilities of introducing new risks into the complex health care system (Cresswell et al., 2015). HIE supports future developments including the involvement of the patient, contributions, and access to shared records systems (Cresswell et al., 2015).

Problem Statement

Medication errors increased 64.4% due to the use of CPOE systems and the inability to exchange information among healthcare facilities (Kruse et al., 2014). HIE and subsequent discrepancies resulted in significant medical errors due to the lack of exchangeable healthcare information using new technology software between some organizations (Wager et al., 2017). The general business problem is managers who lack strategies to integrate compatible CPOE systems among different health care facilities experience a loss of profits. The specific business problem is some health care managers lack strategies to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies health care business managers used to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The population for the study was eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States. The findings of the study might affect social change by decreasing medical errors due to CPOE systems in small clinics, which may lead to an increase in the quality of patient care and result in improved quality of life for patients.

Nature of the Study

Researchers select from qualitative, quantitative, or mixed methods approaches to explore phenomena. In qualitative research, the researcher is the main data collection

instrument (Yin, 2018). The qualitative research method was the most suitable for the doctoral study to explore strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. A quantitative researcher generates numerical data to interpret the presence or absence of a phenomenon (Berger, 2015). The quantitative method was not suitable for the study because the research question demands a narrative explanation for understanding the phenomenon and not understanding relationships or differences among variables. The mixed methods approach employs both quantitative and qualitative approaches (Maxwell, 2016). Because the quantitative method was inappropriate for the study, the mixed methods approach, which includes quantitative inquiry, was equally inappropriate.

Researchers consider several types of qualitative research designs including case studies, phenomenological studies, and narrative approaches. A phenomenological researcher investigates the lived experiences of a large group of participants (Moustakas, 1994). The intent of the study was not to explore lived experiences but rather to identify objective evidence from a small population within a specific field; therefore, the phenomenological approach was inappropriate for the study. A narrative design involves stories regarding participants' experiences. Researchers using the case study design can explore single or multiple phenomena within a real-world context through various types of data and sources (Yin, 2018). The narrative design was inappropriate as understanding life stories had relevance to the study. A multiple case study involves numerous businesses and single case studies focus on participants from one agency or

organization (Yin, 2018). I used the multiple case study design to investigate multiple clinics and collect primary data using the semistructured interviewing technique.

Research Question

The central research question of the study was: What strategies do health care business managers apply to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability?

Interview Questions

1. How is implementing CPOE beneficial?
2. What specific actions hinder accurate usage of HIE for technological inputs to reduce medical errors?
3. What strategies using HIE aid the transfer from paper to electronic charts for practitioner use?
4. What strategies do you or your leaders use to address the barriers to reducing medication errors?
5. What are some ways you have used CPOE to complete daily tasks to increase profitability?
6. How did CPOE systems integrated into health care practices benefit patients and practitioners?
7. What additional information can you provide to assist me in understanding your strategies for implementing CPOE systems to ensure compatibility into your workplace?

8. What key strategies were used in your organization to reduce medication errors to increase your profits?

Conceptual Framework

The conceptual framework for the study was Donabedian's framework for assuring health care quality. The tenets of the Donabedian framework include the quality of health care in health care facilities and the processes, structure, and effectiveness of the health care system (Donabedian, 2014). Based on this theory, HIE can influence the processes of health care and organizational structures to affect positive outcomes when HIE is integrated into health care business practices (Donabedian, 2014). The Donabedian theory focuses on the understanding of CPOE systems communication between information technology within health care organizations for improving organizational performance. The Donabedian framework theory offers a possible foundation for understanding complex ways health care organizations interact and cooperate with technology and tools in transferring patient electronic information. The potential relevance of Donabedian's framework to the study is understanding the interrelated processes of health care systems between health care facilities.

Operational Definitions

The following operational definitions provide an understanding of the terms used for the study:

Computerized physician order entry (CPOE): The process of a medical professional entering orders for medication or other physician instructions electronically instead of using paper charts (Charles, Willis, & Coustasse, 2014).

CPOE implementation: The process of executing or practice of a plan, a method, specification, standard, or policy of CPOE in health care organizations (Romanow, Rai, Keil, & Luxenberg, 2017).

Electronic health records (EHR): An electronic version of a patient's medical history, which is maintained by the provider over time, including all key administrative clinical data for each patient. The EHR strengthens the relationship between clinicians and patients (Horsky, 2016).

Health information exchange (HIE): The electronic movement of health-related information among organizations according to nationally recognized standards (Akhlaq, Sheikh, & Pagliari, 2017).

Interoperability: The extent to which devices and systems in healthcare organizations can exchange and interpret shared data. For two systems to be interoperable, they must be able to subsequently present that data such that a user exchanges data (Hammami, Bellaaj, & Kacem, 2014).

Medication errors: Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer (Gartmeier et al., 2017). The growing awareness of the frequency, consequences, and causes of errors in medicine reinforces an imperative to improve the understanding of the problem and devise workable solutions and prevention strategies (Glickman et al., 2017).

Patient safety: The prevention of adverse effects and errors for patients associated with health care. Health care has become more effective and becomes more complex with

greater use of medicines, treatments, and new technologies (Parker & Adler-Milstein, 2016).

Assumptions, Limitations, and Delimitations

When conducting scholarly research, the researcher is restricted critically in numerous ways. Some deficiencies include whether if the research topic is available**.** Assumptions, limitations, and delimitations allow a researcher to recognize the shortcomings of the research study while adjusting it.

Assumptions

Assumptions are considered facts that are true without verifiable evidence (Eyisi, 2016). One assumption made was that participants selected for my study had sufficient and accurate knowledge about the research question. Another assumption was that research participants answered all questions honestly and truthfully. To negate dishonesty in the study, the consent form explained the rights of the participant to not answer questions they did not feel comfortable disclosing. which still led to data saturation since the participants answered all the questions during their interviews.

Limitations

Potential weaknesses in qualitative studies beyond the control of a researcher are limitations (Holloway & Galvin, 2016). In this case study, I reached saturation with eight participants who were managers in two small health care centers. Interviewing eight managers provided ample information on the specific operations within these agencies but are not suitable to generalize about all healthcare centers in all locations, because circumstances and needs vary between agencies.

Delimitations

Delimitations are characteristics defining the boundaries of the study while limiting the scope (Nelms, 2015). Factors relevant to delimitations include research questions, objectives, adopted theoretical perspectives, and the population chosen for the study (Nelms, 2015). The geographic location of the study was the mid-Atlantic region of the United States. I focused on the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The population for the study was eight clinical business managers within two successful small health care clinics located in mid-Atlantic region of the United States.

Significance of the Study

Leaders in health care can improve the overall effectiveness of health care business practices by adopting new forms of technology to create increased productivity in the organization. Zheng et al. (2016) said the improvement of healthcare safety efficiency created profits for health care organizations due to accurate HIE practices.

Contribution to Business Practice

The findings from the study are valuable to business practices because health care organizations might improve accessibility and reduce the costs of poor quality, efficiency, and effectiveness of health care systems. Leaders of health care organizations who do not integrate HIE in their business plans could transition into adopting HIE with the expectation of improving their facilities to optimize health care practice methods used for patients and physicians integrating HIE into their businesses (Bau et al., 2014).

Integrating HIE in health care facilities may aid clinic profitability by improving public confidence in patient information recording practices.

Implications for Social Change

The findings of this research could contribute to improved health care delivery to patients, resulting in healthier communities. Results of the study may improve patient health and the efficiency of the use of health care technology would improve overall health care quality. Improved clinical patient information systems positively influence individual patient health, improving the general wellbeing of families and communities.

A Review of the Professional and Academic Literature

The objective of this qualitative multiple case study was to explore the strategies health care business managers use to improve CPOE system capability to increase profitability. A majority of the literature was developed from peer-reviewed articles. In compliance with Walden University doctoral study requirements, of the 122 references, 110 references (90%) were published between 2014 and 2018, no more than 5 years before my expected graduation.

The literature review was divided into relevant theories, organizational design theory, relational coordination theory, CPOE implementation, processes, barriers, medical errors, implementation, patient safety, profitability, and HIE. A complete list of key terms used while researching this study were: *HIE*, *CPOE*, *interoperability*, *CPOE implementation*, *medication errors*, *patient safety*, and *EHR*. The key terms were researched using books, Google Scholar, ProQuest and Science Direct, as resources included in the literature review.

Donabedian Theory

The conceptual framework for this case study was the Donabedian framework. The Donabedian framework focused on the experiences of organizational effectiveness due to the use of CPOE systems and HIE in health care organizations. The Donabedian framework focuses on the quality of health care, and the processes, effectiveness, and structure of health care organizations.

In 1970, The National Academics of Science established the Institute of Medicine from Dr. Donabedian's transformative contribution from the Donabedian model (Marjoua & Bozic, 2015). The framework launched a miscellaneous amount of efforts that focused on informing, evaluating, and improving the quality of health care delivered. The Agency of Health care policy and research known as the agency for health care research and quality created in 1989 is influenced by the Donabedian framework (Marjoua & Bozic, 2015). In 1990, the National Committee for Quality Assurance established the main objective of improving the quality of health care (Marjoua & Bozic, 2015). During the evolution of the quality movement, attempts to transition towards models with quality improvement initiatives were data driven.

Donabedian's theory consists of many tenets. Based on the quality model of this theory, improvements in the structure of care would lead to improvements in processes within clinical settings. Donabedian considered how linear structures in the structure of care affect processes, and how quality model process impacts outcomes.

The Donabedian theory relates to my specific study regarding strategies for mitigating information technology discrepancies in health care organizations because the quality health outcomes model, included in this theory, focuses on outcomes management and quality improvement. Health care leaders in the United States have the ability to deliver the highest level of standards of care as well as perform complex procedures. However, the ubiquity and magnitude of health care quality challenges contributes to the problems of misuse, underuse, and overuse of resources in health care organizations such as HIE.

The Donabedian theory includes process, structure, and outcomes (Ancker et al., 2016). The processing portion of the Donabedian theory includes the transactions between providers and patients throughout the entire process of delivering health care. The sum of all actions that constitute health care was included in the process section of the Donabedian theory. For example, the processing portion of this theory includes equipment, human resources, the facility and the factors that take place which classifies technical processes in relation to this study. The structure part of the theory describes the context used where health care is delivered in a health care setting. The structure of the Donabedian theory helps to identify, observe, and measure problems identified in health care organizations with existing processes. The outcomes of this theory focus on the effects of health care on the health status of populations and patients. The effects of health care on patients and populations, health care quality, and changes within a health care organization are included under the outcome portion of the Donabedian theory.

Alternative Theories

Some alternative theories related to health care did not fit the study. For instance, the organization design theory is used to help leaders guide a successful design and understand their organizations. In my study, many health care leaders do not understand the successful design of integrating health care technology into a health care organization, leading to discrepancies. The framework is divided into eight key variables; environment, strategy, core process, structures, systems, culture, results, and leadership for a business to be successful (Guise et al., 2017). The variables included in this framework did result in improvements in efficiency, quality, profitability, cycle time, and the satisfaction of managers in health care organizations. This framework involves being sensitive to the evolving perceptions and needs of health care leaders by understanding changes that occur with new CPOE technologies. Many healthcare organizations close because they were not sensitive to their environment and failed to maintain an attitude that is responsive toward their environment (Guise et al., 2017).

The organization design theory includes a section called strategy. This section is divided into two categories focusing on performance targets and strategies for growth (Guise et al., 2017). A clear organizational strategy helps an organization transform during all phases of implementing CPOE technologies. The sequence of events to deliver the product within an organization is a major part of the core process which includes resources and technology required to produce a deliverable. The systems portion focuses on communication, information sharing, and how decisions are made within an organization. The culture portion involves how an organization operates with leadership

styles, habits, management practices, and worker attitudes (Guise et al., 2017). The results section of the organization design theory focuses on the current performance level within an organization.

The success or health of an organization determines how well an organization is doing, weak points, and any changes required. Leadership is another dimension of the organization design framework where the focus is on how leaders act as the drivers of success. Results of the goals made by the organization are monitored by health care leaders using the organization design framework. However, the organization design framework was not selected because the practices used are no longer adequate to manage in the complex world. Successful leaders in healthcare organizations are changing their assumptions about work, leadership practices, and other organizations to build more collaborative and responsive organizations (Guise et al., 2017).

Relational coordination theory. The relational coordination theory is an alternative theory. The relational coordination theory makes social processes more visible and the interaction of humans underlying the technical process while coordinating complex work (Rundall et al., 2016). Mutual respect, shared goals, and shared knowledge that support the highest level of performance and coordination are three attributes of this theory. Mutual respect enables participants to overcome status barriers. Shared goals are what transcend the tasks that interrelate to the entire process (Rundall et al., 2016). Shared knowledge allows participants to view specific tasks and the relation to the entire process. This theory supports high performance within organizations that

supports timeliness, frequency, accuracy, and, when problems arise within an organization, problem-solving (Rundall et al., 2016).

The relational coordination theory helps to improve the performance of the work process by improving work relationships between people in organizations who perform different functions leading to higher quality communication. The task interdependencies are managed directly with fewer redundancies. Research findings indicated the strength of the relational coordination theory ties among participants in a work process leading to the outcome of efficiency, quality, workforce resilience, and customer satisfaction (Rundall et al., 2016). In health care studies, the relational coordination theory is correlated with increased quality, improved patient satisfaction, shorter length of stay, staff resilience, staff satisfaction, and improved health care clinical outcomes (Rundall et al., 2016). Some of the quality outcomes of the relational coordination theory include reduced medication errors, increased patient satisfaction with care, improved product development quality, reduced turnaround time, and improved on-time performance (Rundall et al., 2016). However, this theory did not match alongside my study because the theory is in premature stages of development.

CPOE Implementation

CPOE systems and EHRs were created to decrease the risk of injuries to patients (Horsky, 2016). The potential for new health care information technologies in health care facilities increased the safety and quality of care. In a study on methods to reduce medication errors in elderly patients with multimorbidity, on average, 8.8 times per 100 medication errors were 70% more likely to occur during the hospital admission process,

where patients above the age of 65 had a higher risk of injuries (Lavan, et al., 2016). The most common type of medication errors included incomplete information entered or unnecessary drugs prescribed. The main reason why health care organizations implement CPOE into their organizations is to improve the accuracy of medication prescriptions between multiple health care organizations; however, the accuracy of medication prescriptions was affected in health care organizations that did not implement CPOE which were due to illegible handwriting and absent or wrong dosages for the patient (Walker, 2016).

CPOE systems allow physicians to provide patient services electronically (Charles et al., 2014). Adapting to CPOE did eliminate illegible handwriting and the use of paper orders. Indication-based prescribing is a method which prevents wrong patient medication errors in CPOE (Schiff et al., 2016). The indication-based computer order entry alerts implemented combined with other strategies or independently with different types of strategies did lower wrong-patient medication errors. Results of this study indicated CPOE systems had no significant effect on workplace organizations but rather on the identification of teamwork on the control time of the implementation to ensure safety and quality.

In the United States, government recommendations were sent out for hospitals to adapt to CPOE systems to improve the quality problems that continuously plague hospitals in the United States (Queenan, Kull, & Devaraj, 2016). Medication errors continue to exist during the process of integrating CPOE into health care organizations. Despite the use of EHRs, patient-centered reconciliation is an important process to

decrease medication errors (Alex, Adenew, Arundel, & Kerns, 2016). Medication errors affect health care facilities financially. Although patients may experience less harm, a significant additional cost is associated with medication errors (Choi et al., 2016). The effectiveness of CPOE depends on the safety measures for patients in particular hospitals. The uses of CPOE compliment the dimensions of patient safety, which can help decision-makers understand how culture influences the effects of implementing new technologies in hospitals.

Although many benefits exist due to using HIE as a method in health care facilities, many discrepancies between CPOE systems in health care organizations were a result of this new method of exchanging patient medical information. The problem of HIE deserves new research because many health care organizations face problems adapting to the new method of exchanging patient medical information. The problem of HIE deserves new research because many health care organizations face problems adapting to the new, because many health care organizations face problems adapting to the new health care technology, leading to sustaining poor business models of exchanging patient health records electronically (Ricciardi et al., 2015). The process of HIE is used properly once health care providers, managers, patients, and health care institutions undergo the process of implementation, usability, barriers, and sustainability.

Many factors affect the adoption of CPOE into health care organizations. Researchers found that the physician specialty ownership status, solo-practice status, the use of lower private insurance revenue stream, and of email consultations and private insurance were significant predictors for a health care organization adopting CPOE

technology (Malhani, Maneno, Ettienne, & Wingate, 2016). The adoption of CPOE caused multiple physicians, and individuals associated with hospital systems, to face challenges on learning how to navigate and remembering the details of CPOE software modules, and the EHRs used (Gellert, Ricardo, & Luke, 2016). Physicians may resist the adoption of CPOE, which may present a risk to patient safety when electronic orders and paper co-exist by paper orders generated in an environment of electronic ordering. However, when CPOE is implemented into a health care organization successfully, the system is beneficial to the health care facility. For instance, implementing CPOE for inpatient chemotherapy using an electronic verification workflow with reduced staff members in a hospital proved CPOE is implemented in complex environments (Martin, Kaemingk, Frieze, Hendrie, & Payne, 2015). Staff members reported safety events decreased after following the implementation of CPOE for transcribing and prescribing chemotherapy patients.

Burnout between physicians was evaluated to associate the relationship between clerical burden, electronic environment, and the burnout rates with United States physicians (Shanafelt et al., 2016). The results of the study indicated physicians who used CPOE and EHR were less satisfied with the amount of time they spent during clerical tasks with an increased amount of burnout on the univariate analysis. A higher rate of burnout existed with physicians who used health care software. Implementing CPOE in acute care hospitals in the United States could generate a substantial amount of savings to society. In this study, a decision analytical model compared CPOE with the ordering of paper in patients at acute care hospitals (Asch et al., 2015). The use of

computer-based provider order entry (CPOE) intervention was used to optimize laboratory testing in patients with the suspected heparin-induced thrombocytopenia. The treatment of health information technology (HIT) and the over-testing were frequent yet potentially harmful occurrences for patients that were hospitalized (Samuelson et al., 2015).

Four key ways to a successful CPOE implementation would require health care organizations to focus first on automating the physician's ordering process, recognize and minimize the effects to ancillary workflows, design a CPOE system to improve physician efficiency, and allow for a flexible implementation approach and rollout strategy (Kilsdonk, Peute, & Jaspers, 2017). Challenges to hospitals seeking to automate their physician workflows stemmed from both the process and product using CPOE systems. In the study of how to improve CPOE adoption by using a phased, flexible implementation process focused on extending CPOE solutions to meet the specific meaningful use requirements depending on the hospital implementing CPOE system (Kilsdonk et al., 2017). The study focused on how physician workflows were automated without significantly affecting other clinical processes and would not require content standardization or change how physicians practice medicine. From a timing perspective, the study to improve CPOE adoption, CPOE was implemented in departmental waves in a short period of time or an incremental implementation process would be used in which a small pilot implementation precedes CPOE deployment.

During the early stages of implementation of CPOE systems, initial perceptions were driven by the unfamiliar perspective of doctors and nurses (Baysari et al., 2018).

Changes in perceptions in a pediatric hospital and behaviors were reported, as the usage of the CPOE system became a routine. Semistructured interviews were taken four times observing the implementation of CPOE. The semistructured interviews in the longitudinal study of user experiences of a CPOE system in a pediatric hospital were taken during weeks one, three, and six months following the implementation. The interviews from 122 users were auto recorded and transcribed. The themes of the interview link to an extended technology acceptance model (e-TAM). The results of the study showed the initial perceptions were driven by the unfamiliarity of the CPOE system implementation. When doctors, nurses and other health care providers became more efficient and proficient using the CPOE system, additional safety benefits became apparent. Increases in reports with benefits were related to usability problems and new types of errors that arose from CPOE use such as reduced patient interaction and delayed medications. The longitudinal study suggests a support program and adaptive implementation process.

Process

The process of integrating information technology into health care organizations has been a topic of discussion since the beginning of 2005 (Walker, Pan, Johnston, & Adler-Milstein, 2005). The HIE was developed to promote quality care, efficiency, and profitability to health care organizations. The HIE was created to mobilize health care information through an electronic process across multiple health care organizations (Walker et al., 2005). Walker et al. (2005) mentioned the value of access to electronic health care information exchange and interoperability between health care providers.

A cost-benefit model was created to prove fully standardized HIE could provide a net value of $77.8 billion per year if fully implemented in health care organizations. The hypothesis of the study on the value of health care information exchange and interoperability resulted in clinical benefits where a substantial increase in financial benefits existed only if HIE was implemented correctly.

The evolution of health information technology policy in the United States transformed the nations' health care system in public and private sectors (Edmunds et al., 2016). Federal regulation laws and policies were completed to create the development of the health care information technology policy. A broad set of challenges faced by the private and public sectors provided a timeline of policies to the key legislation developed, such as the health care information technology policy. Kim et al. (2016) conducted research on the topic of the evolution of EHR-S functionality for care and coordination. The purpose was to improve the safety of patients by reducing the number of medical errors that lead to facilitate and harm the measurement of quality care. The HIE and information gaps in referrals to a pediatric emergency department were discovered in a retrospective cohort study. Bahous and Shadmi (2016) conducted a study which focused on how HIE was beneficial by providing unique information on chronic medications, providing information on the gaps that exist for admissions to the pediatric emergency department, and how HIE lacked 50% of the information on chronic medications. The goal from the researchers was to access enough data to reveal the gaps between information sources in the admissions process, to a pediatric emergency department. The most important source of this study was the patient's medical history. The conclusion to

this study revealed how important data was lacking and HIE systems needed improvement in narrowing the gaps in the number of errors. Serrano et al. (2016) conducted a population-based survey on the willingness to exchange health information via mobile devices. The researchers showed mobile devices offered opportunities for patients and health care providers to exchange health care information electronically. The conclusions to this study indicated respondents were less likely to exchange health information that was considered sensitive.

Barriers

Institutions and governments across the world have made efforts to diffuse and adopt health care information exchange technology, with the expectation of improving the efficiency and quality of health care. The rapid adoption of HIE systems in health care organizations continues to grow alongside challenges and complexity (Dixon, 2016). Health care information exchange technologies require regulatory, legal, and policy frameworks to facilitate the integration process. The full clinical influence of integrating HIE would be beneficial by reducing specific resources and improving quality care measures (Hersh et al., 2015). The barriers that exist with using HIE include inefficient workflow and poorly designed interface updates and features (Park et al., 2015). To integrate a wide adoption of HIE, the fair allocation of costs and benefits among stakeholders is needed.

While the intent of using CPOE systems is to improve communication and reduce ethical issues in health care facilities, some barriers are evident in implementing the health care technology. The CPOE systems improve care in health care organizations, but

some important questions regarding privacy and legal issues were raised (Ben-Assuli, 2015). The use of health information technology for the use of clinical purposes is a fairly new practice in health care organizations. The original intention for CPOE systems in health care organizations was to reduce and eliminate errors, decrease the duplication of tests, and improve the coordination of care (Kazley, 2016). The intent of using CPOE systems in health care organizations was to prevent prescription errors in geriatric patients. Prescription errors occurred frequently throughout medical routines in geriatric settings. In most cases, inaccuracies are reduced by the implementation of CPOE coupled with a decision support system (Frisse, et al., 2016). Learnability issues exist among primary care physicians who experience using CPOE software. A video analysis was conducted with two rounds of lab-based usability tests with the triangular method to analyze the different types of learnability gaps for novice and expert physicians (Clarke, Belden, & Kim, 2015). However, with the use of CPOE, prescription errors in geriatric patients should be avoided. The conclusion of this study revealed prescription errors appeared to be frequent in medical routines in highly specialized geriatric settings, but inaccuracies are avoidable with the implementation of CPOE and careful verification of medications (Frisse, et al.,2016). Researchers showed CPOE systems may reduce medical errors, quality; improve safety, and the value of patient care (Kruse & Goetz, 2015).

Medication Errors

The CPOE systems and EHRs were created to decrease the risk of injuries to patients (Horsky, 2016). The potential for new health care information technologies in

health care facilities was to increase the safety and quality of care. The most common type of medication errors was from incomplete information entered or unnecessary drugs prescribed. The health care industry developed a dependence on information technology for improving and maintaining both business and clinical operations used for reducing medical errors (Bernstein, McCreless, & Cote, 2016). Five constants that routinely influence the successful integration of information technology in health care include the process of implementation (Bernstein et al., 2016).

Medication errors were examined to determine whether patient safety reports were related to CPOE. The conclusion to this study revealed errors related to CPOE involved erroneous dosing, transmission errors, and duplicate errors (Amato et al., 2016). However, standardized safety reports would help vendors and health care organizations to implement and learn prevention strategies. A qualitative analysis was conducted of vendor discussions on the procurement for CPOE, and clinical decision support systems in hospitals (Cresswell et al., 2015). Some strategies to implement the new health care technology involved data collected from digitally audio-recorded discussions from a series of CPOE systems in hospitals. The results of this study indicated an urgent need to encourage collaboration between vendors and providers, with a formalized procurement framework, with value-based specifications to the CPOE system. Researchers demonstrated that CPOE systems can improve the safety and quality of health care services (Farre, Bem, Heath, Shaw, & Cummins, 2016). The implementation process is not straightforward and can create undesired or unintended consequences once in use. Health care managers and researchers applied qualitative studies which were useful while

using the interpretive synthesis to make an important contribution to health care to improve CPOE system compatibility.

The CPOE systems integrated into health care facilities increased the rate of medication errors. The main goal of health care leaders was to integrate CPOE systems to focus on the elimination of paper orders and manage the challenge of low-frequency physician users of CPOE (Gellert et al., 2016). The adoption of the CPOE systems would cause challenges on the procedures in navigating and committing to memory the details of multiple CPOE software modules. Slight et al. (2015) reviewed a random sample of approximately 60,000 medication error reports from MEDMARX to determine where the CPOE systems contributed to the errors and flagged the test scenarios that tested CPOE systems. The CPOE systems are rapidly becoming ubiquitous. Olson et al. (2015) researched ways default settings in the CPOE order sets could influence physician selection laboratory tests significantly. The purpose of this study was to understand the effect of default setting habits in CPOE systems and to determine the order set on ordering habits. Further, the purpose of this study focused on the influence of CPOE systems and the effect on medication errors in chemotherapy and how the effect of implementation of CPOE on medication errors in chemotherapy using tertiary care has an effect on outpatients and inpatients (Niiranen, Silvennoinen, Laaksonen, Airaksinen, & Lehtonen, 2016). The results of this study indicated medication error reports involving chemotherapy occurred during the prescribing and planning of the treatment process. Another incident where CPOE systems were implemented resulting in medical errors was during the clinical decision support process during the experience at Brigham and

Women's Hospital/Partners Health care using clinical support systems. The conclusion of this study proved patient safety, quality, and cost outcomes were affected by the use of CPOE systems positively for efficiency, but negatively with a higher incidence of medication errors (Varghese, Wright, Andersen, Yoshida, & Bates, 2016). Integrating the radiology information system with CPOE influenced on repeat medical imaging investigations (Vecellio & Georgiou, 2016). Redundant and repeat procedures in the process of medical imaging while using some medical modalities such as Computed Tomography (CT) and X-Ray (XR) was an important safety issue addressed from practitioners from repeat imaging requests from the implementation of CPOE systems.

The importance of computerized provider order entry was widely adopted from the decrease in errors. CPOE introduced and contributed to medication errors in health care facilities. Nsakanda et al. (2015) studied the use of simulation modeling to analyze and evaluate the effect of workflow changes in the health care system from CPOE systems in a case of CPOE deployment in hospitals. The simulation tool effectively applied the current level of development compared workflow changes and evaluated the organization and operational constraints. Schiff et al. (2015) composed a study to resolve the depth of CPOE-related medication errors and created an analysis of reported errors and vulnerability testing of current systems. The researchers showed medication reports provide information valuable for understanding CPOE related errors. Although health information technology has the potential to improve the safety of patients, the use and implementation led to consequences unintended and safety concerns (Singh & Sittig,

2015). The long-term goal of the framework is to help achieve the benefits of health care information technology in real-world clinical settings.

The health care industry continues a phase of reducing medication errors, implementing financial information systems in clinical settings to increase health care efficiency, reduce medication errors, and eliminate unnecessary costs (Altuwaijri, 2016). Implementing CPOE systems might lead to the solution of meeting patient safety measures. The role of patient technology in patient safety is correlated to the amount of health care injuries and medication errors in United States hospitals each year (Slight & Bates, 2016). The HIT plays a role in improving patient safety and intercepting medication errors. In 2016, a return on investment for vendor CPOE in four community hospitals focused on the importance of decision support. Electronic prescribing in hospitals decreased the costs positively correlated with medication (Ahmed et al., 2016). The role of CPOE systems played a major role in facilitating medication errors (Koppel et al., 2015). The CPOE systems were software created as part of the process of HIE as the technical solutions to errors that occurred with medication. This software was created to prevent medical errors in the hospital, which was the cause of the decline in profitability, efficiency, and quality of care received by patients. Koppel et al. (2015) performed a qualitative study which included house staff interactions using the CPOE system in a hospital focused on tertiary care. The results of the study proved CPOE systems facilitated approximately 22 different types of risks for medication errors; however, as CPOE systems were implemented, hospitals and clinicians must attend to errors that the system may cause to numerous errors that this software prevents.

An increase in mortality in patients managed with electronic prescribing was a result of recent review measures. The reduced prescribing error rate was found in the CPOE method with minor issues like typographical errors and difficulties with the drop-down menus (Eisenhut, 2018). The factors that increased mortality from the use of CPOE was from one nurse or doctor required to permanently enter orders away from the patient on a computer during the arrival of the patient. During resuscitations, physician orders may have to be handwritten (Eisenhut, 2018). A training prescribing program for junior doctors focused on a reduction of errors from CPOE systems.

To reduce the effect of electronic prescriptions, an audit process may decrease outpatient medication errors. The study on the impact of the electronic prescription audit process to reduce outpatient errors was undertaken to evaluate the effect of electronic prescription audits for outpatients in a quaternary care hospital (Priya et al., 2018). The purpose of the study was to review the clinical benefits of electronic prescriptions by pharmacists in an audit process detecting and monitoring prescription errors before the dosage reaches the patient. Each prescription was generated through CPOE systems that appeared electronically in the through a prescription audit tool integrated with a clinical decision support system. The pharmacist audited each outpatient prescription for the interaction of drugs, dosing errors, drug allergies, therapeutic duplications, and frequency errors (Priya et al., 2018). The National Counsel for Medication Error Reporting and Prevention Index was the reported method used to categorize medication errors.

Impact on Implementation

The effect of the implementation of a CPOE associated with the process of checking pharmaceutical medication orders in three stages of drug management in an orthopedic surgery unit was examined. In an observational study on the effect of CPOE systems on the rate of medication errors in an orthopedic surgery unit, the use of CPOE with the extra assistance of a pharmacist checking the medication orders in the surgical unit reduced the incidence of medication errors in the administration and prescribing stages (Hernandez et al., 2015). In a comparative cohort study, non-intercepted dose errors in prescribing anti-neoplastic treatment using CPOE systems was observed. The CPOE system did not significantly reduce the risk of dose errors but instead decreased the risk of calculation errors (Mattsson et al., 2015). More errors with prescribing medication were introduced with the use of CPOE systems. In the future, strategies to prevent prescription errors could focus on computerized systems integrated into health care organizations to reduce transcription errors between databases. The functionality of their organization would be perfect after implementing CPOE to prevent medication errors which were the cause of iatrogenic injury as a result of avoidable mistakes. As the implementation of CPOE adapts to real-world applications, CPOE systems became useful in reducing medication errors (Schwartzberg, Ivanovic, Patel, & Burjonrappa, 2015). To have medication error-free entry and perfection, objective data analysis must guide the evolution of CPOE systems.

The influence of CPOE on the length of stay and mortality was examined after the implementation of new health care technology within a hospital. A five-year

retrospective pre-post study evaluated patients at an academic medical center to determine their length of stay. After examining CPOE on multiple levels, the system remained statistically a significant predictor of decreased mortality and length of stay in surgical units but increased mortality in intensive care units (Prgomet et al., 2016). In a study on the influence of commercial CPOE and clinical decision support systems (CDSSs) on medication errors, length of stay, and mortality in intensive care units, new technologies were used as a strategy to decrease medication errors from affecting children and adults from the side effects of medication. New technologies have proven to be effective in reducing medication errors using platforms to aid in decision-making and CPOE systems (Ruano,Villamañán, Pérez, Herrero & Álvarez-Sala, 2016). However, the use of these new tools also generated new errors which had a bigger effect on hospitalized children. Health care technology is becoming a powerful tool for the improvement of medication safety. Different tools were recommended to support the prescribing process to prevent adverse drug event rates. Implementation of CPOE software is challenging and often has an influence on the workflow of a health care organization's daily tasks. Technologies are introduced carefully and monitored closely to achieve the desired reductions while preventing medication errors (Seidling & Bates, 2016).

Clinical care in technology within health care organizations has become increasingly dependent upon CPOE systems (Hsu et al., 2015). Although no studies exist to provide the adverse effects of CPOE and the physician's ability to handwrite prescriptions, the CPOE system crashed at a large hospital. The unintentional shutdown

of the CPOE system revealed physicians failed to handwrite prescriptions that were flawless in the digital era. The effect of commercial CPOE and CDSSs on medication errors, length of stay, and mortality in intensive care units reduced medical costs (Prgomet et al., 2016). Computerized physician entry order systems were designed to increase the safety and improve quality of care. The efficiency of this software has not been validated within the emergency departments. Taieb-Maimon et al. (2017) explained CPOE systems have an improved interface design to increase the recognition of wrong-patient medical errors.

Patient Safety

Improving patient safety was an important factor to reduce medication errors in the microsystem of health care organizations during the implementation process of CPOE systems (Dent, 2015). In this study, repairing and replenishing machines for pre-administration assessments such as updating procedures and policies of medication administration, patient vitals, and providing the proper education for CPOE and electronic medication administration record (EMAR) use was evaluated. Although implementing new technologies in health care facilities can be beneficial, the question of whether the adoption of EMR systems inflated Medicare reimbursements. The CPOE systems in this case study were positively correlated to the increase in the complexity of patients upcoding, which is the term related to insurance reimbursements inflamed (Ganju, Atasoy, & Pavlou, 2015). Barriers exist to the adoption of CPOE in the United States. Medical errors are costly and may potentially be life-threatening for patients. The CPOE method significantly reduces medical errors and improves the quality, safety and

value of care; however, thorough analysis and research and the frequency of barriers in adopting CPOE were efficacy, process changes, and training (Kruse & Goetz, 2015).

The implementation of CPOE systems in health care facilities is a continuous process in health care organizations for issues dealing with the expectation of improving the efficiency and quality of health care although barriers exist with the implementation process. CPOE systems were created to decrease the risk of injuries to patients but lead to multiple medication errors during implementation in health care facilities. Improving patient safety was an important factor to reduce medication errors, to influence health care practices and improve patient safety. CPOE systems are implemented accurately within health care organizations for the future of health care facilities leading to CPOE quality, profitability, and compatibility in HIE transactions among a miscellaneous of health care organizations.

Clinical care has increasingly become dependent on CPOE systems. When CPOE systems crashed, physicians failed to write flawless prescriptions in a large hospital to assess the legibility, completeness, and accuracy of physicians' prescriptions written by hand (Hsu et al., 2015). The unintentional shutdown of a long-running CPOE system revealed physicians fail to handwrite flawless prescriptions during this digital era. The current contingency plan for computer prescription disasters in health care facilities includes the preparation of stand-alone prescribing software for service delays to reduce service delays to the minimum. Health care information technology is becoming a powerful tool to improve medication safety (Seidling & Bates, 2016). Different tools have been developed to support the prescribing process, dispensing process, and

administration process although errors may occur at each stage. Hospitals adopt CPOE systems to improve quality problems that plague hospitals (Queenan et al., 2016). The CPOE researchers showed CPOE compliments the dimensions of patient safety of transitions and handoffs, feedback, and organizational learning. The CPOE researchers aimed to help health care managers and decision-makers to strategize on how to understand how cultures influence such initiatives and account for culture when anticipating the effects of CPOE.

The CPOE systems led to the cost-effectiveness in improving medication safety (Hepp, Forrester, Roth, Wirtz & Devine, 2013). The Health Information Technology for Economic and Clinical Health Act continued to drive EHRs and the adoption while demonstrating meaningful use, which improved medication safety and reduced costs inpatient settings. Idemoto, Williams, Ching, and Blackmore (2015) mentioned the implementation to prevent the timing of medication errors was associated with the use of CPOE systems. Through the implementation of a customized alert, medication timing errors associated with CPOE systems were corrected. Langabeer (2016) explored the business strategy in HIE organizations. To sustain the long-term survival of HIEs, further insights into successful business strategies must occur.

The adoption of CPOE systems causes a challenge of learning to commit and how to navigate the details of numerous CPOE and EHR software modules (Gellert, Ramirez, & Webster, 2016). Patient safety is at risk when electronic orders and paper co-exist from physicians resisting CPOE adoption. Innovative safety tools and shared methodologies is used in nursing to implement power plan functionality, CPOE

processes, and staff engagement (Brandon, 2016). Implementing CPOE safely required building, mapping, testing, and providing education for each specialty in health care. The vulnerabilities of CPOE systems were tested to various types of medication errors and a more comprehensive development on how the design could improve was created (Slight et al., 2015). CPOE systems often fail to prevent and detect medication errors.

Quality

In the United States, government recommendations were sent out for hospitals to adapt to CPOE systems to improve the quality problems that continuously plague hospitals in the United States (Queenan et al., 2016). Medication errors continue to exist in the process of integrating CPOE into health care organizations. Despite the use of electronic prescribing and EHRs, the patient-centered reconciliation is an important process to decrease medication errors (Alex et al., 2016). A significant burden arises financially from medication errors. Although patients are not harmed, additional costs are associated with medication errors (Choi et al., 2016). The effectiveness of CPOE depends on the safety measures for patients in particular hospitals. The uses of CPOE compliment the dimensions of patient safety, which can help decision-makers understand how culture influences the effects of implementing new technologies in hospitals.

Profitability

CPOE offers a full-bodied platform for entering recommended tests, prescriptions, and suggestions (Atique, Lee, Shabbir, Hsu, & Rau, 2016). Although CPOE software is very effective, an observable overburden on practitioners and health care professionals develops. New technologies are affecting children and adults

differently, where medication errors throughout the drug treatment process can have significant damage in children but tolerated with adults (Ruano et al., 2016). The falling and rising rates of CPOE systems correlate with the rises and reductions in the length of stay (LOS) of a patient. The CPOE software statistically was a factor affecting the length of stay for lower costs and improved efficiency.

Primary care physicians continue to experience learnability issues while using CPOE systems (Clarke et al., 2015). To determine the gaps of learnability between novice and expert primary care physicians using CPOE systems, applying the triangular method approach, applying two rounds of lab-based usability tests while using a video analysis was conducted. Based on the conclusion of the study on learnability issues primary care physicians experience when using CPOE, future directions of CPOE systems were determined in health care organizations which identified multiple usability issues physicians' face while using EHRs through subtask analysis. The implementation of Automated Drug Dispensing Systems (ADS) and CPOE systems is financially profitable and improved the efficiency of drug distribution in health care facilities (Chapius et al., 2015). The CPOE and ADS systems were also proven to reduce costs related to medications and the number of time nurses dedicated to medications. The main objective in the Slight et al. (2015) study was to increase profitability in health care organizations and to test the vulnerabilities of a wide range of CPOE systems of different types of medication errors while developing a more comprehensive qualitative way of understanding how the design improved. The results of the Slight et al. (2015) provided

insight on the importance of developers building safeguards to ensure safer prescribing to patients.

The purpose of the study on what learnability issues primary care physicians experience when using CPOE focused on the incremental effectiveness with costs in situations where high implementation costs anticipated increases of CPOE in hospitals. CPOE implementation affects clinical care quality, cycle time, and the physician job demand over time. Within complex health care organizations, CPOE has influenced the clinical care process in documentation quality and process standardization. The research question was well framed and significant focusing on CPOE implementation's impact on quality clinical care, cycle time, and the physician job demand over time. Some underlying assumptions, medication errors, and inefficiencies, reduced the quality of care leading to hospitals turning to health information technology (HIT). The sample size was sufficient for this particular study on implementing CPOE in acute care hospitals where physician responses for CPOE implementation were at a large urban Southeastern hospital. However, some limitations include a more diverse sample to have accurate readings for the research question.

Implementing CPOE with the support of clinical decisions leads to long-term substantial savings to society in health care settings (Nuckols et al., 2015). An incremental effectiveness with costs in situations where high implementation costs anticipated increases CPOE in hospitals. The CPOE implementation affects clinical care quality, cycle time, and the physician job demand over time (Rai, Kiel, & Mindel, 2015). Within complex health care organizations, CPOE has affected the clinical care process in

documentation quality and process standardization. However, physicians continue to strive to develop benefit perceptions for medical error reductions, benefit perceptions and how they experience job demands when CPOE is implemented. The CPOE-related medication errors were analyzed for the reported errors and vulnerability testing of current systems (Schiff et al., 2015). From this study, to improve CPOE safety, recurring errors are identified with enhanced monitoring, testing, and reporting of CPOE systems.

Health Information Exchange

The HIE was implemented into health care organizations to improve the electronic sharing of clinical information across multiple boundaries of health care organizations (Hersh et al. 2015). The use of HIE lowered department emergency costs, reduced hospital readmissions, increased the quality of care for the ambulatory quality of care, and improved the process of disability claims. To determine whether patients of the emergency department wanted to share medical records across health care systems through the process of Health Information Exchange, share records automatically, and sign a consent were factors in this study on what patients prefer with Health Information Exchange (Medford-Davis, Chang, & Rhodes, 2016). Another issue that arose with using HIE was the improved privacy and security protections for patients participating in Health Information Exchange and had a preference to sign the consent. A variation exists in the attitudes toward inter-hospital electronic patient record exchange and discrepancies among medical record staff, physicians, and patients (Wang et al., 2015). Technological and individual barriers still exist involving information sharing between health care organizations. The conclusion of this study on the effectiveness of an integrated CPOE

decision-supporting systems with a clinical pharmacist monitoring practice in preventing antibiotic dosing errors revealed discrepancies in the perceptions of the functionality of HIE where patients would prefer communication and further education with regarding implement HIE on a more frequent basis among health care facilities.

Health information exchange enabled patients' records to be in the same location as a patient regardless of where they received care. The process of HIE was an interoperable and reliable way of sharing electronic health information between health care organizations among nurses, doctors, patients from different health care institutions, pharmacists, and within multiple health care settings (Hillestad et al., 2014). In health care organizations, HIE allows patients and health care professionals access to securely share medical information electronically (Hillestad et al., 2014).

Health care organizations have shown a growing interest in information technologies such as HIE and EHRs (Ben-Assuli, 2015). Although the implementation of these systems was meant to improve care, some questions were raised for legal and privacy issues. However, specific implications addressing the issue of implementing new health care technologies in health care facilities were examined with a focus on the emergency department and the use of new technologies and the substantial challenges faced. Four major strategies were conducted to achieve reform-ready information technology where health care executives faced an escalating demand under the health care reform to extract the greatest possible value from their organizations' information technology resources (Freudenberger, Schunder, & Reid, 2013). To encourage the best possible value from IT, a broad, long-term view of IT resources and needs is

recommended. Studies were conducted to obtain a systematic view of identifying barriers and facilitators to implementing electronic prescriptions in primary care (Gagnon, Nsangou, Payne-Gagnon, Grenier, & Sicotte, 2014). Future studies may focus on the perceptions of user groups, managers, vendors, pharmacists, and patients on their experiences with health care technologies and the value of care.

Institutions and governments worldwide have made efforts to diffuse and adopt health care information exchange technology with the expectation of improving the efficiency and quality of health care. The rapid adoption of HIE systems in health care organizations continues to grow although challenging and complex from navigating and managing a network of health information systems (Dixon, 2016). Health care information exchange technologies require regulatory, legal, and policy frameworks to facilitate the integration process. The full clinical effect of integrating HIE would be beneficial by reducing specific resources and improving quality care measures (Hersh et al., 2015). The barriers that exist with using HIE include inefficient workflow and poorly designed interface updates and features (Park et al., 2015). To integrate a wide adoption of HIE, the fair allocation of costs and benefits among stakeholders is needed.

Through the numerous delivery options of technology in health care, various forms of HIE existed. The benefits of HIE allowed health care providers to share EHRs with multiple health care organizations. Confidentiality and access to share the medical history of a patient where the patient received care was beneficial. This form of technology provided an effective, safer strategy of care that tailored to the unique medical needs of a patient (Cresswell et al., 2015). Organizational, strategic, and social factors

could make or break implementations on technology where the need to develop tools to support future developments including the involvement of the patient; contribution and access to shared records are optimized for the effectiveness to minimize the possibilities of introducing new risks into the complex health care system (Cresswell et al., 2015). Health care information exchange supports future developments including the involvement of the patient; contribution and access to shared records are optimized for the effectiveness to minimize the possibilities of introducing new risks into the complex health care system (Cresswell et al., 2015).

Although many benefits from using HIE as a method in health care facilities exist, many discrepancies were a result of this new method of exchanging patient medical information. The problem of HIE deserves new research because many health care organizations face problems adapting to the new a result of this new method of exchanging patient medical information. The problem of HIE deserves new research because many health care organizations face problems adapting to the new because many health care organizations face problems adapting to the new health care technology leading to sustaining poor business models of exchanging patient health records electronically (Ricciardi et al., 2013). The process of HIE is used properly once health care providers, managers, patients, and health care institutions undergo the process of implementation, usability, barriers, and sustainability.

Transition

In Section 1, I provided an overview of strategies for mitigating information technology discrepancies in health care. The HIE and subsequent documentation

discrepancies between authors resulted in significant medical errors from the lack of exchangeable health care information using new technology software among organizations (Vest & Gamm, 2015). Some health care managers continue to lack strategies to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability within their organization. The study I completed focused on the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. A multiple case study was the most suitable approach used to thoroughly answer the research question of what strategies do some health care business managers apply to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability? Health care managers who created strategies to integrate compatible CPOE systems among different health care facilities experienced an increase in profits within their organization.

Section 2 of the study includes procedures in research, the role of a researcher, the design and research method, the participants, techniques and data collection instruments, and verifying validity and reliability. Section 3 of the study consists of the purpose statement, the role of the researcher, participants, research method and design, population and sampling, ethical research, data collections, and reliability and validity.

Section 2: The Project

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The population for the study was eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States. The findings of the study might affect social change by decreasing medical errors due to CPOE systems in small clinics, which may lead to an increase in the quality of patient care and result in improved quality of life for patients.

Role of the Researcher

In this qualitative case study, my role was primarily to collect data and protect the integrity of the study. The researcher is the instrument of data collection in qualitative research. In qualitative research, the researcher is the main data collection instrument for questionnaires, machines, and inventory where the research is considered as the tool used for data collection (Yin, 2018). As a qualitative researcher, I asked probing questions relevant to my research questions in order to think, listen, and engage in deeper levels of conversation. Effective qualitative researchers focus on developing information using theories and ideas from an extensive number of sources (Patton, 2015). As the researcher of my study, I collected data, interviewed participants, analyzed the data, and from the analysis, presented the findings.

To avoid personal bias in a qualitative research study, an explanation regarding any relationships with the research topic or participants is required (Unluer, 2013). As the researcher, although I am a health care professional in the field of information technology, a personal relationship does not exist with the participants selected or the research topic.

Ethical guidelines and standards must be followed when conducting qualitative research. The researcher has the responsibility to fully explain the meaning of what the research is about and how it was disseminated. The Belmont Report discussed three major ethical principles to protect the rights of participants. Justice, autonomy, and beneficence are three primary ethical principles. To protect the rights of the participants in my study, I applied the Belmont Report guidelines.

A face to face interview technique was used to reduce any bias. This technique was used to avoid viewing the data through personal views and reduce bias. To mitigate bias in qualitative research, the researcher must accurately ensure collected and interpreted data represents the beliefs, feelings, and experiences of the participants (Yin, 2018). An interview protocol is useful to collect information that is in depth from participants in qualitative case study research (Yin, 2018). To eliminate personal bias, a predetermined structure must be followed by the qualitative researcher to ensure the reliability of the case study (Moustakas, 1994). The main focus of my qualitative research was on the interview questions and research topic from the interview protocol to further mitigate any potential bias. One of the many advantages of implementing the interview protocol is to ensure the interviews are completed within a given time frame.

Increased consistency during the data collection process provides a precise technique for each interview when applying the interview protocol (Yin, 2018). The purpose of an interview protocol is to ensure the interview process is consistent in addition to mitigating biases that may develop. Furthermore, to decrease disparities in responses, the same questions should be asked during each interview (Houghton et al., 2014). The interview protocol applied to research provided reliable data from the participants towards the study (Patton, 2015).

In qualitative research, Yin (2018) mentioned tools for mitigating biases during research studies was used to verify the data interpreted from participants representing their experiences, beliefs, and feelings. Member checking is an important tool used for mitigating biases in qualitative research. Member checking is also known as receiving feedback from an informant or validation from a respondent (Harvey, 2015). The technique of member checking helped to improve credibility, accuracy, validity, and transferability of a qualitative study (Harvey, 2015). Member checking was performed by recording the responses of each participant with interview questions related to the research question.

I printed a copy of the interview questions with the answers from the participants. The participants had the opportunity to review their answers to the research questions to provide feedback, check for accuracy, and share any additional information not mentioned in their interview. The member checking process is complete once the participant information provided matches the interviewer's interpretation of the information (Harvey, 2015).

Participants

Participants in qualitative research studies are selected based on the needs of the project (Yin, 2018). The eligibility requirements for this study were that participants must be a health care manager or leader, use strategies for mitigating information technology discrepancies in health care, and be employed at a health care organization with full time status. Participants were from my previous places of employment in health care facilities; however, I had no relationship with them. The validity and credibility of a research study is strengthened by the selective eligibility criteria while choosing participants in a qualitative study (Yin, 2018). Yin (2018) said to resolve or answer the research questions, researchers in qualitative studies select participants based on their experience in the field and knowledge and information each participant can provide. Patton (2015) said the selection of qualified participants with experience related to the research question enables researchers to answer and gain information relevant to the study.

The focus of this qualitative multiple case study was to explore the strategies health care business managers use to combine CPOE systems within health care facilities to reduce medication errors and increase profitability in the mid-Atlantic region of the United States. Kruse et al. (2014) reported medication errors increased 64.4% due to CPOE systems and the inability to exchange information among health care facilities. Health care managers who lack strategies to integrate compatible CPOE systems among different health care facilities experience a loss of profits (Dullabh et al., 2014).

CPOE systems allow physicians in the mid-Atlantic region of the United States to prescribe services to their patients using an electronic method. The need for handwritten paper orders assists in achieving the goal of health care managers to increase the efficiency of communication between CPOE systems through cost savings. CPOE systems face major barriers associated with the adoption of clinical systems because of the physicians' resistance to change and high implementation costs. This newly mandated technology is capable of reducing medical errors in the mid-Atlantic region of the United States clinics if healthcare leaders in these organizations are not resistant to the implementation of CPOE in their healthcare organization.

Gaining access to the right participants is very important to receive information that is aligned with the research question. Participants who meet the criteria for the needs of the research study leads to the success of a study (Yin, 2018). My previous places of employment were in health care facilities where CPOE was used. Before contacting any of the participants, I obtained permission to interview participants that meet the criteria of the study adhering to Walden University's IRB guidelines (see Appendix B). The strategy used to gain access to participants relevant to my study was to contact recruiting and human resource managers of health care organizations participating in the study from my previous employment and obtain a list of potential participants within the two health care organizations (see Appendix C). To establish a relationship with the participants of the study, gaining access to the participants was the initial step. To gain access to potential participants in the study, I used email and my cell phone.

The participants received a consent form by email with information about their participation in the study. The consent form included an explanation in the form of a letter about the intent of the research study. Robinson (2014) stated the relationship between the participants and the researcher determines the success of the research project. Establishing a relationship with participants required discussing the study prior to the interviews to develop trust throughout the study. For participants to have an understanding and appreciation of the research topic, the purpose of the research topic is explained (Patton, 2015). A continued engagement was a crucial factor where I contacted my participants via email at least two times which enabled stability and continuity to the relationship.

The process of gaining access to a participant requires a certain level of trust and establishing a relationship with the participants. The relationship with the participant can be formed by creating a form of communication that is effective, offering incentives for the participants in the study, and research transparency (Patton, 2015). During the data collection process, establishing a relationship with participants as a researcher developed open and honest communication throughout the study.

Research Method and Design

Research Method

Researchers select from qualitative, quantitative, or mixed methods approaches to explore phenomena. Qualitative researchers explore objective evidence by collecting narrative data through interviews or observations (Yin, 2018). The qualitative research method was the most suitable for the doctoral study to explore strategies health care

business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The most popular research methods used while completing a study are quantitative, qualitative, and mixed research methods (Yin, 2018). Applying the method of qualitative research allows the participants to answer questions to the interview with their own perspective and voice. In-depth interviews in qualitative research are conducted to explore strategies for mitigating information technology discrepancies in health care. To understand the perspectives of participants from exploring, scrutinizing, and gaining an understanding of the participant's views, is conducted through qualitative research (Moustakas, 1994).

The nature of the research question demands a narrative explanation for understanding the phenomenon and not for understanding relationships or differences among variables (Berger, 2015). The qualitative research method fulfilled the needs of the research question of strategies some health care business managers apply to collaborate CPOE systems within health care facilities, to reduce medication errors and increase profitability. Conversely, a quantitative researcher generates numerical data to interpret the presence or absence of a phenomenon (Berger, 2015). Quantitative research also requires an extended amount of time to create a statistical analysis of data used during the experiment (Hoe & Hoare, 2013). The intent of this study was to explore the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability, where the qualitative research method was applied to resolve the research question.

The mixed method research technique is used by some researchers. The mixed methods approach employs both quantitative and qualitative approaches (Maxwell, 2016). The quantitative method was inappropriate for the study, the mixed methods approach, which includes the quantitative inquiry, was equally inappropriate. In an instance where complex, broader research questions are addressed to collect data, is when researchers would use the mixed method approach (Yin, 2018). Although the research question could have been addressed using the mixed method approach, the purpose of this study did not focus on collecting numerical data, examining the relationship of cause and effect between two variables, nor was the study focused on a large number of participants.

Research Design

I used a multiple case study for my research approach. A researcher uses a multiple case study to investigate a defined, contemporary phenomenon that is common to two or more real-world or naturalistic settings and offers a means of understanding an individual, event, policy, program, or group via multiple representations of that phenomenon (Yin 2018). A multi case study involves multiple businesses while a single case study researcher draws participants from one agency or organization (Yin, 2018). I used the multiple case study design to investigate multiple clinics. Yin mentioned a multi case study design involves the use of various resources to investigate sources of phenomena. The objective of a qualitative research study has multiple dimensions which include direct observations, archival records, documentation, interviews, physical artifacts, and the observations of participants are all parts of a multi case research study

(Yin, 2018). Although multiple dimensions involved in a multi case study, I plan on using documentation from the two clinics and the answers to the interviews from my participants. Identifying the answers to the research question is the objective of qualitative research (Yin, 2018). Applying the multi case study approach to my research question would allow strategies for mitigating information technology discrepancies in health care to improve the status on the rate of medication errors.

A multiple case study research design fulfilled the requirements on discovering strategies for mitigating information technology discrepancies in health care organizations. The multiple case approach was a useful tool in conducting my study. Similarly, a multi case study conducted on EHR and the communications of technologies across health care organizations occurred (Gagnon et al., 2014). The multi case study provided relevant information for decision makers and managers who were facing the challenges of implementing EHR in their health care system. The research also contributed to the field of knowledge transfer and implementation science. The multi case research approach, at different health care organizations, captured individual and organizational factors that determine EHR adoption in clinical settings (Gagnon et al., 2014). Another multi case study conducted methods to reduce medication errors in elderly patients (Lavan et al., 2016). Furthermore, Bahous and Shadmi (2016) conducted a multi case study which was able to capture and provide information on the gaps that exist for admissions to the pediatric emergency department, and how HIE lacked 50% of the information on chronic medications.

Another qualitative research design considered for this study was the phenomenological research design. This design involves the real life experiences of the participants (Patton, 2015). However, the phenomenological design is intended for a narrow scope of analysis involving only lived experiences and therefore was not appropriate for my study (Moustakas, 1994). To receive effective information for the ethnographic approach, researchers must become an active part of the community and explore the type of lifestyle a health care manager would have interacting with patients and implementing CPOE in a clinical setting. Contemporary ethnographic researchers seek to have a better understanding of the physical environment which is both interpretive and descriptive (Patton, 2015). The ethnographic researcher explores the impact of culture or uniqueness of a population to explain behavior. There is nothing unique about the population explored in my study so I did not select the ethnographic design.

Population and Sampling

The target population for this study was eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States. The goal of the population sample selected for this study was to fulfill the requirements of capturing information on strategies for mitigating information technology discrepancies in health care clinics. Quality data to support the topic of the research question will be generated by using the proper sample size in qualitative research (Patton, 2015). The requirements for eligibility for the study participants in this study are the following: (a) be a health care manager or leader, (b) used strategies for

mitigating information technology discrepancies in health care, (c) employed at a health care organization with full time status.

The purposeful sampling method of a study is a technique researchers use to select participants who are well informed about a particular research topic (Patton, 2015). I used purposeful sampling to select participants. The ability to gather large amounts of information by using multiple collection techniques is one major advantage of purposeful sampling (Echoles, 2016). Qualitative researchers use purposeful sampling to select participants and who can provide resourceful information on a particular research topic (Gentles, 2016).

Snowball sampling is another method that grants a researcher access to participants. The process of snowball sampling involves the recruitment of participants in primary research who assist the researcher in identifying other participants useful to the study (Marcus et al., 2017). The results of the study can also be influenced by recruiting participants with biased samples (Patton, 2015). During my recruiting process, other candidates were recommended from qualified business managers as experts to answer the interview questions of my study within their health care organization. Emerson (2015) mentioned snowball sampling gives researchers access to the population in studies that are difficult to sample. Because of the biases that may result from using snowball sampling, this technique did not meet the requirements and needs for this study since no issues that exist when gaining access to the participants.

Another research technique used is random sampling. However, random sampling is used primarily in quantitative research studies versus qualitative research

(Emerson, 2015). The technique of random sampling is time consuming because of the large sample size of participants involved who are most qualified to answer the research question (Emerson, 2015). Emerson (2015) mentioned the random sampling technique also coding and analyzing large amounts of data. Unfortunately, the random sampling technique did not meet the requirements and needs for this research study on strategies to mitigating information technology discrepancies in health care organizations.

For this study, the sample size included eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States. I gained access to participants from prior employment and from a contact at a business networking conference. According to Yin (2018), in multi-case studies, each case either predicts similar results from a literal replication or predicts contrasting results but for anticipatable reasons. The sample size of eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States met the requirements and needs of my study to capture strategies for mitigating information technology discrepancies in health care organizations. When the accurate sample size is used, quality, data generates for the research study (Patton, 2015). Data saturation is influenced by the quality of the sample size used in qualitative studies (Fusch & Ness, 2015). Yin (2018) mentioned that when determining sample size, to conduct rigorous qualitative research large enough for the study, the researcher gathers data for the analysis of the study. Patton stated the idea of using a multi case study is to get contrasting situations not depending on the number of cases selected but to explain

how the differences between the cases explain why the situation occurred in one and not in the other to strengthen the research question.

To ensure data saturation, researchers apply strategies to collect data from participants from the in-depth interviews (Patton, 2015). The beginning step in data collection was through an initial interview process of each participant in person. The introductory email sent to participants is in appendix B which introduced myself, the purpose and title of my study, and the criteria for participants. Once no new information or data was available to collect from the participants of the study, the follow up member checking process was complete. The member checking technique was applied through follow up interviews to ensure data saturation from the participants' answers to the research questions. A portion of the collected data was provided to each participant to verify the data collected. Participants had one week to review the information, make any changes, and respond. During the member checking process, the interpretation of the participants' answers to the research questions received further review. A transcription of the participants' responses to each interview question was given to the participants. Fusch and Ness (2015) mentioned data saturation occurs in a qualitative research study when themes emerge from the answers of the participants and the study becomes replicable. The quality and amount of data used in a research study affirm data saturation (Fusch & Ness, 2015). To ensure data saturation within this study, I used face-to-face interviews with participants while using the documents from the health care organization as a resource. I compiled a variety of documentation from the clinics such as the following: procedures, CPOE implementation policies, and the clinic's manual on CPOE

implementation strategies until themes develop and repetitive information emerge from the participants after interacting three times. To gain access, I asked permission from the health care managers of the health care facilities.

The method used to select participants included contacting at least two clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States who applied strategies for mitigating information technology discrepancies in health care organizations. Gaining access to eligible participants through a networking event called Esther's Preparation Room where eligible healthcare managers were present and spoke on their qualification during a panel discussion benefited the research. Their phone number and email were saved to my cell phone after the event. To reach the potential participants, I scheduled face to face meetings; contact the health care managers by telephone and via email. I interacted with participants one time face to face for the interview, two times over email introducing and thanking them for participating in the study, and one time over the phone for the follow up interview. The participants for this study included eight health care managers or leaders who work in the mid-Atlantic region of the United States and have been exposed to mitigating information technology and faced discrepancies in their organization which are the qualifications to be interviewed for this multi case qualitative study. Information vetted from participants prior to the interviews over the phone and through email was part of the process. Statistics for the study was taken to document withdrawals or did not answer any specific questions. The criteria to be eligible for this study included the following: (a) be a health care manager or leader, (b) used strategies for mitigating

information technology discrepancies in health care, and (c) employed at a health care organization with full time status.

The interview setting requires a comfortable environment when conducting a qualitative interview (Wolgemuth et al., 2015). For the interview setting, I gave the participants the option of selecting an environment with good lighting, readily available, comfortable sitting arrangements, with minimal interruptions. Wolgemuth et al. (2015) mentioned an interview setting should be comfortable, quiet, and free from telephones and any kind of interruption. Allowing participants to select their interview setting with minimal noise and distraction allows the participants to thoroughly answer the research questions (Marshall & Rossman, 2016). Allowing participants to select the interview setting also creates and strengthens the relationship between the participant and the researcher (Seidman, 2014).

Ethical Research

Ethical research is an important piece of any research study which is specifically interested in the analysis of ethical issues raised when participants are part of a research study. To protect the confidentiality of the participants in my study, all the data collected was locked and stored for five years in a safe. Towards the end of the study, a summation of my research findings was also shared with the participants. Walden University's IRB approval number is listed on the final manuscript of the doctoral study. The protection of the privacy of participants in this study to ensure confidentiality was obtained by the use of unique identifiers in replace of their names or any detailed information that could possibly give away a participant's identity. Alphanumeric

identifiers have a possible combination of 20 characters where multiple unique variations were be created for each participant for interview transcripts, the organization of the study, and to identify the participants involved in the study.

The Belmont Report (1979) gave a thorough description of principles researchers should use to protect the rights of participants in a research study. In my research study, all participants received a consent form with detailed information on the research study they participated in. Protecting the well-being, confidentiality, and rights of the participants is very important when conducting researching involving people. I also completed the certification course from the National Institute of Health focused on the protecting human participants.

Furthermore, the process of informed consent main focus is on the rights and protection of participants in any given study (Fisher, 2015). Prospective participants in any research study must first understand the procedures, the purpose, and any potential risks or benefits from their involvement and any alternatives to participating in the study. The data collection process of this study occurred after the approval of IRB with a signed letter of cooperation from each participant (see Appendix C). Throughout the informed consent process of my study, protection of the highest ethical standards was provided to all participants.

Participants in this study had the right to withdraw from the study at any given time without any penalties. Participants could withdraw either by email, phone, or in person based during or after the interview. Statistics were kept for my study if anyone withdrew or did not answer any specific questions. The participation of this study does

not include any incentives or compensation for participating in this study. The voluntary nature of participation in a research study requires researchers to inform the participants that they can discontinue participation in the research study without the loss of benefits or penalty (Fisher, 2015).

Data Collection Instruments

In qualitative research studies, the information used to collect data is the researcher of the study (Yin, 2018). Primary data in a qualitative research study is collected from observations, semistructured interviews, observations, and through the process of reviewing documents (Moustakas, 1994). In my study, I plan to contact the organizational representative to use documents. In semistructured interviewing, the opportunity for the interviewer to explore further responses or themes in combination with a pre-determined set of questions that are open ended to gain responses from the participants and eventually ask follow up questions (Bernard, 2013). The data collection process is also enhanced by the use of semistructured interviews because participants are not limited to responses that are predetermined (Yin, 2018). Consistency was guaranteed throughout the process of data collection. Bernard (2013) revealed the most common source of primary data collection is semistructured interviewing in qualitative research. I collected primary data using the semistructured interviewing technique. Moustakas (1994) mentioned researchers use the method of semistructured interviews, by the review of documents, and the use of observations in qualitative research studies. The method used to obtain organizational records from my research was from a representative of the organization I used my study.

Once the interview process was complete, I used the member checking technique to increase the validity and reliability of the instruments used in the process of data collection. The process of member checking involves sharing the data interpretation of the researcher with the participants of the study to confirm the researcher's interpretations are accurate. The way member checking was incorporated in my study; I synthesized the response of the participants during the interview process for the questions asked. To confirm my interpretation was correct from their answers, each participant in my study received a copy of the interpretations as confirmation that what is documented is a representation of their thoughts in relation to the research question. Moustakas (1994) mentioned the development of a theme in a research study stems from the repeated responses and gaining clarity from the participants. The validity and reliability of the interview were enhanced by implementing the follow up member checking technique until more updates from the data received from the participants of the study.

Data Collection Technique

The intent of this qualitative multiple case study was to explore the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The central research question is: What strategies do some health care business managers apply to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. At the beginning of the interview process, I discussed the topic of my research with the participant over a light lunch, coffee, or tea explaining the purpose of my study. After greeting the participants over some light refreshments, I reviewed the

informed consent process with the participants. I also reviewed the business problem of the study with the participant. After easing the participant into the study environment, I proceeded to ask them the research questions. I was able to recruit at one clinic from being a former employer employed during their CPOE implementation process. I was able to recruit the second clinic health care leaders from a networking event where business owners spoke about their businesses and implementing new strategies. The only incentive I offered was a light lunch which the participants appreciated.

The objective of my data collection technique was to review the documentation on CPOE implementation from the health care clinic records in combination with data received from the interview. The strategy for primary data collection included the process of using semistructured face to face interviews with participants while using the documents from the health care organization as a resource. I compiled a variety of documentation from the clinics such as the following: company documents such as company CPOE integration policies, procedures, and the handbook for new and existing employees to add to my data from the interview and used health care company intranet. The participants who met the selection criteria received an invitation letter, the consent form, and interview questions by email prior to the actual interview. Once there was an agreement, the participant replied back stating, "I consent," confirming their agreement to participate. During face to face interviews with the participants, I gained access to clinical internal documents of the health care facility given to me by the participants from their intranet and policy books. Each participant selected to be a part of the study confirmed that they met the selection criteria before the interview begins through the

initial screening process. The process for confirming the requirements criteria involved interviewing the eligible participants. I met the participants face to face before the interview to receive the signed consent forms. On the day of the interview, the process of the interview was discussed with participants as well as information included in the informed consent (see Appendix B). I used the interview protocol to guide the interview process I recorded all my interviews on a recorder. Many qualitative studies collect video data or audio and are usually transcribed into a written form for closer study (Bailey, 2015). The representation of visual and audible data into written form is an interpretive process which is the first step into analyzing data in this particular type of study (Bailey, 2015).

Semistructured interviews were used during this study to explore the themes and perspectives from participants in this research study. Discussions are prompted by open ended questions when participants receive semistructured interviews (Bernard, 2013). Recording devices provide more information in the data collection process than just transcribing alone (Yin, 2018). I used a Samsung Note 4, utilizing the cell phone's audio recording device for the semistructured interviews since I am an expert using the cell phone's recording device for three years. I would recommend using the Samsung Note 4 to another researcher to record interviews since it is user-friendly and detects quality sound waves. If for any reason there is no sound detected, the phone sends a notification alert. After a recording, the interview can be saved with a specific name given and uploaded straight from the phone to dropbox, google drive etc. I used the Samsung Note 4 recording for corporate meetings in the past. Patton (2015) mentioned the responses of

participants are easily captured by a recording device. Once I captured the interview recordings on the Samsung Note 4 recording device, the recordings were transferred to the database of my computer by downloading the recording to my dropbox application on my phone that uploaded unto the dropbox file on my laptop. Also, a plan B option just in case if the information of the recorded interview was encrypted, I recorded interviews on my Dell laptop using the sound recorder. I brought my laptop to the interviews and explained to the participants that the interviews were recorded on my phone and Dell laptop for the purpose of my study. The interview was recorded using the sound recorder on my Dell laptop in addition to using my Samsung Note 4 recording device.

Although applying semistructured interviews in qualitative studies had numerous advantages, some disadvantages to applying this method were present. Yin (2018) mentioned although semistructured interviews can provide comparable, reliable quality data, semistructured interviews have disadvantages if participants provide biased answers to interview questions. The extensive amount of time used for semistructured interviews is also a disadvantage. To shorten the amount of time in interviews, as the interviewer, I guided the interviewees to focus on answering the research questions directly to avoid indirect responses. Multi case study interviews may take two hours or more to complete during one session or may require multiple sessions leading to a time intensive interview process (Yin, 2018). However, applying semi-structured interviews to qualitative studies has many advantages. Yin (2018) mentioned one advantage with using semistructured interviews are participants provide detailed information on the research questions and express themselves without any restrictions. The development of the relationship

between the participants and the researcher during face to face interviews will increase the cooperation levels during the study (Patton, 2015). The relationship between participants developed prior to this study since I met some at a networking event and worked with the remaining participants. Interviews in a qualitative research study facilitate the process of the researcher collecting up to date information that is important from the participant (Moustakas, 1994).

In qualitative research studies, the transcription method and member checking process improve the credibility, validity, and accuracy of the study (Harvey, 2015). The process of member checking includes a transcript review with the participants of the study to ensure the interpretation is accurate and is a representation of the responses given by the participant from the interview questions. I collected company documents such as company CPOE integration policies, procedures, and the handbook for new and existing employees in order to add to data from the interview and also went on the health care company site. I gained access to these documents during the face to face interviews where the interviewees shared the binders and google drive folders internal to the health care facility with me on their policies and procedures. The main objective was to compile information to analyze CPOE documents on strategies to mitigate information technology and compile the information from the clinic handbook with the data from the interview. Yin (2018) mentioned data can be obtained from interviews, written reports, communications via email, and administrative documents. The information collected from qualified participants included the experiences using CPOE systems in their facility and medication errors that occurred during the implementation process. The findings of

this study that (a) standardizing data formats for all new and existing systems, (b) adapting to a user-friendly HIE, and (c) efficient communication between a patient and practitioner from implementing CPOE, reduced medication errors and increased profits within health care facilities combined with information from CPOE policy information on the clinics' intranet, applied to my data analysis and findings section. For instance, information in one of the policies on the clinics' intranet revealed the standards that exist for all health care leaders to implement on a daily basis to successfully improve the quality of care through the use of CPOE. The CPOE implementation policies reviewed also included an outline of the importance of standardized, user-friendly CPOE systems, and effective communication amongst patient and practitioners applying these methods.

If no additional themes or information is received from participants after follow up member checking interviews, data saturation will occur (Patton, 2015). Once the interview with the participants was complete, copies of the data received from the interviewees, and a transcription was created. The response of each participant was interpreted in the form of a transcription based on the answers to the questions from the participants during member checking. Portions of the collected data were disseminated via email to each participant. Each participant had one week to review my interpretation of their interview data, and respond. After the participants reviewed the data, the participants agreed the information provided was very thorough and captured the details of the interview.

Data Organization Technique

A vital component in multi case study research is the interpreting, organization, and analyzing (Yin, 2018). Security, portability, and tracking are the outcome of storing and organizing data digitally. Staying organized is important when capturing all the information from participants especially when comparing the face to face interview answers with the transcription review when developing themes for the study. The recommended technique of storing data is through a case study database that stores and compiles all research data (Yin, 2018). The interviews for each participant were recorded and kept in an electronic folder in Microsoft Word. The files were labeled as CPOE with the initials of the participant interviewed. To store the electron records, I saved the participant information on to a flash disc with all the transcriptions from the study and recordings. The flash disc has a hard copy of the notes taken during the interview, the transcriptions, and recordings. The information collected from participants is stored safely in the flash disc for up to five years, and only available to me in a locked safe with a combination. After storing the confidential information for five years, all data will be destroyed with a shredder in compliance with Walden University's IRB guidelines.

Data Analysis

The data analysis for this qualitative multi case study is a compilation of semistructured interviews from participants in the health care management and technology field from documents within the organizations. Yin (2018) mentioned in qualitative research, the most significant use of company documents is to enhance and validate evidence from other sources such as semistructured interviews in qualitative

research, company information and documents enhance the evidence received from sources such as the semistructured interviews from the participants of the study. Methodological triangulation, a technique using more than one method to investigate a phenomenon within a stud, was used in the data collection process. This method gives researchers an opportunity to apply numerous methods that provide a clear interpretation and quality data towards the research study (Patton, 2015). I reviewed the following documents from the two clinics in my multi case study: CPOE integration documents, details on each company's information technology database, and the handbook on the EHR mitigation techniques created by the owners of the clinics.

The beginning step of the data analysis process for this multi case study included compiling information from the participants about the company from CPOE integration documents, details on each company's information technology database, and the handbook on the EHR mitigation techniques. I asked participants for this information during the interviews. I developed a transcription from the audio interviews from each participant. Harvey (2015) mentioned that in qualitative research studies, the transcription method improves the credibility, validity, and accuracy of the study. A transcription of the participant's responses was created after each interview saved unto Microsoft Word 2013®. The data received from the participants was validated through the process of follow up member checking transcription reviews. Patton (2015) mentioned the use of member checking interviews in a qualitative study allows the researcher to confirm the credibility, quality, and validity of the study. Participants were given the opportunity to validate their information during the transcription review to their

responses by giving the participants a short summary of the answers to their responses using the member checking technique. Data saturation occurs when no new information is gained.

After the member checking process, where specific data of the interviews were returned to each participant to check for accuracy and resonance with their experiences was complete, a thematic analysis was the next step of the data analysis process to identify themes that developed from the interview and additional data collected from the organizations. The themes developed during the interview were used in the data analysis process to create codes in the study. Yin (2018) mentioned in qualitative research studies, the data analysis process includes reviewing data to reveal themes, patterns, codes, and descriptions. The method of applying the thematic analysis is used to identify, analyze, and report themes within a qualitative research study to create codes to use for the data analysis (Patton, 2015). The data analysis process involved organizing data within the study to develop codes from the themes developed. After compiling the interview data, I created a group of codes to use when I group the data. The data was organized in thematic groups based on organizing the words and grouping the data from the transcription, combined with the additional information gathered from the site. Yin (2018) mentioned coding to develop themes allows for the identification of themes to develop from the core concepts within a study.

In the next step of the data analysis process, I did input my data into the NVivo 11 for Windows software. I selected the NVivo software because the qualitative data analysis software helped to sort, manage, and understand text data. The NVivo software

is also used to code relevant sections of data and compares themes across hundreds of sources within a qualitative research study (Saldaña, 2015). I used the NVivo software to specifically organize and create codes from the themes developed in my study from the data received. Yin (2014) mentioned qualitative researchers use software programs to group and code data from the compilation of documents and interviews. Using the NVivo software had numerous benefits such as the visual interface makes coding easy and quick for eye visualizations, the capabilities of managing large amounts of sources and data, and an accurate analysis of data (Saldaña, 2015). Lewins (2015) stated researchers also use the NVivo software to code, identify themes from the qualitative research while reducing possible mistakes while identifying themes and codes during the process of selection.

The conceptual framework for my study was Donabedian's framework for assuring health care quality. Donabedian's framework addresses the quality of health care in health care facilities and the processes, structure, and effectiveness of the health care system (Donabedian, 2014). The Donabedian Framework applied to my analysis of the data in this qualitative research study from the themes related to strategies for mitigating information technology discrepancies in health care. The themes developed were standardizing data formats for all new and existing systems, adapting to a user-friendly HIE, and efficient communication between a patient and practitioner from implementing CPOE, reduced medication errors and increased profits within health care facilities. The themes developed from the data analysis applies to the conceptual framework with the overall goal of providing health care quality. The themes are

organized into categories based on the analysis of the data. The categorized themes were compared to other findings within the literature of my qualitative research study. The conceptual framework in qualitative research is the catalyst between the research method, research findings, and literature (Vaismoradi et al., 2016). The exposure of themes emerging from the data, literature, and conceptual framework culminate from the rigors of the data analysis process (Vaismoradi et al., 2016).

Reliability and Validity

Reliability

Elo et al. (2014) stated ensuring the results of a qualitative research study involves procedures of reliability for trustworthy and valid results. To check the accuracy of test results, researchers use the qualitative reliability process. The reliability of research is facilitated by the alignment of the research questions in comparison to the questions asked during the interview, theory, and evidence collected (Hess et al., 2014). The reliability of a qualitative study was also measured by the dependability of the study. Member checking is a technique I used during my study to ensure the reliability of my study. Member checking in a qualitative study ensures biases are reduced and the data is accurate. The process of member checking involves confirming the accuracy and credibility of my interpretation of information collected from each participant. Once the initial interviews are completed, I engaged member checking during to review and share the interpretations developed during the interviews. The member checking strategy is used by qualitative researchers to improve reliability and validity (Moustakas, 1994).

Validity

Validity in a qualitative research study requires three dimensions of transferability, credibility, and being able to confirm the research within the study (Kim & Li, 2013). Triangulation is using more than one source when collecting data, such as interviews, documentation, artifacts, etc. Member checking is validating the accuracy of interview data by having participants review their portions and make any changes. The validity within qualitative research is applying methods appropriate for the collection of data analysis for results to be credible (Leung, 2015). Transferability occurs in a study when the results of a qualitative study are applicable to other settings (Marais, 2017). Transferability in a qualitative research study is established by providing readers with the evidence of the research findings where the results can be applied to situation, contexts, populations, and times (Marais, 2017). I incorporated transferability in my study through an interview process. The interview protocol is a technique to help remind me, as an interviewer, to relay important information to the interviewee such as restating the main purpose of the interview, any concerns regarding confidentiality, and what will happen to their information after the interview (Patton, 2015). Transferability in a qualitative research study ensures the participants in the study respond to the same type of questions leading to a description that is comprehensive of the findings of the qualitative research (Patton, 2015). The use of transferability within a qualitative research study will allow other readers to create connections between their experiences and the findings from the research study.

Credibility within a qualitative research study requires methodological triangulation and member checking (Reilly, 2014). Member checking is the foundation of enhancing research credibility and the accuracy of qualitative claims (Reilly, 2014). The process of participant validation or member checking involves the process of confirming the data collected from the researcher's interpretations of the study, thematic categories, and the conclusions from participants to ensure the accuracy of the qualitative research (Reilly, 2014).

The member checking process may expose additional details enhancing the study, gives the participants of the study a chance to clarify information given at first instance, and confirms the conclusion of the researcher's findings is correct from the data presented. I interpreted the responses from the participants and transcripts from the interviews of the participants in my qualitative research study. Methodological triangulation involves multiple methods of gathering information such as the use of interviews, gathering data, observations, documenting, and questionnaires (Patton, 2015). In depth resources from numerous sources were collected with the use of this method in qualitative research and enhance the reliability and validity by the comparison and collection of data from numerous resources (Yin, 2018). Qualitative researchers should use an interview protocol to collect in-depth information from participants about a phenomenon (Yin, 2018). Understanding the phenomena is improved by applying the methodological triangulation which improves the validity of qualitative research findings (Patton, 2015).

Confirmability in qualitative research allows multiple, unique perspectives from each researcher. Cope (2014) mentioned the results of a study collaborated from other researchers after the results of the study are presented from the study. The follow up member checking technique was used to verify the results of my study. The interviews conducted during the follow up member checking process ensured the interpretation of the questions provided during the interview was a true representation of the participants' experience and views related to the research questions. During the member checking follow up process, participants had the opportunity to provide additional information after reviewing the interpretations of the researcher.

Data saturation occurs when the addition of new data does not expose any new information, and the interview process stops (Fusch & Ness, 2015). Researchers reach a certain point in their analysis of data where sampling more data no longer leads to more information related to the research questions of the qualitative study. I used the process of conducting follow up member checking interviews from participants to ensure data saturation was achieved in this study. Furthermore, the major step of ensuring data saturation is by conducting the member checking process which allows participants to verify the responses they gave during the first round of interviews and the opportunity to remove or add data to the study (Fusch & Ness, 2015).

Transition and Summary

A thorough description of the process using research is the objective of Section 2. The multiple case study explored the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and

increase profitability. In this section of the doctoral study, the purpose statement is stated for the second time. The role of the researcher, the participants involved in the study, the research method and design, population and sampling, the ethical research found, data collection instruments used, data collection technique, data analysis, reliability, and validity are discussed. In Section 3 of the study, the presentation of findings, implications of social change in health care, and applications to the professional practice of the health care industry are included. Additional research findings and the recommendations for action is provided in Section 3. In summation, Section 3 of the proposal includes my personal reflection on my experience with the study and a conclusion statement.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative multiple case study was to explore the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The participants in this study were eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States. The participants in this study included health care manager or leaders who used strategies for mitigating information technology discrepancies in health care and were employed at a health care organization with full- time status. All participants in this study had over 5 years of experience in their respective fields implementing CPOE in the workplace. The data in this qualitative multiple case study came from a combination of clinical hospital financial performance documents used to review profitability and costs and interviews with the clinical leaders. The themes which developed from the data were that standardizing data formats, adopting to user-friendly HIE, and efficient communication reduced medication errors and increased profits. The participants in this multiple case study viewed CPOE implementation in health care clinics as beneficial for increasing profits and reducing medication errors, which were beneficial to patients and practitioners. Section 3 includes the presentation of findings, application to professional practice, implications for social change, and recommendations for action. Section 3 also includes recommendations for further research on strategies to mitigate information technology discrepancies in

healthcare organizations. This doctoral study concludes with reflections and a concluding statement.

Presentation of the Findings

The overarching research question for this multiple case study was: What strategies do health care business managers apply to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability? The study included data collected during semistructured interviews with eight health care leaders from the mid-Atlantic region of the United States who worked in two clinics. The findings of the interview included a comparison of experiences of health care leaders in terms of implementing CPOE in their organizations and confidential documents on the health care clinic database to understand strategies to mitigate information technology and reduce discrepancies in health care organizations. Participants were ensured confidentiality by applying the alphanumeric codes I1 through I8 to identify all eight interviewees (see Table 1).

Table 1

Major Themes Developed

Themes Developed	Frequency #
Standardizing data formats reduced medication errors and increased profits	52
Adopting to user-friendly HIE reduced medication errors and increase profits	42
Efficient communication reduced medication errors and increased profits	37

Theme 1: Standardizing Data Formats, Reduced Medication Errors, and Increased Profits

The major theme developed from the confidential database was standardizing data formats reduced medication errors and increased profits. The goal was that information transferred from one clinic to another was standardized across the board. The data analysis proved the use of CPOE systems facilitated communication between multiple health care clinics which enabled practitioners and CPOE systems within their facilities to communicate efficiently, receive prescriptions in a timely manner, and reduce the amount of errors made for prescription entries due to poor handwriting, which increased profitability by saving costs due to not using paper charts and reducing the chances of misreading a prescription. Adapting to CPOE systems did eliminate illegible handwriting and the use of paper orders. Indication-based prescribing is a method which prevents medication errors in CPOE (Schiff et al., 2016). The alerts implemented combined with other strategies or independently with different types of strategies did lower wrong-patient medication errors. The first participant stated documents and files cannot only be shared with people in the practice but with other practitioners in the community. By using CPOE, daily tasks have become easier and more proficient than using paper charting. The more accurate the charting using standard data formats, the better for the patients we care for. Instead of writing everything down, the participants are importing data into the computer at one time which reduced mediation errors. Participant I4 mentioned,

> You can use the system to update medications and if you are searching to see if the patient has any allergies, it will also pop up. Once you prescribe, if there is

something the patient is allergic to, it will pop up in the data system and you can change it. This is how errors are reduced and increases efficiency. We try our best to prevent any errors in our health care facility.

Participant 6 mentioned, proper training was done when enforcing standardized data formatting and the CPOE system used was within budget. The use of CPOE has enabled health care clinics to save money by not needing so many employees anymore to file paper charts since everything is electronic now. The use of CPOE systems helps with decreasing expenses in health care clinics since the format of the data with other clinics who send prescriptions is consistent. Less employees are needed which avoids mistakes and human error when importing patient data.

Participant 2 (I2) explained, CPOE systems enabled health care clinics to do electronic prescriptions and messaging while the patient is present which was less interruptive to the visit. The clinic could have completed electronic prescriptions and messaging without the systems but time tracking on how patients are billed is more based on time and consistency in the data sent to and from other health care organizations about the patient. Health care clinics bill for letter messaging which includes soap notes and prescriptions. The CPOE system has allowed the clinic to bill based on time verses scheduled 30 to 60 minute visits which increases profits. Also in comparison to before when a patient was late, patients were charged the same amount when the hour session was up, but now a patient is aware that they are charged based on time which the system enables the clinic to charge based on time verses packages since there is a standard format for pricing now.

Furthermore, participant 4 explained, the electronic fax is useful since printing is not required and less paper is involved so practitioners can download information to their computers and have access to patient information. The results of this study indicated that standardized data formats for new and existing systems while transferring patient data from one health care facility to another was an effective strategy for reducing medication errors and increasing profitability. In alignment with Donabedian's framework which focused on the sociotechnical systems theory, that recognizes the interaction between technology and people in the workplace, this theory relates to the responses from the participants. The sociotechnical systems theory measures the interactions between technical and social factors that creates conditions for a successful organizational performance (Donabedian, 2014). In this case, implementing CPOE systems within the health care organization increased profitability as an indication of improving the performance within the health care organization from the standard data formats between health care organizations.

Furthermore, when asked about what key strategies were used in the organization to reduce medication errors to increase profits, participant 1 (I1) stated, health care leaders used to have to literally go into every chart and go through pages and pages. However, with the CPOE systems, client research on a patient can be completed from electronic data stored, which takes up less space within the clinic. Participant 2 said, while CPOE systems were implemented, every single system available was reviewed. A lot of the systems did not work for very simple reasons such as financially being too expensive. The clinic is very unique practice where many providers are employed. Many

of the systems were made towards insurance based practices which does not align with their practice. The system would have to match the formatting of the data entered since the clinic is cash-based verses insurance-based like most practices. Participant 3 said, health care leaders no longer have to scan or fax prescriptions since all of the requests are done electronically, scanned and sent out. The key strategies used in the organization to prevent errors were to input tasks for the data entry and proper training.

Table 2

Standardizing Data Formats

Themes Developed	Frequency #
Standardizing data formats reduced medication errors and increased profits	52

Theme 2: Adopting to User-Friendly HIE Reduced Medication Errors and Increased Profits

The second theme developed retrieved from the internal system database of the clinics and from the data analysis was adapting to user-friendly HIE reduced medication errors and increased profits in health care clinics. The adoption of CPOE caused multiple physicians, and individuals associated with hospital systems to face challenges on learning how to navigate and remember the details of CPOE software modules and the EHRs used (Gellert, Ricardo, & Luke, 2016). Physicians may resist the adoption of CPOE, which may present a risk to patient safety when electronic orders and paper co-exist by paper orders generated in an environment of electronic ordering. However, when CPOE is implemented into a health care organization successfully the system is

beneficial to the health care facility. This theme developed is in alignment with the Donabedian theory which focuses on quality improvement. The use of user-friendly HIE systems implemented in health care organizations reduced the medication errors in the health care clinics of this multi case study. The quality improvement processing the Donabedian theory quality improvement model focuses on the structure (includes patients, equipment, supplies, training, and environment), processes (coordination, physician orders, nursing/representative prescriptions), and the outcome of care (clinical outcomes, functional status, satisfaction, cost, and mortality (Donabedian, 2014).

Participant 1 mentioned, in comparison to using paper charts, the clinic no longer has to use paper. The connectivity in the clinic improved where they are able to connect to other practices and share information within the clinic to other medical practices. A lot of documents used comes from other practices from using CPOE systems. Although some of the practices where patient data is exchanged is unknown the health care practitioners are able to access patient information from implementing CPOE which is user-friendly and reduces the errors from handwritten prescriptions. The health care leaders post a lot of protocols for other people to use. Patients have access to their prescription and medical charts at any time that is legible to read for their dosage. Adopting to a system that is user-friendly allowed patients to go online and have access to their charts and medications verses before when paper charts were used and patients had to ask to use the clinic for this information. The use of CPOE saves a lot of time even with the front desk administrative process. The information within health care clinics can

be shared anywhere in the world since it is so easy to use. When practitioners are on vacation, they can also access the patient's chart. Additionally, I2 mentioned,

> CPOE is good for continuity of care, making sure that we can track how patients are being treated and what is happening to them in our clinic, what medications, supplements, and recommendations they were given, and we can always go back and look and we do that because the continuity is very important. It is faster for me to do the typing, user-friendly, and it is very well organized without medication errors or interpretation from poor handwriting. I love the organization. As far as communication, it used to be that we would have to call the patients back. Things also do not get lost as much using CPOE in our clinic.

Participant I3 said at first it was difficult implementing CPOE systems into the clinic's daily operations because they had to input the patient's medication prescriptions from all the paper charts, but once everyone's data was entered, transitioning from paper to electronic and implementing CPOE systems became so much better and easier after health care leaders were trained on using the user-friendly system after understanding how to use it. Participant I4 explained implementing CPOE was beneficial from the nursing standpoint because it was easy to use and it made it easier for the nurses to read doctors' orders typed out clearly instead of written or scribbled on paper in the chart which reduced medication errors substantially. Participant I5 repeated

> Anytime that you are able to incorporate technology effectively in an industry, especially one as important as health care, there are bound to be positive results for a system that is user-friendly. Managing and processing patient information

> electronically increased security, availability and consistency among the records being handled.

Improvements in the structure of care by implementing new systems, processes etc. should lead to improvements in clinical processes that should improve patient outcomes (Donabedian, 2014).

Moreover, participant I6 said the implementation of CPOE systems and adopting to a user-friendly HIE process is beneficial because it not only saves the physician time but also helps in allowing other physicians in different facilities access to the data. Participant I7 stated,

> It is beneficial because we do not have to handwrite charts anymore potentially losing the paper charts and creating medication errors during patient prescription write ups. When we moved from the other building without any Wi-Fi which enables us to use CPOE, it was if we were handicap. We realized we could not prescribe or take any patients in since we were 100% electronic. We were unable to remember or track any patients. We could not even bill any patients etc.

When asked what specific actions hindered the accurate usage of HIE for technological inputs to reduce medical errors, I1 mentioned the person entering the medication may enter data incorrectly leading to mediation errors. However, adopting to a system that is user-friendly, eliminates misplaced charts since everything is electronic in the patient's chart. Participant I2 mentioned English as a second language makes it more difficult if the entire system is in English, and they may not understand the language. Participant I2 said,

> So, like we have someone here who, his English is great. Although he speaks well and understands well, he does not type well or type fast so it is hard for him to use electronic stuff because it slows him down and he hates it. Also, when the internet goes down, it is a night mare because everything that we use is web based. It is all in the cloud so when the internet goes down, we are all pulling our hair out and cannot do anything.

Participant I3 explained the process of inputting new patients involves double checking the information or demographics of the data entered. For soap notes and prescriptions, which is more on the practitioner side and outstanding documents, practitioners have to go through each scan, open it, and make sure all documents are right side up with no missing pages. When uploading the patient information, some of the systems give a preview of the date and what type of document is viewed. Patients receive prescriptions through a system called Full Scripts where all practitioners and health care managers have access to create an account and input the patient's supplements. An email is sent to the patient that their order/prescription is ready to be placed where there was drastic decline in the amount of misread prescriptions that led to medication errors. Participant I4 said ppractitioners that don't follow accurate documentation or proper use of computer charting can hinder patient care therefore causing unnecessary medical errors if the system is not easy to adapt to. Participant I5 mentioned that healthcare providers do not invest money in improving their IT infrastructures it will slow the adoption of HIE practices. Also training all employees on the use of the computer systems and creating standard procedures for how patient data is

handled and entered will reduce medication errors when CPOE systems are implemented. The use of HIE is hindered from the lack of knowledge and training in addition to the lack of interoperability. Participant I5 mentioned a lot of physicians have resistance to change in the clinic, so if a new technology comes in, they may not want implement the system into their practice. The clinic had an electronic system from the previous building used to see patients but no one wanted to use it. No one actually wants to figure out how to use a new system if they do not think it is user-friendly. Physicians continued to handwrite prescriptions even when there was an electronic system. However, once practitioners started using the electric system, the amount of medication errors within the facility reduced.

Participant I8 mentioned, "Some EMR's are set up so you can communicate and send stuff to other practices, but most CPOE systems are firewalled for the practices." From the firewall, health care leaders in this clinic had to communicate outside of the system to other practices. It is also easier to complete data research using CPOE systems that reduce the amount of errors writing prescriptions. The CPOE system is good for this office because each individual practitioner can chat within the system during their patient visit with the administrative team. In case practitioners need patient information, they have access to look for the data needed during the appointment. Health care leaders no longer have to scan or fax prescriptions, and all of the requests are done electronically where it is scanned and sent out reducing the chances of medication errors from bad handwriting.

Table 3

Adopting to User-friendly HIE

Themes Developed	Frequency #
Adopting to user-friendly HIE reduced medication errors and increased profits	42

Theme 3: Efficient Communication, Reduced Medication Errors, and Increased Profits

The third theme developed from the internal system database of the clinics and from the data analysis was efficient communication reduced medication errors and increased profits between patients and practitioners. Health information exchange enabled patients' records to be in the same location as a patient regardless where they received care. The process of HIE was an interoperable and reliable way of sharing electronic health information between health care organizations among nurses, doctors, patients from different health care institutions, pharmacists, and within multiple health care settings (Hillestad et al., 2014). In health care organizations, HIE allows patients and health care professionals access to securely share medical information electronically (Hillestad et al., 2014).

All participants in this study mentioned CPOE integrated in health care clinics benefited patients and practitioners by allowing remote access to files making communication more efficient. CPOE systems are very beneficial because patients have access to their medical information making the communication process more efficient between the doctor and patient. Participant I1 mentioned during the interview that a

majority of CPOE systems now have an additional portal where patients can have access to the main portal. A lot of time is saved because anything the patient wants to see from the practitioner is shared using CPOE systems. This system saves a tremendous amount of time for both the practitioner and the patient. For providers, it is a very organized system to use which saves a lot of time. From the administrative stand point of health care leaders in this clinic, time is no longer wasted creating fee tickets. Fee tickets are created automatically that benefits both patients and practitioners. After the chart notes are created, the fee tickets generate automatically. I2 inserted, "The new way we send prescriptions is through a portal where patients have access to it anywhere and is also legible to the patient and pharmacy since it is an electronic prescription verses written making communication between the pharmacy and clinic more efficient." Practitioners and health care managers no longer have to scan prescription slips to the pharmacy which saves us a lot of time as well. Patients no longer have to fill out a long patient health inventory form. The CPOE system allows health care managers to send the PHI through a portal which saves a lot of time making the patient initial process more efficient. Patients are also able to receive their supplements from the soap notes from the system Fullscript so money is no longer spent on shipping out supplements to patients.

Furthermore patients and practitioners can now communicate through a secure system. With the new system, practitioners share documents and patient information is no longer printed. Participant 5 stated,

> We do not have to print out anything anymore and patients have access to their charts and everything. A patient now has access to their medical information

creating efficient communication at any time, allowing them to go on the patient portal, sign in, and access their portal at any time.

Patients can contact the clinic at any time with the CPOE system that is HIPPA protected. Communication used to be very hard in the clinic but now it is much easier. Patients now have the ability to get their billing information through the CPOE system without contacting as the clinic administration team well. Participant I7 mentioned, "Mainly it improved the efficiency. CPOE systems makes our billing process more efficient as well where fee tickets are generated and bill the patient automatically."

Additionally, CPOE systems benefited practitioners through easier ordering systems. Staff do not have to call the doctor as much because reading on the computer is more straight forward than trying to understand the doctor's handwriting. The patients benefit because the orders are better understood hence less errors. The findings of this study aligned with Romanow et al., 2017 which stated CPOE implementation is the process of executing or practice of a plan, a method, specification, standard or policy of CPOE in health care organizations. This was also in alignment with the Donabedian Theory which states HIE can influence the processes of health care and organizational structures to affect positive outcomes when HIE is integrated into health care business practices (Donabedian, 2014) because in this theme both patients and practitioners are benefiting from CPOE implementation implemented in their clinic which led to efficient communication between both parties. The frequency of responses is displayed in Table 4 from the responses to the research questions from the participants of the study.

Table 4

Efficient Communication

Themes Developed	Frequency #
Efficient communication reduced medication errors and increased profits	37

The health care leaders in this study all mentioned how efficient communication benefited both patients and practitioners with reducing medication errors and increased profits. For instance, I5 mentioned, "Anytime we were able to incorporate technology effectively in an industry, especially one as important as healthcare, there were bounds to be positive results." From this interview, managing and processing patient information electronically increased security, availability and consistency among the records being handled and efficient communication with the patient receiving information from the doctor.

All participants agreed CPOE integrated in their health care clinic benefited patients and practitioners. The integration of CPOE systems benefited the patients and practitioners because they had more efficient communication and improvement of transfer and accuracy of data. Additionally, patients love the integration of CPOE systems because they can sit on their bed and ask any question and expect an answer even if it is 1 A.M. Patients review their results using CPOE systems. Practitioners benefit from having the luxury of looking into the system to verify a patient's prescription from the last time they visited vs. relying solely on the memory of the patient. Once this is verified, the practitioner can simply send a renewal request immediately. This process

makes it easier for a patient to refill their prescription and for the doctor to approve the refill. The Donabedian theory is in alignment with this study because it focuses on the understanding of CPOE systems communication between information technology within health care organizations for improving organizational performance (Donabedian, 2014) which involves incorporating CPOE systems in health care organizations to create improved communications between patients and practitioners. Charts were removed during the process of scanning and were marked as transitional charts if scanning was not complete. Scanning patient charts was a slow and gradual process. Patient charts were scannedletter by letter. This process was difficult because it took a long time and the health care administrators of the clinic had to be careful when prepping charts for the next day so there was not a duplicate chart in the system. The goal was not to get rid of documents that were partially electronic or fully paper charts.

Participant I2 mentioned at first with the new transition, there were times where a practitioner would lose their temper because of the changes within the clinic. However, some strategies used to address the barriers to reducing medication errors were we core groups were created where the practitioners that have been working at the clinic for a while met up to communicate about the focus on reducing the errors on data entry for prescriptions during clinical meetings. Communication was a huge part of the success for implementing CPOE in the clinic's practice and reducing medication errors. Communication and patience helped practitioners address the barriers to reduce medication errors in the clinic making the electronic process of charting a patient's file more efficient. Participant 5 said, "We also focused on recognizing people's strengths.

One person focused on systems and organizing and the structure underneath everything while the clinicians focused on the clinical aspect of addressing ways to reduce medication errors." The focus groups were successful because the clinicians were able to address what they needed clinically and the administrative leaders were able to address what they needed.

Furthermore, participant I3 had difficulty understanding the new system at first slowing down communication. It took time to adjust to the new system because it was not as easy as the old system, Practice Fusion where the process involved uploading a bunch of documents at the same time. Now the process involves viewing a patient's chart one at a time with less room for errors. Participant I4 stated, "Some strategies used to address the barriers to reduce medication errors in our facility is by using the new strategies medication errors reduced due to clear medication orders that were written and carried out by staff." By using CPOE daily tasks have become easier and more efficient than using paper charting. The more accurate the charting, the better for the patients cared for.

Proper training for the use of CPOE systems is beneficial to the functionality of both clinics for patients and practitioners. The findings of CPOE systems integrated in health care clinics benefiting patients and practitioners aligns with the research of Parker & Alder-Milstein (2016) who found that patient safety is the prevention of adverse effects and errors to patients associated with health care. Health care has become more effective and become more complex, with greater use of medicines, treatments, and new technologies where patients benefit from the implementation of CPOE systems from efficient care and improved communication. Furthermore, when asked what strategies

using HIE aid the transfer from paper to electronic charts for practitioner use, participant I1 used the method of scanning all patient charts. Participant I2 mentioned,

> First we would scan the patient charts that were coming in, then we scanned all the patient charts of the people coming in two weeks in advance, and then when that was done, if there was time left, then we scanned the documents of patients in the past month and then the past two months, six months, and then the past year to all the way back to five years.

Legally, patient charts are kept for up to seven years so, the patients that did not come back after seven years, their chart went into storage. Charts were only uploaded within seven years, and then the second time only active patients were uploaded within the past three years. If the patient did not come back within the three years, the patient would have to redo the paperwork. Charts were uploaded alphabetically. Patient I2 said, "We were pretty organized with our paper charts and I will say it is really easy to scroll through 5 to 10 years of documents making the patient visit more efficient." When it was time to look for a patients endoscopy from ten years ago it was easy to find verses using paper charts. The health care leaders of the clinic prioritized active patients than non-active patients. For the practitioners who started using the electronic charts, it was a bit hard to transition. Practitioners were looking for their labs and paper charts which slowed down the communication between patients and practitioners during a visit. Strategies that aid the transfer from paper to electronic files include the willingness and motivation of staff during CPOE system documentation. The process would involve a lot of manual data entry. Some documents could be scanned but a user would have to still go back and

validate all the information captured is correct. The employees would have to transfer the records over in alphabetical order by patient name and start from there. Participant I7 and I8 mentioned, they had to scan any documents that were not uploaded in the system already. Scanning the patient's file improved the efficiency of operations in both clinics. Instead of writing everything down about a patient, the new method of CPOE implementation involves importing it all into the computer at one time which will reduce mediation errors. Participant 7 mentioned, "The system is used to update medications and if you are searching to see if the patient has any allergies, it will also pop up. Once you prescribe, if there is something the patient is allergic to, it will pop up and you can change it." This is how medication errors are reduced and efficient communication is encouraged between the patient and the practitioner. The clinic strived to prevent any errors in the health care facility.

Applications to Professional Practice

Three themes developed during the multi case study using strategies to mitigate information technology and the discrepancies in health care organizations. The conclusion of the multi case study revealed standardizing data formats for all new and existing systems, adapting to a user-friendly HIE, and efficient communication between a patient and practitioner from implementing CPOE reduced medication errors and increased profits within health care facilities. The results of this study prove to be applications of professional practice because health care practitioners play a vital role in the implementation of CPOE systems in health care organizations. Failure to implement CPOE systems within health care organizations would lead to decreased profits,

medication errors, and decreased efficiency within health care organizations. The findings of this study are important to the professional practice of health care organizations because leaders in health care organizations can implement these strategies in information technology using CPOE systems to increase profits, decrease medication errors, and increase efficiency within health care clinics.

During the interviews, the participants stated standardizing data formats reduced medication errors and increased profits. Standardizing data formats was important in reducing medication errors and increasing profitability because numerous benefits of CPOE have aided in solving health care issues (I1, I2, I3, I4, I5, I6, I7, I8). The finding of this study that standardizing data formats to reduce medication errors and increase profits, applies to professional practice because it provides physicians with the decision-making support tools at every point of care, and eliminates illegible handwriting and transcription errors. The challenge with handwriting is that it is subject to personal interpretation and that can be costly to both patients and providers. Standardized data formats allowed accurate orders and completeness, decreased adverse drug events that were previously not identified without the help of CPOE, and promoted patient safety and satisfaction. With CPOE implementation with standard data formats, there was an increase in compliance with monitoring of drug levels and automated ordering reminders. With CPOE, cost data was tracked, and previous patients results, and information were accessed by other physicians increasing, the likelihood of catching any changes in the patient or previous history.

During the interviews, the participants also stated adopting a user-friendly HIE reduced medication errors and increased profits. The results of the study indicated the integration of CPOE within the health care clinics is user-friendly and brought about improvement in drug management, decreased in cost of healthcare service, improvement in patient outcomes and diagnosis and treatment, improvement in disease management, increased in remote monitoring of diseases, and increased in patient safety because the system is user-friendly to both patients and practitioners. As health care continues to grow and technology revolves, CPOE will be a great access to practitioners and patients globally. Finally, the participants stated efficient communication between the patient and practitioner reduced medication errors and increased profits. The use of CPOE systems increased the speed of diagnostics test and treatment modalities, and alert physicians of alternative drugs that can cost less than the original prescription. The use of CPOE systems has promoted the efficiency, cost-effectiveness, safety of medical care and its delivery, and quality of care in the health care organizations. For efficient communication to be successful, practitioners, nurses and other ancillary departments must learn to use the tools provided to promote efficient communication with the patients rather than slowing the process down.

Implications for Social Change

This study would potentially contribute to social change by creating strategies to mitigate information technology discrepancies in health care organizations. The strategies developed from this study can be used by health care managers collaborate CPOE systems within health care facilities to reduce medication errors and increase

profitability. The implementation of CPOE brought substantial changes to the medication order processing workflow which lead to improvements in medication safety (Dougherty & Bonfiglio, 2018). The use of CPOE for medications reduced errors contributing to the improvements in patient safety. The implications of social change once CPOE is implemented into a health care organization is a reduction in prescribing, the ability to manage problems that are medication-related in real time to the user with alerts (Dougherty & Bonfiglio, 2018).

Moreover, the implications to social change from the use of CPOE has the potential to enhance the quality, efficiency, and safety of clinical health care providers where the benefits of using CPOE weight heavily on the optimization of the system. However, the implementation of CPOE into health care organizations present opportunities to improve outcomes. The increase in the amount of care delivered in outpatient settings, CPOE systems is commonly used for electron prescribing and systems for clinical documentation which holds a promise of improving safety and quality, reducing costs and improving the access to information for patients and physicians (Cresswell & Sheikh, 2018).

Furthermore, the decrease in medication errors from the implementation of CPOE systems in health care organizations, increase the interoperability that allows health information from one system to another (Cresswell & Sheikh, 2018). By improving the process of implementing CPOE systems in health care organizations, the quality of health care delivery and the safety by increasing access to information, reducing illegibility, and enabling a closer oversight of clinical care processes. Social change using CPOE

technologies enable patients to manage their health and interact with providers which create opportunities for patients to actively participate in their care, improve the communication between the patient and practitioner, and allow the health care providers to form a partnership with their patients.

Recommendations for Action

The discrepancies of HIE are a reoccurring problem for some health care organizations implementing the new technology within their organization (Hillestad et al., 2014). The strategies to mitigate information technology discrepancies that were shared by the participants of this study can be resourceful to health care leaders experiencing problems collaborating CPOE systems within their health care facilities to reduce medication errors and increase profitability. Health care leaders can use the experiences to the result of this study implement CPOE systems within their health care organizations avoiding the most medication errors and strategies to improve their profit. Based on the research findings of this multi case qualitative study, three recommendations for action developed based on the results of the study. Health care leaders may use the recommendations for action to implement new strategies on the mitigation of information technology to prevent discrepancies. Once the new strategies are implemented successfully, health care leaders can implement the strategies within their health care organization to decrease medication errors and increase profitability.

The recommendation for action based on the research findings included standardizing data formats to reduce medication errors and increase profits. Based on the participants' feedback to this study, the data analysis proved the standardizing data

formats facilitated the communication between multiple health care clinics which enabled practitioners to communicate efficiently, receive prescriptions in a timely manner, and reduce the number of errors made for prescription entries due to poor handwriting which increased profitability by saving costs from not using paper charts in reducing the chances of misreading a prescription. The feedback from the participants was similar to the Donabedian theory which focused on process, where the measure of the process is nearly equivalent to the measurement of quality of care affecting profitability (Donabedian, 2014). Establishment of privacy and security safeguard that is consistent across all systems is mandatory. Security is an important aspect of standardizing data formats where health care and security cannot be separated. Without a consistent system in place to monitor, control and safeguard health data, this issue can hinder the usage of CPOE systems.

The recommendation for action based on the research findings is adapting to a user-friendly HIE reduced medication errors and increased profits. Based on the participants' feedback to this study, participants I1- I8 mentioned patients have access to their prescription and medical charts at any time that is legible to read for their dosage and user-friendly. A patient has the flexibility to go online and access to their charts and medications paper charts. Therefore, implementing CPOE systems into health care clinics greatly reduces the number of medication errors.

The recommendation for action based on the research findings is efficient communication between patients and practitioners reduced medication errors and increased profits. Based on the participants' feedback to this study, all participants

mentioned CPOE integrated in health care clinics benefited patients and practitioners by allowing remote access to files making communication more efficient. Participant I2 mentioned the new way prescriptions are sent is through a portal where patients have access to it anywhere and are also legible to the patient and the pharmacy since it is an electronic prescription verses written. The integration of CPOE has been recognized as a highly valuable tool that increases efficiency and effectiveness of medical work. CPOE removes many intermediary and time-consuming task for physicians and these benefits impacted practitioners, health care managers, nurses, ancillary departments and beyond. Because of the reduction of time in data entering etc. practitioners can spend more time interacting with patients, increasing positive bedside manner that patients appreciate. As CPOE usage increases, practitioners practicing medicine in real time and beyond the walls of hospitals allows for interoperability and easy access of data to treat and manage care.

The results of the study can be used by health care leaders who plan to or already implement information technology into their health care organization. Recipients of this study will receive a summary of the findings of the study. The study will also be in ProQuest where dissertations are uploaded to the school database. I also plan to share the results of my study through journals, or potential conferences.

Recommendations for Further Research

The purpose of this qualitative multiple case study is to explore the strategies health care business managers use to collaborate CPOE systems within health care

facilities to reduce medication errors and increase profitability. The research that was conducted in this multi case qualitative study provided a miscellaneous amount of information on strategies to mitigate information technology discrepancies in health care from leaders in health care clinics. In the future, a study may focus on ways to prevent medication errors from data entry versus poor handwriting after the implementation process of CPOE systems is integrated fully in health care practices. The results to a study combined with the outcome of this multi case study could improve the strategies used to mitigate information technology from discrepancies that exist in health care organizations. Awareness and the understanding of what actually causes discrepancies when CPOE systems are added will assist in strategies to decrease medication errors in health care organizations from implementation.

The understanding of how to mitigate information technology and decrease the discrepancies in health care organizations is an important process of executing a plan, method, specification, standard or policy of CPOE in health care organizations (Romanow et al., 2017). In the future, a quantitative study might focus statistical date that shows the improvement over time implementing CPOE into clinics and any problems faced after data entry implementing CPOE systems in health care organizations. Conducting research on this specific type of study will provide clarity to health care leaders to develop new strategies that also reduce medication errors with data entry of prescriptions after the implementation of CPOE systems.

The major limitation of this study was the sample size. However, in the future research, a study could be conducted with a larger sample size using a quantitative study

approach to collect statistical data on how CPOE systems implemented into health care organizations has improved over time. Another limitation to this study was the memory of participants to recall events during interviews asked about CPOE implementation and the discrepancies that exist in their health care organization. To avoid this limitation in the future, health care leaders could collect a larger data sample, so it will be more accurate and less biased towards having a small sample of participants.

Reflections

The Doctor of Business Administration Program at Walden University required hard work, dedication, and great time management skills. The main purpose of this multi case qualitative study was to explore the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. The multi case study involved data collected from health care leaders of clinics from data compiled through the process of semistructured interviews. Prior to completing this study, I believed health care leaders in the mid-Atlantic region of the United States would be interested in participating in a study that focused on strategies to mitigate information technology and the discrepancies in health care organizations. After the study was completed, I discovered health care leaders of the clinics were interested in identifying the gaps from the implementation of CPOE systems and how to improve the process of effectively integrating it into their clinics.

As a senior health care business system's analyst, one of my main concerns was potentially developing a bias based on the results of the study from my personal experience in the field. Prior to conducting the semistructured interviews, I already had a

perception of what strategies could be used to mitigate information technology and identify the discrepancies in the health care clinics. However, to avoid my personal biases towards the results of the multi case study, I continuously referred back to the ethical guidelines and followed the interval protocol by asking the research questions during the semistructured interview process and follow up questions to achieve data saturation. During the interview, each participant was granted the opportunity to reveal detailed responses on their experiences using CPOE systems.

Furthermore, completing the doctoral study required exceptional time management skills, sacrifice, willpower, determination, and endurance. However, I personally feel fulfilled that I have contributed to the field of health care and identifying the gaps in the implementation of CPOE systems implemented into health care clinics. Interviewing multiple health care leaders from different clinics in different states was rewarding considering I contributed to adding more research on the topic of strategies to mitigate information technology while increasing profits and reducing medication errors. My overall experience broadened my horizons where I learned a lot about the CPOE implementation process from the participants. This study was beneficial and applied to my personal strategies of a professional.

Conclusion

In this multi case qualitative study, I conducted research on the strategies to mitigate information technology discrepancies in health care organizations. The information and data collected for this study was received through the process of using semistructured interviews to gather information from health care leaders about their

clinics. Internal data from within the health care organization was also used. After all the interviews were completed, I completed a data analysis that developed into the themes of this multi case study which were the following: (a) standardizing data formats reduced medication errors and increased profits, (b) adopting to user-friendly HIE, reduced medication errors and increased profits (c) efficient communication between patients and practitioners reduced medication errors and increased profits. The themes developed created an understanding of what strategies health care business managers can apply to collaborate CPOE systems within health care facilities, reduce medication errors, and increase profitability. The CPOE systems allowed health care leaders to retrieve, store, and exchange health information using computers instead of records on paper. The use of CPOE systems in health care organizations versus the use of paper records improves efficiency through decreasing administrative costs and increased safety using accurate drug utilization. Because strategies to mitigate information technology caused discrepancies in health care organizations, CPOE systems implemented in health care clinics would immensely reduce medication errors and increase profitability.

References

Ahmed, Z., Barber, N., Jani, Y., Garfield, S., & Franklin, B. D. (2016). Economic impact of electronic prescribing in the hospital setting: A systematic review. *International Journal of Medical Informatics, 88*, 1-7. doi:10.1016/j.ijmedinf.2015.11.008

Akhlaq, A., Sheikh, A., & Pagliari, C. (2017). Defining health information exchange: Scoping review of published definitions. *Journal of Innovation in Health Informatics, 23*, 684-764. doi:10.14236/jhi.v23i4.838

Alex, S., Adenew, A. B., Arundel, C., Maron, D. D., & Kerns, J. C. (2016). Medication errors despite using electronic health records: The value of a clinical pharmacist service in reducing discharge-related medication errors. *Quality Management in Health Care, 25*(1), 32-37. doi:10.1097/qmh.000000000000080

Altuwaijri, M. M. (2016). Implementation of computerized physician order entry (CPOE) towards patient safety in Saudi hospitals. *Journal of High Institute of Public Health, 38*, 459-473. doi:10.4103/2230-8229.90014

Amato, M. G., Salazar, A., Hickman, T. T. T., Quist, A. J., Volk, L. A., Wright, A. ... & Adelman, J. (2016). Computerized prescriber order entry–related patient safety reports: analysis of 2522 medication errors. *Journal of the American Medical Informatics Association*, doi:10.1093/jamia/ocw125

Ancker, J. S., Kern, L. M., Abramson, E., & Kaushal, R. (2016). The triangle model for evaluating the effect of health information technology on health care quality and

safety. *Journal of the American Medical Informatics Association, 19,* 61-65. doi:10.1136/amiajnl-2011-000385

Atique, S., Lee, Y. L., Shabbir, S. A., Hsu, C. Y., & Rau, H. H. (2016). Organizational benefits of computerized physician order entry (CPOE) system in Pakistan. *2016 International Conference on Platform Technology and Service* (PlatCon). .doi:10.1109/platcon.2016.7456812

Bailey, J. (2015). First steps in qualitative data analysis: transcribing. *Family Practice, 25,* 127-131. doi:10.1093/fampra/cmn003

Bau, V., Brough, M., Hartley, J., Hommel, E., Jiang, Y., Lie, R., Park, Y. J. (2014). *Technological determinism and social change: Communication in a tech-mad world*. doi:10.1177/0267323115600607a

Baysari, M. T., Hardie, R. A., Lake, R., Richardson, L., McCullagh, C., Gardo, A., & Westbrook, J. (2018). Longitudinal study of user experiences of a CPOE system in a pediatric hospital. *International Journal of Medical Informatics*, *109*, 5-14. doi:10.1016/j.ijmedinf.2017.10.018

Belmont Report. (1979). *The Belmont Report: Ethical principles and guidelines for the protection of human subjects of research*. Retrieved from http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Berger, A. A. (2015). *Media and communication research methods: An introduction to qualitative and quantitative approaches*. doi:10.1093/med:psych/9780190243654.003.0023

Bernard, H. R. (2013). *Social research methods: Qualitative and quantitative approaches* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Bernstein, M. L., McCreless, T., & Cote, M. J. (2016). Five constants of information technology adoption in health care. *Hospital Topics, 85*(1), 17-25. doi:10.3200/htps.85.1.17-26

Brandon, A. (2016, March). Frozen: CPOE is change worth melting for. *In 2016 ANA Annual Conference*. ANA. doi:10.1515/9783110476620

Chapuis, C., Bedouch, P., Detavernier, M., Durand, M., Francony, G., Lavagne, P. ... & Payen, J. F. (2015). Automated drug dispensing systems in the intensive care unit: a financial analysis. *Critical Care, 19*(1), 1. doi:10.1186/s13054-015-1041-3

Charles, K., Willis, K., & Coustasse, A. (2014). Does CPOE increase patient safety by reducing medical errors?. *Global Education Journal, 2014*(1). doi:10.1007/978-1-4471-4369-7_15

Choi, I., Lee, S. M., Flynn, L., Kim, C. M., Lee, S., Kim, N. K., & Suh, D. C. (2016). Incidence and treatment costs attributable to medication errors in hospitalized patients. *Research in Social and Administrative Pharmacy, 12*, 428-437. doi:10.1016/j.sapharm.2015.08.006

Clarke, M. A., Belden, J. L., & Kim, M. S. (2015). What Learnability Issues Do Primary Care Physicians Experience When Using CPOE?. *Human-Computer Interaction: Users and Contexts* (pp. 373-383). Springer International Publishing. doi:10.1007/978-3-319-21006-3_36

Cope, D. G. (2014). Methods and meanings: Credibility and trustworthiness of qualitative research. *Oncology Nursing Forum, 41*, 89-91. doi:10.1188/14.ONF.89-91

Cresswell, K. M., Lee, L., Slee, A., Coleman, J., Bates, D. W., & Sheikh, A. (2015). Qualitative analysis of vendor discussions on the procurement of Computerized Physician Order Entry and Clinical Decision Support systems in hospitals. *Business Management Journal. 5*(10), e008313. doi:10.1136/bmjopen-2015-008313

Cresswell, K. M., & Sheikh, A. (2018). Inpatient clinical information systems. *Key Advances in Clinical Informatics* (pp. 13-29). doi:10.1016/b978-0-12-809523-2.00002-9

Dent, E. M. (2015). *Improving patient safety: reducing medication errors in the microsystem*. doi:10.1093/med/978019997176

Dixon, B. (Ed.). (2016). Health information exchange: navigating and managing a network of health information systems. *Academic Press*. doi:10.1016/b978-0-12-803135-3.00001-3

Donabedian, A. (2014). Evaluating the quality of medical care. *Milbank Quarterly*, 83, 691-725. doi:10.2307/3348969

Dougherty, J. A., & Bonfiglio, M. (2018). The Future CPOE Workflow: Augmenting Clinical Decision Support With Pharmacist Expertise. doi:10.1037/e504383010-009

Dullabh, P., Adler-Milstein, J., Hovey, L., & Jha, A. K. (2014, August). Key challenges to enabling health information exchange and how states can help. *National*

Opinion Research Center at the University of Chicago. doi:10.7326/0003-4819-154-10-201105170-00006

Echoles, F. E. (2016). Strategies for mitigating nurse turnover in eastern and northern Virginia (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 1024644)

Eisenhut, M. (2018). Increased mortality in patients managed with electronic prescribing. *Archives of Disease in Childhood, 95* (Supp 1), A78.3-A79. doi:10.2165/0018413-200615450-00012

Emerson, R. W. (2015). Convenience sampling, random sampling, and snowball sampling: How does sampling affect the validity of research?. *Journal of Visual Impairment & Blindness (Online), 109*, 164. doi:10.1016/s0169-7161(88)06006-7

Eyisi, D. (2016). The Usefulness of Qualitative and Quantitative Approaches and Methods in Researching Problem-Solving Ability in Science Education Curriculum. *Journal of Education and Practice, 7*(15), 91-100. doi:10.1002/sce.21198

Farre, A., Bem, D., Heath, G., Shaw, K., & Cummins, C. (2016). Perceptions and experiences of the implementation, management, use and optimization of electronic prescribing systems in hospital settings: protocol for a systematic review of qualitative studies. *Business Management Journal, 6*(7), e011858. doi:10.1136/bmjopen-2016-011858

Fisher, J. A. (2015). “Ready-to-recruit” or “ready-to-consent” populations? Informed consent and the limits of subject autonomy. *Qualitative Inquiry*, *13*, 875-894. doi:10.1177/1077800407304460

Freudenberger, J., Schunder, L., & Reid, W. (2013). 4 strategies for achieving reform-ready IT: health care executives face an escalating demand under health care reform to extract the greatest possible value from their organizations' IT resources. *Health care Financial Management, 67*(6), 112-118. doi:10.12927/hcpol.2013.23623

Frisse, S., Röhrig, G., Franklin, J., Polidori, M. C., & Schulz, R. J. (2016). Prescription errors in geriatric patients can be avoided by means of a computerized physician order entry (CPOE). *Zeitschrift für Gerontologie und Geriatrie, 49*, 227-231.doi:10.1007/s00391-015-0911-2

Fusch, P., & Ness, L. (2015). Are we there yet? Data saturation in qualitative research. *The Qualitative Report, 20*, 1408-1416. Retrieved from http://tqr.nova.edu/

Gagnon, M. P., Nsangou, É. R., Payne-Gagnon, J., Grenier, S., & Sicotte, C. (2014). Barriers and facilitators to implementing electronic prescription: a systematic review of user groups' perceptions. *Journal of the American Medical Informatics Association, 21*, 535-541. doi:10.1136/amiajnl-2013-002203

Gagnon, M. P., Ouimet, M., Godin, G., Rousseau, M., Labrecque, M., Leduc, Y., & Abdeljelil, A. B. (2014). Multi-level analysis of electronic health record adoption by health care professionals: a study protocol. Implementation Science, *5*(1), 30.

Ganju, K. K., Atasoy, H., & Pavlou, P. A. (2015). *Does the Adoption of EMR Systems Inflate Medicare Reimbursements?.* doi:10.2139/ssrn.2712758

Gartmeier, M., Gartmeier, M., Ottl, E., Ottl, E., Bauer, J., Bauer, J. ... & Berberat, P. O. (2017). Learning from errors: critical incident reporting in nursing. Journal of Workplace Learning, 29(5), 339-352. doi:10.1108/jwl-01-2017-0011

Gellert, G. A., Ramirez, R., & Webster, S. L. (2016). Toward the Elimination of Paper Orders. *Applied Clinical Informatics, 7*(1), 33-42. doi:10.4338/aci-2015-05-soa-0065

Gentles, S. J. (2016). *Sampling in Qualitative Research: Insights from a Systematic Overview of the Methods Literature*. doi:10.1186/s13643-016-0343-0

Glickman, S. W., Mehrotra, A., Shea, C. M., Mayer, C., Strickler, J., Pabers, S. ... & Pines, J. M. (2017). A Patient Reported Approach to Identify Medical Errors and Improve Patient Safety in the Emergency Department. *Journal of Patient Safety*. doi:10.1515/9783110249507

Guise, J. M., Winter, S., Fiore, S. M., Regensteiner, J. G., & Nagel, J. (2017). Organizational and training factors that promote team science: A qualitative analysis and application of theory to the National Institutes of Health's BIRCWH career development program. *Journal of Clinical and Translational Science, 1*(2), 101-107. doi:10.1017/cts.2016.17

Hammami, R., Bellaaj, H., & Kacem, A. H. (2014, June). Interoperability of health care information systems. In Networks, Computers and Communications. *The 2014 International Symposium* (pp. 1-5). IEEE. doi:10.1109/sncc.2014.6866536

Harvey, L. (2015). Beyond member checking: A dialogic approach to the research interview. *International Journal of Research & Method in Education*, *38*, 23-38. doi:10.1080/1743727X.2014.914487

Hepp, Z., Forrester, S. H., Roth, J., Wirtz, H. S., & Devine, E. B. (2013). Cost-Effectiveness of A Computerized Provider Order Entry System In Improving Medication Safety: A Case Study In Ambulatory Care. *Value in Health, 16*, A205-A206. doi:10.1016/j.jval.2013.03.1038

Hernandez, F., Majoul, E., Montes-Palacios, C., Antignac, M., Cherrier, B., Doursounian, L. ... & Hindlet, P. (2015). An Observational Study of the Impact of a Computerized Physician Order Entry System on the Rate of Medication Errors in an Orthopaedic Surgery Unit. *PloS One*, 10(7), e0134101. doi:10.1371/journal.pone.0134101

Hersh, W., Totten, A., Eden, K., Devine, B., Gorman, P., Kassakian, S. ... & McDonagh, M. S. (2015). *Health Information Exchange*. doi:10.1016/b978-0-12-803135-3.00014-1

Hillestad, R., Bigelow, J., Bower, A., Girosi, F., Meili, R., Scoville, R., & Taylor, R. (2014). Can electronic medical record systems transform health care? Potential health benefits, savings, and costs. *Health affairs, 24*, 1103-1117. doi:10.1377/hlthaff.24.5.1103

Holloway, I., & Galvin, K. (2016). *Qualitative research in nursing and health care*. John Wiley & Sons. doi:10.7748/cnp.16.3.15.s14

Horsky, J. (2016). Errors Related to CPOE. *Safety of Health IT*, 27, 27-39. Springer International Publishing. doi:10.1007/978-3-319-311123-4_3

Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2014). Rigour in qualitative case study research. *Nurse Researcher, 20*, 12-17.doi:10.7748/nr.2013.03.20.4.12.e326

Hsu, C. C., Chou, C. L., Chen, T. J., Ho, C. C., Lee, C. Y., & Chou, Y. C. (2015). Physicians Failed to Write Flawless Prescriptions When Computerized Physician Order Entry System Crashed. *Clinical therapeutics, 37*, 1076-1080. doi:10.1016/j.clinthera.2015.03.003

Idemoto, L. M., Williams, B. L., Ching, J. M., & Blackmore, C. C. (2015). Implementation of a custom alert to prevent medication-timing errors associated with computerized prescriber order entry. *American Journal of Health-System Pharmacy, 72*(17). doi:10.2146/ajhp140790

Johnson, B., & Turner, L. A. (2013). Data Collection Strategies in Mixed Methods Research. *Handbook of Mixed Methods in Social and Behavioral Research* (pp.297-319). doi:10.4135/9780857024329.d12.1111/j.1468-0009.2014.0039.x

Kazley, A. S. (2016). HEALTH INFORMATION SYSTEMS. Managing the Long-Term Care Facility: *Practical Approaches to Providing Quality Care, 303*. doi:10.1016/b978-0-08-027201-6.50016-9

Kilsdonk, E., Peute, L. W., & Jaspers, M. W. (2017). Factors influencing implementation success of guideline-based clinical decision support systems: A systematic review and gaps analysis. International journal of medical informatics, 98, 56-64. doi:10.1016/j.ijmedinf.2015.11.011

Kim, D., & Li, X. R. (2013). Introduction to the special issue on advancing research methods in marketing. *Editorial Journal of Business Research, 66*, 1243-1244. doi:10.1016/j.jbusres.2012.02.019

Koppel, R., Metlay, J. P., Cohen, A., Abaluck, B., Localio, A. R., Kimmel, S. E., & Strom, B. L. (2015). Role of computerized physician order entry systems in facilitating medication errors. *Jama, 293*, 1197-1203. doi:10.1001/jama.293.10.1197

Kruse, C. S., Regier, V., & Rheinboldt, K. T. (2014). Barriers over time to full implementation of health information exchange in the United States. *Journal of Medical Internet Research, 2*, 286-293.doi:10.2196/medinform.3625

Langabeer II, J. R. (2016). Exploring Business Strategy in Health Information Exchange Organizations. *Journal of Health care Management, 61*(1), 15. doi:10.1080/1369118x.2012.696273

Lavan, A. H., Gallagher, P. F., & O'Mahony, D. (2016). Methods to reduce prescribing errors in elderly patients with multimorbidity. *Clinical Interventions in Aging, 11*, 857. doi:10.2147/cia.s80280

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. Journal of Family Medicine and Primary Care, 4, 324-327. doi:10.4103/2249-4863.161306

Lewins, A. (2015). Computer assisted qualitative data analysis software (CAQDAS). *Researching Social Life, 21*, 411. doi:10.1002/9781405198431.wbeal0177

Maat, B., Bollen, C. W., van Vught, A. J., Toine, C., Egberts, G., Carin, M., & Rademaker, A. (2014). Impact of computerized physician order entry (CPOE) on PICU prescribing errors. *Intensive Care Medicine, 40*, 458. doi:10.1007/s00134-013-3193-4

Malhani, M. A., Maneno, M. K., Ettienne, E. B., & Wingate, L. (2016). Factors affecting adoption of computerized physician order entry system. *Value in Health*, *3*(19), A274. doi: doi:10.1016/j.jval.2016.03.1954

Marais, L. (2017). *Exploring leaders' strategies for employee engagement in the South African mining industry* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 10256071)

Marcus, B., Weigelt, O., Hergert, J., Gurt, J., & Gelléri, P. (2017). The use of snowball sampling for multi source organizational research: Some cause for concern. *Personnel Psychology, 70*, 635-673. doi:10.1111/peps.12169

Marjoua, Y., & Bozic, K. J. (2015). Brief history of quality movement in US health care. *Current Reviews in Musculoskeletal Medicine, 5*, 265–273. doi:10.1007/s12178-012-9137-8

Marshall, C., & Rossman, G. (2016). Designing qualitative research (6th ed.). Thousand Oaks, CA: SAGE.

Mattsson, T. O., Holm, B., Michelsen, H., Knudsen, J. L., Brixen, K., & Herrstedt, J. (2015). Non-intercepted dose errors in prescribing anti-neoplastic treatment: a prospective, comparative cohort study. *Annals of Oncology*, mdv032. doi:10.1093/annonc/mdv032

Maxwell, J. A. (2016). Expanding the history and range of mixed methods research. Journal of Mixed Methods Research, 10, 12-27. doi:10.1177/1558689815571132

Medford-Davis, L. N., Chang, L., & Rhodes, K. V. (2016). Health Information Exchange: What do patients want?. *Health Informatics Journal*, 1460458216647190. doi:10.10.1177/1460458216647190

Moustakas, C. (1994). Phenomenological research methods. Thousand Oaks, CA: Sage Publications. doi:10.4135/9781412995658

Nanji, K. C., Patel, A., Shaikh, S., Seger, D. L., & Bates, D. W. (2016). Evaluation of perioperative medication errors and adverse drug events. *The Journal of the American Society of Anesthesiologists, 124*(1), 25-34. doi:10.1097/aln.0000000000000904

Nelms, T. C. (2015). The problem of delimitation: Parataxis, bureaucracy, and Ecuador's popular and solidarity economy. *Journal of the Royal Anthropological Institute, 21*, 106-126. doi:10.1111/1467-9655.12149

Niiranen, K., Silvennoinen, R., Laaksonen, R., Airaksinen, M., & Lehtonen, L. (2016). DD-032 The impact of computerized physician order entry on medication errors in chemotherapy. *European Journal of Hospital Pharmacy, 23*(Suppl 1), A118-A118. doi:10.1136/ejhpharm-2016-000875.267

Nsakanda, A. L., Grant, G., Vafei, M., & Leafloor, M. (2015, January). A Simulation Modeling Approach to Understanding Workflow Changes in Health care: The Case of CPOE Deployment at the Ottawa Hospital. *System Sciences (HICSS),*

2015 48th Hawaii International Conference on System Sciences (pp. 2933-2941). IEEE. doi:10.1109/hicss.2015.355

Nuckols, T. K., Asch, S. M., Patel, V., Keeler, E., Anderson, L., Buntin, M. B., & Escarce, J. J. (2015). Implementing computerized provider order entry in acute care hospitals in the United States could generate substantial savings to society. *The Joint Commission Journal on Quality and Patient Safety, 41*, 341-341. doi:10.1097/hmr.0b013e3181c8b1e5

Olson, J., Hollenbeak, C., Donaldson, K., Abendroth, T., & Castellani, W. (2015). Default settings of computerized physician order entry system order sets drive ordering habits. *Journal of Pathology Informatics, 6.* doi:10.4103/2153-3539.153916

Park, H., Lee, S. I., Hwang, H., Kim, Y., Heo, E. Y., Kim, J. W., & Ha, K. (2015). Can a health information exchange save health care costs? Evidence from a pilot program in South Korea. *International Journal of Medical Informatics, 84*, 658-666. doi:10.1016/j.ijmedinf.2015.05.008

Parker, C. J., & Adler-Milstein, J. (2016). Errors Related to Health Information Exchange. *Safety of Health IT*, 153-165. Springer International Publishing. doi:10.1007/978-3-319-31123-4_12

Patton, M. Q. (2015) *Qualitative Research & Evaluation Methods* (5 th ed.) Thousand Oaks: Sage.

Pelayo, S., Anceaux, F., Rogalski, J., Elkin, P., & Beuscart-Zephir, M. C. (2013). A comparison of the impact of CPOE implementation and organizational

determinants on doctor–nurse communications and cooperation. *International Journal of Medical Informatics, 82*(12), e321-e330. doi:10.1016/j.imedinf.2012.09.001

Prgomet, M., Li, L., Niazkhani, Z., Georgiou, A., & Westbrook, J. I. (2016). Impact of commercial computerized provider order entry (CPOE) and clinical decision support systems (CDSSs) on medication errors, length of stay, and mortality in intensive care units: a systematic review and meta-analysis. *Journal of the American Medical Informatics Association, 24*, 413-422. doi:10.1093/jamia/ocw145

Priya, K., Joy, N., Thottumkal, A. V., Warrier, A. R., Krishna, S. G., & Joseph, N. (2018). Impact of Electronic Prescription Audit Process to Reduce Outpatient Medication Errors. *Indian Journal of Pharmaceutical Sciences*, *79*(6), 1017-1022. doi:10.4172/pharmaceutical-sciences.1000321

Queenan, C. C., Kull, T. J., & Devaraj, S. (2016). Complements or Substitutes? Culture–Technology Interactions in Health care. *Decision Sciences.* doi:10.1111/deci.12199

Rai, A., Keil, M., & Mindel, V. (2015). How Does Computerized Provider Order Entry Implementation Impact Clinical Care Quality, Cycle Time, and Physician Job Demand Over Time?. doi:10.1007/springerreference_64599

Reilly, R. C. (2014). Found poems, member checking and crises of representation. *Qualitative Report, 18*(30), 1–18. Retrieved from http://tqr.nova.edu/

Ricciardi, L., Mostashari, F., Murphy, J., Daniel, J. G., & Siminerio, E. P. (2015). A national action plan to support consumer engagement via e-health. *Health Affairs, 32*, 376-384. doi:10.1377/hlthaff.2012.1216

Robinson, O. (2014). Sampling in interview-based qualitative research: A theoretical and practice guide. *Qualitative Research in Psychology, 11*, 25-41. doi:10.1080/14780887.2013.801543

Romanow, D., Rai, A., Keil, M., & Luxenberg, S. (2017). Does extended CPOE use reduce patient length of stay?. *International Journal of Medical Informatics, 97*, 128-138.

Ruano, M., Villamañán, E., Pérez, E., Herrero, A., & Álvarez-Sala, R. (2016). New technologies as a strategy to decrease medication errors: how do they affect adults and children differently?. *World Journal of Pediatrics, 12*, 28-34. doi:10.1007/s12519-015-0067-6Schreiber, R., & Shaha, S. H. (2016). Computerized Provider Order Entry Adoption Rates Favorably Impact Length of Stay. *Journal of Innovation in Health Informatics*, 459-465. doi:10.14236/jhi.v23i1.166

Rundall, T. G., Wu, F. M., Lewis, V. A., Schoenherr, K. E., & Shortell, S. M. (2016). Contributions of relational coordination to care management in ACOs: Views of managerial and clinical leaders. *Health Care Management Review*, *41*(2), 88. doi:10.1097/hmr.0000000000000064

Saldaña, J. (2015). The coding manual for qualitative researchers. Los Angeles, CA: Sage.

Samuelson, B. T., Glynn, E., Holmes, M., White, A. A., Martin, D. B., & Garcia, D. (2015). Use of a computer-based provider order entry (CPOE) intervention to optimize laboratory testing in patients with suspected heparin-induced thrombocytopenia. *Thrombosis Research, 136*, 928-931. doi:10.1016/j.thromres.2015.09.005

Schiff, G. D., Amato, M. G., Eguale, T., Boehne, J. J., Wright, A., Koppel, R. ... & Bates, D. W. (2015). Computerized physician order entry-related medication errors: analysis of reported errors and vulnerability testing of current systems. *Business Management Journal: Quality & Safety, 25*, 226-232. doi:10.1136/bmjqs-2015-004486

Schiff, G. D., Seoane-Vazquez, E., & Wright, A. (2016). Incorporating Indications into Medication Ordering--Time to Enter the Age of Reason. *National English Journal of Medicine, 375*, 306-9. doi:10.1056/nejmp1603964

Schreiber, R., & Shaha, S. H. (2016). Computerized Provider Order Entry Adoption Rates Favorably Impact Length of Stay. *Journal of Innovation in Health Informatics, 23*, 459-465. doi:10.14236/jhi.v23i1.166

Schwartzberg, D., Ivanovic, S., Patel, S., & Burjonrappa, S. C. (2015). We thought we would be perfect: medication errors before and after the initiation of Computerized Physician Order Entry. *Journal of Surgical Research, 198*(1), 108-114. doi:10.1016/j.jss.2015.03.004

Seidling, H. M., & Bates, D. W. (2016). Evaluating the Impact of Health IT on Medication Safety. *Evidence-Based Health Informatics: Promoting Safety and*

Efficiency through Scientific Methods and Ethical Policy, 222, 195. doi:10.1111/bcp.12217

Seidman, I. (2014). Interviewing as qualitative research: A guide for researchers in education and the social sciences. *Teachers College Press.* doi:10.1177/1468794114535050

Serrano, K. J., Yu, M., Riley, W. T., Patel, V., Hughes, P., Marchesini, K., & Atienza, A. A. (2016). Willingness to exchange health information via mobile devices: findings from a population-based survey. *The Annals of Family Medicine, 14*(1), 34-40. doi:10.1370/afm.1888

Shanafelt, T. D., Dyrbye, L. N., Sinsky, C., Hasan, O., Satele, D., Sloan, J., & West, C. P. (2016, June). Relationship Between Clerical Burden and Characteristics of the Electronic Environment With Physician Burnout and Professional Satisfaction. In Mayo Clinic proceedings. doi:10.1016/j,mayocp.2015.08.023

Singh, H., & Sittig, D. F. (2015). Measuring and improving patient safety through health information technology: The Health IT Safety Framework. *Business Management Journal Quality & Safety*, bmjqs-2015.2014. doi:10.1136/bmjqs-2014-003555.

Slight, S. P., Eguale, T., Amato, M. G., Seger, A. C., Whitney, D. L., Bates, D. W., & Schiff, G. D. (2015). The vulnerabilities of computerized physician order entry systems: a qualitative study. *Journal of the American Medical Informatics Association*, ocv135. doi:10.1093/jamia/ocv135

Slight, S. P., & Bates, D. W. (2016). The Role of Health Information Technology in Patient Safety. *America's Health care Transformation: Strategies and Innovations, 60*. doi:10.1515/9781614514343-010.

Stake, R. E. (2013). Multiple case study analysis. Guilford Press. doi:10.1177/1098214007307454

Taieb-Maimon, M., Plaisant, C., Hettinger, A. Z., & Shneiderman, B. (2017). Increasing Recognition of Wrong-Patient Errors through Improved Interface Design of a Computerized Provider Order Entry System. *International Journal of Human–Computer Interaction*, 1-16. doi:10.1080/10447318.2017.1349249

Tsuda, K., Kimura, Y., Tanimoto, T., Takaba, Y., Okubo, K., Ishii, T., & Kobayashi, K. (2016). Impact of the automatic rounding-off function of the computerized physician order entry system on the ordering time and dose dispersion of chemotherapeutic drugs in regimens for hematologic malignancies. *International Journal of Medical Informatics, 85*(1), 76-79. doi:10.1016/j.jmedinf.2015010.006

Unluer, S. (2013). Being an insider researcher while conducting case study research. *The Qualitative Report*, *17*(29), 1-14. Retrieved from http://www.nova.edu/ssss/QR/index.html

Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice, 6*(5), 100. doi:10.5430/jnep.v6n5p100

Varghese, P., Wright, A., Andersen, J. M., Yoshida, E. I., & Bates, D. W. (2016). Clinical Decision Support: The Experience at Brigham and Women's

Hospital/Partners HealthCare. *Clinical Decision Support Systems*, 227-244. Springer International Publishing. doi:10.1007/978-3-31913-1_13

Vecellio, E., & Georgiou, A. (2016, August). Integrating the Radiology Information System with Computerized Provider Order Entry: The Impact on Repeat Medical Imaging Investigations. In Digital Health Innovation for Consumers, Clinicians, Connectivity and Community: *Selected Papers from the 24th Australian National Health Informatics Conference (HIC* 2016) 227, 126. IOS Press. doi:10.14236/jhi.v23i1.166

Vest, J. R., & Gamm, L. D. (2015). Health information exchange: Persistent challenges and new strategies. *Journal of the American Medical Informatics Association, 17*, 288-294. doi:10.1136/jamia.2010.003673

Wager, K. A., Lee, F. W., & Glaser, J. P. (2017). *Health care information systems: a practical approach for health care management*. John Wiley & Sons. doi:10.7748/phc.13.8.12.s16

Walker, J., Pan, E., Johnston, D., & Adler-Milstein, J. (2005). The value of health care information exchange and interoperability. *Health Affairs, 24,* W5. doi:10.1377/hlthaff.w5.10

Wang, H. Y., Lu, C. L., Wu, M. P., Huang, M. H., & Huang, Y. B. (2012). Effectiveness of an integrated CPOE decision-supporting system with clinical pharmacist monitoring practice in preventing antibiotic dosing errors. *International Journal of Clinical Pharmacology & Therapeutics, 50*(6). doi:10.5414/cp201678

Wang, J. Y., Ho, H. Y., Chen, J. D., Chai, S., Tai, C. J., & Chen, Y. F. (2015). Attitudes toward inter-hospital electronic patient record exchange: discrepancies among physicians, medical record staff, and patients. *BMC Health Services Research, 15*(1), 1. doi:10.1186/s12913-015-0896-y

Wolgemuth, J. R., Erdil-Moody, Z., Opsal, T., Cross, J. E., Kaanta, T., Dickmann, E. M., & Colomer, S. (2015). Participants' experiences of the qualitative interview: Considering the importance of research paradigms. *Qualitative Research, 15*, 351-372. doi:10.1177/1468794114524222

Yin, R. K. (2018). *Case study research and application: Designs and methods* (6th ed.). New York: The Guilford Press.

Zheng, S., Tucker, A. L., Ren, Z. J., Heineke, J., McLaughlin, A., & Podell, A. (2016). The Impact of Internal Service Quality on Nurse Inefficiency and Medical Errors. doi:10.2139/ssrn.2784503

Appendix A: Participant Invitation Letter

Date: [Insert Date]

Re: Request to Participate in a Research Study

Dear [Name]:

My name is Oluwatosin Oluokun, and I attend Walden University, in pursuit of a Doctor of Business Administration (DBA) degree specializing in health care management. I am conducting a research study on strategies for mitigating information technology discrepancies in health care to explore the strategies health care business managers use to collaborate CPOE systems within health care facilities to reduce medication errors and increase profitability. I am concentrating on eight clinical business managers within two successful small health care clinics located in the mid-Atlantic region of the United States. The title of my study is "Strategies for Mitigating Information Technology Discrepancies in Health care." I would like to interview clinical business managers who meet the following criteria:

- Be a health care manager or leader.
- Used strategies for mitigating information technology discrepancies in health care.
- Employed at a health care organization with full time status.

If you are interested in participating in the study, please refer to the attached consent form for more details about the study. Participation in the study is voluntarily and you can withdraw at any time. Upon completion of the study, I shared my research findings with study participants. After reviewing the attached consent form and if you agree to participate in the study, please contact me by phone at (240) 565-7262 or reply to the following email address, oluwatosin.oluokun@waldenu.edu. Please feel free to contact me by email or phone if you have any questions, concerns or would like additional information. Thank you for your time and consideration.

Sincerely,

Oluwatosin Oluokun
Doctoral Candidate
Doctor of Business Administration Program
Walden University

Appendix B: Site Agreement for DBA Case Study

Partner Site
Contact Information
Date

The doctoral student, [Insert Student Name], is conducting a case study involving our organization and is therefore approved to collect interview data from leaders (which I will identify to the student) in support of that effort, in addition to analyzing internal, de-identified site records* that I deem appropriate to release for this purpose.

**At the discretion of site leadership, the student may analyze the partner organization's de-identified records, including: aggregate personnel/client records that have been de-identified before being provided to the doctoral student, other de-identified operational records, meeting minutes, digital/audio/video recordings created by the organization, training materials, protocols, manuals, reports, agreements, questionnaires that were collected under auspices of site as part of continuous improvement efforts, and other internal documents.*

I understand that, as per the student doctoral program requirements, the student will publish a scholarly report of this case study project in ProQuest as a doctoral capstone (with site and individual identifiers withheld), as per the following ethical standards:

a. In all reports (including drafts shared with peers and faculty members), the student is required to maintain confidentiality by removing names and key pieces of evidence/data that might disclose an organization's/individual's identity or inappropriately divulge proprietary details. If the organization itself wishes to publicize the findings of this project that is the organization's judgment call.
b. The student will be responsible for complying with our organization's policies and requirements regarding data collection (including the need for the site's internal ethics/regulatory approval, if applicable).
c. Via an Interview Consent Form, the student will describe to interviewees how the data will be used in the doctoral project and how all interviewee's privacy will be protected.
d. The doctoral student will not use these data for any purpose other than the project outlined in this agreement.

I confirm that I am authorized to approve research activities in this setting.

Signed,

Authorization Official Name

Appendix C: Interview Protocol

In the beginning of the interview process, I will discuss the topic of my research with the participant over a light lunch, coffee, or tea explaining the purpose of my study. After greeting the participants over some light refreshments, I will review the informed consent process with the participants. I will review the business problem of the study with the participant. After easing the participant in to the study environment, I will proceed to ask them the following questions:

1. What is CPOE and how is implementing this system beneficial?
2. What specific actions hinder accurate usage of HIE for technological inputs to reduce medical errors?
3. What strategies aid the transfer paper to electronic charts for practitioner use?
4. How did your organization address the barriers developing new strategies to reduce medication errors?
5. What are some ways you have used CPOE to complete daily tasks to increase profitability?
6. How did CPOE systems, integrated into health care practices, benefit the patients and practitioners?
7. What additional information can you provide to assist me in understanding your strategies for implementing CPOE systems to ensure compatibility into your workplace?

After we are done with the interview, a follow up member checking interview will be scheduled in about the next week based on the participant's availability. During this

interview, I will introduce the follow up member checking questions over light refreshments and thank them once again for their participation in the study. During the member checking interview, the participants will review the transcription created based on the answers they gave during the first interview. Afterwards, the participants will sign each page of the transcription of the answers they stated from their first interview for verification that the answers on the transcriptions are their verbal statements.