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The Influence of Electronic Health Records Systems on Physicians' Efficiency and Effectiveness

William Everette Bond
Walden University

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Walden University

College of Management and Human Potential

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William Everette Bond

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Walden University
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Abstract

The Influence of Electronic Health Records Systems on Physicians' Efficiency and
Effectiveness

by

William Everette Bond

MBA, Strayer University, 2011

BS, Virginia Polytechnic Institute and State University, 1980

Abstract Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Management

Walden University

August 2022

Abstract

Electronic Health Records (EHR) were introduced into the field of medicine to replace outdated paper files with searchable, and easily transferrable electronic files. The results of numerous research studies have shown that the use of EHR allowed for beneficial outcomes for the physician and the patient. Some of the benefits included a reduction in scheduling and medication prescription errors. Concurrently, some of the negative factors attributed to EHR use included interoperability issues, reductions in facetime with patients, increased physician workload, and an increase in physician burnout. Little research was found that examined the negative factors from the perspective of the physician. The theoretical framework for this study was the technology acceptance model (TAM). The purpose of this qualitative transcendental phenomenology study was to examine the influence of EHR use from the perspective of the physician. Data for this study were collected through semi-structured interviews with five medical professionals and the data was analyzed using a description-focused coding strategy. From the results of this study, it was found that the negative factors of interoperability, physician burnout, and reduced facetime with patients attributed to EHR use were disconfirmed. The negative factor of increased workload was confirmed but was deemed manageable by the physicians. The application of the findings from this study may contribute to the body of knowledge applicable to EHR use by physicians. In addition, the findings from this study can contribute to positive social change by improving the quality of healthcare, physician workplace efficiency, EHR interoperability, physician to patient relationship and reducing medication prescription errors.

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Chapter 1: Introduction to the Study

Prior to the enactment of the Health Information Technology for Economic and Clinical Health (HITECH) and as part of the American Recovery and Reinvestment Act (ARRA) of 2009, most medical records were predominantly written by hand on paper medical charts (Kuhn et al., 2015). The handwritten notes were often illegible, except to the author, which rendered the notes and associated diagnoses unusable as a document to be shared. In addition, sharing paper medical charts was a time-consuming process which required the charts to be physically transported, mailed, faxed, or the information relayed over the telephone to the requesting party. The improper handling, filing and storage of paper medical charts often resulted in moisture damage, insect damage, or physical damage to the files (Menachemi & Collum, 2011). Contributing to the damage is the natural degradation of the files. To overcome the physical limitations of paper medical charts, HITECH promoted electronic health records (EHRs) systems as the tool that revamped the healthcare data documentation process by supporting file sharing, reduce file stowage activities, eliminate the physical damage to files, and promote a decrease in medical costs. In addition to the filing improvements associated with EHR systems, the primary goal of introducing EHR systems into the medical community was to improve healthcare outcomes (Gold & McLaughlin, 2016).

Although EHRs were promoted as being significantly superior to paper charts, Guinn et al., (2019) found that statement to not to be true in all cases. The use of EHR systems were found to increase the clerical burden of physicians, resulting in a general reduction in physician-to-patient face time during medical visits. The use of EHR

systems were also found to increase the none compensated work hours that physicians were required to work to reconcile medical files. The average number of none compensated work hours that physicians worked as a result of having to reconcile medical files was 28 hours per month (Guinn et al., 2019).

Approximately half of all physicians surveyed reported experiencing some level of professional burnout that can be directly contributed in part to governmental mandates and regulations associated with the implementation of EHR systems, and to the flawed functionality of EHR systems (McHugh et al., 2011). My goal for this study was to capture the lived experiences of physicians using EHR systems. Knowing how EHR systems usage affect physicians work performances could inform changes that could potentially be implemented to help EHR system design engineers improve the functionality of future EHR systems. The findings from this study could also contribute to positive social change by informing design engineers to design future EHR systems that are intuitive, standardized, and supportive of medical outcomes for patients.

Background of the Study

In 2009 the United States government enacted the HITECH Act to promote the use of EHRs (Adler-Milstein & Jha, 2017). EHRs were promoted as systems that could be used to stimulate improvements in healthcare quality and delivery. In support of promoting the use of EHR systems, Incentive payments are made to physicians or other medical providers who use the systems in interaction with Medicare and Medicaid patients (Mason et al., 2017). Although the implementation of EHR systems is growing,

research concerning EHR operation and meaningful use has not supported the claims that were purported to be attributed to system usage.

One of the most prominent problems encountered with the use of EHR systems is the lack of interoperability. The lack of interoperability is defined as the inability of EHR systems to exchange information comprehensively and reciprocally with other EHR systems (Mason et al., 2017). The lack of interoperability results from incompatible functionality between systems supplied by the various EHR system vendors, incompatible generational functionality changes within vendor brands, and from end user implemented modifications to their in-house EHR systems (Guinn et al., 2019). The lack of interoperability hinders the end user from having a high degree of confidence in the information that is depicted in patient's medical files. In addition, interoperability hinders data sharing between EHR systems and medical facilities (Mason et al., 2017).

With the introduction of EHR systems into the field of medicine, the amount of time physicians engage in uninterrupted face-to-face interactions with patients has been on a decline while the amount of time required for desktop medicine has increased (Tai-Seale et al., 2017). Desktop medicine is defined as activities such as ordering medication online, placing orders online for medical procedures and tests, reviewing online test and procedure results, and communicating online with patients and other medical professionals (Tai-Seale et al., 2017). A study by Tai-Seale et al., (2017) found that physicians apportioned equal amount of time to face-to-face interactions with patients and to performing desktop medicine. The study also found that the additional data-entry tasks along with patients having 24-hour access to physicians through the EHR systems

has contributed to physician's burnout (Collier, 2017). In an increasing number of cases, physicians are reducing their desktop medicine tasks by employing medical scribes. Medical scribes are employed to document patient procedures in real time, input data into EHR system medical files, document patient laboratory results, and preparing patient discharge instructions (Reick-Mitrisin et al., 2020). The addition of the medical scribe has been shown to have a positive impact on reducing the physician desktop medicine tasks. The downside to hiring a medical scribe is the amount of time required to train the scribe to be productive in the medical facility and the cost to hire the scribe (Collier, 2017).

EHR system manufacturers frequently make upgrades to their EHR systems without seeking input from physicians. These upgrades have resulted in interruptions to physician's workflow and physician-to-patient interface as the physicians must have time to become familiar and proficient with the changes. A study conducted by Davis, (2020) found that physicians need to play an integral role in informing the updates to current EHR systems and the design of future EHR systems for the systems to be useful to the physician in supporting patient care.

The problems that physicians are having with the currently available EHR systems are impacting the efficiency and effectiveness of the physician in their medical practice. One of the most impactful outcomes from the use of the currently available EHR systems is physician burnout. Physician burnout is the reduction in the physician's intrinsic motivation resulting from the additional workload placed on physicians by the introduction and use of EHR systems (Tajirian et al., 2020). Symptoms of physician

burnout include emotional exhaustion, depersonalization, and a general sense of not being productive (Tajirian et al., 2020). Studies have shown that 44% of all physicians have had at least one episode of burnout in their career (Hartzband & Jerome, 2020). A study by Melnick et al. (2020) showed that improving the usability of EHR systems has a positive impact on reducing physician burnout.

There has been little research found concerning the lived experiences of physicians working with EHR systems while striving to provide quality healthcare to patients. This study attempted to fill this knowledge gap. The results of this study could be used to inform IT engineers of the requirements for the development of future EHR systems. This study is needed to aide in the development of future EHR systems that could fulfill the original intent of the EHR systems proposed by the HITECH act of 2009.

Problem Statement

EHRs are developed in cooperation between interdisciplinary teams of healthcare workers, information technology professionals and engineers (Lintern & Motavalli, 2018; Sheffer, 2016). As healthcare workers have new ideas, engineers integrate those potential benefits into systems (Helton et al., 2017). Healthcare professionals' adoption and meaningful use of EHRs are the principal goals of the HITECH Act of 2009 and the Federal Health IT Strategic Plan (Henry et al., 2016). Meaningful use is the process of using EHR systems to improve healthcare delivery. However, failure to meet meaningful use subjects the medical provider to financial penalties (Adler-Milstein et al., 2015) and may be the result of engineering failure (Yang et al., 2016). By the end of 2015, 87% of all office-based physicians had adopted a certified EHR system. The 87% EHR adoption

level was deemed acceptable by U.S. governmental standards and efforts that previously focused on EHR adoption rates are now directed towards increasing physicians' use of EHR to support healthcare delivery (Henry et al., 2016).

Although patients have benefitted from physicians who utilize EHR systems, these benefits were realized at a cost. The additional time needed to input data into EHR system during patient visits has resulted in protracted office visits, reduced face-to-face times, a reduction in the number of patients seen, reduced revenue, and mutually less satisfying office visits (Kruse et al., 2016; Matthews, 2017). Engineers were often facilitating behind the scenes changes with healthcare providers to make the systems more streamlined and to lessen the burden on physicians (Ele et al., 2017). The general problem is that physicians are being provided EHR systems which have been designed without communication between design engineers and the physicians (Huang, 2017). Researchers have examined how EHR system usage has impacted the operation of hospitals and medical facilities processes; little has been written examining EHR system usage from the perspective of physicians. Although similar studies have been conducted linking EHR functionalities and medical practice performance (Doohee et al., 2016); this study is unique in that it links EHR system use to physician efficiency and effectiveness which is a current gap in the literature (Sines & Griffin, 2018; Shanafelt et al., 2019; Shah et al., 2019).

Purpose of the Study

The purpose of this qualitative transcendental phenomenology research study is to explore the lived experiences of physicians who have implemented and are currently

using an EHR system in their practice. The physicians selected for this study must also have a minimum of 1 year experience working with paper medical files. Physicians are exploring ways to be more efficient and effective. The U.S. government mandated physicians to adopt and integrate a EHR system into their medical practices (Mason et al., 2017). EHR system functions and configurations are not standardized across the various developers and vendors. These non-standardized systems have left physicians to deal with usability, interoperability, documentation, and other quality issues with the systems (Kruse et al., 2016). With physicians spending more time interacting with the various available EHR systems, there is a need to gain an understanding of the impact of using EHR systems have on physicians' beliefs and attitudes towards the available systems and their use. The results of this study could influence how design engineers can contribute to improving EHR systems to suit physician's needs (Heaton et al., 2016; Huang, 2017). By making future EHR systems more intuitive, less cumbersome, and more standardize physicians may be more willing to accept using the systems during medical appointments.

Research Questions

The focus of this qualitative transcendental phenomenological study is to explore the lived experiences of physicians who have implemented an EHR system. EHR design engineers could use the results of this study to gain insight into improving the efficiency and effectiveness of future EHR systems. The central research question is: What are the lived experiences of physicians who have implemented an EHR system?

Subquestions

What experiences have physicians encountered that influenced their decision to continue to use paper medical files or to convert to EHR systems to document patient encounters?

The sub questions developed to answer this question are as follows:

1. How has physician efficiency and effectiveness impacted patient care?
2. How has physician efficiency and effectiveness impacted the physician patient relationship?
3. What impact, if any, does using a EHR system have on physician to patient communication?

Conceptual Framework

I based the conceptual framework for this study on Davis's (1989) technology acceptance model (TAM). This model is used to address how users of new technology perceive the usefulness and ease of use of new technology (Lai, 2017; Garcia, & Silva, 2017). There are three components to this model. Perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI). PU is the technology end users' perception of how well the technology helped them perform their job. PEOU is the end user's perception of how easy the technology helps them perform their job, and BI is a measure of the technology end user willingness to use the technology to perform his/her job. Research has shown that PEOU, PU, and BI interconnectedly influence each other (Mokhtar et al., 2018). The motivation for an end user to use a new technology is centered on the user's perception of the ease of use and usefulness of the technology. The ease of use and usefulness of a technology are based on the features and capabilities

of the technology meeting the end user expectations and needs. How well a technology supports the end user needs impacts the performance of the end user using that technology which aligns with the problem statement, purpose, and research questions of this study.

How the physician reacts to his/her perception of the technology drives the usage behavior to the technology. The TAM model is extensively used in the field of information systems and technology adoption (Asadi et al., 2017; Iqbal & Zeeshan, 2015). The TAM model is a good fit for this study because the EHR system is an information gathering and sharing system, which Kruse et al., (2016) stated was mandated by the HITECH Act of 2009 and is reluctantly being adopted by the medical community. The conceptual framework of this study is related to and supports Clausing's and Holmes (2010) concept of technology readiness. Technology readiness involves proving an innovative technology prior to placing the technology into service.

Nature of the Study

This study was qualitative with a transcendental phenomenological design. I used a qualitative approach for this study because it supports the need for the researcher to have personal verbal interaction with the participants to collect unbiased data that is relevant to the targeted population and subject matter (Elkatawneh & Hassan, 2016). The qualitative approach supports the researcher as the data capture instrument and the design of this study which is to capture the narrative data that examines the lived experiences of physicians interacting with EHR systems. Through verbal interaction with the participants, I was able to capture nonverbal reactions to the semi-structured research

questions and to clarify for the research participant any question which might not have been understood. The researcher can also ask the participant to elaborate on his/her response to the research question(s). Modifications were made to the research questions during the interviews when I found that the question(s) did not producing informative information from the participants.

I used the transcendental phenomenological approach because it was suited to address my goal for this study, which was to examine the lived experiences of the physicians who have adopted and are currently using an EHR system in their medical practice (Schutz, 1967). The exploratory nature of this study would have been hampered if I had used the predetermined categories of analysis of quantitative methods.

Qualitative research was aligned with my goals for this study, which were to gain an in-depth insight into the impact that EHR systems use has on physicians (Elkatawneh & Hassan, 2016).

The population for this qualitative study consisted of 5 purposefully selected physicians from the state of Virginia who have integrated and currently use an EHR system in their practice. To limit the scope of this study, the physicians for this study were selected from the field of general medicine. Studies have shown that there is a need for a collaborative effort among EHR system design engineers, physicians, and policy makers to improve the functionality and design of future EHR systems (Henriksen et al., 2020).

The data for this study were in the form of narratives and was collected through semi-structured face-to-face interviews with purposefully selected participants. The data

was recorded with two portable digital recorders, with one of the recorders serving as a backup in case the primary recorder fails. I also made handwritten field notes during the interview to capture information that I find particularly interesting. I also made field notes about things that I am learning about the subject and any changes that may be required concerning the interview process. I also asked the research participants in advance if they are willing to have their interviews video recorded with an Apple iPad.

Analysis of the interview data was conducted on an ongoing basis. Merriam and Tisdell (2016) stated that continuous analysis of the data is the only aspect of qualitative research that can be considered as a preferred process sequence. Waiting to end of the data collection process to analyze the data can result in an overwhelming and unfocused task. After each interview I developed tentative themes for the data, document any ideas that the data generate, and assess how the interview was conducted so that appropriate changes to the interview process can be made prior to the next interview session. The interview questions were also be assessed and modified as necessary prior to the next interview session. Each interviewee was provided identifying notations for easy retrieval and categorization. I kept a working copy and a backup copy of all data captured during and after the interview sessions. In analyzing the data, I listened to the recorded interviews, review my notes, and using the Microsoft Word computer program transcribe the data. By transcribing the data, myself I reacquainted myself with the data and identify themes and trends. The data was reviewed and grouped by relevancy and codes developed to group the data. I reviewed and grouped the data by relevancy and created codes to group the data. I grouped the coded data by themes and categories that emerged

from the data. I examined relationships among the themes and categories to determine the essence of the participants experiences (Merriam & Tisdell, 2016).

Definitions

Behavioural intention (BI): A measure of the technology end user willingness to use the technology to perform his/her job (Mokhtar et al., 2018).

Coding: The process of assigning meaningful and credible designations (such as letters, numbers, and colors) to data for the purpose of expediting data retrieval (Merriam & Tisdell, 2016).

Effectiveness: Effectiveness as it relates to this study is a determination of whether a desired outcome is accomplished (Altayyar, 2020).

Efficiency: Efficiency in this study is related to the physician obtaining the maximum outcome for the effort that is applied (Lamovšek & Klun, 2020).

Electronic Health Records (EHR): An EHR is an electronic longitudinal record of a patient health information that is collected during the routine delivery of healthcare (Cowie et al., 2017).

Epoche: The ability to openly accept what is transpiring before you. To see people, events, or things from the perspective of no prior knowledge. To see people, events, or things as though for the first time (Roberts, 2019).

Health information technology for economic and clinical health (HITECH): An Act passed in 2009 by the US Senate to promote the adoption of health information technology (HIT) by authorizing Medicare and Medicaid incentives for HIT use.

Interoperability: The bi-directional transfer of information between communication systems (Suess et al., 2019).

Perceived Usefulness (PU): The technology end users' perception of how well the technology will help he/she perform their job (Mokhtar et al., 2018).

Perceived ease of use (PEOU): The end user's perception of how easy the technology will help he/she perform their job (Mokhtar et al., 2018).

Physician burnout: A psychological syndrome that is caused by a combination of emotional exhaustion, depersonalization, and a sense of low personal achievement (Patel et al., 2019).

Small medical practice: A medical practice consisting of one to four physicians (Sines & Griffin, 2018)

Technology acceptance model (TAM): A model that reflects the relationship between the actual use of a new technology and the technology user's attitude towards the technology, the perceived ease of use of the technology, and the perceived benefits that could be realized from the use of the technology (Matikiti et al., 2018).

United States Centers for Disease Control and Prevention (CDC): An American medical organization that operates 24 hours a day and 7 days a week to combat foreign and domestic originated health, safety, and security threats against American citizens by fighting diseases, putting science into action, nurturing public health, and keeping abreast of health security (Centers for disease control and prevention, not dated {n.d.}).

Assumptions

Assumptions are ideas and beliefs that the researcher accepts as truths and proceeds with his/her research as though they were (Martin, & Parmar, 2012). The assumptions through the course of the research study were either held true or shown to be unwarranted. Based on the researchers' limited research experience, six assumptions are being made. The first assumption is that physicians truthfully respond to the research questions and not just say what they think the researcher wants to hear or to simply not be truthful with their response. This premise is guided by the assumption that physicians hold to the Hippocratic Oath and responded ethically when dealing with the public. While there are no known methods or processes to control for untruthful responses, this assumption informs the reader that the possibility exists. The second assumption was that the requirement for physicians to use EHR systems was in effect through to the end of the study. The researcher has not read any documentation that would contradict this assumption. If this assumption does not hold true it could have a detrimental impact on this study. The third assumption was that all physicians who agreed to participate in the study remained a participant until the conclusion of the study. This assumption was based on the premise that physicians are interested in having their voice heard in hopes of influencing the design parameters of future EHR systems.

The fourth assumption was that physicians that were practicing medicine prior to the introduction of EHR had a harder time adjusting to using EHR systems than doctors that have entered practice post EHR introduction. The premise of this assumption is that younger adults adopt more easily to new technology than older adults. The fifth

assumption was that no new governmental legislations was introduced that could eliminate the mandate that requires physicians to implement EHR systems into their practice. This premise is based on the lack of literature on this topic. The sixth assumption was that the Coronavirus (COVID-19) subsided to a level to which in-person research interviews were allowed to take place. This assumption is based on the efforts of the United States Centers for Disease Control and Prevention (CDC) and the United States Food and Drug Administration (FDA) to research, test, approve and disseminate vaccines to combat COVID-19. Although not the researchers preferred method, this assumption can be overcome by performing the interviews by phone or by WebEx.

Scope and Delimitations

EHR systems were posited as the replacement for and improvement over traditional paper medical files. EHR systems were deemed to provide interoperability between medical facilities, improve patient care, reduce medical errors, and eliminate paper waste (Shahmoradi et al., 2017). Contrary to the posited benefits, it has been found that the use of EHR systems have resulted in increased clerical burden, contributed to physicians' professional burnout, and has necessitated that physicians spend an average of 28 hours of personal time per month inputting data into the EHR system (Shanafelt et al., 2019).

The impact of using an EHR system can have a substantial impact on how physicians operate within their office. The use of EHR systems have also been found to impact physicians' general level of satisfaction with work and home life. The focus of this study is the impact of EHR system use on the physicians' level of satisfaction at

work and the resulting impact to the physician efficiency and effectiveness at work.

The purpose of this study is to examine the lived experiences of physicians who have experience working with paper medical files and EHR systems. The results of this study could be used to help improve the design of future EHR systems.

Delimitations

Delimitations are conditions or parameters set by the researcher to limit the scope of the study (Ellis & Levy, 2009). The participants in this study were limited to physicians who work full time within small medical practices in the state of Virginia. The physicians selected for this study came from general medicine and the physicians had a minimum of one-year experience working full time with paper medical files and a minimum of one year working with EHR systems. The physicians chosen for the study must also not be actively in the planning stages to retire within a year of the date of the research interview. This ensured that the physician had a vested interest in improving the current EHR systems. The medical field of ophthalmology was chosen to control for factors that may affect physicians in other fields of medicine, to limit the scope of the study, and to narrowly focus the study.

Limitations

The participants that were selected for this study came from the medical field of general medicine. The selected participants were also constrained to the state of Virginia. Medical practitioners outside of the selected group and location were not provided an opportunity to provide perceptions of the phenomenon of inquiry. The constrained

participant criteria was a limiting factor in generalizing the results of the study to other populations and states (Merriam & Tisdell, 2016).

The second limitation for this study was that the work experience of the participants. The participants must have a minimum of one year working full time with paper medical files and a minimum of one year working full time with EHR systems, the work experience requirement excluded participants who have made the conscious decision not to adopt and use an EHR system and participants who have none to less than a year experience working with paper files and less than a year experience working full time with EHR systems.

The third criteria is to exclude participants who have a made a decision to close their medical practice and leave the field of medicine. This criterion eliminated participants who have no personal stake in improving their EHR system functionality or useability. Participants who leave the practicing side of medicine but chooses to mentor current and incoming physicians were considered for participation in this study.

The fourth limiting criteria is to not allow physicians to participant in the study who have a personal stake in one or more EHR systems design, production, or distribution chain. The personal stake includes any compensation or benefits the physician may receive from the relationship. This criterion eliminated participants who may be bias towards the adoption and use of EHR systems.

The fifth limitation of this study is transferability. There are several strategies to enhance transferability of a research study such as developing rich, thick description of the study and selecting research participants that represent a maximum variation in the

targeted population. In this study the rich, thick description of the study provided by the selected participants did not represent a maximum variation in the targeted population (Merriam & Tisdell, 2016).

Significance of the Study

This research may be a source of information to help fill the gap in the literature concerning physician's perception of working with EHR systems. This study may help fill this gap by focusing specifically on how an externally mandated information technology system impacts the beliefs and attitudes of physicians towards their work processes and patient interactions. This research is important because it addresses an under-researched area of medicine and technology as it relates to the relationship between EHR design engineers, physicians, and physician-patient relationship (Shanafelt et al., 2016). Organizations may use the results of this study to help overcome barriers to developing new medically focused information technology that physicians implemented and used. The results of this study may also have the potential to identify barriers to EHR systems use, physician-to-patient interactions, and interoperability. Because of the broad range of EHR systems available on the market, engineers have an opportunity to team with physicians and EHR system manufacturers to streamline and standardize EHR systems architecture and functions. The revised EHR systems could contribute to social change by eliminating factors that inhibit physicians' efficiency and effectiveness during EHR use.

Significance to Practice

The purpose of this study is to explore the lived experiences of physicians working with EHR systems. By exploring the physician's experiences with EHR systems, engineers working on the next generation of EHRs could use the information to help make the systems more user friendly and less intrusive. EHR system design engineers could also use the results of this study to modify existing EHR systems to better meet the needs of physicians. Modifications to the current EHR systems may help physicians to become more receptive to and efficient at using the current EHR systems. In addition, physicians who become more receptive and efficient at using current EHR systems may become motivated to help new physicians that are entering the medical field to better acclimate to EHR system use. A reduction in the time that it takes new physicians to become familiar with EHR systems may allow the physician to become efficient and effective sooner than it may have been possible if the help was not made available.

Significance to Theory

The results of this qualitative study could aid engineers in the development of future generations of EHR systems that are more intuitive than current systems and more holistic compatible with other EHR systems by exploring physicians lived experiences with current systems. EHR systems with enhanced features could improve physician-patient interaction during care visits and help reduce physicians after hour none-compensated data loading tasks. I have found numerous research studies written concerning the factors influencing physician's acceptance and implementation of

EHR systems, but little has been found concerning the use of EHR systems from the perspective of the physician. Findings from this study may provide insight into the use of new information technology from the physician perspective which could add to or further support the TAM theory community conversation.

Significance to Social Change

The purpose of this study is to explore the influence of EHR systems on physicians' efficiency and effectiveness. The findings of this study could contribute to social change by exploring the lived experiences of physicians using current EHR systems for the purpose of providing information to EHR design engineers to incorporate into the next generations of EHR systems. The design changes could contribute to improvements in health care delivery by allowing physicians to be more efficient in accessing, modifying, and storing patients' medical data. The study could also have an impact on reducing medical errors and improving interoperability within medical facilities and across organizations. This study may also contribute to positive social change by improving the communication and collaboration of physicians and EHR systems design engineers for the purpose of reducing physician burnout and increasing both the physician and the physician's patient level of satisfaction with the medical services provided during the medical office visits. In addition, the results of this study could contribute to minimizing the number of physicians taking early retirement or changing careers due to issues associated with the current EHR system design and functionality.

Studies have shown that the design and functionality of the current EHR systems fall short of the needs and preferences of physicians. The correction to current EHR systems and the design of future EHR systems need to be a collaborative effort by physicians and EHR system design engineers. This study is needed to assess physicians needs for EHR systems functionality by exploring the lived experiences of physicians working with current EHR systems.

Summary and Transition

The purpose of this study is to explore the lived experiences of physicians who have a minimum of a year working experience with both paper medical files and with EHR systems within the state of Virginia. The physicians chosen for this study were selected from the medical field of ophthalmology. The Virginia Board of Medicine Practitioner Information website (Vahealthprovider.com/search) was used to identify the participants for the study. Studies have shown that EHR systems are not supplying the benefits that were purported by the government when the systems were released to the medical community.

Chapter one introduces the study and provides the background of the study, the problem statement, the purpose of the study, research questions, conceptual framework, nature of the study, definitions, assumptions, scope and delimitations, limitations, and the significance of the study to the study, practice, theory, and social change. The information discovered from performing this study could help supply design engineers with practical guidance in designing the layout and features of future EHR systems. The outcome of this study could also serve as a source of information that could be used by

physicians to help drive governmental regulations and policies in support of standardizing the design, layout, and functionality of EHR systems among the various EHR systems designers, manufacturers, and distributors.

Chapter two builds upon the foundation of chapter one by supplying an in-depth and exhaustive synopsis of the literature concerning the subject matter of this study. Not all of the literature that was found was included in the literature review. Some of the literature contained good information but was not foundational to the study and was also outside of the five-year literature age limit for the study. I also found research literature from numerous researchers on a common topic whose conclusions did not match and in some cases diverged from each other.

Chapter two contains the strategy that was used to conduct the literature search for this transcendental phenomenological research study, the theoretical framework for the study, the literature review, and the summary and conclusion of chapter two. The literature review section of chapter two is comprised of the foundational and current literature supporting the research problem statement and research questions. Literature supporting the practical need for the study and the theoretical framework supporting the study is also included. To substantiate the need for this study, literature from similar research studies were reviewed and assessed for relevance.

Chapter 2: Literature Review

The purpose of this transcendental phenomenological research study was to explore the lived experience of physicians who have implemented an EHR system related to adopting the EHR regarding effectiveness and efficiency. Physicians are always looking for ways to make their practice more efficient and cost effective. The governmental mandate to adopt and integrate a non-standardized technology into work processes has led to usability problems, lack of interoperability, and diminished documentation quality (Kruse et al., 2016). With physicians spending more time inputting data into inefficient EHR systems, there is a need to gain a better understanding of the impact to physicians' beliefs and attitudes towards their work practices and how engineers can contribute to improving EHR systems (Heaton et al., 2016; Huang, 2017).

Literature Search Strategy

In this section, I describe the strategies that I used to search for literature applicable to this qualitative transcendental phenomenological dissertation study. In this section is a summary of the databases and search terms used to find and retrieve usable data. For the literature review I primarily used Walden's library of databases and Google Scholar.

This study was centered around EHR. To find literature germane to this topic I searched in CINAHL & MEDLINE, ProQuest Central, and Science Direct databases using the search term *electronic health records*. The search was refined using *English Language*, peer reviewed, full text, and scholarly journal as the search parameters with a

date range between January 2016 and November 2019. ProQuest Central was the most robust source for data on my topic.

To narrow the literature more closely to my topic I added the term *physicians* as the second search line to the term *electronic health records*. By adding this term to my search, I found literature on physician burnout, EHR system interoperability, EHR system implementation, and cyber security. I used the literature found in this search for comprehensive knowledge on the dynamics of the EHR system-physician relationship.

To further expand on my topic, I added the search term *engineers* to tie-in the development and design elements of the EHR systems into my study. I found through this search literature on physician face time with the EHR system and the impact on physician-patient face time and literature on the lack of standardized layouts and screen features of the various EHR systems available on the market.

I added the term *burnout* to the above search parameters and found how the use of the unstandardized EHR systems contribute physician burnout and how burnout impacts physician's workplace efficiency and effectiveness. I also found literature on how physicians have hired medical scribes to offset the clerical burden of EHR system use and has had a positive impact on physician burnout.

I also searched Science Direct, CINAHL Plush, Thoreau Multi-Database, and Google Scholar for literature on this study. I concluded my search when I did not find any new data and the data that was found was a repeat of what had already been found.

Theoretical Framework

The theoretical framework for this study was based on Davis' technology acceptance model (TAM) (Davis, 1989). With this model the researcher can address how users of new technology perceive the usefulness and ease of use of new technology (Garcia, & Silva, 2017; Lai, 2017). How the physician reacts to their perception of the technology drives the usage behavior to the technology. The TAM model is extensively used in the field of information systems and technology adoption (Asadi et al., 2017; Iqbal & Zeeshan, 2015). The TAM model was chosen for this study because the EHR system was designed for information gathering and sharing. The EHR implementation was mandated by the HITECH Act of 2009 and was reluctantly adopted by the medical community (Kruse et al., 2016). The theoretical framework of this study was based on Clausing and Holmes's (2010) concept of technology readiness. Technology readiness involves proving an innovative technology prior to placing the technology into service.

Ngenye and Kreps (2020) conducted reviews of published research on communication in the field of healthcare and found few studies based on phenomenology as compared to studies based on grounded theory and ethnographic. Ngenye and Kreps went on to say that research based on phenomenology yielded reliable results to complex questions. The need for reliable results to complex questions suited my goal for this study which was to examine the lived experiences of physicians using EHR systems.

Mason et al., (2017) conducted a qualitative phenomenology study to explore the lived experiences of rural primary care physicians and their assistants in overcoming barriers to EHR systems implementation. The study was based on the complex adaptive

system framework. Twenty-one physicians and their assistants from the state of Missouri were purposeful selected for the study. Face-to face interviews were conducted to collect the narrative data for the study. The analysis of the interview data revealed four themes that comprised the barriers to EHR implementation. The four themes included a lack of financial resources, health information exchange issues, insufficient business background, and a lack of change management (Mason et al., 2017). Mason et al., (2017) choose qualitative phenomenology to study the complex nature of the research topic and to explore the lived experiences of the physicians. My decision to use qualitative phenomenology in my study was based on the need to explore the lived experiences of the physicians

In phenomenology there are two primary theoretical frameworks that are available, Husserl's transcendental phenomenology and Heidegger's Hermeneutical phenomenology (DeHart, 2020). Husserl is recognized as the originator or father of phenomenology and Heidegger was a student of Husserl (Price, 2015). Husserl transcendental phenomenology is based on the concept of bracketing or epoche. Bracketing or epoche is the process in which a researcher suspends preconceived notions or beliefs concerning a phenomenon of interest. Since preconceived notions or beliefs are suspended no additional frameworks or lens can be used to examine the phenomenon of interest (Jackson et al., 2018). Although Heidegger was a student of Husserl, they differed when it came to the concept of bracketing. Heidegger did not support the idea that a researcher could bracket or suspend his/her judgement because the researcher could not isolate him/herself from the circumstances of the phenomenon being studied (Jackson

et al., 2018). Heidegger used the term *dasein* as the state of a person's existence in the world. Heidegger hermeneutic phenomenology is based on the hermeneutic circle. The hermeneutic circle is a revisionary process in which the researcher revises his/her understanding of a phenomenon as new information becomes available (Lengyel, 2018).

For this study, it was important that I not go into the study with preconceived ideas or beliefs that could influence the data collected and the outcome of the study. To minimize the impact of my preconceived ideas or beliefs on the outcome of the study, I needed to suspend judgement concerning the research. The theoretical framework that I used to support this goal was Husserl transcendental phenomenology, and therefore was chosen as the foundation for this study.

Literature Review

The purpose of this literature review was to synthesize the current body of research and articles relating to the influence of EHR systems on physicians' workplace efficiency and effectiveness. The information that I discovered while conducting the review was used to identify gaps in the current body of knowledge regarding EHR systems and used to solidify the focus of this study which was "The Influence of EHR Systems on Physicians' Efficiency and Effectiveness". The literature that I found during the review also contained historical significance for the implementation of EHR systems and served as the foundation for the research questions and theoretical framework of this study.

Prior to the introduction of EHR systems into the field of medicine, all medical files were handwritten documents. The paper files were useful but were often hard to

read, missing pertinent information, not easily shared within office, not easily shared with other medical facilities, awkward to navigate, and very often files were difficult to retrieve when needed (Syed et al., 2018). To minimize the inherent disadvantages of paper medical files EHR systems were introduced.

EHR systems originated during the early 1970s as the technology to revolutionize the medical community (Gold et al., 2012). In 2009 the United States government enacted the HITECH Act to promote the use of EHRs (Adler-Milstein, & Jha, 2017). EHRs are often identified interchangeably as an electronic medical record (EMR) (Collier, 2017). Although similar in function there are significant differences. EMRs were designed around the needs of the clinician and contained information on patient demographics, medical history, and surgical data. EMR contained data similar to what was loaded into paper medical files. EHRs were designed around the comprehensive informational needs of the medical team, laboratories, and the patient (Singh et al., 2020). Data entered into EHR systems are considered legal documents and must be accurate and complete and readily available for future legal and/or medical inquiry (Ka et al., 2018). EHRs were also designed to provide information to physicians for clinical decision-making, interprofessional communication, and for facilitate billing data (Wilbanks & Langford, 2019).

The HITECH Act was used to promote the use of EHRs systems as an aide to medical professionals to stimulate improvements in healthcare quality and delivery (Kuhn et al., 2015). EHR systems were touted as a vital component to the effort to modernize the health care system (Collier, 2017). In support of promoting the use of

EHR systems, \$27 billion of federal Incentive payments were made available to physicians and other medical professionals whose use of EHR systems met certain mandated criteria during the course of providing medical services to Medicare and Medicaid patients (Mason et al., 2017; Melnick et al., 2020). Although the adoption and implementation of EHR systems is continually growing, literature reporting EHR adoption and use has not supported the claimed benefits that were expected to be achieved by using the systems.

One of the most prominent problems encountered with the use of EHR systems is the lack of interoperability between systems. The lack of interoperability is defined as the inability of EHR systems to comprehensively exchange information with other EHR systems residing in medical facilities using a EHR system manufactured by a different manufacturer (Mason et al.,).

Lack of interoperability can result from incompatible functionality between systems supplied by various EHR vendors, incompatibility resulting from revised operating system changes within vendor brands, and interoperability that are the result of end user modifications and preferences (Guinn et al., 2019). One of the major drawbacks to lack of interoperability is the reduced level of confidence that the end user has in the information that is transferred into patient's medical file from outside medical facilities. Research conducted by Kolasa and Kozinski (2020) found that interoperability should be considered during the development phase of digital information systems and should take into account data format standards, data exchange, data interpretation and legal aspects of data exchange.

With the advent of EHR systems adoption, the amount of time that physicians spend in face-to-face interactions with patients has declined while the time that is allocated to desktop medicine has increased (Kruse et al., 2016). Desktop medicine is defined as activities beyond direct patient care such as ordering medication online, submitting online orders for medical procedures and tests, reviewing online test and procedure results, and electronically communicating with patients and other medical professionals (Tai-Seale et al., 2017). Tai-Seale et al. (2017) conducted a study and found that physicians apportion equal amount of time to face-to-face interactions and desktop medicine. In the study, Tai-Seale et al. (2017) also found that the additional data-entry tasks along with patients having 24-hour access to physicians through the EHR systems has contributed to physician's burnout (Collier, 2017). In some cases, physicians have lessened their desktop medicine tasks by employing medical scribes. The addition of medical scribes has lessened the physician desktop medicine tasks but has also added to physicians' personnel and financial burden.

EHR manufacturers frequently make upgrades to their EHR systems without seeking input from the physician end user. These uninformed upgrades have resulted in interruptions to physician's workflow and physician-to-patient interface as the physicians must become familiar with the changes (Sieck et al., 2020). A study by Sieck et al., 2020 found that physicians have to play an integral role in the design of future EHR systems for the systems to be useful in supporting patient care.

There has been little research into the lived experiences of physicians working through the shortcomings of EHR systems while striving to provide quality healthcare to

patients. Physicians could use the outcome of this study to inform IT engineers of the design requirements needed for the development of future EHR systems. In addition, the outcome of this study could also be used to aide in the development of future EHR systems that could support the intent of the EHR systems as purported by the HITECH act of 2009.

Physician Burnout

There have been many research studies conducted to explore the roadblocks encountered in adopting EHR systems into medical facilities. Odom and Willeumier (2018) conducted a study and found that the time involved in switching over to the new system, the costs associated with purchasing the new system, the cost to train staff, and reliability concerns with the new technology all contributed to the hesitation that many small medical facilities had in adopting EHR systems. Once installed and put into use other issues associated with the new technology became apparent. One outcome associated with the adoption and use of EHR systems was physician burnout (Odom & Willeumier, 2018; Pozdnyakova et al., 2018). Physician burnout is a complex condition and occurs when there is a sustained dissatisfaction and imbalance in the physician work-life structure, followed by emotional exhaustion, depersonalization, and coupled with a sense of inadequacy (Kemper, 2019; Stehman et al., 2019). Burn out is not unique to any one medical specialty and occurs across all. A study by Melnick et al. (2020) found that for every hour that a physician spends with a patient, he/she must spend an additional 1 to 2 hours of personal time inputting information into an EHR system. The additional clerical burden coupled with poor EHR system usability, nonintuitive user interfaces, and

information overload leads to a general feeling of dissatisfaction, diminished ability to care, and physician burnout (Collier, 2017). In this study Melnick et al. (2020) defined usability as the ability to use a product as designed to achieve a predetermined objective with effectiveness, efficiency, and satisfaction. The study concluded that the usability rating of the EHR systems currently in use, fall below the usability rating of common technologies such as Microsoft Excel which has the lowest usability rating of all common technologies (Melnick et al., 2020).

In 2016 a primary care physician closed her practice due to process inefficiencies, increased clerical duties and reduced face-to-face time with patients resulting from EHR data entry requirements (Wright & Katz, 2018). A study by Sinsky, Dyrbye, West, Satele, Tutty, and Shanafelt (2017) found that approximately twenty percent of physicians in the United States reduced their working hours, and approximately 1 in 50 exited the field of medicine as a result of factors that contributed to physician burnout. Before the end of the year 2025, the United States Department of Health and Human Services estimates the U.S. will have a 45,000 to 90,000 physician deficit (Sinsky et al., 2017). The deficit numbers take into account new physicians entering the medical field. To address this issue and preserve an adequate number of working physicians, efforts need to be made address physician burnout, dissatisfaction with EHR systems and work-personal life balance.

Studies have found that the additional EHR clerical workload is a leading contributor to physician burnout which often leads to substance use, depression, increase physician attrition rates, and suicide (Wright & Katz, 2018; Pozdnyakova et al., 2018).

In addition, substantial increases in medical errors, reductions in productivity, and increases in physician turnover have been directly contributed to physician burnout (Slavin, 2019). It is estimated that by the year 2030 there will be a shortage of 120,000 physicians which will be contributed in part to physician burnout (Davis, 2020).

Collier (2017) reported that EHR systems are more designed to make the medical billing process, coding, and protection from litigation issues easier than they are to help improve the effectiveness and efficiency of the medical processes. To lessen the impact that future EHR system designs contribute to physician burnout, EHR design engineers must engage and seek physicians' input when designing system parameters that could make the systems more intuitive and user friendly (Sieck et al., 2020; O'Donnell, Kaner, Shaw & Haighton, 2018).

Medical Scribes

There are documented positive outcomes that can be realized when EHR systems are used in support of the delivery of medical services. A few of these benefits include improved clinical care, a reduction in medication prescription errors, improved quality of care, enhanced access and manipulation of information, and improvements in scheduling patient appointments (Pozdnyakova et al., 2018; Sieck et al., 2020). These benefits, in some cases can be short lived as EHR systems are required to be upgraded or replaced as technology evolves, new features are added, and old systems become obsolete (Sieck et al., 2020). To take some of the burden of EHR system usage off the physician and to address EHR-related dissatisfaction, many medical facilities hire medical scribes.

A medical scribe is a medical employee who provides no direct medical services to patients. The medical scribe works alongside the physician, providing documentation and data entry services. The hiring of a medical scribe has been posited as a potential solution to physician dissatisfaction with the EHR system use within medical practices (Pozdnyakova et al., 2018). There are two primary classifications of scribes, the in-house scribe, and the outsourced scribe. The in-house scribe is normally selected from within the medical facility in which he/she works and is trained by the physician and staff. The in-house scribe must be versed in the language and terminology used in the medical field in which he/she works and should hold a degree as a licensed practical nurse (LPN) or as a medical assistant (MAs). In-house scribes are usually employed within large medical facilities which have the time, resources, and finances required to train the scribe (Pozdnyakova et al., 2018). Outsourced scribes are usually employed in small medical facilities which do not have the time, resources, and finances to train an in-house scribe. Outsourced scribes are hired because they require little to no training to be productive (Pozdnyakova et al., 2018). Like the in-house scribe, the outsourced scribe holds a degree as an LPN or as a MA.

A study by Pozdnyakova et al. (2018) found that physicians working with scribes experienced a reduction in workplace stress, measured an increase in workplace productivity, experienced increase levels of workplace and homelife satisfaction and freed up the physician time to allow for an increase in physician-to-patient interaction time. The results of the study also revealed that the presence of the medical scribe in the

room with the physician and patient during the performance of medical services had no noticeable impact on the patients' level of satisfaction with his/her service.

A collaborative project involving Google and Stanford Medicine is evaluating the development of a digital scribe. The digital scribe consists of voice-recognition software combined with artificial intelligence to capture relevant information during a medical visit. Once captured, the data is transferred to and recorded in the resident EHR system. The design of the system is in its infancy and due to the life-threatening impact of incorrectly recorded data, there is no current plans to put one of these systems into actual use (Collier, 2018). Therefore, physicians continue hiring and employing human medical scribes to help offset the inefficiencies of using an EHR system.

Small medical practices consisting of one to four physicians are steadily decreasing while the incident of physician burnout is steadily increasing. Like large medical facilities, the small medical facilities are hiring medical scribes to lessen the physician administrative duties. The full impact of the scribe on the operations of the small medical facilities is not well known and required additional research (Sines & Griffin, 2018). The need to hire a scribe to lessen the clerical duties of the physician attests to the inadequacy of the current EHR systems. To design-in the needed EHR features required a collaboration of the design engineers and physician during the design and configuration processes of future EHR systems.

Interoperability

President Barack Obama signed into law the 21st Century Cures Act on December 13, 2016 (Majumder et al., 2017). The goal of the act was to expedite the development of

medical treatment through policy changes, investments, drug development, the development of medical devices, and improvements in healthcare delivery (Majumder, et al., 2017). Many of the provisions of the act was based on information sharing and therefore supports interoperability. The Institute of Electrical and Electronics Engineers (IEEE) defines interoperability as "the ability of a system or a product to function within a network of similarly functioning systems or products in support of normal operation of the system or product by the end user (Kellar et al., 2017). Section 4003 of the 21st Century Cures Act echoes the IEEE definition of interoperability and adds the provision that interoperability provides for complete access, exchange and use of EHR data in accordance with State and Federal law, which emphasizes the importance that the government places on the need for interoperability (Majumder et al., 2017). In healthcare, the goal of interoperability is to reciprocally share medical information among medical facilities in support of shared knowledge and patient care. Any patient related information is shared with the pre-knowledge and permission of the patient (Kheyr et al., 2019).

Physicians working in large hospitals, multi-physician medical facilities, and single physician private practice offices are all dealing with interoperability issues with their EHR system (Hawthorne & Richards, 2017). Some of the issues that all physicians are experiencing includes inconsistent standards among EHR systems, lack of consistency in the make/model of the EHR system being used by the various medical facilities, semantics, and the potential security risk that could be incurred when data derived from human subjects is inadvertently exposed on the various systems (Kellar et

al., 2017). These factors singularly and in various combination makes obtaining true interoperability difficult to achieve. In addition to the operational and design challenges to achieving EHR systems interoperability, there are ideology issues such as should the government mandate interoperability by setting standards that all systems must meet or should the systems be allowed to naturally self-standardize through generational upgrades to the EHR hardware and operating systems (Kellar et al., 2017).

The lack of Interoperability among the various EHR systems remain a relevant and open issue within the medical community. If interoperability is ever to be achieved, then there must be a greater level of collaboration between the EHR system design engineers and the end users. The collaboration could potentially result in systems that can be used to streamline data transfer, increase data quality, have better data interfaces, and be instrumental in reducing inaccurate documentation of patient assessments (Kellar et al., 2017).

Barriers to EHR Adoption

Purchasing an EHR system is expensive and difficult. There is the substantial initial purchase cost of the computer system and software, the cost to install the system, training and support cost, disruption in workflow, clinicians' attitudes toward new technology, patient privacy and security issues, and there is no guarantee that the system produces appreciable financial returns (Singh et al., 2020; Odom & Willeumier, 2018). There have also been reports of potential benefits to EHR system adoption. Benefits such as reducing medical and prescription record errors, improving medical staff adherence to clinical procedures, and aide in increasing workflow efficiency. However, these potential

benefits have not been substantiated and in particular the benefits to workflow efficiency (O'Donnell et al., 2018). To illustrate some of the barriers to EHR adoption, the following four research studies are presented and summarized.

To examine the barriers to EHR adoption, Mason et al., (2017) conducted a qualitative phenomenological study based on the complex adaptive system framework to explore the lived experiences of rural primary care physicians and their assistant's efforts to overcoming barriers to EHR system adoption and implementation. The study took place in the southeastern region of Missouri. From the research, Mason et al. (2017) identified four themes that emerged which formed the barriers to EHR adoption. The themes included a lack of financial support, interoperability issues, change management issues, and inadequate educational business background on the part of the staff.

A study by Dutta and Hwang (2020) of the literature concerning the potential barriers to EHR adoption from the perspective of the physician was conducted. The study was focused on research literature published from 2014 to 2018. The databases that were used in search of the literature included PubMed, Web of Science, Scopus, The Cochrane Library, and ProQuest. From the literature search, 25 barriers to EHR adoption were identified. Of the 25 barriers that were identified, five were consistently considered to be primary barriers. The five primary barriers included patient privacy and security issues, high initial costs, disruption to workflows, system complexity, and lack of interoperability. The researchers went on to state that even if the barriers to implementation were resolved, the physicians' natural human behavior to resist change

could also impact EHR implementation and will need to be addressed (Dutta & Hwang, 2020).

A study was conducted to explore the factors hindering the adoption of EHR systems in seven small private practice medical facilities located in Hong Kong. The researchers, Or, Tong, Tan, and Chan (2018) examined the lived experiences of 8 physicians and 15 clinical assistants during the time period in which the new EHR systems were being implemented into the practices. The researchers used in-depth semi structured study interviews to obtain consistent data pertaining to each participant experiences and opinions. The analysis of the data revealed 14 barriers to EHR systems adoption and implementation (Or et al., 2018). Some of the factors were closely related and so grouping the similar items together there were seven primary barriers. The seven barriers include financial cost, time requirements cost, system operational factors, clinical workflow issues, technology trust issues, training, and software (Or et al., 2018). The researchers found that although there is no single methodology that can be used to ease the interoperability of EHR systems, early intervention into the identified barriers is critical to the successful adoption and implementation of EHR systems.

Researchers Sieck et al., (2020) conducted a qualitative study to identify factors that hinders the adoption of EHR systems from the perspective of the physician. Researcher's Sieck et al. (2020) conducted semi-structured telephone interviews with physicians from various medical disciplines. The disciplines included infectious disease, hospitalist, general surgery, emergency medicine, gastroenterology, neurology, pulmonology, and dermatology (Sieck et al., 2020). After the analysis of the collected

data, the researchers identified 4 primary themes that impacted physician's ability or willingness to adopt EHR systems. The themes included the impact of changes, dealing with changes, factors that assist in adaptation, and the effect on patient outcomes (Sieck et al., 2020).

The term impact to change involves technology upgrades pushed through the system by the service provider. The changes can range from a change in screen color to the repositioning of touch screen buttons. System parameter changes happen often and requires time on the part of the physician to adopt to the changes. These disruptions are not long term but hampers the physician in completing his/her work (Sieck et al., 2020).

Managing changes is concerned with how new or proposed changes to the EHR systems are communicated to the physician. Many of the changes are communicated through emails, which occur so often that physicians often experience email fatigue. Physicians sometime deal with email fatigue by not responding to the EHR system related emails until they receive a final notice email. Physicians in the study stated that changes to the EHR systems should be rolled out on a predetermined schedule to help eliminate email fatigue (Sieck et al., 2020).

The theme "Factors that facilitate adoption" deal with the changes that the physician can make in their response to EHR system changes. One of the responses that the physician can have to unexpected EHR updates and changes is to develop a positive mental attitude towards the changes. Developing an attitude that the changes are necessary and beneficial make accepting the changes easier (Sieck et al., 2020). The physician can also request to have a representative take part in EHR development focused

meetings. Taking part in the meetings allowed the physicians to have their voice heard and to feel that they contributed to the changes. Being a contributor to the changes allowed the physician to easily accept the changes that are rolled out. In addition to serving on focused committees, physicians can also learn from other physicians about how they accept and handle changes.

Impact on Patient Care

Impact on patient care involves the use of the EHR system during visits interfering with the physician-to-patient face time. The good side of EHR system use during patient visits is having on hand the complete history of the patient from all medical facilities that have implemented an EHR system. The use of the EHR system also reduces the possibility that the patient will become frustrated from being requested to provide previously giving information (Sieck et al., 2020).

The research studies presented in this section focused on the barriers to EHR systems adoption. The consistent themes throughout the studies were cost, interoperability, and disruptions to workflow. These are the same barriers to adoption that were cited in other studies that contributed to physician burnout and early retirement from the field of medicine. By being disrupters to the physician's processes, these barriers also impact the physician workplace efficiency and effectiveness.

Physician to Patient Communication/Face Time

In the field of medicine, communication/facetime is paramount for the patient to describe his/her concern or issues to the physician and for the physician to systematically ask the appropriate questions of the patient so that a suitable medical diagnosis can be

made. Communication/facetime between the physician and the patient is essential for patient centered care which has been found to result in improved medical outcomes (Rathert et al., 2017). When communication/facetime between the physician and the patient is hindered or interrupted there are negative consequences to both the physician and the patient. One of the primary hindrances to communication/facetime is the physician use of EHR systems during patient visits. The physicians use of EHR systems during patient visits has impacted and contributed to the destruction of the relationship between the physician and the patient (Zhao et al., 2019). EHR system use has been shown to redirect the physician attention from the patient to the EHR system screen, resulting in a compromised physician to patient and patient to physician communication exchange (Rathert et al., 2017; Alkureishi et al., 2016). Conversely, engaging communication between the physician and the patient has the potential to stabilize patients' emotions, support the sharing of pertinent medical information, and improve the patient satisfaction with the care received (Hitawala et al., 2020).

A study conducted by Marmor, Clay, Millen, Savides, and Longhurst (2018) examined the impact of EHR system use on physician-patient relationship from the perspective of the patient. The researchers examined the EHR system use by physicians in internal medicine, cardiology, and gastroenterology from a single medical facility. The researched started in March 2015 and was concluded in March 2016. The data for the study was obtained from the EHR system by downloading the physician hour usage report. For the same research period, the researchers also obtained the provider (physician) performance reports. The provider performance report summarizes the level

of patient satisfaction to the medical services received (Marmor et al., 2018). Data for this study was collected during normal working hours and for working hours outside of the physician normal workday. For this literature review, only the results that occurred during the physician normal workday was considered. Data obtained during working hours outside of the normal workday are not being reported in this literature review because the design of my study is confined to physician normal work hours. The result of the study indicated that the use of EHR systems during medical services negatively impacts the physician-patient relationship. From the perspective of the patient, the physician attentiveness to the EHR system equates to a lack of interest in the patient, resulting in a disruption in the physician-patient communication stream. The researchers recommended that future EHR systems be designed to function intuitively which could help minimize the disruption to physician-patient communication.

Street et al., (2018) conducted an observational study to examine the impact that the various types of physicians to EHR system interface has on patients. The EHR system interfaces that were examined included mouse clicks, keystrokes, screen gaze, switch screens, pop-ups, and data entry. Thirty-two physicians were randomly recruited from across the fields of nephrology, rheumatology, cardiology, pulmonology, gastroenterology, and primary care to take part in the study. Two hundred and seventeen patients of the physicians were also randomly selected to participate in the study. Both physicians and patients were from the VA San Diego Healthcare system and from the University of California at San Diego (UCSD) Healthcare. The researchers examined video and patient care consultations.

The results of the study showed that the more time physicians spent typing into the EHR system resulted in less questions from the patient and less active engagement of the patient with his/her consultation. Prolonged gazes at the EHR computer screen by physician also reduced the level of patient participation in the consultation. The study also revealed that physician mouse clicks or data entry into the EHR system resulted in patient silence during the consultation because the patient did not want to interrupt the physician thought processes which contributed to silence on the part of the physician and the patient (Street, et al., 2018). It was also found that the ability of the physician to continue to engage the patient in dialog while interacting with the EHR system improved the delivery of care. Future EHR systems should be designed to allow physician to deliver more patient-centered care by reducing the physicians need to redirect his/her attention from the patient.

Technology Literacy

Technology is continuously evolving and changing as new discoveries are made and ways of doing things change to suit the needs of the end user and the evolving production methods of the manufacturer. EHR system manufacturers follow the evolving technology trend to keep their products current and relevant. As the products evolve and progress, the end user's knowledge, and skills to effectively use the products must also adapt and change. However, it is basic human characteristic to resist change (Dutta & Hwang, 2020).

O'Donnell et al., (2018) conducted a study of the research literature concerning the attitudes of physicians towards the adoption of electronic medical records (EMR)

systems. As mentioned earlier in this paper, the term EMR and electronic health records (EHR) are often used interchangeably (Collier, 2017). One of the results of the study revealed that computer skill level and age impacted the adoption and use of EHR systems. Young and computer skilled physicians adopted and accepted the use of EHR systems as part of their medical regimen, while older less skilled physicians were less likely to adopt and use EHR systems (O'Donnell et al., 2018).

A study by Or et al., (2018) was conducted to explore the factors that had impacted the implementation of EMR systems into private practice clinics. The clinics that were selected for this study were located in the country of Hong Kong and the clinicians were in the early stages of implementing their EMR systems. The data for the study was obtained through in-depth semistructured interviews with the private practice clinicians. The result of the study revealed that the clinicians had insufficient technology knowledge and skills which had a significant detrimental impact on EMR implementation. The clinicians were found to be lacking in typing proficiency and EMR system operational knowledge (Or et al., 2018). The lack of technology knowledge and skills impeded the clinicians from embracing the EMR systems. To correct the clinicians lack of technology literacy, the researchers suggested that the clinicians be involved in the early stages of future EMR systems development (Or et al., 2018).

EHR System Cost

EHR systems are expensive to purchase, maintain, and to update. Implementing and operating an EHR system requires a substantial outlay of capital for equipment, software, training, and maintenance. Despite the time and capital expenditures needed to

implement the systems there are those who question the need of the system or the lack of return of the value of the investment (Mason et al., 2017).

Physicians who have implemented EHR systems and use the systems during patient encounters, have experienced a reduction in the volume of patients that are seen during a normal workday. The reduction in patient volume consequently results in a reduction in revenue for the physician and his/her practice (Sines & Griffin, 2018).

Without an intervention to compensate for the reduced patient volume, such as hiring a medical scribe, the physician and his/her practice is subject to financial loss and disruption in workflow efficiency. The impact of the cost factors for implementing and operating EHR systems are greater for small and private practice facilities that do not have the financial resources that the larger and better funded facilities have (Or et al., 2018).

EHR System Usability

In this section of the literature review the subject of EHR system usability is briefly discussed. Usability is defined as the degree to which the end user can specifically utilize a product to accomplish predetermined goals and objectives with effectiveness, efficiency, and satisfaction (Melnick et al., 2020). For this paper, the product is the EHR system, and the predetermined objectives is to attend to the needs and concerns of the patient.

The U.S. government has over-sight of the development and functionality of EHR systems. EHR system usability is overseen by the Office of the National Coordinator for Health Information Technology (ONC) (Ratwani et al., 2018). The ONC goal was to put

into place policies that require EHR system designers to incorporate feedback from physicians into future designs of the systems. The ONC also mandates testing high-risk EHR functions that relate to medication.

EHR system use during patient office visits are not meeting the expectations of physicians. Unmet usability expectations have resulted in physicians expressing frustration with the EHR systems and a developing a general sense of dissatisfaction with the medical profession. Physicians have stated that EHR systems are not intuitively operable, and studies have shown that the operational problems are causally linked to physician burnout (Melnick et al., 2020). To compensate for the usability issues of the EHR systems, physicians are developing and using technology workarounds.

Documented use of EHR system workarounds have been noted since the passing of the HITECH Act in 2009 (Barrett, 2018). Workarounds are defined as actions or inactions specifically designed by the user to complete a task or sequence of tasks by means other than the actions or inactions intended by the system designer (Koppel et al., 2008). Workarounds are also defined as behaviors that technology users adopt to overcome perceived limitations in the functions and parameters of the technology being used (Friedman et al., 2014). One example of a workaround is the use of sticky notes during physician consultation with patients. By using sticky notes physicians noted that they keep more engaged with their patient than he/she would have if they had turned from the patient to enter data into an EHR system during the consultation. At the conclusion of the physician consultation with the patient the physician would engage the EHR system to input data from the sticky notes into the system. Workarounds are

perceived by the users as time savers and as aides to process efficiency. To others who use the data inputted from the workaround process may find it difficult to find and retrieve the data and to comprehend and utilize data which may be composed of none standardized phases and terms (Barrett, 2018). Additional research is needed to examine the impact of workarounds on patient care, safety, and increases in insurance company liability (Barrett, 2018).

Clinical Workflow

Clinical workflow involves the processes that clinicians and medical staff use to access and collect patient data, the methods and timelines that are used by medical staff to enter patient data into the EHR system, and the processes that are used to administer effective patient care (Fauss, 2018). In general, clinical workflows are task that are required to be systematically performed to achieve a desired medical outcome (Hans et al., 2018). The introduction of EHR systems into the medical field has had little to no impact on improving clinical workflows but has markedly contributed to user dissatisfaction with the system and administrative burden (Guinn et al., 2019). A scholarly journal paper published by Krawiec, (2019) reports that the use of EHR systems have a significant positive impact on reducing the occurrence of medical errors, and patient mortality. The use of the EHR system also continues to be a source of disruption to clinicians and medical staff workflows. The increased need to focus on the EHR system screen to input and retrieve data during patient medical visits results in workflow inefficiencies. Although the use of EHR systems in medical practices have not made improvements to medical workflows, future development of EHR systems should made

with a collaboration of the EHR system design engineer and the end users to improve the system impact on workflows.

System Interface Design

The terms, system interface and user interface was used interchangeably throughout this study, and based on the researcher tendencies, the term system interface was the term that was used most often. With the introduction of computers, gaming systems, cell phones, tablets, and smart watches the use of computer screens for human-to-computer interactions have become common, familiar, and the preferred method of interaction (Jiang & Fang, 2020). No two people are perfectly aligned with their preferences on what and how they want data, screen layout, screen size, and screen colors to be designed into a system. What is considered important to one person may be an hinderance or unimportant information to another. Determining how much and where to place data on the computer screen has been an issue since the development of the computer screen (Jiang & Fang, 2020). Designing in as much information as possible on the computer screen has proven detrimental to data clarity and usage. Designing in a moderate amount of data has been found to support data clarity and usage.

A study by Or et al., (2018) found that physicians and clinical assistants wanted their EHR system interfaces to be customizable to suit current and emergent needs and preferences. To be effective for use, EHR system interfaces should be designed to support the cognitive and functional performances of the user, the user needs, and expectations (Or et al., 2018). EHR systems that are not designed to support the end user have resulted in end user stress, negative use experience, inefficient outcomes, medical

errors, and non-use. In the medical field poor user-interface can have detrimental impact to the health and safety of the patient (Wilbanks & Langford, 2019). A leading cause of medical errors is the physician working with inadequately customized EHR systems (Wilbanks & Langford, 2019). Systems that hard to read, maneuver and understand does not contribute to the efficiency, effectiveness, and outcomes of medical interactions. Therefore, engineers designing future EHR system should consider the results of research on interface design to minimize past design failures and to include physicians and clinical assistants as consultants for the new designs.

EHR Information Burden

The in-box of EHR systems can become inundated with information. Some of the information is critical to the physician and the health and safety of his/her patients. Other information consists of general health guidance, alerts, and low-value information that serves as time and attention distractions. EHR system serves as the primary delivery system for test results, refill requests, and referral information. Primary care physicians spend on average one hour per workday managing EHR systems inbox messages. The burden of managing the inbox messages can and has contributed to physician dissatisfaction with his/her job and physician burnout, and loss of situational awareness (Murphy et al., 2019). As stated by the United States Veterans Affairs (VA), 70% of the VA physicians have indicated that the volume of messages in their EHR systems are unmanageable and 30% of the physician's report that they have inadvertently discounted critical procedural results as a consequence of the information overload (Shah et al.,

2019). To make improvements to the EHR messaging system, requires an understanding of the design and system function (Shah et al., 2019).

Murphy, Satterly, Giardina, Sittig, and Singh (2019) conducted a study to determine the strategies that could be used to improve the efficiency of using the EHR inbox. The researchers developed a mixed-method study of the physicians working for the Departments of Veterans Affairs (VA). Data for the study was collected using surveys and interviews (Murphy et al., 2019). Five themes emerged from the study; The EHR system inbox notifications should be limited to actionable items, Inboxes should be designed to maintain messages, the functional efficiency of EHR inboxes need to be improved, the managing of the EHR inbox content should be a team effort, and a dedicated time slot should be set aside to manage the EHR inbox messages (Murphy, et al., 2019). The results of this study align with the results of previous studies in that the design and functionality of the current EHR systems continue to fall short of the original vision for the EHR system. The design and functionality short comings of the EHR systems continue to contribute to job dissatisfaction and physician burnout. Job dissatisfaction and physician burnout impacts the physician efficiency and effectiveness and helped in driving the focus of my research study. To help move the design and functionality of future EHR systems closer to the original vision for the systems, design engineers, physicians, and clinicians need to collaborate throughout the design process.

EHR and Cyber Risk

Technology has an impact on the way we work, play, and engage in our leisurely pursuits. From our arm chair the television can be controlled, lights turned on and off,

music volume controlled, security cameras can be commanded to playback events, and phone calls can be placed and ended. In the medical community, EHR systems are an ever-evolving technology that is being used in large medical facilities and small private medical practices. As written about elsewhere in this proposal, there are good and bad aspects to using EHR systems, and there are also risks involved. In this section cyber risks are discussed.

Cyber risks are actions that negatively impacts the operation and integrity of information technology (IT) assets and serves to compromise the confidentiality and availability of information and the integrity of the IT equipment and infrastructure (Sardi, Rizzi, Sorano & Guerrieri, 2020). Personal information such as the patient's name, birth date, blood type, social security number, insurance information and genetic information are often stolen. Personal health information is valued on the dark web and is worth more than credit card or social security number information. Once compromised these types of information cannot be restored nor can the privacy of the patient (Argaw, Troncoso-Pastoriza, Lacey, Florin, Calcavecchia, Anderson, Burlison, Vogel, O'Leary, Eshaya-Chauvin & Flahault, 2020). The loss of the privacy data combined with the loss of the patient confidence and possible financial loss has long term detrimental impact to the patient and the medical facility. The compromised information can require medical facilities to delay medical procedures and could place patients' lives at risk. The person, persons or entity committing cyber-security breaches of medical facilities are rarely found (Argaw et al., 2020).

In the world of finances, there are policies and procedures in place to compensate a customer of a business or a financial institution if he/she suffers financial loss because of cyber-security issues. In addition, financial institutions and most large businesses have the resources to invest in cyber-security monitoring, preventive, and recovery measures. Conversely, the medical field is in its infancy when it comes to the field of IT. The medical field has a history of underinvesting in projects, is cost constrained by the government, has little experience and expertise in cyber-security, and has limited resources to invest in and support cyber-security (Argaw et al., 2020).

Ransomware is used to encrypt an infected device to lock files for the purpose of extorting a ransom from the owner of the files for the key to unlock the files. Ransomware is spread through what appears to be a legitimate email from source known by the intended victim (Spence et al., 2018). In October of 2019 there were ten cases of ransomware attacks on hospitals. Three of the attacks occurred in the State of Alabama in the U.S. and seven occurred in country of Australia. The attacks disrupted the hospital workflows and required incoming patients to be diverted to other local hospitals. The 2020 outbreak of the Covid-19 pandemic saw a spike in the incidents of cyber-attacks. From January 2020 to April 2020, the World Health Organization reported that the number of detrimental incidents of cyber-attacks are more than five times more than they were one year ago (Sardi et al., 2020). These cyber-attacks are the result of deliberate and accidental actions and inactions of people and technology. These attacks are continuing to be an issue with medical facilities with IT driven EHR systems (Argaw et al., 2020). The healthcare industry is one of the primary targets for ransomware because

it lacks a robust IT security infrastructure and because physicians are willing to pay the ransoms because they require the most up to date medical files of their patients.

Uninformed patient treatments can result in improper patient care, patient harm and medical malpractice suits (Spence et al., 2018).

The incidents of cyber-attacks continue in the medical field and other fields that depend on IT. A study by Koczkodaj et al., (2019) found that 173 million data breaches of EHR systems have occurred since October 2009. October 2009 was the date that the recording of data breaches began. Small medical practices that do not have the financial backing of the larger medical facilities often suffer the most due to the lack of a robust IT infrastructure. The added threats of cyber security breaches can impact the efficiency and the operation of small medical facilities.

EHR System Templates

One of the purposes of integrating an EHR systems into a medical practice was to ease the clerical burden of the physician. EHR system were designed with pre-populated templates that allowed the physician to change only what was required to make a record suitable to a particular patient. These prepopulated forms were designed to save the physician time by not having to enter data in certain data fields which theoretically would result in a higher quality of care (Musher et al., 2019). The systems were also designed so that the physician could save time by cutting and pasting his/her own notes or the notes from other physicians into a file.

The disadvantage of using the prepopulated EHR system templates is that physicians can inadvertently or purposefully omit or retain data that was not germane to

the patient being seen and therefore would be subject to the act of fraud (Musher, et al., 2019). Fraud, in the case of EHR systems, involves the overt or deceptive act of entering or retaining discrepant data in the EHR system. Although medical fraud is not normally directly attributed to medical notes, it is the results of the notes. The cases of fraud are normally attributed to improper reimbursements (Musher et al., 2019). The researchers suggested that the EHR systems be designed so that the physician can populate the EHR templates with yes or no answers or left completely blank for the physician to fill in data applicable to the patient being seen.

Technology Acceptance Model

History has shown that the use of technology influences the ability of persons or organizations to respectively obtain personal and professional goals. The decision to integrate a technology into personal and professional goals is determined by the predictor factors of perceived usefulness and perceived ease of use of the technology (Huang et al., 2021). Perceived usefulness is defined as the end user perception that the adoption and use of the technology enhances the end user job performance. Studies have shown that perceived usefulness is the primary factor in determining new technology acceptance and use (Kalayou et al., 2020). The term perceived ease of use is defined as the end user perception that the technology as designed works as described to perform the intended outcome (Huang et al., 2021). Perceived ease of use is the component of TAM that predicts the acceptance or rejection of the new technology (Huang et al., 2021).

Davis (1989) developed the technology acceptance model (TAM) based on the social psychology theory of reasoned action by Fishbein and Ajzen (1977) for his 1989

dissertation. The theory of reasoned action is based on the premise that social behavior is linked to the user attitude and intention to perform (Sanyal et al., 2017). The theory was conceived to explore the end user acceptance of new technology (Matikiti et al., 2018). The end user in this model can be characterized as an individual or an organization. The TAM model is founded on the premise that the end user motivation to use a technology is influenced by how easy the technology is to use and by the benefits that can be realized from using the technology (Matikiti, et al., 2018). Although TAM has been applied across a wide range of new technology applications, the primary focus of the TAM model is the field of information technology which aligns with the EHR information system of this study. The TAM model has also been extensively used in the healthcare field to assess the acceptance or rejection of information technology (De Benedictis et al., 2020).

A qualitative study was conducted by Sieck et al. (2020) to identify factors that impact the decision of physicians to use or not use an EHR system. Nine physicians from a Midwest academic medical center were interviewed by phone. The physicians interviewed were from the fields of infectious disease, hospitalist, general surgery, emergency medicine, gastroenterology, neurology, pulmonology, and dermatology. The interviews were semi-structured and were thirty minutes in duration. The interviews included questions concerning physician's background and qualifications, years of EHR use, EHR training, impact of EHR system use on productivity, and EHR system use on communication and interoperability (Sieck et al., 2020). The researchers used the extended TAM (TAM2) model which included the factors of the original TAM model with the addition of the factors of quality, social environment, and technology use. The

objective of the study was to understand the adaptation of physicians to EHR system use. The researchers found that the physicians wanted to be involved in the design, development, training, and communications regarding EHR design and upgrades which could help improve the adaptation to EHR system use (Sieck et al., 2020). This study is important to my study because of the implementation of similar parameters. Both studies are qualitative and involve EHR systems, physicians, and the TAM model. This study also supports the need for additional research concerning physicians and EHR system use and supports the use of the TAM model as a framework for EHR system use. Although the TAM model has gone through revisions over the years (TAM2, TAM3, unified theory of acceptance, etc.), this study was based on the original TAM model which has been shown to be consistently effective (De Benedictis et al., 2019).

A study by De Benedictis et al., (2020) was conducted to explore the factors that inhibit medical professionals from helping in the process of implementing Electronic Medical records (EMR) within hospitals. The term EMR is often used interchangeably with the term EHR, but they are not the same. Functionally, EMRs are the electronic version of the old paper medical records and serve as a record for the medical practice. EMR medical files are not easily shared among medical facilities. EHRs have high levels of functionality such as interoperability, medical alerts, ability to fill prescriptions, and schedule office visits and procedures for patients (Singh, et al., 2020).

The case study research was conducted in an Italian University Hospital in Rome and a combination of physicians and nurses took part in the study by completing a survey which consisted of a 7-point Likert scale. 114 acceptable surveys were returned

complete. The framework of the study was based on the TAM model. The results of the study revealed that peer influence and perceive usefulness were the primary determinants to EMR use.

A study conducted by Comer et al., (2018) was designed to explore medical professionals' perception of the usefulness of community health measures based on EHR systems. The researchers sent out one hundred and thirty-three requests to local public health workers in thirty-one health departments in the state of Indiana to complete an online survey. The researchers also sent out a questionnaire composed of fifteen questions requesting data on demographics, use of community health measures, and geographic interest in support of the survey. The researchers used the TAM model as the framework for the study. The TAM model was used because the researchers wanted to understand the community health workers perceived usefulness of a proposed community measure. By exploring the perceived usefulness of the community health measures the results of the study could help in facilitating the adoption of EHR systems within the health agency (Comer, 2018).

The TAM model is useful when new technology is being introduced and there is a need to understand the parameters that could either support or reject the technology adoption. My research study was used to explore the impact that existing EHR systems are having on physicians. I explored the perceived usefulness and perceived ease of use components of TAM to understand from the perspective of the physician how the EHR systems are currently impacting the physician workplace efficiency and effectiveness.

Summary and Conclusion

EHR systems were designed with the intention of improving medical processes for the physicians and the medical outcomes for the patients. From the inception of the implementation of EHR system there were problems which could not have been imagined by the design engineers. Knowing how to design a system that works well in the design lab does not necessarily mean that the system works well within the sphere of real-life working conditions, nor does it mean that the system can be accepted.

From the beginning of the EHR systems roll-out, many of the older physicians were not receptive to having to switch from the familiar paper filling system to the new electronic systems. Some of the older physicians were also not technically literate and experienced frustration in using the EHR systems. As presented earlier in this literature review, some frustrated physicians retired early rather than to face the daily dissatisfaction with using the EHR systems. Patients have also expressed their frustration with the physician using the system during medical visits. The diminished eye-to-eye contact, the reduced level of personal conversation, and seemingly lack of engagement of the physician with the patient has been mutually diminished during the medical visits. Both physician and patient are impacted by the introduction of the EHR system into the medical visit. Some patients perceive the EHR system as the introduction of a third person into the medical examination room.

Physicians are experiencing increased clerical duties due to the introduction of the EHR systems. The need to be technology literate while providing the pre-EHR system level of patient care is placing additional stress on the physicians. Physicians are

compensating for the introduction of the EHR systems by postponing entering data into the EHR system during patient visits and are entering the data during their afterwork hours, which is decreasing the physician satisfaction level of his/her work-home life balance. Physicians are also compensating for the increased clerical workload by hiring medical scribes. While hiring the scribes takes the clerical load off the physician, it is offset by the financial burden that the physician must endure to hire the medical scribe.

One of the detrimental outcomes that can be contributed to the use of EHR systems is physician burnout. Physician burnout is due in part to the inefficiencies in the configuration and operation of the EHR system. Burnout occurs when the physician becomes emotionally exhausted, has feelings of depersonalization, and experiences reduced personal accomplishments. Physicians experiencing burnout often cope with the condition by retiring or quitting the medical field, self-medicate with alcohol and drugs, and in extreme cases commit suicide.

EHR system data breaches are continuing to be a problem for the medical community. The loss or corruption of data erodes the trust of patient with medical facilities who are supposed to keep the patient data safe and for the physician whose trust in the IT community is eroded by the data breaches. The patient can change physicians when they feel that their physician is not protecting his/her data. The physician has less options when it comes to data breaches and must deal with the problems as they occur. The issues with data breaches negatively impacts the physicians work processes.

In addition to data breaches which are the results of outside entities, physicians also data issues from the physicians themselves. While using the EHR systems

physicians are faced with inputting patient data into prepopulated templates. The failure of the physician to remove data from the EHR system prepopulated templates that are not related to the patient being treated could result in data fraud. Physicians can also incorrectly input data into the EHR by entering data through the cut and paste process.

Although there are beneficial outcomes to implementing EHR systems, the nonbeneficial outcomes of using the systems are impacting the efficiency and effectiveness of physicians in carrying out their duties. Studies have been conducted to examine the negative impact that EHR system use has on physicians. I have found little research of the impact of the use of EHR systems on physician efficiency and effectiveness from the perspective of the physician. The goal of the outcome of this study is to determine from the perspective of the physician what changes are needed to improve the layout and the functionality of the system to make it more supportive of the physicians' duties and less stressful in the use of the system.

The literature review identified reoccurring themes that are related to physician workplace efficiency and effectiveness. The themes are physician burnout, medical scribes, interoperability, physician-to-patient communication, technology literacy, EHR system cost, EHR system useability, clinical workflow, System interface design, and cyber security. The research design presented in the following chapter 3 was used to examine these themes as they relate to the gap of this study which is the impact of EHR system use on physicians' workplace efficiency and effectiveness.

Chapter 3: Research Method

The purpose of this transcendental phenomenological research study was to explore the lived experience of physicians who implemented an EHR system and the impact to effectiveness and efficiency. Physicians are always looking for ways to make their practice more efficient and cost effective. The governmental mandate to adopt and integrate a non-standardized technology into work processes has led to usability problems, lack of interoperability, and diminished documentation quality (Kruse et al., 2016). With physicians spending more time inputting data into inefficient EHR systems, there is a need to gain a better understanding of the impact to physicians' beliefs and attitudes towards their work practices and how engineers can contribute to improving EHR systems (Heaton et al., 2016; Huang, 2017).

Research Design and Rationale

The focus of this qualitative transcendental phenomenological study was to explore the lived experiences of physicians who have implemented an EHR system. I chose phenomenology because of the need to examine the phenomenon of interest from the perspective of the physician. It was required that all of the participants have had similar experiences with the same phenomenon to answer the central research question: What are the lived experiences of physicians who have implemented an EHR system? The sub-questions are:

What experiences have physicians encountered that influenced their decision to to use paper medical files or to convert to EHR systems to document patient encounters?

Three research questions were developed to answer the research question.

1. How has physician efficiency and effectiveness impacted patient care?
2. How has physician efficiency and effectiveness impacted the physician patient relationship?
3. What impact, if any, does using a EHR system have on physician to patient communication?

None of the other research designs met the requirements needed for this study.

Role of the Researcher

The researcher serves as the principal instrument for collecting data in qualitative research studies (Janesick, 2011). In this qualitative transcendental phenomenological study, one-on-one semi structured interviews were used to collect narrative data from physicians who have had experience with EHR systems. As the researcher I organized, analyzed, stored, and processed the data. No observation data was collected.

I have no work experience in the field of healthcare, and I have had no personal experience with EHR systems. I had no supervisory, instructional, or professional relationship with the participants that took part in this study. I have a personal relationship with one of the medical specialists in the field of ophthalmology. One of the ophthalmologists is my wife. As my wife I personally confirmed her credentials. The research questions asked of my wife were the same semistructured questions that were asked of all participants.

To minimize overall bias in this research study I invoked epoche. Epoche is the Greek term which means to reframe from judgment (Patton, 2015). Epoche has been used by researchers to become aware of their own biases and prejudices and see the

phenomenon of interest from a fresh prospectus. Epoche is a necessary and ongoing phenomenological procedure (Patton, 2015).

Ethical issues were considered and addressed throughout the development and performance of this research study. All research plans were presented to, reviewed by, and approved by Walden University Institutional Review Board (IRB) prior to the data collection. \$15 gift cards were provided as a thank you to each of the 5 participants. With help of the IRB, I developed the informed consent form that were signed by the participants prior to taking part in the study. Prior to conducting the research interviews I reviewed the informed consent form and the purpose of the study with the participants. The participants were reminded that they could quite the study at any time for any reason without the fear of reprisal.

Methodology

Participant Selection Logic

To examine the individual experiences and meaning of a common phenomenon, I used purposeful sampling to select the participants. Purposeful sampling was defined as the process of intentionally selecting a small number of participants, who had intimate experience with the phenomena of interest from which information-rich data was obtained (Suen et al., 2014). With purposeful sampling I had the option of applying inclusion factors to the participant selection process for the purpose of eliminating participants whose input was not relevant in supporting the study's purpose (Ritchie et al., 2013). To support this study the participants were selected based on the following eligibility criteria:

- (a) The participant was degreed physician,
- (b) The physician had experience recording medical data using paper medical files and EHR systems to document patient information,
- (c) The physicians worked in the State of Virginia to limit the scope of the study,
- (d) The physicians were willing to provide detailed lived experiences information,
- (e) The physicians were willing to make themselves available for interviews by telephone,

To ensure that the research encompasses a diverse perspective of the research phenomenon, a maximum variation sampling strategy was used (Merriam & Tisdell, 2016). Maximum variation sampling involves selecting participants with diverse backgrounds who may have different perspective on the research phenomenon (Merriam & Tisdell, 2016).

The participants credentials were initially obtained through telephone conversations with the participants. To verify the credentials, I cross referenced the information provided by the participants against the information posted in the publicly available Virginia Board of Medicine website (www.dhp.virginia.gov/medicine.com), Virginia Physicians Inc. website (www.vaphysicians.com), and the AMA Physician Masterfile website (www.sgim.org). Online directories were convenient and cost-effective resource to identify and confirm participants credentials as meeting the requirements of a study (McCormack et al., 2013).

To determine the physician's availability and willingness to participate in the study I mailed letters through the U.S. postal service to potential participants providing

details of the study and requesting a response of their willingness to participate. Each participant that showed a willingness to participate in the study was sent an informed consent form.

Qualitative research is based on studying a small number of participants while focusing on extracting deep and rich descriptive information from each of the participants (Merriam & Tisdell, 2016). Polkinghorne (1989) posited that five to 25 participants be selected for a qualitative phenomenological study. For this study I planned a range of 20 to 40 participants for the initial interviews. If saturation was achieved with the initial participants, then the interviews would cease, and the data collection would be considered sufficient for the study. Data saturation is described as the point at which adding additional data no longer yields new information (Aldiabat & Navenec, 2018). This study was conducted during the COVID-19 pandemic and the number of participants for the study was five.

Instrumentation

In qualitative research, the researcher serves as the primary data collecting instrument (Peredaryenko & Krauss, 2013). I was the researcher for this qualitative transcendental phenomenological research study, and I served as the primary data collection instrument. The data was collected through the administration of a semistructured interview by telephone. The semistructured interviews consisted of open-ended questions which I presented to the participants which allowed the participants to answer the questions without my influence (Merriam & Tisdell, 2016). Each primary

research question was followed by interview questions which allowed the participants to elaborate on answers already given or to add additional information.

In phenomenology research, the interview is the primary method for recording the participants' lived experience with a phenomenon (Brinkmann, 2013). The interviews were recorded manually with pen and paper and electronically with a handheld digital voice recorder and an external microphone equipped Apple notebook computer.

The interview process was guided by an interview protocol that I developed for the study. The interview protocol is a tool used to help facilitate the interview process by ensuring the consistency of the questions asked and to ensure that the interview is conducted within the pre-determined timeframe (Gugiu & Rodriguez-Campos, 2007). The interview protocol was used to establish the trustworthiness of the collected data (Kallio et al., 2016). The interview questions were presented in ascending order of difficulty to help build the trust and confidence of the participant (Fusch & Ness, 2015). The interview protocol contained promptings for the following dialogue between the participants and me:

1. I discussed the background and purpose of the study,
2. I provided the participants with my contact information,
3. I discussed informed consent and provided opportunity for the participants to sign the informed consent form,
4. I discussed participants right to confidentiality,
5. I asked the participants permission to record the interviews
6. I administered the interview questions,

7. I asked the participants' permission for follow-on interviews at an later date if needed,
8. I supplied close-out comments.

Triangulation of the research data was planned to enhance the creditability and reliability of the data (Fusch & Ness, 2015). I planned to interview physicians of various ages, ethnicities, and gender to obtain different perspective on my topic. The data for this study was planned to originate from semistructured interviews and from operating procedures and guidelines. In addition, it was planned to use member checking to verify the accuracy of the data (Birt et al., 2016). Member checking involves supplying transcripts of the research data to each research participant to assess the accuracy of the data. Member checking also provides the participant the opportunity to add to or edit the data. Due to the impact of COVID-19 on physician time and availability triangulation was not performed.

Procedures for Recruitment, Participation, and Data Collection

The participants for this qualitative transcendental phenomenology research study were physicians purposefully selected from medical practices located in the state of Virginia. Five physicians took part in this study.

The data for this study originated from physicians supplying answers to open-ended none-leading research questions. Semi structured interviews were conducted by telephone. Telephone interviews was not the preferred method for obtaining data because none-verbal body and facial reactions cannot be seen and documented. The advantage of telephone interviews was that I was able to conduct interviews during the

height of the COVID-19 pandemic. The disadvantage of telephone interviews was that I was not exposed to the participants informal body and facial communications (Merriam & Tisdell, 2016).

In this qualitative research study, I was the key data collecting instrument (Merriam & Tisdell, 2016). The data for this study was generated by the interviewee responding to open-ended research questions.

Prior to the start of each interview session I reviewed the purpose of the study with the participant, stated the length of the interview, reviewed the rights of the participant to refuse to answer any and all questions, reviewed the participant right to obtain a copy of the research results, reviewed the participant right to privacy, and reviewed the participant right to end participation in the study at any time for any reason without the fear of reprisal from the researcher. I treated each interviewee with courtesy and respect. The interview sessions for this study were held to an hour. Ten interviews were proposed to be conducted per week and the interviewing session were proposed to end when saturation of data was reached. During the interviews, I read the research questions clearly and succinctly to make sure the participant understood the question. The interviewees were allowed to answer the questions to their satisfaction. I asked additional questions to when help was needed to fully understand the interviewee answers.

Data Analysis Plan

A data analysis plan provides the reader with sufficient details to allow the reader to understand why the study was conducted and how the study was conducted. The plan

should include details on the design of the study, the type of data to be collected, the data collecting instrument, data handling, and any software that was used in organizing and analyzing the data (Merriam & Tisdell, 2016).

For this qualitative transcendental phenomenology study, the interview data was audiotaped with two Tascam DR-40X portable digital recorders. The second recorder served as a back-up to the primary unit. Handwritten notes were taken during the interviewing sessions. To transcribe the data, I listened to the audiotaped interview sessions and type the data into a Microsoft Word file. By transcribing the data, I took an opportunity to review the data and I identified patterns and trends. If the transcribing process become too burdensome, I used one of the available automatic transcription software such as Audacity and Express Scribe Transcription (Adu, 2019). The data was analyzed with MQDA Miner Lite which is a computer assisted qualitative data analysis software (CAQDAS). MQDA Miner Lite was used to support the analyses of text, audio, pictures, webpages, and social networks. Data collected during the interviewing sessions was analyzed the same day as it was collected. The daily analyzation of data helped provide early insight of the data and was used to identify data saturation.

For this study there were four questions, one central question and three sub-questions. The central question was: What are the lived experiences of physicians who have implemented an EHR system? The research questions and the interview questions are the same which provides a one-to-one connection with the data that is being sought.

Coding

Coding, in qualitative research is the process in which text data is examined, labeled, compiled, and organized into meaningful themes or categories for further analysis (Merriam & Tisdell, 2016). The term code is defined as a word, short sentence or phrase that is assigned to parts of a transcript to identify and group interrelated patterns and/or actions or ideals together (Williams & Moser, 2019). There are many methods for coding data such as process coding; coding based on human physical or mental actions, in vivo coding: coding based on participants language, descriptive coding: coding using nouns to summarize data, values coding: coding based on what participants value, dramaturgical coding: coding based on participants wants, needs, or motives and versus coding; coding based on conflicts and power struggles (Elliott, 2018). This study was based on the wants, needs, and motives of the participants and was well suited for values coding. Any discrepant data found during data analysis was addressed with a follow-up the participant.

Issues of Trustworthiness

Credibility

Credibility in qualitative research determines whether you can believe the research results (Henderson & Rheault, 2004). There are many strategies available to establish credibility including reflexivity, prolonged field engagement, thick description, triangulation, seeking negative instances, member checks, and peer debriefing. (Merriam & Tisdell, 2016) recommends that two strategies be used in a study. I chose peer debriefing and member checking to institute credibility.

Peer debriefing involves having a skilled qualitative researcher, not affiliated with the study, meaningfully challenge all aspects of the study. The peer for this study was a PhD graduate in Systems Engineering from George Washington University. The peer researcher was selected to provoke critical thinking in the researcher and to help ensure that the study results were derived from the study data. Peer debriefing enhances credibility and trustworthiness (Hadi & José, 2016). Due to the COVID-19 pandemic the peer reviewer was not used.

Member checking is the process of having the participants in the study review and confirm the research data and findings (Hadi & José, 2016). Feedback from the participants was to be used to correct or expand on the research data and results. Member checking is considered to be invaluable to the credibility of the study (Hadi & José, 2016). To accomplish member checking each participant is explained the purpose of member-checking and are asked if they are willing to take part in member checking.

Transferability

Transferability is defined as the ability to apply research findings to similar settings or groups beyond those that were part of the original research (Cope, 2014). Lincoln and Guba (1985) stated that it is up to the reader to transfer the results of the study to other settings based on the thick descriptions provided by the researcher. The strategy for implementing transferability in this study I provided thick and rich descriptions of all aspects of the study concerning the phenomenon. In this study transferability was established by providing the reader with the strategy for purposeful sampling participants and by providing thick and rich descriptions of the background of

the study, the settings in which the study took place, descriptions of the participants, the context of the study, and the findings of the study (Merriam & Tisdell, 2016).

Dependability

Polit and Beck (2014) defined dependability as maintaining the continuity of the research parameters over the course of the study. Research dependability can be established and maintained through the incorporation of an audit trail, peer debriefing, and prolonged engagement with the research participants (Hadi & José, 2016). In this study, dependability was established and maintained by making sure the research process is logical, detailed, and documented (Merriam & Tisdell, 2016).

Confirmability

Confirmability is the qualitative concept of insuring that the research findings originate from the research procedures and data and not from the researcher's biases and prejudices (Bloomberg & Volpe, 2019). Confirmability can be established through triangulation strategies, reflexivity, dialogic engagement, and reflective discourse. In this study I established confirmability by providing reasoning for my methodological and theoretical research choices and provide details so that the research data can be traced back to its origin. I also kept an ongoing reflexivity journal of my study. Throughout this study. I was open to critical questioning and be transparent regarding any aspect of the research process (Bloomberg & Volpe, 2019).

Ethical Procedures

Following the approval of the dissertation proposal, the proposal was automatically submitted to the Walden University Institutional Review Board (IRB) for

review and comments. Concurrently with the submittal of the dissertation proposal for approval, I completed and submitted Walden's form "A" to the IRB for approval. Form "A" is titled "First Step of Ethics Review (2019)". Following the approval of form "A" I worked closely with the IRB to develop the participant consent form and research flyers/invitations for study participation.

When my study was approved to go forward, I provided prospective participants with an informed consent form by way of the U.S. Postal Service, by email, or hand delivered. The informed consent conveyance method was based on the proximity of the participant to my location. The informed consent form contained the following information:

- The name and contact information of the researcher
- A summary and purpose of the study
- Name of sponsoring institution
- Risks / benefits to participants of study
- The participant selection process
- Information concerning the participants' right to withdraw from the study at any time and for any reason without the risk of reprisal
- Participants guarantee to privacy (Merriam & Tisdell, 2016)

The data that was collected and analyzed during the study has been stored for a period of 5 to 10 years (Merriam & Tisdell, 2016).

Summary

The purpose of this study is to explore the lived experiences of physicians working with EHR systems. EHR systems were developed to lessen the burden of documenting patient's information, help in providing universal access to patient files, reduce medical errors, and increase the number of patients that can be seen in a day. This study is based on Husserl's transcendental phenomenology and was used to examine EHR usefulness from the perspective of physicians.

Chapter 3 of this study was used to introduce the parameters upon which this study was carried out. In this chapter the research method was introduced followed by discussions on the research design and rationale, the role of the researcher, the research methodology, and issues of trustworthiness.

Chapter 4 followed chapter 3 and was used to introduce the results of this study. In addition to the results, chapter 4 also contained relevant data on demographics, data collecting and analysis, evidence of trustworthiness, and a summary of the chapter.

Chapter 4: Results

The purpose of this qualitative transcendental phenomenological study was to explore the lived experiences of physicians whose offices are in the state of Virginia regarding their perception of the influence of EHR systems use has on their workplace efficiency and effectiveness. The study was conducted in 2021 during the COVID-19 pandemic and I used criterion and snowball sampling strategies to help in the recruitment of participants. five participants agreed to participate in the study which included four physicians and one radiologist. The study is based on the central research question; “What are the lived experiences of physicians who have implemented an EHR system” and on the following sub-questions:

RQ1: How has physician efficiency and effectiveness impacted patient care?

RQ2: How has physician efficiency and effectiveness impacted the physician to patient relationship?

RQ3: What impact, if any, does using an EHR system have on physician to patient communication?

In this chapter I presented the demographics of the participants, the data collection methodology, the interviewee responses to the research questions, data analysis, and the summary of the chapter.

Research Setting

The study was conducted in 2021 during the height of the COVID-19 pandemic in the state of Virginia. During this time doctor offices and hospitals were overwhelmed with patients exhibiting symptoms of COVID-19 and those requesting COVID-19 test.

Many hospitals were full and did not have beds for patients. Makeshift tent hospitals were set-up to handle the patient loads. Doctors, nurses, and other medical staff were in high demand. All none-essential medical procedures were deferred to allow medical staff to focus on patients with COVID-19. Initially I planned to recruit 15 participants for my study but was unable to due to the pandemic. After a long period of sending out mail invitations and making telephone invitations I was able to recruit five participants for my study.

Demographics

This study included five participants from the field of medicine as research participants. All participants were age 30 and above and included both men and women. The participants included two ophthalmologist, two internal medicine physicians, and one radiologist. Each participant had at least 2 years of experience working with paper medical filing systems and a minimum of 2 years working with EHR systems.

Data Collection

In qualitative research, the researcher is considered to be the primary research instrument (Janesick, 2011) and the interview is considered to be the primary method of collecting qualitative data (Brinkmann, 2013). For this study I developed a semistructured interview script which consisted of open-ended questions to allow the research participant to provide as much or as little information as they deemed appropriate to answer the research questions. To prepare for the data collection process, I visited the Virginia Board of Medicine Practitioner Information website (Va.healthprovider.com) and I searched local Virginia phone books to compile a list of

physicians that met the requirements for my study. To be a participant in the study the participant was required to be a medical doctor and practice medicine in the state of Virginia. The participant was also required to have experience working with paper and EHR medical files. I called the medical office of each potential participant to confirm their eligibility to be part of my study and to confirm their mailing address. In none of the phone calls to potential participants was I allowed to talk to the physician, all communications were with the receptionist or attending nurse and none of receptionist or attending nurse would give out the physicians' email address as a method of communication with the physician. Once the mailing addresses were confirmed I mailed out a research package consisting of a copy of the research invitation letter, two copies of the research informed consent form, and a stamped and pre-addressed envelope for the participant to return to me a signed copy of the informed consent form. The second copy of the informed consent form was for the participant to have a copy of the form to store in their personal file. Both the invitation letter and the informed consent forms were pre-approved by the IRB. Upon receipt of a signed informed consent form, I called the participant to set-up a date and time for the interview. During the call I introduced myself, provide the participant my contact information, provided a brief summary and purpose of the study, and reviewed the informed consent form with the participant. I also informed the participant that the interview would take place by phone and would last between 30 and 60 minutes. In addition, I asked the participant if they had any objection to the interview being audio recorded.

On the day prior to an interview, I made arrangements to ensure that on the day of the interview that I would have privacy and no distractions while conducting interviews. I reviewed and rehearsed my research questions and checked the operation of my home phone and audio recorder. I procured a fully charged cell phone as a backup to my home phone and had on hand a second audio recorder as a backup to the primary audio recorder. I also had on hand a notebook and pencil to take handwritten notes during the interviews.

Per chapter 3 of this study, my plan was to have 15 participants take part in the study, but due to the time restraints placed on physicians by the COVID-19 pandemic I was only able to find 4 physicians and 1 radiologist willing to take time out of their busy schedule to participate in my study. The five interviews were conducted on October 3, 2021, October 18, 2021, November 19, 2021, November 19, 2021, and on January 5, 2022. The shortest interview took 30 minutes, and the longest interview took 45 minutes to complete. After each interview I transcribed the audio interviews by hand and due to COVID-19 I did not find it necessary to interrupt the participants with member checking. I have stored the transcripts from the five interviews on a password protected computer.

Data Analysis

The data analysis process for the study was started after the transcripts from the five research interviews were manually transcribed and stored onboard a password protected computer. Each transcript was assigned an ID and the identifiable information was masked. To aid in manipulating and analyzing the transcribed qualitative data, I downloaded the free version of the computer software program QDA Miner Lite (Version

2.09) from the website: <https://provalisresearch.com/products/qualitative-data-analysis-software/freeware/>. The free program had basic functions which I used to input data, code data, and display the results of the data analysis.

The first step I took was to prepare myself by examining my preconceptions and expectations for the data and the outcome of the study and set them aside. This process is called *epoché* (Patton, 2015) and I performed this process whenever I sensed that my preconceived ideas were coloring my decisions. My *epoché* process involved taking a pause and reflect on my preconceived ideas. The next step of the data analysis process was to load the five research transcripts into the document fields of the QDA Miner Lite software program. Next, I loaded the demographic information for each participant into the program. In the QDA Miner Lite software program, the combination of a participant's transcript and associated demographic data is known as a case (Adu, 2019). The next step was to condense the three research questions into codes that represented each question. These codes are known as anchor codes (Adu, 2019). To keep track of the intent and meaning of each anchor code there is a notes section in the program that can be used to document how you originated the code and how the code is associated with the research question. The following are the three research questions and the associated anchor codes:

RQ1: How has physician efficiency and effectiveness impacted patient care?

Anchor code 1: Efficiency / effectiveness patient care

RQ2: How has physician efficiency and effectiveness impacted the physician-patient relationship?

Anchor code 2: Efficiency / effectiveness patient interaction

RQ3: What impact, if any does using a EHR system have on physician to patient communication?

Anchor code 3: Communication

The next step involved reviewing the transcripts, identifying the empirical indicators that answered each research question, and assigning a code to each of the empirical indicators. Empirical indicators are the identified portions of the participant answer to the research question that best answers the interview question. The following are two examples of the interview questions that I asked in association with this study and the corresponding identified empirical indicators.

Interview question: Has using EHR systems increased or decreased your time with the patient?

Participant response: That is a hard question. Probably slightly decrease the time with the patient because you are spending more time documenting. More time is spent on the patient, reviewing the charts, reviewing the records, reviewing the outside notes. So, there is more time spent on the patient, but less time spent talking to the patient and interacting with the patient.

The empirical indicator that I selected from the participant response to represent the research question was; probably, slightly, decrease the time with the patient because you are spending more time documenting. The empirical indicator “less time spent talking to the patient and interacting with the patient” in the same response to the interview question also answers the research question.

Interview question: What impact, if any has EHR systems had on your daily work processes effectiveness?

Patient response: Pretty effective, but it takes a lot of time to get it done. It takes much more time to do the paperwork now than what it used to be; it is much more time to do electronic file than the paperwork. The thing that slowed me down the most with paperwork was being able to read what the other consultant had and to get to it. The problem here is mainly, there is so much information that you have to whittle it down until you can get a viable note out and a viable plan of action.

The next step involved grouping the codes based on their common characteristics under the respective anchor codes. The grouping of the codes based on common characteristics are called categories. Themes are then developed based on the trends found while examining the categories (Adu, 2019).

Evidence of Trustworthiness

Credibility

In chapter 3 of this study, I stated that the credibility of this study was to be established through peer debriefing and member checking. Due to the impact of COVID-19 the peer debriefing strategy did not take place. I did carryout the member checking strategy by mailing the transcripts and the findings of the study to the participants for confirmation of content and conclusion.

Transferability

Transferability is the ability to apply the processes and methodology of a research study to a similar setting or population (Cope, 2014). The strategy that I used to establish

the transferability of this study was to provide detailed descriptions of the purposeful sampling of the participants, rich descriptions of the context and background of the study, detailed descriptions of the purpose of the study and by providing thick and rich description of the results of the study.

Dependability

Dependability is the stability and consistency of the parameters of a research study over time (Polit & Beck, 2014). In this study I used the QDA Miner Lite software program to support the attainment of dependability. The program was used as a repository for the interview questions and participants responses. I also used the program to develop, store, and document the study codes and themes. With the information that I provided the processes and procedures used to produce the research results can be traced.

Confirmability

Confirmability is the qualitative concept of insuring that the research findings originate from the research procedures and data and not from the researcher's biases and prejudices (Bloomberg & Volpe, 2019). Confirmability can be established through triangulation strategies, reflexivity, dialogic engagement, and reflective discourse. In this study I established confirmability by providing reasoning for my methodological and theoretical research choices and I provided details that can be traced back to its origin. I also kept a reflexivity journal of my study. Throughout this study I was open to critical questioning and transparent regarding all aspect of the research processes.

Study Results

For this study, I conducted five semi-structured telephone interviews to explore the impact of using EHR systems has on physician workplace efficiency and effectiveness. The participants for the study came from the field of medicine and included four physicians and one radiologist. The study took place during the COVID-19 pandemic and the resulting medical personnel shortage limited the number of physicians that were available and willing to take part in the study.

At the conclusion of each interview, I listened to the recording of the interview to examine the data for any information that might need additional clarification and warranted a possible second phone call to the participate. After reviewing the recordings no additional interviews were deemed necessary. I transcribed each interview by hand by repetitively listening to the recorded interviews, paying close attention to voice inflections, hesitant speech, and any emphasis placed on words and or phrases. After transcribing the interviews, I relistened to the recorded interviews with the transcripts in hand to confirm that the transcriptions matched the recorded interviews.

The participant responses to the research questions were considered separately but were combined when the responses yielded similar results. The free version of the computer program QDA Miner Lite was used in examining the responses to the research questions. The examination of the data revealed emerging themes that aligned with the research questions. Four themes emerged from research question 1, four themes from research question 2, and two themes emerged from research question 3 (see tables 1, 2,

and 3 respectively). To present the results of the study I chose to explain the findings as it related to each research questions.

Research Question 1: How has Physician Efficiency and Effectiveness Impacted Patient Care?

Research question 1 was formulated to assess any operational or design parameters of the EHR system that might have an impact on the efficiency and/or effectiveness of the physician in the performance of his/her duties. In support of the research question, interview questions were developed to elicit responses from the research participants.

IQ3: What are some of your positive experiences working with EHR systems?

IQ4: What are some of your negative experiences working with EHR systems?

IQ5: What impact if any has using EHR systems had on your daily work process efficiency?

IQ6: What impact if any has using EHR systems had on your daily work processes effectiveness?

IQ12: How has using EHR system impacted your workload?

IQ14: What functions or features of the EHR system would you change?

The analysis of the data revealed that the five participants shared similar experiences with EHR systems as it related to workplace efficiency and effectiveness. The consensus is that the use of the EHR systems has a positive impact on workplace efficiency and effectiveness as it relates to patient care. The participants also shared a common need for the standard data presented on the screen to be minimized. From

further examination of the data four themes emerged: (A) EHR negatives, (B) EHR positives, (C) EHR training, and (D) physician workload. Research question 1 and the resulting themes are summarized in table 1.

Table 1

Emergent Themes

Research Question (RQ)	Theme A	Theme B	Theme C	Theme D
RQ1: How has physician efficiency and effectiveness impacted patient care?	EHR Negatives	EHR Positives	EHR Training	Physician Workload

Theme (A): EHR Negatives

All five participants reported negative responses to the use of EHR systems in their medical practice. Three participants reported that EHR systems have too much information preloaded into the system. When creating new relevant notes for a patient, physicians have a tendency to copy and paste from the existing preloaded notes to create new notes. Copying and pasting saves time when inputting data. At times incorrect or unneeded information is copied into the new notes. Physicians must be careful when using preloaded data which could result in the copying and pasting of errant information into relevant data fields. One of the three participants reported that once errant data is created and inadvertently sent, it requires a lot of administrative effort to correct the data.

Two participants reported experiencing EHR system unexpected shut-down while using the system with a patient. The shutdown could result in data loss and the unavailability of information needed by the physician to treat the patient. The systems are also prone to screen freezes and glitzes that are common to computers. One participant reported that the EHR systems are susceptible to computer hacks, viruses, and Ransomware.

The more time a physician spends entering and/or correcting data in the EHR system during a patient visit the less time the physicians have with his/her patients. Technical issues with the system also impact the physician time with the patient. One participant reported that if the physician is not proficient in typing, then the physician to patient face time is impacted.

Theme (B): EHR Data Positives

I asked the participants to respond to the question, what are some of your positive experiences working with EHR system? The responses to the question were similar from each participant. One participant succinctly stated that EHR systems allowed for the medical charts to be completed quicker than it did when paper medical files were used. Another participant stated that EHR are more compact, easier to read, less cumbersome, and easier to transfer to other physicians than paper medical files. The participant also pointed out that the files in the EHR system can always be found and the files can be accessed from a remote location. Another participant stated that “the best thing about it (EHR) is everything is easy to read since it is all printed and clear. You can read anybody’s notes, you will not have any problems with that.” Another participant said:

I am able to draw on a lot of data such as, I have my chart, I have my old chart.

I have the medical records I am using now which pull in all your x-rays, pull in your lab reports, pull in your consult dictations, also and in addition you can, most of the time obtain the records from other healthcare systems. I am in the Bon-Secours system, but I can see the Sentara system and most of the time, I can see the Chesapeake Lee medical system. It is the completeness of the charts”.

Another participant stated:

The turnaround time is one of the main advantages, the fact that it is almost immediate once you transcribe a report and send it that the person on the other end of the computer can pull it up and have the information available which is very important, especially in an emergency setting. Just making sure that there is a record to can be retrieved. It is really good for having prior records to compare, it's a lot easier to go back for an extended period of time without having things be lost.

Theme (C): EHR Training

I asked each of the five participants “Do you think you are getting the proper training for the EHR systems?” One participant stated:

O we got good training when we first got the system together, I did this in the emergency room first and they had people fly in that were experts, they flew in and kinda sat with us and helped us for each and every case and they did it

for a week. And even now they have a video if you have a problem on how to get through some part of the medical records, and they have support staff that you can call if you get a bottle neck going and there is a physician liaison, so if you have a significant problem, you can call her and ask her if she has any solutions. It is a lot of help.

Another participant stated, *my particular vendor has lots of on-line videos and on-line manual help and they are quite attentive in answering questions and you can always call, and a technician will work with you as necessary, but there is a lot of on-line help and training.* The remaining three participants answered this question in similar manner to the two participants whose response I quoted.

Theme (D): Physician Workload

Four out of five of the participants responded to the question concerning the impact of the use of EHR system on physician workload indicated that they experienced an increase in their workload. The additional workload was the result of having to load data in the system outside of normal work hours. Some of the additional after-hour workload resulted from computer savvy patients asking questions and asking for prescription refills through the EHR system. The typing skills also plays a part in the additional time needed to load data, answer questions and/or fill prescriptions. The participant that indicated that the EHR system decreased their workload did not elaborate on their answer.

Research Question 2: How has Physician Efficiency and Effectiveness Impacted the Physician-Patient Relationship?

Research question 2 was developed to explore the impact to the physician-patient relationship resulting from the use of an EHR system during patient care visits. In support of the research question, interview questions were developed to elicit responses from the research participants.

IQ9: How has using the EHR systems impacted your relationship with your patient?

IQ10: Has using an EHR system increased or decreased your time with your patient?

The analysis of the data revealed that the five participants shared similar experiences with EHR systems as it related to physician to patient relationship. The data analysis revealed that the use of the EHR systems has a negative impact on physician to patient relationship. From further examination of the data four themes emerged: (A) Physician-patient interaction, (B) EHR data input, (C) Physician to physician interaction, and (D) Recommended EHR updates. Research question 2 and the resulting themes are summarized in table 2.

Table 2

Emergent Themes

Research Question (RQ)	Theme A	Theme B	Theme C	Theme D
RQ2: How has physician efficiency and effectiveness	Physician-Patient Interaction	EHR Data Input	Physician-Physician Interaction	Recommended EHR Updates

impacted the
physician-
patient
relationship?

Theme (A): Physician-Patient Interaction

The 5 participants agreed that the EHR system improved their relationship with their patients. One of the participants explained that information exchanged between the physician and the patients through the EHR system is a more legible source of information than the information that was exchanged through paper medical files. Two participants stated that they can look at the patients' labs and notes from other doctors concerning the patient which makes the time with the patient more productive. A third participant stated that even though they must enter data into the EHR system they still make the effort to make face-to-face contact with the patient, thus negating any negative impact to the physician to patient relationship. The fifth participant noted no change in the physician to patient relationship as a result of using an EHR system.

Theme (B): EHR Data Input

The 5 participants had similar experiences with the process of entering data into the EHR system. The primary factor impacting data entry that all 5 participants addressed was the participant's typing skills proficiency. One participant stated that entering data in the EHR system charts now takes longer than it did with paper charts because of the participants level of typing skills. The participant also stated that there should be a better method to get information into the system and that an automatic spell

correct feature would help with the data input process. Another participant stated that the EHR system they use has a feature that automatically populate the EHR system notes with data such as the patient vital signs. Another participant stated that with the EHR system, data entry is much quicker than it was with paper medical files and if one of their patients is treated at an affiliated medical facility the information from that medical visit is automatically populated into the medical charts. One participant is currently using software called “Dragon Speech” to dictate notes into the EHR system. The participant also stated that with their accent the “Dragon Speech” software has proven to be 99% accurate in transcribing their speech. The fifth participant response aligned with the other participants statements concerning the physician typing proficiency impacting the data entry process.

Theme (C): Physician-Physician Interaction

Physician to physician interaction concerns any aspect of the EHR system that facilitates or hampers interoperability. Interoperability is the transfer of information between communication systems (Suess, Beard, & Trohimovich, 2009). The response of all five participants to the impact of the use of the EHR system on physician-to-physician interaction was positive. Medical files were deemed easy to transfer, easy to read, and easy to retrieve labs and x-rays from other physicians. One participant stated that if one of their patients is hospitalized, they can view the EHR system and have immediate access to the reason for the hospitalization, lab results, and current treatments. One participant stated “. I am able to draw on a lot of data such as, I have my chart, I have my old chart. I have the medical records I am using now which pull in all your x-rays, pull in

your lab reports, pull in your consult dictations, also and in addition you can, most of the time obtain the records from other healthcare systems. I am in the Bon-Secours system, but I can see the Sentara system and most of the time, I can see the Chesapeake Lee medical system. It is the completeness of the charts”.

Theme (D): Recommended EHR Updates

Theme (D) was developed as a result of the participant’s response regarding the need for changes or updates to the EHR system. Some of the changes suggested by the participants included a spell check feature for the medical notes, and voice transcription software. Another participant stated that no changes are needed, and they are very satisfied with their EHR system as it stands. Another participant stated that they would like for the EHR systems to be universal in that it can be interconnect to any other EHR system.

Research Question 3: What Impact If Any Does Using a EHR System Have on Physician to Patient Communication?

Research question 3 was used to explore the impact that using an EHR system during medical visits has on physician-to-patient communications. In support of the research question, interview questions were developed to elicit responses from the research participants.

IQ9: Has using the EHR systems impacted your relationship with your patient?

IQ10: Has using an EHR system increased or decreased your time with your patient?

The analysis of the data revealed that the five participants shared similar experiences with EHR systems as it related to physician to patient communication. The data analysis revealed that the use of the EHR systems does not negatively impact physician to patient communications. From further examination of the data two themes emerged: (A) Accessing EHR communication features, and (B) Assessing communication errors. Research question 3 and the resulting themes are summarized in table 3.

Table 3

Emergent Themes

Research Question (RQ)	Theme A	Theme B	Theme C	Theme D
RQ3: What impact if any does using a EHR system have on physician to patient communication?	Assessing EHR communication features	Assessing communication errors	_____	_____

Theme (A): Assessing EHR Communication Features

Communication in the contest of this theme involves examining the impact of the use of EHR system on physician to patient communication. The five participants provided similar responses to the question on this topic. EHR use improved the communication of four of the participants and the fifth participant stated that it did not negatively impact communication. One participant stated that information passed

between the physician and the patient is clear and easy to read and allows the patient to pass the information to other physicians.

Theme (B): Assessing EHR Communication Errors

The five participants responded that the errors encountered in using the EHR were the result of the physician's typing ability and copying and pasting errors.

Summary

The purpose of chapter 4 is to present an analysis of the data concerning the lived experiences of physicians working with EHR systems in the state of Virginia. Three research questions and twenty interview questions were presented to examine the impact of EHR use on physician effectiveness and efficiency as it relates to the physician daily work processes.

The first research question RQ1: How has physician efficiency and effectiveness impacted patient care? The results of the study revealed that physician efficiency and effectiveness were not negatively impacted by EHR system use and the resulting impact to patient care was positive. None of the five participants of the study reported negative impacts to patients.

The second research question RQ2: How has physician efficiency and effectiveness impacted the physician-to-patient relationship? The relationship between the patient and the physician in all cases showed improvements. The improvements came as a result of improved communication between the physician and the patient and to the on-demand availability of medical files.

The third research question RQ3: What impact if any does using an electronic health records system have on physician-to-patient communication. The communication between the physician and patient was improved due to the on-demand availability of medical data which allowed for open dialogue concerning medical findings.

Chapter 5 provides detailed interpretations of the study findings, the limitations of the study, recommendations, implications, and the conclusion of the study.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to examine the influence of EHR system use on physicians' efficiency and effectiveness as it relates to physician-to-patient interaction. I conducted this study because physicians were reporting that the use of EHR systems were negatively impacting physician's workplace performance. As a result of this study, I found that the use of EHR systems did not negatively impact physician's workplace performance, physician-to-patient interactions, and did not contribute to physician dissatisfaction with the field of medicine. All indications showed that physicians are satisfied with the use of EHR system during medical encounters.

Interpretation of Findings

In chapter 2 a study by Kolasa and Kozinski (2020) found that a lack of interoperability between the various EHR system should be a factor to consider when chosen a system. A lack of interoperability is the inability of information systems to share information among other similar electronic devices (Guinn et al, 2009). In this study I did not specifically ask questions concerning the factors that went into the participants decision in choosing their EHR system or if they were involved in the decision. But through questioning concerning data sharing, I found that none of the five participants indicated that they had experienced issues involving a lack of interoperability. Based on the answers that I received from the interview questions a lack of interoperability is not an issue that is currently being experienced by physicians with their EHR systems. A future study with an interoperability focus will need to be conducted to confirm my interpretation of the findings.

The topic of physician burnout was discussed in Chapter 2. Odom and Willeumier (2018) conducted a study and found that stress associated with purchasing, adopting, and using an EHR system often led to physician's burnout. Burnout occurs when there is a variable that causes sustained dissatisfaction in the physician work-live structure which leads to emotional exhaustion, a sense of depersonalization and inadequacy (Kemper, 2019; Stehman et al., 2019). None of the five participants stated or alluded to experiencing any of the symptoms of burnout. The five participants expressed their sense of satisfaction with the use of their EHR system. Based on the information provided to me by the five participants, at least with these five participants physician burnout has not been a factor in their personal experience with their EHR system. My interpretation of the results is that a sample size of five is not sufficient to confirm that physician burnout is not a factor.

In Chapter 2 of this study, patient care was another factor impacted by the use of EHR systems. Patient care was presented as it related to physician-to-patient face time. Face time refers to the time that the physician is facing the patient while speaking to them during the medical visit. Rathert et al (2017) conducted a study and found that using an EHR system during patient medical visits diverts the physician away from the patient resulting in reduced physician-to-patient face time. The reduce face time negatively impacts the physician-to-patient relationship. The results of this study confirmed that the use of the EHR system impacts the physician-to-patient face time but does not negatively impact the physician-to-patient relationship. The information available to the physician allowed for the interaction between the patient and the physician to be more meaningful

than it would have been if the EHR system was not available. My interpretation of the data was that the use of EHR system helped in making the communication process more productive.

Technology literacy refers to how well the physician can understand and manipulate the technology to achieve a desired result. O'Donnell et al., (2018) conducted a study and found that older and less computer skilled physicians would be resistant to the introduction of new technology. The five participants in my study were all above the age of 40. The input that the patients provided on the use of technology centered around typing skills. All five participants indicated that the physician's typing ability was the primary factor that impacted EHR system use. One of the physicians used a transcription program to load data. My interpretation of the results of this study is that the use of the EHR system is only limited by the ability of the physician to manually input data. The results of this study also disconfirm the findings of earlier studies that the physician's level of technology literacy determines the physicians use of the system. Additional studies need to be conducted to confirm the results of my study.

Cyber risks are another problem that could have a negative impact on EHR system use. Cyber risks are breaches in information systems that compromise the operation and integrity of the system (Sardi et al., 2020). Included with cyber risks are ransomware concerns. Ransomwares are programs that are developed for the purpose of locking files on a targeted information sharing device for the purpose of extorting money from the system owner. The participants of my study were aware of ransomware and the negative impact it could have on their EHR systems. None of the five participants in my

study have been victims of ransomware. Although the participants of my study have not experienced ransomware attacks firsthand the threat of ransomware attacks continues to be a potential threat to information sharing devices. Ransom ware continues to be a potential threat to information sharing technology.

The screens on EHR systems contain high value information on patients such as lab results, vital signs, health prognosis, treatment regiments, medical notes, prescriptions, medical alerts and scheduled medical visits. The screens also contain low-value information, which is good to know information but is not vital to the patient currently being treated. Research conducted by Murphy et al., (2019) contributed the overload of information as a factor to physician dissatisfaction with their job and to burnout. Two of the five physicians in my study contributed the overabundance of information on the EHR systems screen as being a problem. One of the two physicians was very vocal in wanted the data on the screen streamlined to just what was needed at the time. My interpretation of the findings is that the concerns of EHR overabundance of information needs to be addressed.

Limitations of the Study

The primary limitation of this study was the small number of participates that I was able to recruit for the study. My initial goal for this study was to interview fifteen physicians to gain an understanding of the impact of the use of EHR systems has on physician effectiveness and effectiveness from the perspective of the physician. I planned to analyze the data from the fifteen physicians to determine if I had achieved saturation and if I had achieved saturation no more physicians would be interviewed. If

data saturation had not been achieved at that point, then I would add two additional physicians in succession until saturation was achieved. Due to the COVID-19 pandemic I was only able to interview five physicians for the study. The five physicians that took part in the study provide similar answers to the interview questions and based on the answers I suspect that data saturation was achieved. I was unable to recruit additional physicians to confirm my assertion.

Recommendations

This study was based on qualitative research methodology. I chose the qualitative method because I wanted to examine the impact of the use of EHR system on physician's effectiveness and effectiveness from the perspective of the physician. With qualitative research methods the participant is given the opportunity to tell their story in their own words which would not be possible using a quantitative method. Also with qualitative research methods I was able to make adjustments to the research interview questions if the line of questioning was not producing useable data.

Transcendental phenomenology methodology was chosen for this study because the participants of the study were experiencing a common phenomenon. The common phenomenon was the negative impact to workplace efficiency and effectiveness as a result of the use of EHR systems during patient visits. Earlier studies on this phenomenon showed that physicians experienced professional burnout due to the demands of using EHR systems (McHugh et al., 2011), experienced a lack of interoperability between systems resulting communication issues (Mason et al.), found the need to hire medical scribes to populate medical data into the systems during patient

visits (Pozdnyakova et al., 2018), and other hindrances to the physician work processes. The result of this study indicates that these hindrances and others mentioned in this study may no longer be applicable as a result of the ongoing changes in technology.

As a recommendation for future research, a study should be conducted post COVID-19 and the associated precautionary restraints that would allow for a larger population of participants, longer available time with each participant, and the ability to conduct the research interviews in-person. The results of the study could be used to confirm or disconfirm the results of this study and examine any long-term impact that COVID-19 might have imposed that would negatively impact physician effectiveness and efficiency during patient medical visits.

A second recommendation is to conduct a study examining EHR system use from the perspective of the patient. While physicians might not perceive the use of the EHR system use during patient visits as a problem, the patient might have the perception that the physician is inattentive to their needs or their interactions with the patient might seem impersonal. The results of the study could also be used to examine the patient perceptions based on the patient's biological age. Younger patients, more adapt with using emerging technology might have perception that differ from those of older patients.

A third study that should be considered is the obsolescence of the EHR systems now in use. With the constant changes in technology and the growing needs for the technology to be more capable of performing medical tasks, current systems should be assessed for continued use. This study should be applied across medical fields and include physicians, medical scribes, patients, and nurses. A wholistic evaluation should

be made of the current ranges of systems and a systematic review of how electronic records systems be standardized.

According to the answers that were provided by the physicians in my study, the problems identified in previous studies have not negatively impacted their work processes. The problems have either been corrected, the physicians have accepted the problems as being a part of the process, or the problems have been solved through the evolution of the EHR systems upgrades. The impact of the problems could also have been overshadowed lately by the stress that the physicians had been experiencing as a result of the COVID-19 pandemic. I recommended that this study conducted again, post COVID-19 to determine if the impact of COVID-19 had any influence on the results of the study.

The results of this study can be used by physicians and other medical professionals that use EHR systems as part of their workplace processes to be more proactive and vocal in what features are needed and which are not. Physicians should also use what was learned from this study to examine other medical devices which have features or configurations that have been accepted as standards but are not without fault. Future studies should also have a quantitative component to measure the physician-to-patient face time in relationship to the time the physician is facing the EHR system and to measure the working hours outside of normal work hours that the physicians use to input data into the system that could not be loaded during normal working hours. These measures could drive additional changes to the system that would support the physician effectiveness and efficiency in the workplace.

Implications

The growth of technology is never at a standstill, it is constantly in the process of being changed and improved. The result is technology that is more advanced than previous versions, more intuitive and capable. From a historical perspective, technology that is viewed as state-of-the-art today could easily be placed in the category of a relic in a year or two from now. Many companies today that are reliant on technology to stay competitive and relevant have established obsolescence departments that proactively monitors the company's technology for items subject to become obsolete and monitor suppliers who may discontinue a particular needed item. To mitigate the impact of obsolete technology and for vendors no longer stocking the technology, the obsolescence department identifies ahead of time substitutions for the technology and for an alternate supplier of the technology.

Changes in technology has an impact on the end user expectations of that technology. As an example, an increased number of automobile drivers have the expectation that their automobile will start by the push of a button verses the turn of a key. Another example is the increasing number of homeowners that are depending on voice activated technology such as the Amazon Alexa to operate electronic devices around their home. The ideas and attitudes of the persons using the technology towards that technology are also subject to change. The person using the technology can choose to adapt to using the technology as presented or they can help drive initiatives to change the technology to suit actual needs.

The issues that were identified with the use of EHR systems at the beginning of my study as presented by other research studies did not appear to have had a substantial impact on the five medical participants of my study. None of the five participants related any substantial issues in using their EHR systems. The problems identified in the previous studies could have been resolved through the evolution of technology growth or through the acceptance of the problems by the physicians using the systems. Either of the two possible solutions to the problems with EHR systems have the potential to drive positive social change. The changes could potentially have an impact on the level of the individual and/or on the level of the organizational.

Implications for Social Change

Positive social change occurs when social needs are identified, solutions are developed, and corrective actions are available for possible implementation. For my study the problems associated with using EHR systems were identified through an examination of previous research studies. The results of the previous studies were examined against the results of my study, and I found that positive changes have been made. My study serves as a qualitative confirmation of the positive changes.

On the level of the individual, physicians could learn from this study that the mandatory implementation of a technology imposed by an entity (United States Government) outside of their organization should not be accepted as provided if the technology does not promote the physician workplace effectiveness and efficiency. The forced use of technology usually results in the types of problems identified in chapter two of this study. Physicians should insist on having input on the design, functionality, and

configuration of any new technology that they are being mandated to use and insist on having a voice in the decision to implement the technology. Having a voice at the design stage of a new technology could possibly help physicians in the acceptance, implementation, and use of the technology and could possibly be a factor in avoiding some if not all of the problems reported in chapter two of this study.

On an organizational level, the results of this study along with the results of the studies presented in chapter two of this study could be used to inspire physicians to group together to effect changes to technology that impacts their workplace processes. Physicians have a busy and stressful occupation. Any and all technology introduced into the medical field should be beta tested by physicians to assess the suitability of the technology for actual in-service use. During the beta test, aspects of the technology can be examined to determine if further development is needed prior to use. The technology could also be tested in a medical school for student and teacher feedback.

As a result of this study, I recommend that a future research study be conducted on the subject of EHR system use. The study would be developed to examine physician response to data input through electronic transcription programs. In chapter two some of the physicians in the studies hired transcriptionist to load medical data into the EHR systems. Although the transcriptionist was cited as being a great aid to the physician, the added cost of having to hire a transcriptionist added additional financial burden. If the outcome of the future study is favorable to the use of transcriptionist to load medical data into the system, then the future EHR systems may be required to come equipped with an electronic transcriptionist program as standard feature.

Conclusions

Paper medical files were in use within hospitals and medical facilities prior to the introduction of EHR systems. Paper medical files were susceptible to water damage, insect damage, and damage from improper handling. Physicians handwritten files were often illegible to all but the physician. Paper medical files were often misfiled or lost. Sharing paper medical files among physicians within the same medical facility or those outside of the medical facility was often a time-consuming effort. The EHR system was introduced to overcome the shortcomings of the paper medical files. Initially EHR systems were not unanimously accepted. Physicians with rudimentary typing skills and those that were tech adverse found the systems difficult use. Over the course of time, the design and functionality of EHR have evolved to the point at which they are indispensable tools of the medical trade. My study was founded on physicians' negative perspectives on the use of EHR system. The result of this study disconfirms the initial negative perspectives as not applicable to the current lineup of EHR systems.

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