Small Clinic Electronic Health Records Implementations: An Options Thinking View

Joey Helton
Georgia State University

Dawn Wade
Georgia State University

Rich Erhardt
Georgia State University

The rapid evolution of electronic health records (EHR) has made it difficult for small medical and dental practices to remain competitive. While studies have shown that offices who use EHR receive more insurance reimbursements, it is unclear how offices should choose the appropriate implementation. Research suggests that office decision makers can make better-informed decisions by examining real options. However, researchers have never evaluated real options in relation to implementation choices governed by federal regulations. To examine this gap in the literature, we address EHR software implementations using real options theory to determine how these options can best serve decision makers.

INTRODUCTION

The rapid adoption of electronic health records (EHR) has greatly influenced the health care industry in the last decade. In an effort to improve patient care and help providers make better decisions about treatments, the federal government has enacted laws to govern the way Medicare and Medicaid reimbursements are processed (Jones, Rudin, Perry, & Shekelle, 2014). These mandates require that all providers who are eligible to receive Medicare and Medicaid payments acquire federally compliant software. Providers should use the software to achieve specific objectives, such as electronically saving health information in a shared format, which can promote more rigorous information exchange to improve the quality, safety, and efficiency of health outcomes. These mandates are necessary to avoid providers being penalized by a progressively increasing reduction in reimbursement rates. Practitioners have the freedom to purchase any federally compliant software, but their prices and functionalities vary drastically. The government has developed online resources to help providers choose between over 2,900 certified software systems. By 2013, EHR use was at 78%, compared to 51% in 2010 (Furukawa et al., 2014). Although implementation rates have improved drastically, small office settings make up a significant portion of those practices which have not implemented the software (Jamoom, Patel, Furukawa, & King, 2014).

Many practices have been using EHR for several years because of their need to network with different providers and share patient information. These practices bring teams of consultants into the

practice to customize software that meets their workflow and daily needs. These types of implementations can cost hundreds of thousands of dollars, but they are necessary for the practices to function efficiently (Inverso et al., 2015). Some practices have on-site information technology (IT) departments, as well as training and implementation guidelines, to ensure that different work systems function together coherently. IT professionals who work in the practice are responsible for finding the best solutions for the practice. They are typically very knowledgeable about the specific needs of the practice and the various business processes that they need to support. Software systems must have an array of functionalities and be configured so that future components can be developed if necessary. The literature shows that software implementations by practices with eleven or more physicians have increased significantly since 2010, but the number has decreased for small practices and physicians who practice alone (Hsiao et al., 2013).

Several studies suggest that the remaining offices have not implemented EHR because they face multiple barriers, which exist particularly for small practices. Compared to larger practices, small practices have implemented EHR at a slower pace, although the reasons are not specific to any category, such as physician age, region, or rural status (Hsiao et al., 2013). For small practices that have been using paper records or systems that are not compliant, the shift to using electronic records has proven to be very challenging (Oster, 2015). In some instances, the decision makers in small practices are the doctors, many of whom do not possess the knowledge and skills necessary to select an appropriate software package; thus, these decisions are completely out of their realm of comfort. An additional challenge to software implementation is reluctance to transition because physicians fear they will have a heavier workload if they incorporate electronic records into their daily routines (Hsiao et al., 2013). Other challenges include a knowledge gap when small practices purchase compliant software from vendors. There is an abundance of consultants available for hire, but their cost, consultants' lack of knowledge about the workflows of the practice, and a lack of IT competence has dissuaded many decision makers within small offices from working with consultants. Previous studies have found that choosing appropriate EHR software is one of the biggest challenges for practices (Heisey-Grove, Danehy, Consolazio, Lynch, & Mostashari, 2014). The threat of change, lack of knowledge about different software packages, unfamiliarity with IT processes, and limited budgets leave small practices hesitant when they attempt to comply with federal regulations.

In this paper, we adopt Myers' view of real options thinking, and we apply Fichman's point of view as it relates to IT investment decision making (Myers, 1977; Fichman, Keil, & Tiwana, 2005). This framework allows us to study how decision makers in practices can view their available choices when implementing EHR software. The premise behind real options thinking is that future investment opportunities will become apparent based on previous investment choices (Adner & Levinthal, 2004). As it relates to EHR implementations, we propose that the software that small practices choose to implement now will determine which IT capabilities these practices will have in the future. We believe that this approach will help small practices to implement software, since they lag behind larger practices because they are not sure which software to choose. Researchers have studied similar IT investment problems using this approach that helps to guide the decision-making process during times of uncertainty. Therefore, we address the following research question, "how does real options thinking lead to different EHR implementation decisions in small physician practices?"

We conducted the research using a qualitative multi-case study of three small practices. Options' thinking offers a lens through which stakeholders can make informed decisions when implementing the software package that best fits their needs in both the short and long terms. The goal of the study was to examine how real options thinking shaped EHR implementation decisions. We hope that, if decision makers can make better decisions, small practices will be able to implement software that is federally compliant, allows them to receive their maximum reimbursements, and provides future opportunities that can benefit their businesses.

The overall structure of the paper includes a background section, which includes literature on EHR implementations, as well as the real options framework as described by those in IT. The third section will detail the approach we used to obtain and analyze data from the case studies. The fourth section will

present the analyses of the three practices. Finally, section five will discuss the findings of the case study with recommendations, acknowledgment of limitations, and ideas for future research.

BACKGROUND

According to Health IT, EHRs are rapidly replacing paper charts within the medical community, which sets a new standard of care. An EHR is an electronic patient record that computer software creates and manages. According to the American Academy of Family Physicians, a patient's EHR can include items such as past medical history, demographics, physician's notes, patient concerns, known patient allergies, lab reports, and a list of current medications. Physicians can access and update the EHR through secure software and online. An EHR system also allows the physician the ability to share patient data electronically both internally and externally with other providers as needed.

EHR software offered by some vendors provides options to medical providers that include the capability to provide decision support, as well as patient outcome reports. Electronic access to patient data may enable providers to make better decisions and provide better patient care. EHRs may also reduce the incidence of medical errors by improving the accuracy and clarity of medical records, reducing duplication of tests, reducing delays in treatment, and by keeping physicians more informed, which allows them to make better decisions. The result could be a reduction in medical error by improving the overall accuracy and clarity of provider communication (Ben-Assuli, Sagi, Leshno, Ironi, & Ziv, 2015).

In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act introduced the first substantial commitment of federal resources to support the widespread adoption of EHRs. To remain in compliance with Medicare/Medicaid mandates, medical practices must adopt and successfully demonstrate their use of a certified EHR technology by 2015 (Van der Tang, 2012). For the purpose of this study, we define a small practice as having between one and three physicians. According to Medical Economics, the average small practice generates $700,000-$800,000 in service reimbursements from insurance companies, Medicare, and Medicaid each year. The penalty for a noncompliant practice is lowered reimbursement rates. For practices that are noncompliant, the Medicare/Medicaid adjustment schedule is 99% for 2015, 98% for 2016, and for each subsequent year reimbursement rates will continue to drop by a percentage that the federal government has yet to determine (Ben-Assuli et al., 2015).

In 2012, the Centers for Medicare and Medicaid Services (CMS), projected that the 2014-2015 National Health Expenditures (NHEs) would reach 18% (or roughly $3 trillion) of U.S. GDP. Of this, a third was reimbursed by Medicare/Medicaid (CMS, 2012). Therefore, the financial consequences for small practices that are not compliant can be substantial. Not only are government reimbursement regulations now requiring the use of EHRs, but more insurance entities are also beginning to require that practices participate in certified EHR systems. Even with the federal requirement and insurance push, the number of small practices implementing EHR systems continues to decrease.

There are currently more than 2,900 compliant EHR systems on the market. Picking the best system for a healthcare practice can be difficult, especially for small practices, as they typically do not have full-time IT professionals on staff (Van der Tang, 2012). HealthIT.gov estimated that the average cost of an EHR implementation was $70,000 or more; this cost is just for the basic system and is incurred per provider. At the cost of $70,000 per provider, a small practice with three providers that purchases a "basic" compliant system could spend upwards of $210,000. Many small practices do not have the financial resources to make such a purchase.

When faced with different software options, physicians make decisions about purchasing the essential features that are required to be in compliance with both federal and insurance regulations, as well as optional features that may help them focus on things like practice sustainability and growth. Essential features are portions of the EHR software that will make the practice compliant with federal regulations. An example would be the ability of a patient to access his or her health information online, also known as a patient portal. According to HealthIT.gov, a patient portal is required by 2015 for a practice to be in compliance with ACA's guidelines for full reimbursement. Optional features, on the other hand, are

portions of the software that the practice might implement to make the day-to-day office operations run a bit smoother, but federal regulations do not require them. An example would be automatic patient appointment reminders generated by the system, or "robo-calls."

For some small practices, the cost and complexity of implementing an EHR system are just too much and may lead the physician to merge with a larger entity or close the practice (Shih, McCullough, Wang, Singer, & Parsons, 2011). Merging with a larger entity allows the practice access to a compliant EHR system at a reduced price that it negotiates on a case by case basis. In some cases, physicians decide to close the practice altogether.

THEORETICAL FRAMEWORK

Real options thinking began in financial literature and management scholars adopted it later. Since its transfer from finance to management, the real options perspective has received considerable attention. Its appeal is rooted in its approach to investment because it accounts for the inherent value of flexibility (Ben-Assuli et al., 2015). Black and Scholes (1973) produced the seminal research on options, but the term "real options" first appeared in Stewart Myers' paper, "Determinants of Corporate Borrowing" (Myers, 1977). The basic concept is that an organization has the right, although not the responsibility, to exercise a business project (Myers, 1977). Adner and Levinthal (2005) stated that after purchasing an option, an investor has the future choice to exercise that option or not based on new information that the investor did not know previously. For example, a business executive purchased an option, and between the original purchase and date the option comes due, there is new information about this endeavor that offers evidence the environment has changed. The executive may now choose either to exercise the option or let it expire at its due date. This exercise of options pertains to deferring, abandoning, expanding, staging, or contracting options. Depending on the structure of the original option, there may be additional choices available to the executive.

Researchers have also used the real options theory to examine IT investments. Sandberg, Mathiassen, and Napier (2014) stated, "Managers may, therefore, draw on digital options thinking to examine IT capability investments without obligation to pursue them." Real options provide the flexibility to add additional functionality during and/or after the implementation process. Availability of real options proves to be valuable both during and after the implementation process. For example, real options provide an opportunity for the system and software to grow and adapt to current and progressing trends/needs. As Black and Scholes (1973) explained, "Real options allows an organization to assess more accurately uncertain IT investments, but perhaps more importantly, can guide managers in how to create actively and extract value."

Uncertainty is a fact of life for most large IT capital investments (Fichman et al., 2005). However, most IT project implementation administrators "downplay" the level of risk involved. Fichman et al. (2005) stated, "major IT initiatives produce disappointing results 50% of the time or more; this uncomfortable fact rarely makes it into the planning processes of many organizations." Organizations often will take a defensive posture due to uncertainty; there are four typical defensive postures. The first occurs during the planning process in which not all facts are taken into account, such as the reality of the failure rate. The second posture is to penalize large projects with large risks, overshadowing the fact that they may also have the potential to reap high rewards. The third is to put a silver coating on a project, requiring strictness in the project's planning stage and ultimately its execution, which can result in false reducibility of project success. The fourth is placing the blame for a poor project on the project manager as opposed to the reality of the uncertainty impacts in the process of the project; this is misplaced blame. These postures provide possible exposure to uncertainty and thus risk for the organization (Fichman et al., 2005). Fichman et al. (2005) asserted that a better approach to options thinking, which avoids these defensive postures, is to assume a proactive stance that fully acknowledges and seeks to manage uncertainty in projects. They stressed that the heart of options thinking is in understanding how options create actual value and the distinction between what an organization must do on a project, versus what the organization may do on a project (Fichman et al., 2005).

Fichman et al. (2005) provided six types of real options in relation to IT, as depicted in Table 1.

TABLE 1
OPTIONS DEFINITIONS ADAPTED FROM FICHMAN ET AL. (2005)

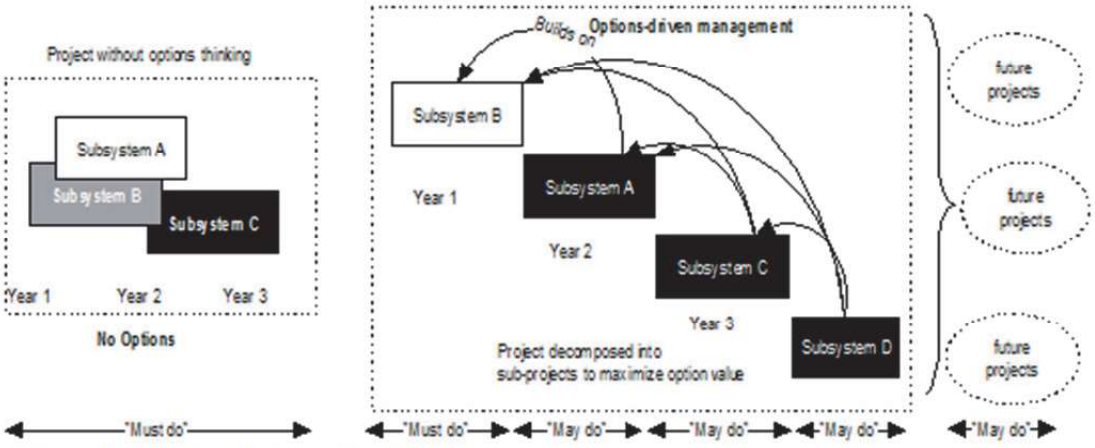
Options	Definition
Stage	A project divided into distinct stages with each stage being contingent on a reassessment of costs and benefits at the time the preceding stage is completed.
Abandon	A project can be terminating midstream and remaining project resources relatively easily redeployed.
Defer	A decision on whether to invest can be deferred for some period without imperiling potential benefits.
Strategic Growth	An initial baseline investment could open the door to pursue a variety of potential follow-on opportunities.
Change Scale	Resources allocated to the project can be contract or expanded, or the operational system enabled by a project can be scaled up or scaled down
Switch	An IT asset developed for one purpose can be redeployed to serve another purpose (switch use), A key foundation technology supporting a project can be swapped out for another (switch inputs).

In the management literature, options thinking supports strategy "as a process of organizational resources-investment choices, or options" (Zimlich, 2013). The use of options thinking can provide a strategic advantage component, which aids in the successful implementation of IT projects. Considering an option gives the holder a preferential advantage in making a future investment, and this strategy has aided IT projects (Fichman et al., 2005). Sandberg et al. (2014) suggested that a firm's options stem from its capabilities and environmental opportunities. Options are generated through the organization's resources and current capabilities. For example, Coca-Cola has greater technological investment opportunities than a local pizzeria due to significant differences in available capital, business maturity, and technological capability (Sandberg, Mathiassen, & Napier, 2014).

Van Reedt Dortland, Voordijk, and Dewulf (2014) discussed the challenges that health care decision makers have with rapidly changing demographics, financial pressures, medical-technological developments, and policy changes. Governments and health care providers across the world seek ways to cope with booming healthcare costs in a time of decreasing public budgets. Van Reedt Dortland et al. (2014) argued that, due to the uncertainties surrounding health care, real options provide the flexibility in strategy that is necessary for health care decision makers to be successful. An options thinking approach offers a more structured way to balance the costs and benefits of strategies when dealing with future uncertainties (Fichman et al., 2005). In large medical firms, issues such as those discussed above would be spread across many departments typically seen in large medical conglomerates. In the typical small medical practice, on the other hand, the doctor is typically a sole proprietor, which means it is likely the doctor has to deal with all of these issues alone. Having a new way of thinking about the impact of the above issues and potential options to handle them strategically during EHR implementation could be exponentially helpful for small practices. Figure 1 shows the differences between traditional and options thinking in evaluating IT investments. Fichman et al. (2005) stated that managers can enhance value creation with two general strategies. The first involves shifting project elements that are part of the baseline implementation from "must do" to "may do" status, and the second involves performing a systematic search for opportunities beyond the baseline implementation that represent additional "may

do" elements. Although not directed to the medical community, Fichman et al.'s paper (2005) provided a very good structure for clinicians to consider when deciding to undertake an EHR implementation. In this study, we examined the application of this model in a small practice medical clinic environment, which was largely ignored in the existing scholarly literature.

FIGURE 1
DIFFERENCES BETWEEN TRADITIONAL AND OPTIONAL THINKING



Note. Adopted from Fichman et al. (2005).

RESEARCH METHODOLOGY

Research Design

The purpose of conducting multiple case studies is to understand how EHR implementation decisions can be made through a lens of real options for small practices. The events related to this study took place between July 2015 and September 2015 within the confines of physician offices. Myers' real options thinking provided the lens through which we attempted to interpret the data from the case studies (Myers, 2013). Since Myers' application of real options was related to financial investments, we also used Fichman's interpretation of real options as it related to IT regarding how decision makers can create and extract value from the EHR software (Fichman et al., 2005).

We conducted interviews at six total research sites, and we chose three to include in the study because they displayed some use of real options when implementing their EHR software. The first practice was a 15-year-old dental practice in Louisville, Kentucky that had two doctors. Their practice implemented an EHR software package five years earlier. One of the doctors served as the CIO for a large dental organization in Kentucky and also had a background in IT; this led to him being the practice's decision maker for the EHR system. The second practice was a nonprofit health care organization that provided assistance to individuals affected by HIV/AIDS in Atlanta, Georgia. The organization had been using an EHR system for approximately ten years and typically provided services to almost 1,000 people. The CEO and a panel of other executives were the decision makers when choosing an appropriate software package to implement. The third practice was a pulmonary/family practice office located in Warner Robins, Georgia. There was one doctor who had been practicing for more than 19 years and who was the decision maker when implementing the EHR software that the practice had been using for six years at the time of the study.

We based our choice to use a qualitative multiple case study on the notion that the researcher can exercise control in such a situation (Yin, 2013). This was valid because the study participants were not aware of real options, so the researchers had to remain in control. The "how" nature of the research question, combined with a focus on different types of office settings, suggested that a multiple case study

approach was justified, which was supported by Yin (2013). Yin suggested that a case study is appropriate when the researcher has little control over the events taking place and when there is a contemporary phenomenon in real life. These case studies also were subject to the disadvantages associated with case studies, such as a lack of access to key participants with decision-making authority, challenges when trying to focus on the important issues, and a limited amount of time to conduct empirical research (Myers, 2013). However, we feel that the disadvantages were outweighed by the contribution that this paper makes to engaged scholarship.

The "how" nature of the research question also suggested that we should design the research to be a process study because there is a sequence of events that have transpired. Van de Ven (2007) described a process study as one in which things change and develop over time instead of being primarily focused on variables. With real options, it is important to understand the process in which the software was implemented over time to understand if it created and extracted value.

Data Collection

Before collecting data, an interview protocol was designed that contained the preliminary interview questions (Yin 2013). To develop the questions we reviewed literature related to real options thinking, real options in IT, as well as EHR in different fields. In April 2015, the Institutional Review Board (IRB) at Georgia State University approved the interview protocol, and we used the protocol as the baseline for our inquiry. Following the IRB approval, cases were chosen by the researchers' ability to have local access to perform the interviews in the areas they are located. These firms were also chosen because they had implemented an EHR system currently in use in their practices. Invitation letters were sent out to doctors' offices that met the criteria of a small practice with a request to accept and set up an interview time. The result was a dental practice in Louisville, Kentucky, a non-profit in Atlanta, Georgia, and a pulmonology/ family practice in Warner Robins, Georgia. Once interviews were agreed upon, the researchers conducted the interviews.

The interviews were conducted using a semi-structured format so that the format could change slightly if needed. This format allowed the participants to explain more if necessary and allowed the interviewer to have a deeper understanding of the context that in turn allowed concepts to emerge from further exploration (Eisenhardt and Graebner 2007). All of the interviews were conducted face-to-face and recorded via audio recorder then later transcribed using a third party.

Data Analysis

For each case study, we examined how decision-makers implemented EHR software through rigorous analysis of interview transcripts. Each researcher read each transcript multiple times to look for similarities and differences. The goal was to allow codes to emerge from the data that later allowed a coding scheme to be developed and applied to the transcripts. After a thorough examination of the data in context with the coding scheme and a review of the literature, we began to see findings emerge.

The QSR International NVIVO Qualitative Analysis software was used to code the transcripts from the interviews. The focus of the data analysis is to provide insight into the potential use of options thinking with relation to EHR implementation utilizing the Myers and Fichman lens (2005). This allowed the researchers to determine where options were considered pre, post, and future tenses.

CASE ANALYSES

Practice A

Practice A was a small dental practice with two dentists and nine other employees. This practice was 15 years old and served approximately 100 patients per week. One of the doctors had a Master's of Science in IT and had experience with software, including implementations. In addition to being a dentist, he also served as the CIO for a dental organization. His experience with IT made the practice's decision to implement an EHR system easier to understand from a technical perspective. The doctor chose to form a committee of various dental offices in the area when deciding to implement an EHR as an opportunity

to share information and ideas. The members of the committee conducted site visits to other offices that had already implemented EHR to examine their software packages. This gave the committee an opportunity to hear about the advantages and disadvantages of the different software packages and create a short list of packages to consider for implementation. After they had completed the site visits, the committee spent approximately three months comparing the software packages to decide which one offered the best core functionality that would meet the needs of the dental practices. Once the committee agreed on two packages that best fit their needs, Practice A installed a test version of each software package to evaluate each system in an attempt to draw conclusions. The practice developed a list of functionalities that it deemed essential, as well as a list of functionalities that would be "nice to have." It used these lists when evaluating, comparing, and contrasting the two systems.

Once the practice evaluated the trial versions of the software, the practice was committed to implementing EHR, although there was a high level of uncertainty. Before implementing the software, there was concern about the time it would take to implement the system and the effect that it would have on the practice's day-to-day business. The practice was not sure if all of its records would convert into the system because the records were in a different format, so the risk of losing patient information was a very real possibility. There were additional concerns about whether the practice could configure the system to work as needed for the workflows of the business in real-time or whether it would make work more difficult for everyone. After the software was installed, there were worries about the ease of use for employees and whether the practice would be able to get assistance from the vendor as problems occurred, particularly when entering new codes and expecting that the insurance companies would accept them. The predominant concern for Practice A was whether the system's costs were worth the hassle of implementation and maintenance. Installing a system that was compliant would help them not lose the rate of reimbursements, but it did not guarantee that they would receive the financial incentives related to Meaningful Use.

Practice A's decision to implement EHR posed many uncertainties, but it also provided an abundance of flexibility. Before implementing the EHR system, the practice created options because, once it installed the software, the practice had the flexibility to choose which modules and/or feature to use in the future. Ultimately, Practice A chose the software package that allowed access to the data from the backend database in SQL Server versus the software package that only had a flat file data system that was archaic because the practice wanted to build analytics and other custom tools to go with the software package. The dentist said, "We basically match up the data for analytics and business decisions. We match up the data so we can transfer information to various systems for automation. Trying just to improve our electronic flow process is the best way to say it."

When Practice A chose the software package that best fit its needs, it was a package that was certified as being compliant with Meaningful Use. By doing this, the practice created an option because the decision makers knew that Meaningful Use would have benefits associated with it, as well future obligations that they could utilize. An example of how the practice exercised these options is evident by the ICD-10 coding mandate that became effective on October 1, 2015. The ICD-10 mandate was introduced several years ago, but the choice of the practice to implement a system that would be compliant was evidence of them exercising the option. By running an update on its software system, the practice used embedded capabilities that introduced more than 10,000 new codes to the medical community. This update did not require any additional purchases or switching to another vendor; the option was embedded with the flexibility.

Initially, the financial incentive introduced by the government was the biggest motivator for Practice A when deciding to implement electronic records. This included the monetary benefits that came from being compliant with Meaningful Use, as well as avoiding a reduction in reimbursements by using the compliant software. However, the biggest motivation came after evaluating the different software packages, when the practice recognized it could get access to the data that was saved in the databases to perform analytics. Once it implemented the chosen software, each night the practice was capable of downloading the data into a database that analytical tools used. This allowed the practice to use the data analytics in business decisions regarding patient care, administrative tasks, including staff schedules, and

future business decisions based on the current needs of the patients. The practice's ability to understand that having access to the backend data for additional analytics and tool creation would allow it to create additional value occurred because of its continued use of real options. By recognizing that, while adhering to the *must do* items related to the EHR requirements, the practice was moving away from the *must do* status, it that allowed the practice to move beyond the baseline implementation and focus on strategic growth options that involved follow-up investments and activities that allowed the practice to become more productive and efficient.

The biggest challenge for Practice A was ensuring that the software package met its needs by thoroughly evaluating the trial software before converting existing data into the format used by the new EHR software. This conversion process was very tedious and revealed obvious flaws in the practice's existing workflows it needed to streamline. The conversion's complexity made the practice question whether the vendor was the right decision and whether it should abandon the EHR efforts entirely. During this time, the practice could have chosen to abandon the part of the implementation that required data conversion by manually inputting the records instead. Fortunately, the site visits and help from the vendor made the transition easier once the conversion was complete.

Practice A defined success by the value it extracted from accessing the data saved in the databases of the software package, although initially it only focused on avoiding penalties by being compliant and receiving incentive payments for implementing on time and according to the guidelines. One doctor stated, "I think personally the way I measure success is the amount of information we are consuming and redelivering back to the office." The practice only chose to implement the modules within the software that were useful at the time of the implementation. In fact, it did not use all of the functionality installed currently, although the practice admitted it should, and doing so could potentially be useful for the practice. However, they providers found comfort in knowing that these options were available when they choose to use them. The software the practice installed is an open source design that allows developers to have access to all of the data instead of select fields. The software also has the ability to be modified, including custom code that creates more functionality for the practice. The flexibility of the system allowed the practice to employ part-time developers to add additional analytics to the system, an option that the practice created.

Overall, Practice A was very satisfied with its EHR implementation and had not considered abandoning the system or switching to another vendor. The service level agreement with the vendor allowed the practice to get help on issues and functionality with which its members were not comfortable. When there were problems, the practice contacted the vendor, and the vendor addressed their concerns, which sometimes led to changes in the software to accommodate the different requests. The practice was able to qualify for the government payment incentives for becoming qualified under Meaningful Use, which allowed them to capitalize on those resources while increasing the earning potential and efficiency for the practice overall.

Practice B

Practice B was a local nonprofit organization that was founded in 1990. With clinics located in both Midtown and Gwinnett, Practice B was one of the largest direct patient care nonprofits in the Southeastern United States. The organization's mission was to work with individuals (men, women, and children) who are infected and/or affected by HIV/AIDS. Services provided included medical care, prevention and educational programs, rehabilitation services, and behavioral/mental health. Although the organization offered several services to the community, our primary focus in this study was on the organization's clinic. There were two physicians on staff who worked with both locations; combined, they provided clinical services to a total of 960 patients.

Practice B worked with several local and national funders that included private insurance groups, local community grants, state funds, federal programs, and other federal funded resources. Each funder had a different set of reporting criteria that must be met for the practice to receive reimbursement. The organization's largest funder, the Ryan White Act, required that the organization adhere to local, state, and federal reporting guidelines for reimbursement. Similar to insurance companies, the Ryan White Act

worked within a fee-for-service reimbursement model; however, unlike insurance companies, the reimbursement requirements varied depending on patient diagnosis and treatment. Some of those requirements included statistical data, such as patient gender, HIV status, annual income, personal information, other government funded programs that the patient used, and mental health status screenings. Having the ability to track and access this data was very important to the organization.

There were more detailed reporting requirements relating to reimbursements for medical nonprofits that offer clinical services. The practice's motivations in implementing an EHR system was to be able to utilize the system more efficiently to collect required data needed to secure funding and service reimbursements. As one study participant explained, "I think the challenge for a non-profit is the data collection piece is so much different and with most medical practices there's no data reported requirement. They are not collecting data for any federal source as we are, so we had to have something that was flexible, and that we could export data from."

Due to reporting requirements, Practice B had specific needs that were not addressed easily by current EHR systems on the market. Knowing that their needs would be specific, Practice B developed a search panel consisting of the executive director, two physicians, and select community volunteers. Once the panel identified and implemented the system, Practice B found system flexibility to be paramount. Real options concepts not only allow an organization to assess uncertain IT investments more accurately but, perhaps more important, they also can guide managers in how to create actively and extract value (Fichman et al., 2005). Practice B found real options to be beneficial because its needs were so specific that the software engineers had to develop new software for the practice during the implementation process.

Whenever an IT project has flexibility about which applications and functions to implement, and when or how to implement them, real options are present (Fichman et al., 2005). The strategic growth option offered flexibility and was another motivator for EHR implementation within Practice B. Strategic growth options that were important to Practice B included an option to automate billing, an option to track and collect patient data, an automated appointment reminder option, and an option to streamline clinical operations, processes, and functions.

Once the organization decided on a system and moved forward with implementation, it became overwhelmed by the amount of data that the system produced. The process of data input, as well as reporting outputs, also overwhelmed the organization. One study participant noted that "there are a thousand places to park data and a thousand different note types that people could have. Moreover, you can change and arrange how you see patients in the order of the screens of how you would like to see patients. So, you may want to look in their nose, first, and other people want to look in their ears, first. It is just the flow of practice can be different in the software. However, also as part of that, people can plug data in at different places, and what we quickly realized was we had apples and oranges as far as data. Everything was in there, but to get it back out was very different."

Practice B used change scale options throughout the software implementation, as decision makers decided to expand the system to include additional options. The options offered additional system uses of EHR, such as internal communication not just between the medical providers within the clinic, but also with the behavioral health specialists and the case management professionals. An example that one study participant gave was that the Ryan White grant required flu shots for anyone who received Ryan White-funded services. For the clinic to comply with this requirement, it had to submit data reports to Ryan White that showed the number of Ryan White-funded patients at each site who had received flu shots. When the data was pulled from the EHR system, the organization found that it was not compliant with the flu shot requirement. The clinic was then able to use the EHR system to flag the record of each patient who had not received the flu shot. Each flagged chart noted that the next person within the organization to see the patient needed to communicate with the clinic immediately. This communication allowed patients the ability to receive flu shots while onsite rather than having to make an additional visit to the clinic. This is a great example of IT capability investments being put to use when acquiring new technology and developing competence within that technology to further organizational goals (Jamoom et al., 2014).

Overall, Practice B's implementation and use of EHR software was a positive experience for this organization. Although not aware at the time, the stakeholders understood the EHR system purchase and implementation through a real options lens. The stakeholders within the practice vetted and researched the system that was right for the organization. The decision makers mentioned that the EHR system they chose, as well as its embedded and available options, has the capacity to grow with the practice both in the short- and long-term.

Practice C

Practice C was a sole proprietor medical practice with one doctor. There were six employees in different capacities: two nurses' aides, two clerical/administrative front desk workers, and two other support personnel. Two other sub-contract employees handled the practice's billing off-site. This practice was a pulmonology clinic at its core, with family practice attached. The doctor had practiced for 19 years and was the decision maker and implementer of the EHR system selection.

The doctor in this practice was more focused on patient care than practice management, including software used for documentation. For this reason, he relied upon others' expertise when deciding how to keep records. He stated, "At the time of establishment of this practice [I] decided it was best to start off [the] practice with an EHR system from the ground floor... [due to] experience from other physicians, ones that were actually working with electronic medical records." Although the practice began with an EHR system, it eventually needed to be replaced. The change in systems suggested little consideration of future needs that could not be met by EHR.

The doctor explained that there were two possibilities available at the point when he decided to replace the previous EHR. One was to purchase an expansion of the existing EHR. The second was to purchase another, entirely new EHR system. He based much of this decision on governmental compliance. The doctor explained, "To fulfill those requirements (government) with the old system we would have to buy different modules to be added." He was heavily influenced by information from other practices. The doctor also considered some of the knowledge he learned from the practice's experience with the original EHR system and the options to grow in the future with the new EHR package if required. He stated, "Well, it was users but not with the practice. It was another practice that would just make recommendations to us about the software." The doctor also indicated in the interview that the practice could have brought the old system up to compliance, but that option was more expensive than purchasing a new one. The ultimate choice was to replace the current system, but this decision brought with it a few challenges. The largest challenge the doctor identified was the time it took to train the staff to use the new system effectively. The doctor explained that it took some time to get up to speed, and there were still some areas where the practice was not where it needed to be. The doctor went on to state that the largest challenge was "being able to adapt to the system because it does not work the other way."

The choice of software came with some inherent options that would be available in the future. The doctor understood that the chosen software was more robust than what he currently needed, but if required, he would have options for the future. The doctor stated, "they (software company) implemented new things over time, like e-prescribing, for example, that we have to get later on." This software was compliant with Meaningful Use and ICD-10. When asked if the doctor thought the new EHR system would keep up with federal government changes, he said, "We would expect so, but as far as I know it is something the system that we are using is supposed to meet all the criteria, all the requirements that the government has."

Since this software was designed for and marketed to large practices, the doctor expected the opportunity to exercise strategic options. The doctor said, "It is a system that is designed for big practices. So as a solo practitioner and everything, I think there is a lot of room to grow with this system." Even though not specifically understood by the doctor as "options thinking," it seems there were expectations for options to be available in the future. As this doctor dealt with the uncertainty of the future, he now potentially had the ability to stage growth of his practice or growth of governmental policy influencing the current implemented software. He certainly chose to defer options, as he chose to purchase billing at a later time than at implementation. The practice also added an e-pharmacy module after implementation.

FINDINGS

This purpose of this study was to examine three real EHR implementations in the field and draw on the experiences of those directly involved. Our intent was to provide insight into the applicability of options thinking to decision makers of EHR implementations in small practices. We propose insight on how real options thinking could change the perspective of decision makers in small medical practices in relation to their EHR implementation. Considering the federal mandates and the impact of such businesses on their communities, methods to assist these decision makers in this sector could prove to be exceptionally beneficial, considering small practices' slow EHR adoption rate. We have used the lens provided by Fichman et al. (2005) to analyze our findings.

Previous scholars have not considered options thinking as a method of analysis for the creation of strategic advantage in EHR implementations. We, therefore, have adopted the lens provided by Fichman et al. (2005) to examine at options thinking and its application in the EHR implementation environment. In this study, we investigated EHR implementation by three geographically different small medical practices.

We intended the interview questions we asked of the three practices to elicit information about whether the doctors' decisions employed options thinking. In doing so, the researchers recognized that the language used in the existing literature would not be the same used by the doctors and that the doctors would not consider the use of options thinking specifically as defined in this and other papers. Therefore, the researchers had to analyze and code the interviews to translate what the doctors verbalized into the language used in the literature. The three researchers independently coded each interview, and then we reviewed all information for cross-case inferences. It is interesting that when plotted in a diagram, each of the cases used a different set of options (Table 2).

TABLE 2
USE OF OPTIONS

	STAGE OPTION	ABANDON OPTION	DEFER OPTION	STRATEGIC GROWTH OPTION	CHANGE OPTION	SWITCH OPTION
Practice One	Decision makers chose stage option by understanding the software choice would allow them to grow into future mandates such as ICD-10.					
Practice Two				The strategic mindset was evident in choices made understanding that the software choice came with the function they knew they would utilize at a future date.	Decision makers chose to make changes and incorporate new functions that become evident will add value.	

Practice Three				Decision maker chose strategic growth option considering the knowledge about future options that they chose not to implement at the time of purchase such as billing and E-pharmacy.		Switch option took place when the decision maker chose not to purchase modules into the existing system and buy into a completely new system.

The practices used all options, except for defer and abandon. It is reasonable to assume that the abandon option was not exceptionally viable in this environment, considering the governmental mandates and ultimately the reduction in reimbursements that would result from abandonment. It would be the medical conglomerate that might be able to absorb this abandon option. In a rural community, reimbursements may very well constitute the majority of the income in a small practice. In similar fashion, a decision to defer would be difficult considering that the government has routinely slipped implementation dates of the current law, thus providing a possible illusion of defer as an option.

Options thinking allows for a more proactive posture if applied early in the design of an EHR implementation. The options thinking mindset will allow decision makers to approach EHR projects with a more complete view of decisions' implications on EHR implementation projects. This different perspective from previous approaches is likely to result in different decisions. If small practices understand how to create and exercise options on the front end of EHR implementations, it may aid in increasing the total number of small practices adopting EHR.

Fichman et al. (2005) laid out six essential points to options thinking in IT investment projects, not all of which have implications for the EHR decision maker. Points two, four, and five dealt specifically with an IT software development project. Point two posted how real options thinking promotes flexibility and a quantifiable value in the development process of IT projects. Point four requires the adoption of new project management guidelines that promote flexibility in the development process and deliver results. Point five was that real options are most abundant in firms undertaking IT projects that are complex, strategic, and/or innovative. For decision makers in ERH implementations, these are not contributing factors and realistically are not issues imperative for them to consider.

The first point, real options thinking, is a new way of thinking about implementation of IT projects and is very telling in and of itself. Fichman et al. (2005) stated that real options thinking constitutes a new way of thinking about how to structure and manage projects. The concept of options thinking is now about ten years old, and yet we still do not see its use in literature in the small medical practice environment. The researchers also did not witness it as a specific mindset by the doctors in the small practices observed in this study.

The third point made by Fichman et al. (2005) was that real options thinking provides for value through the application of one or more of the six forms of options. This suggests that having an options thinking mindset means one should be familiar with forms in which options present themselves. This requires some education for the decision makers in the area of EHR. It is through options that value is created. Thus being fluent in this method of thinking will help to identify and manage those options once they present themselves.

The sixth and final point was that using real options will require a cultural change. In the world of small practices, the doctor is often the sole proprietor and simultaneously holds the positions of doctor, office manager, HR manager, IT manager, etc. Thus, the doctor must be informed on a multitude of concepts and disciplines to be able to manage the organization. All of these management areas have

cultural implications on their own, and yet adopting options thinking is likely to influence the existing culture. We agree with Fichman et al. (2005) that the doctors must recognize this so that they can manage this cultural disturbance. Real options thinking requires that its use is supplemented with a candid conversation about the real risk and potential failure of projects to identify the value of the available options.

LIMITATIONS

The limitations of this study need to be understood when considering its conclusions and implications for small practices. In this study, we recognized that two primary limitations exist. First, the use of multiple case studies included the possibility that our findings might not be not generalizable to all practices because these were small case studies, and the observations are unique to each practice. However, the depth of information in each case study should outweigh any disadvantages from this limitation because of the applicability to practices that still need to implement EHR. The study focused on three different types of practices, which also limited the similarities that the research will examine. These findings may be different if applied to larger practices or the same type of practices.

A second limitation of the study was the absence of all six real options in the three case studies. The absence of two of the options does not mean that it is impossible for a practice to exercise the options. These options were just not present in this study.

FUTURE RESEARCH

This study contributed to gaps in the literature by exploring how decision makers in small practices chose federally compliant EHR software for implementation while implicitly using real options. Additional research can be done to address gaps regarding the success or failure of those options over time. A longitudinal study could address how the real options lens could save or cost practices more money, as well as the impact on government reimbursements and any potential penalties for late implementations. An additional future research opportunity could study the use of real options in large practices, and it could focus on how these successes or failures could be applied to implementations in small practices that have less knowledge and expertise regarding federally compliant software.

CONCLUSION

This study used real options theory to examine healthcare IT projects in small practices, particularly EHR software purchase and implementation. Decision makers involved in EHR selection can have lots of uncertainty about which options are needed in both the short-term and the long-term. Study results identified how small practice decision makers can utilize real options theory to understand better which options are available to them when purchasing and implementing EHR systems. Real options can also be a helpful tool in assisting a small practice in evaluating an EHR system's overall fit within the practice and the system's overall ability to meet specific practice needs. Small practices that use a real options mindset during the EHR selection process can better prepare for both current and upcoming projects and tasks. This mindset can also affect how these projects and tasks can be structured and managed better. Real options are also useful in assisting small practices with evaluating a particular software's ability to grow with the practice.

The software that a small practice purchases and implements now will determine future practice IT capabilities. Small practices that purchase software without a real options mindset risk limitations with future strategic practice growth and software upgrades; however, small practices that utilize real options will be better poised for future growth and sustainability. Scholars have studied similar IT investment projects using the theory of real options. However, literature introducing real options into healthcare IT is limited. Our research makes a meaningful contribution by introducing the concept of real options into healthcare IT projects, particularly the introduction of real options into small practice EHR

implementation and investment. This introduction extends current knowledge by viewing the theory of real options through an additional lens. Our contribution follows Fichman et al.'s (2005) suggestions to identify which of the six defined options are integrable into small practice healthcare IT investment projects. Whether the practices in this study understood the concept of real options or not, all three small practices still utilized real options when selecting their software. Of the six defined options introduced by Fichman et al. (2005), we identified that the practices utilized four available options: stage options, strategic growth options, change options and switch options. The two options not utilized in the three cases were the defer option and the abandon option. The current healthcare environment does not lend itself to the abandon option, as non-compliance leads to decreased reimbursement and possible practice closure.

Although the medical community contributes to 18% the U.S. GDP, current literature has not yet expanded real options thinking into the medical environment. This study has done that successfully. By focusing on small practices, we were able to identify how incorporating real options into EHR implementation can better assist decision makers when purchasing and implementing EHR software. The goal of the study was to examine how real options thinking shapes implementation decisions in small practice EHR implementations. This study will be useful in helping small practice stakeholders make better decisions through the purchase and implementation of EHR software that is not only federally compliant, which allows them to receive their maximum reimbursements, but also provides future growth opportunities that can benefit the practice.

REFERENCES

2015 Edition Health Information Technology (Health IT) Certification Criteria, 2015 Edition Base Electronic Health Record (EHR) Definition, and ONC Health IT Certification Program Modifications. Final rule. Fed. Reg. 80, 200 (2015).

Adner, R., & Levinthal, D.A. (2004). What is not a real option: Considering boundaries for the application of real options to business strategy. *Academy of Management Review, 29*(1), 74-85.

Arvantes, J. (2011, April 1). Government investment in health IT spurs innovation in EHR equipment. Retrieved December 11, 2015 from URL.

Ben-Assuli, O., Sagi, D., Leshno, M., Ironi, A., & Ziv, A. (2015). Improving diagnostic accuracy using EHR in emergency departments: A simulation-based study. *Journal of Biomedical Informatics, 55*, 31-40.

Black, F., and Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy, 81*(3), 637.

Centers for Medicare & Medicaid Services. (2012, May 1). National health expenditure projections 2012-2022. CMS.gov. 1 May 2012. Retrieved June 5, 2015 from URL.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*(1), 25-32.

Fichman, R. G., Keil, M., & Tiwana, A. (2005). Beyond valuation. *Options Thinking in IT Project Management," California Management Review, 47*(2), 74-96.

Furukawa, M. F., King, J., Patel, V., Hsiao, C. J., Adler-Milstein, J., & Jha, A. K. (2014). Despite substantial progress in EHR adoption, health information exchange and patient engagement remain low in office settings. *Health Affairs, 33*(9), 1672-1679.

Heisey-Grove, D., L.-N. Danehy, M. Consolazio, K. Lynch and F. Mostashari (2014). "A national study of challenges to electronic health record adoption and meaningful use." *Medical Care, 52*(2): 144-148.

Hsiao, C. J., Jha, A. K., King, J., Patel, V., Furukawa, M. F., & Mostashari, F. (2013). Office-based physicians are responding to incentives and assistance by adopting and using electronic health records. *Health Affairs, 32*(8), 1470-1477.

Inverso, G., Flath-Sporn, S. J., Monoxelos, L., Labow, B. I., Padwa, B. L., & Resnick, C. M. (2015). What is the cost of meaningful use? *Journal of Oral and Maxillofacial Surgery, 74*(2), 227-229.

Jamoom, E. W., Patel, V., Furukawa, M. F., & King, J. (2014). EHR adopters vs. non-adopters: Impacts of, barriers to, and federal initiatives for EHR adoption. *Healthcare (Amsterdam), 2*(1), 33-39. Elsevier.

Jones, S. S., Rudin, R. S., Perry, T. & Shekelle, P. G. (2014). Health information technology: An updated systematic review with a focus on meaningful use. *Annals of Internal Medicine, 160*(1), 48-54.

Myers, M. D. (2013). *Qualitative research in business & management*. Thousand Oaks, CA: Sage Publications.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics, 5*(2), 147-175.

Oster, C. (2015, April 22-25). Rugged terrain: The challenges of using EHR across systems. 48th Annual Communicating Nursing Research Conference, Win.

Sandberg, J., Mathiassen, L., and Napier, N. (2014). Digital options theory for IT capability investment. *Journal of the Association for Information Systems, 15*(7), 422-453.

Shih, S.C., McCullough, C.M., Wang, J. J., Singer, J., & Parsons, A. S. (2011). Research article: Health information systems in small practices. Improving the delivery of clinical preventive services. *American Journal of Preventive Medicine, 41*, 603-609.

Van der Tang, L. (2012). Small-practice culture influences EHR success. Age of EHRs has not rendered post-it notes extinct. *MGMA connexion/Medical group Management Association, 12*(2), 40-42, 1.

Van De Ven, A. H. (2007). Engaged scholarship: A guide for organizational and social research.

Van Reedt Dortland, M., Voordijk, H., & Dewulf, G. (2014). Making sense of future uncertainties using real options and scenario planning. *Futures, 55*, 15-31.

Yin, R. K. (2013). *Case study research: Design and methods.* Thousand Oaks, CA: Sage Publications.

Zimlich, R. (2013, February 25). 6 keys to profitability. *Medical Economics.* Retrieved October 9, 2015 from http://medicaleconomics.modernmedicine.com/medical-economics/news/modernmedicine/modern-medicine-feature-articles/6-keys-profitability?page=full.