Spring 5-2013

The Impact of Technology Attitudes and Skills of Rural Health Clinic Nurses on the Level of Adoption of Electronic Health Records in Mississippi

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The University of Southern Mississippi

THE IMPACT OF TECHNOLOGY ATTITUDES AND SKILLS OF RURAL HEALTH CLINIC NURSES ON THE LEVEL OF ADOPTION OF ELECTRONIC HEALTH RECORDS IN MISSISSIPPI

by

Jennifer Lynn Styron

Abstract of a Dissertation
Submitted to the Graduate School
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

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ABSTRACT

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The evolution of health information technology continues to reform the delivery of efficient, safe, and equitable healthcare in the United States. One such example is the emergence of electronic health records (EHRs) and the discerning emphasis placed on using this technology in meaningful ways. While the integration of EHRs into daily practice impacts all healthcare professionals, nurses remain a prominent driver in the successful adoption and usage of these systems. It is therefore imperative to understand the impact of nurses' technology attitudes and skills on the level of EHR adoption in Mississippi.

This quantitative study examined the technology attitudes and skills of rural health clinic nurses on the level of adoption and meaningful use (as defined by CMS) of electronic health records. Approximately 44 rural health clinic nurses (or those serving in a rural health clinic nursing capacity) participated in a survey that solicited demographic information, healthcare facility information, electronic health record information; and information regarding the technology skills, and technology attitudes of the respective participant. The findings show no significant relationships between current stage of EHR meaningful use and rural health clinic practice ownership; nor do factors that impede or facilitate the diffusion process significantly differ by practice ownership. Findings also

indicate that the technology attitude of a nurse is not significantly impacted by (1) the age of the nurse, (2) the number of years of nursing experience, or (3) the current stage of EHR meaningful use at the nurses' respective rural health clinic.

Results of the study indicate that Mississippi's rural health clinics are at varying levels of EHR meaningful use with some clinics still at a level of no adoption. In addition, technology attitudes of rural health clinic nurses still remain low. As evidenced by technology attitude scores, clinic nurses lack confidence in using technology and in the technology itself. Training should be focused on the application of health information technologies to increase nurses' self-confidence and understanding of effective use. Further, administrators and practice owners should involve nurses throughout the adoption lifecycle to ensure nurses are a vital component in the development and integration of EHRs.

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May 2013

ACKNOWLEDGMENTS

There are so many people who contribute to the success of a doctoral graduate. The first of which is the dissertation committee. I would like to thank my chair, Dr. Shuyan Wang, who provided me guidance, support, and pushed me to do my absolute best in all aspects of my scholarly work. She has provided me with numerous opportunities to develop my professional skills and continues to remain an invaluable mentor. I would also like to thank the members of my dissertation committee, Dr. Taralynn Hartsell, Dr. James Johnson, and Dr. Kathleen Masters. Each committee member has dedicated their time to this project, provided encouragement and guidance, and been a great source of wisdom. For this, I will forever be grateful.

I would also like to thank my family and friends for their ongoing support, constant encouragement, and enduring love even when times were tough. This would include my dad, Dr. Ronald Styron, who has been instrumental in my professional development and has served as a role model for me throughout my life; my mother, Mrs. Luanne Styron, who has been a motivator, my rock, and a tremendous help during my data collection; and Dr. Leslie Arceneaux, Nick Lucia, Jeff Lucia, and Bryan Schmidt who provided continuous support throughout my graduate pursuit. I cannot thank each of you enough. I would like to also thank my good friend and mentor Dr. Joan Exline. Her persistence, focus, love, and support meant so much to me. She will always be missed.

Finally, I would like to thank the Mississippi Rural Health Association and the University of South Alabama's College of Nursing for their support for this project. Without which, this project would not have been successful.

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CHAPTER I

INTRODUCTION

The use of technologies by office staff and nurses in the healthcare field could lead to improved patient care (Ferris, 2010; Gagnon, Duplantie, Fortin, & Landry, 2006). Four specific types of health information technology (IT) shown to have the greatest impact on patients are personal health records (PHRs), electronic prescribing or ePrescribing, remote disease monitoring, and electronic health records (EHRs) (Bihari, 2010; Levinson, 2007). Personal health records consist of any personal health information available for a specific individual in an online document. Personal health records also provide patients with the ability to access, manage, collect, view and share his/her health information. Electronic prescribing is another type of health IT that allows participating doctors to prescribe medications to pharmacies electronically. Remote disease monitoring allows for the collection and transmission of personal health information in order to monitor diseases at a distance. This information is typically gathered by the patient and sent electronically to the doctor.

Electronic health records have been identified as the hub of patient health data and provide the ability to for providers to share and collect patient health information and compile it electronically. Cartwright-Smith, Thorpe, Burke, and Rosenbaum (2010) identified greater access to information and information transparency as one of the benefits to EHRs and believed it will facilitate public reporting and allow health providers to assess performance along a continuum of a patient's health and medical history. Electronic health records are similar in basic purpose to the traditional, paper-based records; however, by virtue of being digital, they are readily accessed, duplicated,

shared, and transported via networks, the least not being the Internet. The Healthcare Information and Management Systems Society (HIMSS) defines EHRs as:

> a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting that includes patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EHR automates and streamlines the clinician's workflow and has the ability to generate a complete record of a clinical patient encounter - as well as supporting other care-related activities directly or indirectly via interface - including evidence-based decision support, quality management, and outcomes reporting. (2012, para. 1)

The expected goals of EHR adoption are the reduction of health costs resulting from errors and duplications, improved patient quality of care, better coordinated care across the continuum of healthcare services, promotion of evidence-based medicine, and the improvement of record keeping, mobility, and reporting. Improvements in quality of care are expected from providing appropriate guidance to help guide medical decisions at the time and place of care and the reduction of medical errors, health disparities, incorrect patient information, and inappropriate and/or duplication of care. These outcomes work to advance the objective of the Institute of Medicine in providing safe, effective, patient-centered care in a timely, equitable, and efficient manner (Institute of Medicine [IOM], 2001).

Because health IT is relatively new and encompasses a large realm of technologies (i.e., emerging and information and communication technologies), a great deal of variation still exists among healthcare providers' level of health IT utilization

throughout the country. While the use of health IT could dramatically improve healthcare and decrease health costs within the United States, there has been little adoption of such technologies in rural areas (Bahensky, Jaana, & Ward, 2008; Jha et al., 2009).

Bailey (2009) indicated that rural areas have unique challenges regarding the use of health care information systems that should be considered during the planning and implementation phases of health IT adoption. Research on health IT adoption and usage has increased over the last decade however literature that explores rural health clinic adoption of health IT is lacking (Menachemi, Burke, Clawson, & Brooks, 2005). This disparity in research on health IT adoption in rural areas prohibits the understanding of challenges specific to this population's adoption and usage of health IT deterring its infusion into the healthcare field (Seeman & Gibson, 2009). Moreover, it limits the ability to provide appropriate resources and training initiatives to increase adoption and usage levels of health IT.

The complexities of health IT adoption and usage is further compounded in rural areas due to recent government mandates associated with the Patient Protection and Affordable Care Act (PPACA). Signed into legislation in 2010, PPACA expanded the net rural coverage to include an additional 5.4 million rural residents, with over three million of these newly insured individuals residing in the south. Newly insured rural residents also include a higher portion of non-elderly individuals (UnitedHealth Center for Health Reform and Modernization, 2011). PPACA is projected to increase the estimated number of insured rural residents in the south and west regions of the United

States by over 20%, potentially exacerbating current challenges to provide care to those in remote rural areas (UnitedHealth Center for Health Reform and Modernization, 2011).

With the passing of the Patient Protection and Affordable Care Act (2010), the Centers for Medicare and Medicaid (CMS) services established the electronic health record (EHR) incentive program. As of January, 2011, healthcare providers could elect to participate in the EHR incentive program that would compensate healthcare "professionals, eligible hospitals and critical access hospitals to adopt, implement, upgrade, or demonstrate meaningful use of certified EHR technology" (Centers for Medicare and Medicaid Services [CMS], 2011a, para. 1). The incentive program was intended to promote and reward pioneers and early adopters of EHRs who utilize these health records in meaningful ways.

Meaningful use was defined by the American Recovery and Reinvestment Act (ARRA) of 2009 and included three main components: (1) the use of a certified EHR in a meaningful manner, such as e-prescribing; (2) the use of certified EHR technology for electronic exchange of health information to improve quality of health care; and (3) the use of certified EHR technology to submit clinical quality and other measures (CMS, 2010, 3). While the advantages of early adoption can provide financial assistance for the initial costs associated with the purchase, installation, and implementation of an EHR system, the implications for those who do not adopt EHRs are more abrupt.

Found within ARRA are implications for healthcare providers who fail to adopt and utilize EHRs in meaningful ways by 2014. Providers who have not initiated participation in the Medicare incentive program by 2014 will incur payment reductions starting in 2015. Further, while the incentive programs provide initial assistance to

healthcare providers adopting and utilizing EHRs, incentive programs specific to Medicare will expire in 2016; with Medicaid incentive programs stopping shortly after in 2021.

While this mandate is beneficial for many healthcare providers, adoption rates have remained low in rural areas placing rural healthcare providers at a higher risk of noncompliance. According to UnitedHealth Center for Health Reform and Modernization, rural residents rely on these federal programs more so than in non-rural areas of the United States (2011). Even without penalties from failing to meet the meaningful use criteria, these programs fall short of providing reimbursement to rural healthcare providers for the actual costs associated with providing healthcare services to these residents. Consequently, additional financial strain is imposed on these providers.

Statement of the Problem

The unique composition of the setting itself, the state of Mississippi, and challenges associated with health IT adoption in rural areas pose a significant challenge to the adoption and meaningful use of electronic health records. Challenges within the state of Mississippi include highly populated rural areas, high poverty levels among the citizenry, and the number of medically underserved areas and populations. Other challenges include low levels of health IT adoption in rural areas, low levels of EHR adoption, a skeleton healthcare workforce, and cumbersome federal mandates. Each of these challenges is described in this section.

Population

Rural challenges are more prominent in the southern region of the United States which contains the largest number of rural residents (UnitedHealth Center for Health

Reform and Modernization, 2011). The state of Mississippi possesses a large rural population with "a high minority composition, high poverty rates, and some of the unhealthiest residents in the nation" (Cossman, Ritchie, & James 2005, p. 1). The Rural Assistance Center (RAC) (2012) reports that the state of Mississippi covers 46,907 square miles and is divided into 82 counties. Of the 82 counties, Mississippi's Office of Rural Health identified 65 counties, or 79% of the counties within the state, as rural (Mississippi State Department of Health Office of Rural Health [MORH], 2008). In 2010, Mississippi had an estimated population of 2,967,297 people, of which 55%, or 1,636,272 people, lived in rural Mississippi (United States Department of Agriculture Economic Research Service [USDA-ERS], 2012a). This data indicates Mississippi has the largest percentage of citizens living in rural areas of any state in the nation and is in sharp contrast to the national average (17%) of the U.S. population who reside in rural areas (USDA-ERS, 2012b).

Poverty Level

Recently, Mississippi has also experienced an increase in residents who live below the poverty line. Data reported in the 2009 and 2010 American Community Survey showed an increase in Mississippi residents living below the poverty level from 21.9% in 2009 to 22.4% in 2010 (United States Census Bureau, 2011). Both the 2009 and 2010 surveys revealed that the percentage of Mississippi residents living below the poverty level was higher than any other state. Those living in poverty in Mississippi represent a much larger percentage than the reported national average of 14.3% in 2009 and 15.3% in 2010 of the U.S. population (United States Census Bureau, 2011). The United States Department of Agriculture Economic Research Service (USDA-ERS)

(2012a, 2012b) reported that the average per-capita income for all Mississippi residents in 2009 was $30,401, compared to $39,635 nationally. Estimates from 2009 also indicated a higher poverty rate (25.8%) in rural Mississippi when compared to 18.3% in urban areas of the state (RAC, 2012).

Medically Underserved Area/Populations (MUA/Ps)

The United States Department of Health and Human Services (HHS) Health Resources and Service Administration (HRSA) developed a designation system that indicates the number of medically underserved area/populations (MUA/Ps) for each state by county. Building upon this system, HRSA also has an identification system used to determine health professional shortage areas (HPSA) for primary medical care providers, dental, and mental health professionals. Medically underserved areas and populations are designated by HRSA as areas or populations that have "too few primary care providers, high infant mortalities, high poverty, and/or a high elderly population" (HRSA, 2012a, para. 10; HRSA, 2012b, para.11); while HPSAs are designated areas that have "shortages of primary medical care, dental, or mental health providers and may be geographic (a county or service area), demographic (low income population) or institutional (comprehensive health center, federally qualified health center or other public facility)" (HRSA, 2012c, para. 6). Relative to the FY 2012 Mississippi State Health Plan (MSDH, 2011), HHS defines a health professional shortage area (HPSA) as:

1. a geographic area that has a ratio of at least 3,500 persons per primary care physician and insufficient access to those physicians within a 30 minute traveling radius; and
2. areas with 3,000 to 3,500 persons per primary care physician that have

> unusually high needs for primary care services and have insufficient access to primary care doctors within a 30 minute traveling radius (p. 21).

Mississippi's fiscal year (FY) 2012 state health plan, in accordance with HRSA's health professional shortage area definition, identified "136 primary medical care professional shortage areas with 70 of those reported as single county designations" (Mississippi State Department of Health [MSDH], 2011, p. 21). There are a total of 5,313 active medical doctors with 42% of these doctors practicing as primary care providers (PCPs). According to Mississippi's FY 2012 state health plan there is one PCP for every 1,398 persons within the state (MSDH, 2011). Shortages of primary care physicians in rural areas may also be attributed to an older physician population within these areas as 27% of physicians in rural areas and 29% of physicians in remote rural areas are over the age of 55 (UnitedHealth Center for Health Reform and Modernization, 2011). The FY 2012 Mississippi state health plan also reported "121 HPSA designations for dental health professionals with 71 of these reported from single county designations" (MSDH, 2011, p. 23). These numbers reveal that there is only one dentist for every 2,358 persons within the state. Also contained within the report are low numbers of nurses within Mississippi with a total of 36,136 registered nurses with 2,463 certified as advanced practice registered nurses; and an additional 13,226 licensed practical nurses (MSDH, 2011). These statistics indicate a critical shortage of healthcare professionals serving in Mississippi's rural areas.

Health IT Adoption in Rural Areas

The healthcare industry currently offers a variety of health information technologies which reduce costs and improve patient outcomes. However, even with

these advantages, health IT adoption rates have remained low in rural areas. The problem therein for Mississippi is that the state reports the highest number of rural areas than any other state in the U.S. while failing to adopt EHRs. Furthermore failure to adopt EHRs during the incentive period of the federal mandate could widen the gap between quality care in rural areas; and be detrimental on sustaining the state healthcare system. Additionally, research is scarce on rural adoption of health IT, which further complicates proactive measures to assisting these entities in the adoption and use of EHRs.

Electronic Health Record Adoption

As with any major technological shift, there are several complex challenges, potential improvements, and development opportunities associated with EHR adoption. Challenges associated with EHR adoption include compliance with federal legislation and state and federal privacy laws (of particular note is the health insurance portability and accountability act also known as HIPAA), EHR certification, technology development, rural and urban adoption, and maintenance and support. EHR adoption faces other significant adoption barriers including initial and ongoing investment, insufficient return on investments, lost productivity, increased legal exposure, increased management and administration effort, and changes on established business practices. Moreover, the time and cost associated with the adoption of EHRs are significant and include costs associated with a lack of efficiency and the inability to purchase additional medical equipment which could equally impact patient care or result in improved health services.

Healthcare Workforce

The healthcare profession encompasses a unique workforce that typically strives to care for and serve our nation's citizens. The services and care provided are vital to the

health and livelihood of our population. With a national healthcare workforce shortage, an aging healthcare workforce, a scarce amount of healthcare services and providers in rural areas of the United States, and the newly insured population it is evident that the demand for services will far outweigh the supply that is currently available (Alliance for Health Reform, 2011; Derksen & Whelan, 2009).

Additionally, the sociopolitical climate and restriction of voluntariness on EHR use may also impact health professionals' attitudes, especially nurses as their attitudes toward the utilization of EHRs have a significant impact on usage. Research indicates that understanding the needs, attitudes, facilitators, and barriers of adopting an innovative technology is crucial in the effective adoption, implementation, and utilization of that innovation (Rogers, 2003). The advancements made through the use and integration of healthcare information technologies have helped to reshape and define quality care in the United States. However, not all entities have been afforded the opportunity and/or have chosen to adopt EHRs. Resistance of health providers to provide patient care using health IT is common (Geibert, 2006).

Federal Mandate

In recognition of the challenges providers face, and in an effort to promote the adoption of EHRs, the federal government has offered various types of incentives to assist with the purchase, adoption, and meaningful use of this technology. From a broader perspective, constituents of the federal incentive program believe that the use of EHRs in meaningful ways, "will improve the nation's healthcare system and the health of Americans" (Ferris, 2010, para. 4). However, even with federal subsidy, provider adoption of EHR remains a complex problem, with basic adoption rate estimates around

one in five (AHRQ, 2010a; Cummings, 2010). For one, EHR is but one component of a complex and dynamic healthcare industry. The national EHR adoption mandate comes amid other healthcare reforms (e.g. universal health insurance coverage) and the intersection of emerging technologies including consumer health IT applications (AHRQ, 2010b) and telemedicine, economic hardships, political uncertainty, and judicial scrutiny. As a whole, EHR adoption is not a singular problem, but interdependent with many other equally important and resource-heavy issues.

One of the major aims for increasing rural healthcare provider participation in the incentive program is to help compensate for the initial technology costs associated with adopting and utilizing EHRs. But, by failing to register for such incentive programs, rural healthcare providers put additional strain on their already limited resources and, in 2014, will begin to receive reduced payments for Medicaid and Medicare services that consists of up to 40% of their patient payments. For rural providers, decreased payments from Medicaid and Medicare, who are the predominant insurers of patients that utilize rural healthcare providers, increases the probability of widening the gap between those services provided in non-rural areas and the healthcare needs of residents found in these areas. Thus, equitable healthcare is threatened.

In conclusion, rural healthcare facilities are found at contrasting levels of adoption and meaningful use of EHRs (Lewis, 2010; McCullough, Casey, Moscovice, & Burlew, 2011). If the current body of knowledge pertaining to the adoption of EHRs into non-hospital, rural, and/or small-sized eligible Medicare/Medicaid providers is not expanded, the gap between equitable, quality care and disparities in these settings could be

detrimental. Achieving a better grasp of adoption rates is a fundamental step toward improving healthcare outcomes.

In summary, the challenges faced are quite complex given Mississippi's unique composition, challenges associated with EHR adoption in rural areas, and low levels of optimism of healthcare leaders in Mississippi with regard to EHR adoption in rural areas. Mississippi has a large number of medically underserved areas and populations, and the state's rural area population and poverty levels are the highest of any state in the nation (Cossman et al., 2005). Additionally, Mississippi's skeleton healthcare workforce compounds the challenges of rural adoption of health IT. These challenges combined with cumbersome federal mandates and low levels of EHR adoption in rural areas indicate that the state of Mississippi is confronted with additional barriers to the successful adoption and meaningful use of EHRs.

Purpose of the Study

Understanding how health IT, specifically electronic health records, have been adopted throughout the state and the attitudes of nurses practicing in rural health clinics will provide constituents with invaluable information on how to assist in the adoption and advancement of meaningful use. This will ensure that healthcare providers stay in compliance with federal legislation, and receive incentive payments for EHR use. Further, it will provide the opportunity to develop practical training and resources needed to assist healthcare professionals in developing the needed technology skills and competencies to utilize EHRs in meaningful ways.

Determining the level of EHR adoption and meaningful use is complex, given the background of EHR adoption, the challenges of and training necessary when adopting a

new technology, the special challenges of providers in rural and underserved areas, the nature of technology and the industry, and the overarching sociopolitical climate. The potential benefits of EHRs provide a compelling rationale to support further investigation into the level of adoption and use among health providers. PPACA's federal mandate requiring providers to incorporate EHRs into daily practice further augments the need for research on the current level of EHR adoption by providers and the factors that impede/facilitate the adoption and meaningful use of EHRs.

The intent of this study was to gain a significant understanding of Mississippi's rural health clinics (a) current stage of EHR adoption, (b) factors associated with EHR integration and usage that impede and/or facilitate the diffusion process, (c) current technology skills and usage of practicing nurses in rural health clinics, and (d) nurses' current attitudes towards technology. Failure to understand the current state of EHR adoption and provide the resources and support necessary to effectively adopt and use EHRs in meaningful ways could be detrimental to health services provided in rural health clinics in Mississippi. Further, if EHR systems are not adopted and utilized in meaningful ways, it is possible that the gap in quality of care and services provided for rural residents will expand.

Research Questions

The research questions included:

RQ1: Was there a statistically significant difference between practice ownership and the current stage of EHR use?

RQ2: Were there factors associated with EHR integration and usage that impeded the diffusion process? If so, did they differ by type of practice ownership?

RQ3: Were there factors associated with EHR integration and usage that facilitated the diffusion process? If so, did they differ by type of practice ownership?

RQ4: Was there a statistically significant relationship between technology attitudes and the age of the nurse?

RQ5: Was there a statistically significant relationship between technology attitudes and the number of years of nursing experience?

RQ6: Was there a statistically significant difference between technology attitudes and the current stage of EHR use?

Definitions of Terms

Centers for Medicaid and Medicare Services. The Centers for Medicaid and Medicare Services is the United States federal agency that administers *Medicare*, *Medicaid*, and the Children's Health Insurance Program (CMS, 2012).

Critical access hospitals. A CAH is a small rural hospital with 25 inpatient beds or less. CAHs offer 24-hr emergency care and are usually at least 35 miles from the nearest hospital or 15 miles in areas with difficult roads or terrain. Hospitals are designated by Medicare who pays for most inpatient and outpatient services at these facilities on the basis of reasonable cost (UnitedHealth Center for Health Reform and Modernization, 2011, p. 64).

Diffusion process. The diffusion process is "the process in which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 5).

Electronic health record. Also known as EHRs, are a health related information on a specific individual that conforms to recognizable interoperability standards that are created, managed, and consulted by authorized clinicians and staff across more than one health care organization (National Alliance for Health Information Technology, 2008, p. 17).

Electronic medical record. Also known as EMRs, are a health related information on an individual that can be created, managed, and consulted by authorized clinicians and staff within one health care organization (National Alliance for Health Information Technology, 2008, p. 16).

Healthcare professional(s). Healthcare professional(s) include but are not limited to "physicians, nurse practitioners, nurses, dentist, pharmacists, paramedic staff, community health workers, or specialists who provides health-related services to patients or is involved in the research, support, or delivery of health-related services" (Eli Lilly & Company, 2012, para. 8).

Healthcare provider. A doctor or other healthcare professional who is authorized by the state to practice medicine and provides health services for payment (Hipaa.com, n.d.).

Health information exchange. The electronic movement of health related information among organizations according to nationally recognized standards (National Alliance for Health Information Technology, 2008, p. 22).

Healthcare information organization. An organization that oversees and governs the exchange of health related information among organizations according to nationally recognized standards (National Alliance for Health Information Technology, 2008, p. 22).

Health information and management systems. A set of components and procedures organized with the objective of generating information which will improve health care management decisions at all levels of the health system (Lippeveld, Sauerborn, & Bodart, 2000).

Health information technology. Health information technology, also known as health IT, "involves the exchange of health information in an electronic environment," (United States Department of Health and Human Services [HHS], n.d., para. 1).

Health professional shortage area. An area designated by the Health Resources and Services Administration (HRSA) as "having shortages in primary medical, dental, or mental health providers and may be urban or rural areas, population groups or medical or other public facilities" (Health Resources and Services Administration (HRSA), 2012c, para. 6).

Information and communication technology. Information and communication technology include those tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means (World Information Technology and Services Organization [WITSA], 2006, p. 2).

Medically underserved area(s). Also known as MUAs, these areas "may be an entire county or group of contiguous counties, a group of county or civil divisions or a

group of urban census tracts in which residents have a shortage of personal health services" (HRSA, 2012a, para. 10).

Medically underserved population(s). Also known as MUPs, may include groups of individuals who have economic, cultural or linguistic barriers to health care (HRSA, 2012b, para. 11).

Personal health record. Also known as PHRs, are an electronic record and health related information on an individual that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared, and controlled by the individual (National Alliance for Health Information Technology, 2008, p. 19).

Practice ownership. The practice ownership refers to the majority (or sole) owner of a particular health practice. The Medical Group Management Association (2004) defined following types of practice ownership: government, hospital/integrated delivery system, insurance company or HMO, management services organization or physician practice management company, physicians, University or medical school, and organizational component of an academic medical institution.

Regional health information organization. A health information organization that brings together health care stakeholders within a defined geographic area and governs health information exchange among them for the purpose of improving health and care in that community (National Alliance for Health Information Technology, 2008, p. 22).

Rural health clinic. As defined by the Mississippi Rural Health Association [MRHA], a rural health clinic is "a clinic that is located in a rural, underserved area that

utilize the resources of midlevel practitioners to provide primary care services to Medicaid and Medicare patients residing in rural communities" (2011, para. 1).

Rural settings. While rural settings are identified by a number of government agencies, the U.S. Census Bureau defines these settings as "all territory, population, and housing units located outside of urban areas (50,000 or more people) or urban clusters (between 2,500 and 50,000 people)" (United States Census Bureau, 2012, para. 1).

Assumptions

The researcher assumed that all healthcare providers that met the selection criteria were provided the opportunity to participate in the study voluntarily. This assumption implied that each nurse within the given population was provided the opportunity to express opinions, perceptions, and experiences specific to the adoption and meaningful use of EHRs to ensure that the study was not biased. Additionally, this assumption implied equal opportunity for participation within the sample population and was specific to rural health clinics.

The researcher also assumed that all respondents provided accurate and honest self-reported answers. Furthermore, because of the sociopolitical influences and pressures associated with the adoption and utilization of electronic health records, it was assumed that no individual would discuss or influence any self-reported answers or his/her colleagues' answers to ensure validity to reported answers. To help ensure confidentiality, participants were provided assurance that information provided remained private and anonymous, and that participation was completely voluntary.

The researcher also assumed that all participants took adequate time to complete the questionnaire thoroughly and completely and returned the completed questionnaire in

a timely fashion. The final assumption was that the sample size would be large enough to identify statistically significant differences, and the results could be generalizable to the sample population.

Delimitations

This study was limited to the state of Mississippi because it had the largest rural population and highest level of poverty of any state within the country. Due to the selection criteria restricting participation to nurses practicing in rural health clinics in the state of Mississippi, findings of this study may not be generalizable beyond the scope of the state. While findings may potentially provide insight to other rural healthcare provider settings who share similar characteristics and challenges in electronic health record adoption and implementation but such entities should proceed with caution when utilizing the findings of this study.

This study was also limited to one type of health information technology (IT), EHRs, because (a) EHRs contain the greatest potential for improved safety and quality of health care in the United States and (b) the adoption and use of EHR has been mandated by the federal government for universal implementation. Though EHRs are an integral part of health IT, this specific type of technology is but one component of the numerous health information technologies including telehealth, mobile devices, electronic prescribing, etc. Therefore, the results of this study may provide limited, if any, information about the general adoption of health information technology as the study was specifically focused on electronic health records.

Another limitation was the lack of direct observation of actual usage of EHRs. Those who participated in the study were asked to self-report their levels of EHR usage

and attitudes pertaining to technology. This may have led individuals to self-report higher levels of EHR use, and positive technology attitudes as opposed to the actual level of EHR and technology usage of participants. Further those individuals who do not fully understand the meaningful use criteria as defined by CMS may not have an accurate understanding of the current stage of their respective rural health clinic's EHR usage.

Furthermore, participants in this study may had limited, if any, exposure to EHRs. Participants may have lacked a thorough understanding of meaningful use of electronic health records due to the lack of clear definitions, the inability to utilize electronic health records in healthcare provider settings, or the personal experience or exposure to the initial adoption of electronic health records. This may have cause misperceptions about meaningful use and led participants to misreport current stages of meaningful use.

Justification for the Study

Need Assessment

A preliminary needs assessment was conducted in Mississippi at two health summits to better understand the current perceptions of Electronic Health Records (EHRs) and the level of self-reported optimism felt regarding the use of EHRs. Data was initially collected from the 2011 Mississippi Health Summit participants who were either from organizational entities, health-related professionals, or public officials in the State of Mississippi. Data was also collected at the 2011 Mississippi Rural Health Association annual conference extending initial findings and targeting a more specific population, specifically rural healthcare professionals in the state of Mississippi.

Findings

Participants were asked on a scale of 1 to 5, with five being "strongly agree" and one being "strongly disagree" to report their level of optimism about the rate of successful EHR adoption (a) in general, (b) in Mississippi, (c) in Mississippi's stand-alone practice, and (d) in Mississippi's rural healthcare settings. Based on the responses of the need assessment, it was determined that most healthcare professionals were optimistic about the successful adoption and use of electronic health records in general. However, when asked about their optimism for adoption in Mississippi, levels of optimism were lower than the general optimism levels reported. Levels of optimism for Mississippi's stand-alone practices and rural healthcare practices received the lowest levels of optimism with rural healthcare practices receiving the lowest optimism response average of 3.08. This suggests that healthcare professionals in the state of Mississippi are generally optimistic about electronic health record adoption however, are less likely to be optimistic about the adoption of EHRs within the state and further within the rural healthcare providers of the state. These findings form the basis of this study and suggest further research should be conducted to investigate perceptions of Mississippi's rural healthcare practices as reported levels of optimism were the lowest for this particular group within the state. Further, the attitudes of computers and technology merits further investigation as low levels of optimism may suggest an overall low attitude of technology use in general.

Benefits of the Study

As previously stated the levels of optimism for successful EHR adoption were low for rural healthcare facilities within the state of Mississippi, therefore further

research is needed to explore barriers that currently exist in the adoption and use of EHRs in rural healthcare settings. The findings of the need assessment also highlighted the demand for further research regarding a better understanding of electronic health records including the benefits and challenges of EHR adoption and use, current levels of EHR adoption, and the current technology attitudes and use of health care professionals.

This study had several potential benefits. Data collected provided an overview of Mississippi's rural health clinic settings, their level of adoption, self-identified barriers of adopting and utilizing EHRs in meaningful ways, and the self-identified resources needed to effectively integrate EHRs into current clinical practice. The study also identified technology attitudes of nurses practicing in rural health clinic settings and their self-reported technology skills and usage. This provided state health agencies with a better understanding of EHR adoption within the state and identified those agencies that are spearheading initiatives for meaningful use of EHRs to allow agencies to further explore how to reconstruct similar adoption environments for those falling behind in the adoption and utilization processes. Data was also critical in identifying state support and resources that are needed to adequately assist rural healthcare providers in the adoption and meaningful use of EHRs.

Findings from this study also provided an opportunity for rural healthcare providers to acquire federal subsidy for adopting EHRs provided the healthcare provider can demonstrate the meaningful use of the acquired EHR system. With state agencies and local support for EHR adoption rural providers may be afforded a more realistic opportunity to participate in the incentive program thus alleviating the potential of

additional financial strain on healthcare providers for initial startup costs associated with EHR adoption.

Another benefit of this study was to provide valuable insight into the current technology attitudes and skills of nurses practicing in rural healthcare facilities in Mississippi. While and Dewsbury (2011) define information and communication technology (ICT) in the health care setting as those technologies that "enable the exchange of data through the telephone or the Internet" (p. 1302). With the growth in health information technologies over the last two decades and an aging healthcare provider population, it is possible that many individuals have not been provided adequate educational opportunities and training resources to appropriately and sufficiently address their learning needs. Determining whether there is a relationship between technology attitudes by age was also explored. While and Dewsbury (2011) also suggest that the use of ICT in the clinical setting could lead to potential benefits in areas such as "patient assessment, health promotion, and clinical interventions" (p. 1303). By better understanding nurses' current technology use, training can be geared to meet the targeted audience at their appropriate technology skill level with training objectives geared towards increasing technology skills levels thus providing a greater potential for electronic health records to be adopted and utilized in meaningful ways.

Findings may also be beneficial in evaluating the effectiveness of current healthcare professionals' college curriculum. While there is still a need for a devoted field in health informatics, technology skills sets are needed by all healthcare professionals due to the changing work environment and increased use of health IT. Without ensuring students have an understanding of health IT and the skills needed to

successfully utilize these technologies, the transition into the workforce will be difficult and may require additional training and education. By better understanding the needs of the current workforce, educators will be able to better understand technology skills new healthcare professionals will need and can revise curriculum accordingly to ensure the healthcare workforce trained today have both the knowledge and skill sets needed to appropriately utilize health IT upon entering the healthcare workforce.

Understanding where healthcare professionals are at in their acceptance of health IT and the use of EHRs is critical to the adoption, successful implementation, and use of these systems. Adoption theories identify that without user acceptance of an innovation, the adoption of that particular innovation will be low. Identifying attitudes and acceptance levels of users as well as barriers and resources needed to adopt and use of EHRs will assist healthcare professionals within the state in developing strategies to overcome barriers and providing the resources needed to create an environment that fosters user acceptance.

This study provided valuable information that could prevent dire consequences for the citizens of Mississippi. If the issues surrounding the adoption of and usage of electronic health records are not addressed, the healthcare of Mississippi residents residing in rural counties, approximately 56% of the state's population (United Health Center for Reform and Modernization, 2011), could be impacted by a reduced number of both healthcare facilities and healthcare providers in rural service areas. The United Health Center for Reform and Modernization's 2011 report, *Modernizing Rural Health Care: Coverage, quality and innovation*, indicated that only 39% of primary care physicians and 42% of all primary care providers are active in rural areas. This indicates

that while the majority of the population lives in rural areas, the majority of primary care providers and physicians are located in urban areas. This current gap in the need for healthcare services and the proximity of healthcare locations in rural areas is already strained in the state of Mississippi. The failure of rural healthcare facilities and professionals to adopt and utilize EHRs in meaningful ways will ultimately lead to reduced medical payments and could potentially impact the financial stability and ability to sustain healthcare practices in rural areas. This further amplified the need for this study since most rural areas are already medically underserved and face a critical health professional shortage.

Summary

With the wide array of emerging health information technologies available and the potential role health IT can play in facilitating improved the quality of care and increased patient safety, it is important that healthcare providers adopt and utilize these technologies and do so in meaningful ways. Health IT offers both rural healthcare providers and residents an opportunity to improve accessibility to equitable healthcare and increase the continuum of care particularly for those residents in remote rural areas.

Electronic health records, though merely one type of health IT, has been widely viewed as a probable and effective mean to improve healthcare within the United States. Additionally, the adoption and use of electronic health records within the current U.S. sociopolitical climate given the current federal legislation of the PPACA indicate that using EHRs is a critical component and will be required by healthcare providers throughout the country. This quantitative study assessed the technology attitudes and

skills of rural health clinic nurses on the level of adoption and meaningful use (as defined by CMS) of electronic health records.

Chapter I provided a foundation from which the project was derived, justifies the extreme need for this study, and established the groundwork for the remaining chapters. A list of operational terms is provided to ensure central terms surrounding the project are clearly defined. Concluding the chapter are delimitations and assumptions of the study.

Chapter II expands upon the foundational knowledge of chapter one and provides the theoretical framework utilized within this study, addresses major constructs of the study, and refines these constructs specific to the purpose of this study. This will include providing an accurate representation of key concepts such as healthcare reform, health information technology, and technology attitudes. Within Chapter II, electronic health records are discussed in greater detail, along with the potential benefits and challenges to adopting and using EHRs in meaningful ways.

Chapter III discusses the methodological approach utilized for this study. Specifically, it describes the participants, procedures, and the instruments involved in assessing technology attitudes and skills of rural health clinic nurses on the level of adoption of electronic health records in Mississippi. Succeeding is Chapter IV, which will provide the descriptive and statistical results of the study along ancillary findings. Chapter V, the final chapter, will provide an overview of the study discussing key findings and how they connect with current research surrounding health IT. Additionally recommendations for practice and future research will also be discussed.

CHAPTER II

REVIEW OF RELEVANT LITERATURE

Chapter II will include the theoretical framework for this research study, and examine current literature surrounding healthcare reform, health information technologies with a focus on electronic health record adoption and implementation, and the current technology use of healthcare professionals. The relationship between electronic health record adoption and implementation, the state of healthcare in the United States, and the technology skills of healthcare professionals are all integral components to the adoption, implementation, and meaningful use of EHRs. Facilitators and barriers to adoption, with those specific to rural healthcare being emphasized, will also be discussed to better understand factors influencing or impeding the adoption of EHRs.

Theoretical Framework

At the core of any emerging technology integration and usage are three constructs: technology adoption lifecycle. In order to develop a valid and reliable instrument that effectively measured appropriate constructs, relevant theoretical frameworks were reviewed and utilized within instrument development. Furthermore, prior research studies were examined to avoid duplication of efforts and to identify effective measures of technology adoption in the healthcare field. The scope of available research to draw from is broad, but provides a theory-based foundation for inquiry into the current challenges of adoption and meaningful use of EHRs.

Given that the focus of this study is associated with EHR adoption, implementation and usage that impede and/or facilitate the diffusion process, technology adoption frameworks appeared to be the most appropriate. Adoption research

perspectives are applicable in the context of technology adoption by healthcare providers. For example, understanding the adoption lifecycle is important to the integration of health information technology as it focuses on the introduction, implementation, acceptance, and success of a particular technology. Current literature identifies various adoption stages that health care providers will face in implementing EHRs as well as stage-specific barriers. It is therefore important that the current stage of adoption is identified so that efforts to assist providers in progressing along the adoption cycle can be both relevant and effective.

Understanding behaviors and intentions specific to technology usage is also important. The theory of reasoned action (Fishbein & Ajzen, 1975) as well as the theory of planned behavior (Ajzen, 1985) both imply that an individual's attitude and motivation directly impact actual or intentional behavior. As a result, attitude and motivation are important variables when conducting research on technology acceptance and usage as both impact adoption and use of a particular technology, in this instance EHR adoption and use. Beyond providing predictors of acceptance and usage, understanding behavioral intention and use behavior is advantageous for organizations as it provides a mechanism for such entities to intervene (Yi, Jackson, Park, & Probst, 2006).

The theoretical framework selected for this study was the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003). The Unified Theory of Acceptance and Use of Technology (UTAUT) blends the diffusion of innovation (DOI) theory (factors specific to adoption such as social influence and facilitating conditions), TRA and TPB (belief that attitudes and motivation impact behavior and use), and the technology acceptance models (perceptions of performance

and effort). The UTAUT model embeds eight technology adoption models' constructs and includes existing model constructs from the theory of reasoned action (TRA), the motivation model (MM), the theory of planned behavior (TPB), the combined TAM and TPB, the model of PC utilization (MPCU), and social cognitive theory (Schaper & Pervan, 2007, S214). Figure 1 provides an overview of the theoretical models and how they connect to one another and to the UTAUT model.

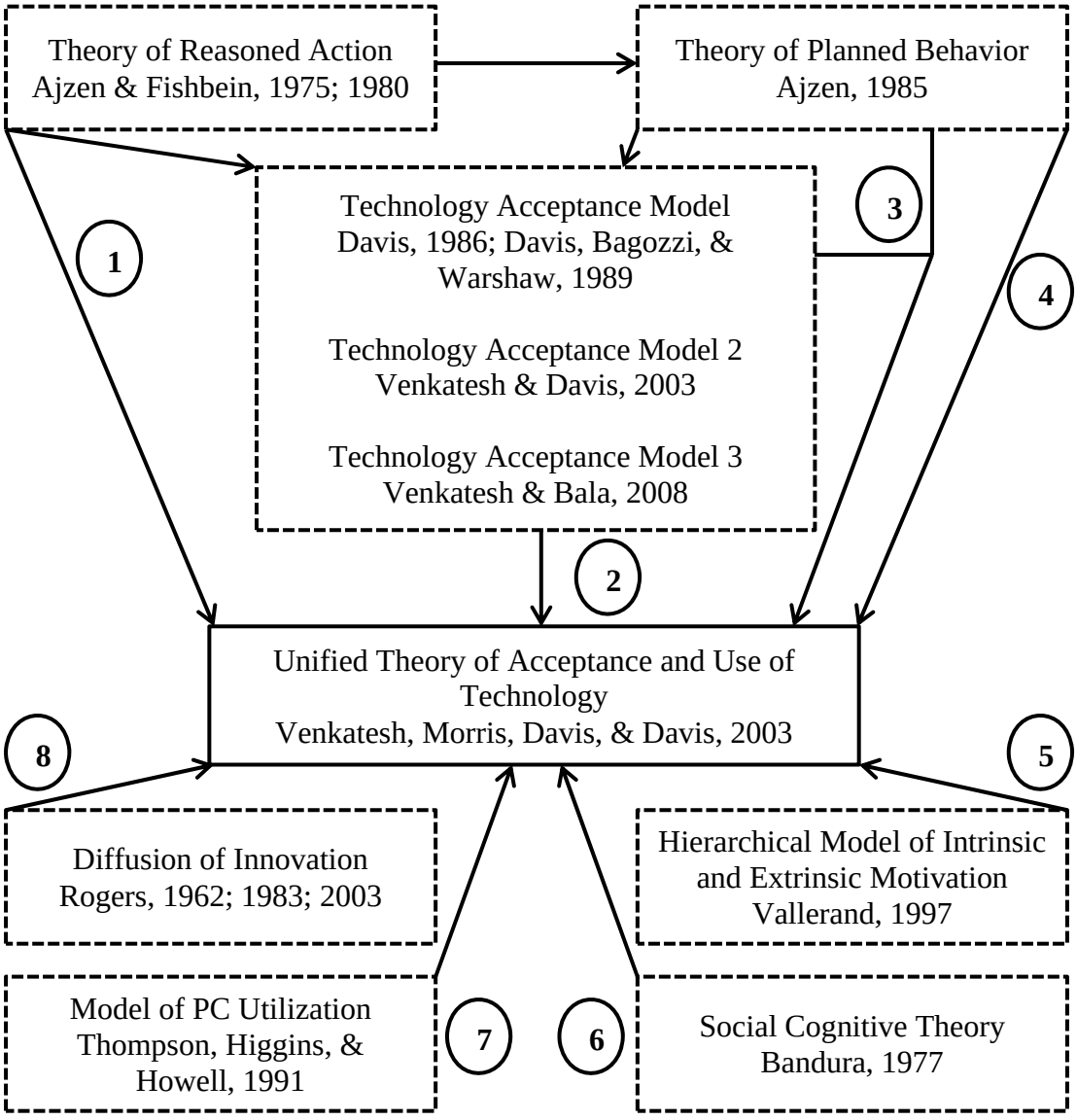

Figure 1. Theoretical models and their extensions to the Unified Theory of Acceptance and Use of Technology.

UTAUT Determinants and Moderating Variables

Determinants. The UTAUT postulates that four determinants (performance expectancy, effort expectancy, social influence, and facilitating conditions) are directly correlated with technology use (Burkman, 1987); and serve as predictors of intention to use technology (Brown, Dennis, & Venkatesh, 2010). Each of these determinants will be explored to provide a better understanding of what each construct entails.

Performance expectancy is the belief held by an individual that the use of a specific technology would assist that individual in some type of performance gain (i.e., increased job performance and/or outcomes, improved efficiency in daily tasks). Brown et al. (2010) identify that this determinant was derived from the technology acceptance model's perceived usefulness construct and that attitudes towards technology are accounted for within this variable. EHRs have been recognized as a more efficient way to collect, store, and share health information (Silow-Carroll, Edwards, & Rodin, 2012) however have also been attributed to feelings of anxiety and increased workload (Carayon, Smith, Hundt, Kuruchittham, & Li, 2009). By understanding if users believe the utilization of EHRs is advantageous to their job performance, one will be able to predict the intention and usage of EHRs by rural health nurses.

The second determinant, effort expectancy is the effort required by an individual in order to use the technology. Effort expectancy utilizes perceived ease of use, complexity, and ease of use all of which are constructs incorporated from existing models (Venkatesh et al., 2003). The greater the effort expectancy, the less likely an individual is to adopt and use a particular technology. Nurses' belief regarding the ease of use of a technology was also a significant predictor of quality of care (Karsh et al., 2009).

Determining the level of ease of use and complexity of the technology will be an important construct in understanding the adoption and use of EHRs.

Social influence is the belief held by the individual that other individuals, deemed important, consider the technology useful and that it should be used. Social influence as it pertains to behavioral intention can be can be moderated by gender, age, experience, and voluntariness (Hennington & Janz, 2007). Social influence was also found to be a significant factor in influencing health IT adoption (Kijsanayotin, Pannarunothai, & Speedie, 2009). This construct is particularly interesting as the adoption and meaningful use can be seen as both voluntary and involuntary. Whether nurses' adoption and use is impacted by social influence will be important in determining the best approach to proactively supporting the adoption process of EHRs.

The fourth construct, facilitating conditions, are those beliefs held by an individual that the organization and technology infrastructure have the support needed to assist the individual in the use of the technology. Facilitating conditions will be particularly important in rural health clinics as these healthcare providers tend to have strained resources. Ruxwana, Herselman, and Conradie (2010) also indicated that rural areas require investment in infrastructure in order to appropriately support adoption and use of a particular technology. Additionally, the absence of technology infrastructure results significantly impacts the adoption and use of technology (Brown et al., 2010).

Moderating variables. The UTAUT model also takes into account four key moderating variables, which are experience, voluntariness of use, gender, and age (Venkatesh et al., 2003). Given that the mandate it required and that nurses are not key decision makers in regards to EHR adoption, voluntariness as a moderator was excluded.

However, the other three variables may impact the acceptance and use of technology. Experience was found to be negatively associated with adoption and use indicating that as the number of years or nursing experience increases, these health professionals' adoption and use of technology decreases (Kowitlawakul, 2011). Additionally, literature suggests that an individual's age is significantly correlated with technology attitudes (Hinson et al., 1994; Dillion, Blankenship, & Crews, 2005; Eley, Fallon, Soar, Buikstra, & Hegney, 2008; Moody, Slocumb, Berg, & Jackson, 2004). Finally, gender has been found to influence the determinant social influence and user intention, particularly for women (Bandyopadhyay & Fraccastoro, 2007; Brown et al., 2010).

Relevance of UTAUT to Study

In an effort to create a more appropriate framework for technology acceptance specific to the health sector, the UTAUT (Venkatesh et al., 2003) was developed and serves as the primary framework for this study as it accounts for "socio-technical issues, and the role of technical social, individual, and organizational issues in the process of individual acceptance and use of information and communication technology (ICT)" (Schaper & Pervan, 2007, p. S214). The UTAUT is believed to be more relevant to the health care sector and capable of providing a broader understanding of the numerous factors attributing to behavioral intention and use behavior (Schaper & Pervan, 2007; Straub, 2009). More specifically, the UTAUT was found to be a good model for EHR (Hennington & Janz, 2007).

Additionally, by integrating components of the above mentioned eight technology acceptance models into one unified theory, it is thought to be the most comprehensive and a better predictor of acceptance and use of technology (Bandyopadhyay &

Fraccastoro, 2007; Schaper & Pervan, 2007; Straub, 2009). The UTAUT is also more reliable in terms of the variability it can explain. Independently, the eight technology models explain 17-53% of the variability in use of information technologies (Straub, 2009); however when combined into a single theoretical framework, UTAUT explains 70% of the variance (Bandyopadhyay & Fraccastoro, 2007; Schaper & Pervan, 2007; Straub, 2009; Venkatesh et al., 2003).

The UTAUT developed by Venkatesh et al., (2003) also indicated that age and gender (which are often unaccounted for in adoption and use theoretical models) may have key influences on use; and that social influence are important in relation to adoption and use however, these influences tend to be more important for older workers, particularly women, an in earlier stages of adoption. With an aging healthcare workforce (IOM, 2011) dominated by female nurses (United States Department of Labor, 2011), age and gender must be accounted for when exploring the adoption and use of EHRs.

This study also focuses on merely one specific type of health IT, EHRs. UTAUT is thought to be unique in that it measures a specific self-efficacy toward a particular technology (accounted for in the effort expectancy variable) rather than an individual's overall computer self-efficacy (Straub, 2009, p. 639). Therefore the variability explained will be specific to EHR adoption and will ensure the relevance of the findings to EHRs as opposed to broader technology adoption findings.

Healthcare

Healthcare is a complex, dynamic industry that has continued to evolve and change within the realm of our nation's history; entailing various perspectives on the effectiveness of the system as a whole. Some individuals have made proclamations about

the quality of the United States' healthcare system; and that the healthcare provided to our citizens has been among the best healthcare in the world. Contrary to these beliefs, many view our healthcare system both fragmented and broken citing the lack of accessibility of health care for all citizens and the control given to health insurers to approve/deny medically needed coverage among some of the concerns of the U.S. healthcare system. Information provided within this section is meant to provide a basic context for which the health information technology (health IT) explored in this study is set in, and is in no way exhaustive of the history of our healthcare system.

The number of underinsured individuals has always been a challenge to the U.S. healthcare system and continues to remain a critical concern to the well-being of our countries' ability to provide affordable, safe, and quality care. While the intent of healthcare reform such as the Patient Protection and Affordable Care Act (PPACA) is to close disparities within the current system, a great deal of financial apprehension remains in regards to dramatically increasing the number of uninsured or underinsured given our current economy. In a 2009 report by the Kaiser Family Foundation, 46 million Americans are reported to be uninsured. This number has dramatically increased (up by 11 million) from the reported 35 million uninsured in the 1990's (Reinhardt, 2001). The continual growth in these numbers is quite alarming considering factors that attribute to uninsured citizens, such as the national economy and unemployment rate, are on the rise. In addition, the large percentage of individuals who are underinsured add to the continued challenges of our current system and the ultimate goal of providing affordable, relevant coverage to citizens. Concurrently, healthcare enterprises continue to face financial

constraints further complicating the ability to ensure these facilities are equipped to provide innovative, safe, and high quality care.

Reinhardt (2001) also dissected health spending over the time period of 1965-1997 into three categories the golden age of medicine, the gilded age of medicine and managed care. Reinhardt's synopsis of this time frame provides a rudimentary understanding of the healthcare system and its changes lending insight to the growing costs of our current healthcare system. The first era termed by Reinhardt as the golden age of medicine spanned from 1965 to 1987 and demonstrated a healthcare system which was "open-ended fiscally" and "afforded providers complete clinical freedom" (2001, p. 4). The gilded age of medicine spanned from 1982 to 1992. During the gilded age, premiums paid by employers rose significantly for both small and large employers; the cause of these raised premiums are controversial but are a result of either the launch of emerging technologies or the 1980's government deregulation policies (Reinhardt, 2001). Regardless of the causality, this was the start of escalated healthcare costs within the United States.

The final time period, 1992 to 1997, was termed managed care and was defined by Reinhardt (2001) as:

> The ability of private employers to force upon their employees employer-sponsored health insurance products that limited the employees' choice of providers to defined networks, that often limited direct access to medical specialists, and that sometimes limited somewhat patients' access to new and expensive medical technology. (p. 5)

While managed care kept health spending from substantially rising during this time frame, overall spending once again started to rise. Concurrently, the attempt to control for both cost and access to health services was not widely received (Reinhardt, 2001).

Healthcare Reform in the United States

Among this timeframe was also a substantial amount of attempted healthcare reform that strived to provide universal health care and accessibility. In the report *Focus on Health Reform: National Health Insurance—A Brief History of Reform Efforts in the U.S.*, the Kaiser Family Foundation (2009) identifies four reforms relevant to the aforementioned time frame 1960-1965 The Great Society: Medicare and Medicaid; 1970-1974 Competing National Health Insurance Proposals; 1976-1979 Cost-Containment Trumps National Health Insurance; and 1992-1994 The Health Security Act (p. 1). Additionally, the Consolidated Omnibus Budget Reconciliation Act (COBRA), the Children Health Insurance Program (CHIP), and the Patient Protection and Affordable Care Act (PPACA) will be embedded into these periods in order to better understand the political climate at which times these acts were passed.

Introduction of Medicare and Medicaid. During 1960-1965 President Johnson along with congressional leaders attempted to build *a great society* by providing health coverage to elderly poor Americans through the Kerr-Mills Act of 1960. Though not as successful as initially hoped the act, which provided federal grants to states to provide such coverage, only had 28 states participate and, of those states, many underestimated the funding needed to initiate and sustain the program. These experiences, coupled with the findings of the program, helped to establish new ideas of reform which included the

development of a single bill with three layers commonly known as Medicare A, Medicare B, and Medicaid (Kaiser Family Foundation, 2009, p. 4). In 1965, both Medicare and Medicaid were signed into law under the Social Security Act.

Political influences on healthcare. Kaiser Family Foundation's report (2009) deemed the next time frame (1970-1974) as one that included competing proposals for a national health insurance. Though set in an opportunistic environment for reform, proposals were inevitably defeated by a lack of bipartisan agreement on any specific reform initiative. The theme during the 1976 to 1979 time period was cost-containment attributing the lack of a national health insurance to "an economic recession, inflation, and uncontrollable health care costs" (Kaiser Family Foundation, 2009, p. 7). One of the major health costs investigated during this time period that impacted the ability to propose national health insurance was hospital costs which eventually led to the "Medicare Prospective Payment System in 1983 shifting government payment from a charge-based system to predetermined, set rate based on the patient's diagnosis" (p. 7). Because of the instability of the economy during the late 70's and 80's and the growing concern of many Americans that they would lose their job or be unable to pay for health care, the Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1986 was passed. This act provided an individual who lost their health benefits, due to a loss or change of job, the right to purchase their previous health insurance plan under certain circumstances (United States Department of Labor, n.d.).

The final health reform identified in Kaiser's Family Foundation report (2009) was the Health Security Act (1992-1994) that proposed "universal coverage, employer and individual mandates, competition between private insurers, and would be regulated

by government to keep costs down" (p. 7). Going back to the managed care era discussed in Reinhardt (2001), this act would have included a "managed competition where private insurers and providers would compete for businesses and individuals" (p. 8). Though the act did not pass it contributed to the 1997 Children's Health Insurance Program (CHIP) put into place to provide health insurance to low-income children (Kaiser Family Foundation, 2009, p. 8).

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 signed by President Clinton reformed the nation's welfare system in that it required an individual work and, in return, provided time-limited assistance over a two-year period. Seven years following, the Medicare Modernization Act of 2003 signed into effect by President Bush created a new prescription drug benefit program for those individuals eligible for receiving Medicare. Within the restructuring of the Medicare Modernization Act was an increased reliance on private insurance and cost-sharing responsibilities to the beneficiary (Center for Medicare Advocacy, 2004).

Introduction of health information technology. President Bush, also signed executive order 13335 into effect in 2004 to initiate the development of an interoperable health information technology infrastructure and to improve the quality and efficiency of health care and charged the Secretary of Health and Human Services to establish the position of National Information Technology Coordinator under the Office of the Secretary (Executive Order No. 13335, 2004). The National Information Technology Coordinator was charged with developing a nationwide interoperable health information technology infrastructure with the intent ensuring all Americans had health records available in electronic format by 2014. Additionally, the Director of Office of Personnel

Management provided options for incentives for those healthcare entities that adopted the use of the interoperable health information technology (Executive Order No. 13335, 2004).

Patient Protection and Affordable Care Act. The final reform included in this overview is the Patient Protection and Affordable Care Act (PPACA). This act was signed into effect by President Barack Obama and represents "the most significant transformation of the American health care system since Medicare and Medicaid" (Manchikanti, Caraway, Parr, Fellows, & Hirsch, 2011, p. E35). This healthcare reform was heavily campaigned for by 112th Congress and was passed with no bipartisan support. Additionally, it has left the healthcare providers, insurance companies, pharmaceutical companies, and citizens divisive on whether the impact of the law will be positive or negative in trying to improve the healthcare system within the United States. Advocates for the legislation view the reform as a way to help millions of uninsured Americans while non-advocates view the new reform as financially unsustainable (Manchikanti et al., 2011, p. E36).

Health information technology for economic and clinical health. Among many provisions of the PPACA is the Health Information Technology for Economic and Clinical Health (HITECH) Act which borrows from President Bush's E.O. 13335 as it "authorizes creation of an infrastructure to promote the nationwide adoption and use of health information technology (HIT) through incentive payments for Medicare and Medicaid providers who become 'meaningful users' of certified electronic health records (EHRs) technology" (Cartwright-Smith et al., 2010, p. 1). This current mandate requires the infusion of information technology into the healthcare setting and in predefined ways.

In order to obtain the incentives put in place by the Centers for Medicare and Medicaid (CMS) providers must show that they are utilizing a certified electronic health record system and EHRs in HITECH's meaningful ways.

Incentive payments began in 2011 and are in place for five years. During this time, providers can opt into the incentive program assisting them with initial costs of installing an electronic health record technology. Those incentives continually decrease over the period of five years and by 2016 those providers who are not utilizing a certified electronic health record technology in meaningful ways, the rate of pay for Medicare and Medicaid payments will be reduced and will result in a non-compliance penalty of up to 3% of the amount otherwise due. The challenges associated with the adoption of use of electronic health records will be discussed within this chapter to provide a better understanding of the implications of meaningful use.

Impact of Healthcare Reform

The cost of healthcare is also a growing concern for both employers and employees in the United States. While the reform attempts to reduce healthcare costs, it is too early to determine the economic impact the act will have our individual health and healthcare costs. One of the major barriers reported in any electronic health record adoption literature includes the financial costs of installing, integrating, maintaining the electronic health record system and the resources needed to provide appropriate training and education for healthcare professionals in order to effectively utilize EHRs in meaningful ways. Further the impact of the Centers for Medicare and Medicaid's meaningful use requirements for electronic health records do not take into account the challenges faced by practicing healthcare providers located in rural areas. This portion of

healthcare currently serves 50 million Americans who live in rural areas (UnitedHealth Center for Health Reform and Modernization, 2011). While barriers to adoption are addressed, few research studies adequately address the provider related costs and burdens of adoption for healthcare professionals who serve in rural areas. An overview of rural healthcare will be discussed below to further identify the target population for this study.

Rural Healthcare

The intent of healthcare reform is to improve the health of our nation, but healthcare disparities have and will continue to be an issue moving forward with reform. In his 2009 article focusing on rural issues for health care reform, Bailey identifies the top ten issues that include:

> The rural economy, public health insurance plans, a strained health care delivery system, provider and workforce shortages, an aging population, an increased at-risk population, a greater need for preventive care and health and wellness resources, a lack of mental health services, increasing dependence on technology, and effective emergency medical systems. (pp. 1-6)

Each issue identified by Bailey (2009) is within itself a barrier to the adoption and implementation of health information technology (health IT). However, the viability of healthcare providers and professionals being able to adopt and implement health IT are unlikely when met with additional barriers. Such improbable scenarios are typically found within rural settings and further complicate the challenges faced by rural healthcare providers and professionals in their quest to provide equitable, quality care to rural residents. Each issue will be described in further detail to accurately depict issues based on the current health care reform.

The Rural Economy and Public Health Insurance Plans

The U.S. manufacturing workforce has decreased within rural areas of the U.S. shifting a large number of rural residents to self-employed or small business employments. This shift has resulted in many rural residents lacking employee-sponsored health insurance options. The rural population is characterized as having less insured and underinsured residents than its urban counterparts. Consequentially, the fifty million Americans residing in rural areas are more likely to utilize public health insurance plans such as Medicare and Medicaid (UnitedHealth Center for Health Reform and Modernization, 2011).

Strained Healthcare Delivery, Providers, and Workforce

Rural areas experience additional barriers to delivering quality care as healthcare facilities are typically less accessible and have greater financial strain than those found in urban areas. Clinics and community health centers are the most common providers in rural areas (UnitedHealth Center for Health Reform and Modernization, 2011). Because rural area healthcare providers are sparse, most rural areas utilize local health departments to provide health services and rely on primary care providers to deliver needed health services. Additionally, Medicare and Medicaid payments for the services provided in rural areas often fall short of the actual costs of providing care. As most rural residents are covered under these plans, rural healthcare providers face financial deficits straining the already underrepresented healthcare services provided in these areas (Bailey, 2009). Other strains to the system include declining occupancies and revenues, the inability to recruit and retain a highly skilled workforce, and inadequate and aging infrastructures (UnitedHealth Center for Health Reform and Modernization, 2011).

There is also a deficiency in the representative populations of providers and healthcare workforce in rural areas. Only 11% of practicing primary care physicians work in rural areas, many of which live close to urban areas or in small rural population areas (UnitedHealth Center for Health Reform and Modernization, 2011). Due to the lack of physicians, nurse practitioners and physician assistants are a critical component to the delivery of healthcare services in rural areas. About 12% of nurse practitioners and 70,000 physician assistants practice in rural settings (UnitedHealth Center for Health Reform and Modernization, 2011, p. 15).

The healthcare shortage is amplified by the vast amount (nearly 20%) of Americans who reside in rural areas with a projected population growth in these areas within the next 20 years around 18% (UnitedHealth Center for Health Reform and Modernization, 2011). As the challenge of a qualified healthcare workforce continues to remain a challenge in rural areas, healthcare providers are unsure as to whether they will accept newly covered Medicaid enrollees (UnitedHealth Center for Health Reform and Modernization, 2011). These concerns indicate the potential for an even greater healthcare disparity between the actual and needed delivery of healthcare services in these areas.

Characteristics of Rural Population

Rural residents also present unique demographic challenges to healthcare providers such as they tend to have an older and higher at-risk population than urban areas. In its working paper, *Modernizing Rural Health Care: Coverage, quality, and innovation,* the UnitedHealth Center for Health Reform and Modernization indicated that rural residents are typically older and poorer than other area residents with 15% of the

population in rural areas over the age of 65 compared to the national percentage of 13% (2011, p. 7). Minorities are also more prominent in rural areas (USDA-ERS, 2009) and are at an increased risk of developing chronic health conditions and health-associated issues. The Rural Assistance Center reported that "African Americans comprise 13% of the rural population with another 8% comprised of Hispanics and nearly all Indian American/Alaskan Natives residing in rural areas" (2012, para. 2).

Certain chronic conditions are also found more commonly with rural residents such as hypertension, diabetes, cancer, arthritis, asthma, chronic bronchitis, and mental orders (Bailey, 2009; UnitedHealth Center for Health Reform and Modernization, 2011). Within the rural population, racial and ethnic minorities have a greater chance of being diagnosed with a chronic condition amplifying again the health disparities that currently exist. The aging and minority makeup of rural populations add an additional level of complexity to health services and cost-effective healthcare solutions in rural areas. Both rural residents and practicing healthcare professionals incur additional costs when chronic conditions are diagnosed including the costs of follow-up and maintenance visits and medications for treatment of the condition. Additionally, education for individuals with chronic conditions is another component driving healthcare challenges (and costs) in rural areas.

Additional Resources Needed

Additional resources that remain lacking particularly in rural healthcare are preventive care services, health and wellness resources, technology adoption and use, and effective emergency medical systems. Without the implementation of these resources, rural healthcare providers will continue to struggle and the gap between current

healthcare disparities in rural areas will further widen. Many resources, such as the advancements in health information technology (e.g., telehealth) are particularly beneficial to rural areas. Telehealth is defined as "all possible variations of healthcare services that use telecommunications" (McGonigle & Mastrain, 2012). Uses of telehealth could include both clinical and nonclinical services and could be a function of both asynchronous and synchronous communication. However, the use of telehealth remains sparse in rural areas because of the slow rate of adoption, a lack of coordinated implementation strategies, inadequate broadband Internet access, and financial strains on existing resources. The following discusses additional resources further justifying their role and need in rural healthcare services.

Preventive care. Preventive care is considered an appropriate means to reducing healthcare costs. For example, many argue it is far less expensive to provide preventive care services than to treat a disease or chronic condition (Alexandraki, 2012). The use of preventive services allows healthcare professionals to identify healthcare issues proactively as opposed to merely treating the medical condition. Maciosek and Goodman (2006) found that the most beneficial preventive care services taking into consideration the services cost-effectiveness were aspirin chemoprophylaxis; immunizations including childhood, influenza, and pneumococcal; and screenings for preventive drinking, tobacco-use, colorectal cancer, hypertension, and vision. In addition to reduced health costs, individuals who utilize preventive care services increase the likelihood of having a high quality of life, often live longer, and have a greater probability of remaining disease free. Similarly, preventive services are all complimentary to the most frequently cited health disparities found within rural areas. However, Maciosek and Goodman's (2006)

study was limited to the general U.S. population in which there were reported racial and ethnic disparities in the use of preventive services. The authors cautioned that differences in the most beneficial preventive services may exist in subpopulations with higher racial and ethnic minorities (Maciosek & Goodman, 2006).

Health and wellness resources. There is also a greater need for health and wellness resources as rural populations tend to have higher obesity rates than urban counterparts (Bailey 2009; USDA-ERS, 2009). Rural populations tend to have higher levels of drug and alcohol abuse, teen pregnancy, and domestic violence (UnitedHealth Center for Health Reform and Modernization, 2011). The need for supplementary mental health services is also critical in rural areas. The UnitedHealth Center for Health Reform and Modernization denoted an increased level of suicide and higher levels of untreated depression in rural men than in their urban counterparts (2011). Additionally, more than 40% of American soldiers returning from war live in rural areas signifying a grave need for mental health services as these individuals will, or are at increased risks of post-traumatic stress disorder and traumatic brain injury (UnitedHealth Center for Health Reform and Modernization, 2011).

Increasing dependence on technology. Over the last ten years, there has been an increased emphasis placed on the role health information technology (health IT) can play in delivering safe, quality, and effective care (IOM, 2001; National Research Council, 2000). Advocates of health IT deem that these technologies are beneficial for both patients and healthcare professionals and will assist in improving safety and in the delivery of quality care (IOM, 2011). While adoption of various health IT has started diffusing across the nation, adoption in rural areas remain slow indicating barriers to

adoption. These barriers may include the lack of broadband and high-speed Internet available, capital resources, and healthcare professionals' resistance to adoption of health IT, most specifically, electronic health records (Bailey, 2009). Solo physicians are one example of a rural constituent that will face additional financial challenges to the adoption of EHR. These physicians bear more financial burden than those practicing in a hospital setting and are less likely to implement health IT (Medicare Payment Advisory Commission [MedPAC], 2004). According to Dolan (2011) "only 31% of solo practitioners had electronic medical records in July of 2011 as opposed to 76% of providers with 26 or more physicians" (para. 6). While these practitioners are aware of the consequences of non-adoption such as federal payment reductions for non-compliance, many lack the ability to purchase EHR systems or believe there will be little to none return on investment for the adoption of EHR in their practices. Such federal mandates have added another level of complexity to the adoption and implementation of EHRs and, as a result, may play a key role in either reducing or further widening healthcare disparities in rural areas.

Effective emergency medical systems. Typically, rural residents tend to rely heavily on emergency medical systems (EMS). Nevertheless, EMS providers are faced with analogous rural health provider challenges such as underfunding, and a lack of qualified and trained healthcare professionals (Bailey, 2009). The lack of quailed healthcare professionals is reflected in the number of volunteers (approximately 80%) that comprise the EMS provider workforce (UnitedHealth Center for Health Reform and Modernization, 2011). EMS providers also face infrastructure challenges making electronic medical records inaccessible often times. EMS providers in rural areas also

cover a greater geographic region making it more difficult for responders to promptly get to the accident site. Because of the increased length of time it takes to get the patient to the hospital, electronic medical record accessibility could help EMS responders provide both timely and appropriate care to patients.

Clearly for numerous reasons identified above, electronic health records could greatly benefit rural residents and the providers that provide health care services. Increased accessibility of health information could greatly assist healthcare providers in delivering appropriate care and would allow a holistic overview of a particular patient's medical diagnoses and medical conditions (Miller, West, Brown, Sim, & Ganchoff, 2005). However, without taking into consideration the unique challenges rural healthcare providers face and appropriately allocating the resources and support needed in these areas to successfully adopt and implement the mandated changes, the chance for healthcare disparities to widen between urban and rural areas remains.

Health Information Technology

As mentioned above, the increased adoption and use of health information technology (health IT) has been cited as one way to reduce health disparities, medical errors, and costs; improve the quality and continuum of care for patients; and increase accessibility of health services and information to patients and health care providers (Castro, 2009; United States Department of Health and Human [HHS] Office of the National Coordinator for Health Information Technology [ONC], 2010). Health IT can also play an important role in improving rural healthcare. For example, rural residents frequently have to travel greater distances to seek medical treatment due to a lack of healthcare facilities in rural areas. One advantage to the use of health IT, such as the use

of electronic health records, is that it allows rural residents' health information to follow them across healthcare settings. Additionally, the use of telemedicine has afforded the opportunity to provide care to those who may be in remote locations allowing for increased access to follow-up care and the delivery of education.

Health information technologies are defined as technologies in the health care field that "allow health care providers to collect store, retrieve, and transfer information electronically" (MedPAC, 2004, p. 159). Health IT technologies are typically associated with at least one of the following three applications of use: administrative and financial, clinical, or infrastructure (MedPAC, 2004). Systems that include administrative and financial applications provide features that assist hospitals and physicians with administrative tasks such as the ability to perform billing and accounting; while systems that include clinical applications provide clinician benefits such as the ability to reference relevant health information in professional journals (e.g., Medline) and enter patient information specific to the patient's care (MedPAC, 2004). Infrastructure applications include the ability of various EHR systems to share and transfer patient information improving the communication between providers and connecting patient information for a more thorough portrayal of an individual's health.

Health IT has become a buzzword in healthcare reform, although individual technologies found within the scope of health IT are not often well defined. The broad and often vague descriptions utilized to define health IT have resulted in slightly modified meanings for the same definitions or confusion in identifying the differences in similar terms. One example includes the use of health records that are electronic. Misuse is common when describing electronic health records, electronic medical records, or

personal health records as these words are often used interchangeably. In 2008, the National Alliance for Health Information Technology developed two working groups to clarify some of the ambiguity surrounding key health IT terms.

The types of health IT frequently discussed and commonly utilized include telemedicine, social networking, distributed e-learning, and telehealth or eHealth. The common thread among these uses of health IT is that each utilizes telecommunications to provide service. Individual health technologies or sometimes a conglomerate of health IT is key to providing healthcare service to underserved areas. Below is a brief synopsis of each to allow for a better understanding of the use of each within the health care profession.

Telemedicine

Telemedicine is defined as "the provision of clinical services using the electronic exchange of medical information, cross-site transmission of digital images and electronic communications (UnitedHealth Center for Health Reform and Modernization, 2011, p. 42). Information and communication technology (ICT) and ICT systems have allowed advances in telemedicine and in the ability for healthcare providers to share information quickly and remotely; and has provided an alternative option to providing physical face-to-face care. UnitedHealth Center for Health Reform and Modernization (2011) identified examples of telemedicine to include "physician-patient email, remote monitoring of vital signs and video patient consults with physicians and even the use of mobile devices (cell phones and laptops) to provide mobile health services also known as mHealth" (p. 42). The center recognized that the improvements in individual technologies such as cameras and digital imaging and the use and accessibility of both

healthcare providers and individuals in using a mobile device have assisted in the relative advantages of using telemedicine as a delivery of care. The national health IT policy committee met in December of 2011 and discussed the current research being conducted in the United States which investigates the use of mobile devices in healthcare such as Skype, text messaging, email and health applications all of which can be accessed and utilized through the use of a Smartphone (U.S. HHS ONC, 2011, p. 21). This is yet another example of how information and communication technologies are being integrated to improve accessibility to healthcare for all.

Telemedicine can be utilized in a variety of ways. One common use of telemedicine includes the transfer of data images for analysis, also known as "store and forward" (UnitedHealth Center for Health Reform and Modernization, p. 42). This process describes the ability of a healthcare physician to electronically store a data image to the patient's health record and then forward the data image along to the provider by means of an electronic device. This process reduces the amount of time it takes for a patient's information to be stored with their health record and provides a faster, more accessible approach for providers to send and receive patient information. Another use includes the ability for patients and providers to meet either synchronously or asynchronously in an online environment. The use of Internet, Web cams, and audio and video conferencing technologies provides the opportunity for patients to interact virtually with their providers. UnitedHealth Center for Health Reform and Modernization (2011) identified that this application of telemedicine has allowed for group videoconferencing sessions between the patient, primary care provider, and specialist; quick diagnoses of common medical issues; and the increased ability to offer behavioral health care services.

Additionally, as the demand for interprofessional practice and education continues to grow, telemedicine will be heavily utilized to bring collaborative groups together to engage in IPE/IPP activities. While synchronous communication is preferred, asynchronous communication such as preparing a video report for another to view at a later time is another means of care that can be offered through the use of these health IT technologies (UnitedHealth Center for Health Reform and Modernization, 2011). Other examples of use include supporting patient self-managed care, remote monitoring, intensive care unit (ICU) telemonitoring, telepharmacy, and enhanced training and provider communication (UnitedHealth Center for Health Reform and Modernization, 2011).

Telemedicine has the potential to extent current services a provider can offer, improve efforts of coordinated care across care settings, positively impact the quality and efficiency of care provided, and offer the opportunity to individual's being treated to self-manage their own health care (UnitedHealth Center for Health Reform and Modernization, 2011). Particularly in rural areas telemedicine has increased rural residents' accessibility to healthcare specialists (UnitedHealth Center for Health Reform and Modernization, 2011). While the implementation and use of telemedicine indicate that these services could be particularly advantageous to rural residents, there tends to be a reduced rate of rural provider use (fewer than 10%) with healthcare providers in rural areas primarily utilizing connected networks in place for education and administrative functions (UnitedHealth Center for Health Reform and Modernization, 2011).

Telehealth or eHealth

Telehealth also falls within the telemedicine category. According to the UnitedHealth Center for Health Reform and Modernization (2011), telehealth includes "a broader set of uses of the technology that includes but also extends beyond the delivery of medical care" and "supports activities such as remote medical education, health services research and some administrative functions" (p. 42). Telehealth allows individual healthcare providers the ability to provide medical services as well as offers the capacity to connect with systems of different providers for the purposes of sharing data. Electronic health records are a key type of telehealth in that they allow various providers remote access to patient health information to assist in the quality of treatment and coordination of care across settings. Other technologies that are considered important aspects of telehealth include computerized provider order entry (CPOE), clinical decision support systems (CDSS), bar coding, radio frequency identification, automated dispensing machines, electronic materials management, and interoperability (MedPAC, 2004, p. 160).

Computerized provider order entry. Computerized provider order entry (CPOE) is a type computerized entry system that allows a provider to electronically submit orders for medicine and medical care (Castro, 2009). One of the major potential benefits of CPOE systems is that it helps reduce medical errors made in prescriptions or medical treatment. Similarly, ePrescribing systems allow providers to enter and submit prescriptions to the pharmacy electronically (Castro, 2009). An extensive literature review reported mixed evidence for the support of CPOE finding reductions in medical errors in critical care units and, in some cases, reporting the use of CPOE creating new

medical errors (Maslove, Rizk, & Lowe, 2011). Additionally, with the combined use of a clinical decision support system (CDSS), CPOEs have the ability to reduce adverse drug effects and dosage errors, and prescribe medications more accurately (MedPAC, 2004).

Clinical decision support systems. Clinical decision support systems (CDSS) potentially offer unique benefits to improved healthcare as these systems are able to utilize the health information available to identify individual issues with treatment recommendations. CDSS supports healthcare providers and professionals with real-time diagnostics and treatment recommendations ranging from basic support such as warnings and alerts for prescription adverse effects or interactions with other medicine, to complex support such as clinical pathways and protocols (MedPAC, 2004, p. 160). These systems provide evidence of the increased benefits of health IT including comprehensive patient health information, and the impact of a system to improve the quality of care. Because of the aforementioned benefits, the use of CDSS is especially important in the meaningful use of electronic health records.

Clinical technologies. Clinical technologies are another health IT benefit increasing safety in the delivery of healthcare services and reducing the number of medical errors. Clinical technologies includes bar coding, radio frequency identification, and automated dispensing machines. Bar coding utilizes a scanning device on both the medicine and the respective patient's armband to electronically capture information and determine whether or not the medicine is correct for that particular patient. This provides a proactive safeguard by identifying whether the medicine a healthcare professional is about to give is accurate and correct for the patient receiving the medicine. In addition to medication verification, bar coding can also assist with patient identification and counting

of surgical items reducing the number of counting discrepancy incidences (Ellner & Joyner, 2012).

Radio frequency identification (RFID) is derived from the general concepts in bar coding but tracks a patient electronically through wireless communication systems (MedPAC, 2004). RFID tagging, which is currently being tested in laboratory settings, has the potential to alert healthcare professionals in operative settings if a change in the plan of care is needed and provides the ability to automatically adjust staff schedules and assignments accordingly (Ellner & Joyner, 2012). Ellner and Joyner (2012) also pointed out the benefits of RFID tagging in disposable items include automated purchasing and restocking based on current supplies. As the growth in the adoption and use of health IT continues to emerge in our current healthcare system, other potential uses of this specific technology might come to fruition.

Another type of clinical technology that could improve clinical efficiencies in healthcare settings is automated dispensing machines. This technology is responsible for the dispersion of medication dosages for patients in hospitals settings and provides another patient safety measure by ensuring that the proper dosage and medicine are given to the patient. Automated dispensing machines have also reduced the costs associated with drug theft, regulated controlled substances, and provided a way to document the dispensing, waste, and expiration of drugs (McClure, O'Neal, Grauer, Couldry, & King, 2011).

Electronic materials management. Electronic materials management (EMM) and interoperability are also additional benefits to telehealth care. EMM is a system which allows healthcare providers to track and manage various elements of medical materials

(i.e. pharmaceuticals) (MedPAC, 2004) and is one of the benefits found within the administrative and financial applications of health IT. Jenkins and Christenson (2001) identified the resemblance of EMMs to enterprise resource planning systems which allow businesses to incorporate business functions across an organization. Without the use of health IT, the ability to integrate such functionality would not be possible. Benefits of EMMs include providing large healthcare organizations the ability to review, monitor, and assess entities such as finances, human resources, workloads and workflows, sales and distribution, and marketing across healthcare facility sites. Jenkins and Christenson (2001) go on to distinguish the key difference between enterprise resource planning systems and EMMs which is the focus on managing staff and care processes in the healthcare setting. Such functionality becomes particularly important within telehealth as these processes can be labor intensive and many of the telehealth providers have limited staff on-site. Research conducted by Berman and Korosec (2005) proposed the use of planned coordination among organizations as an effective component in solving complex community problems however identified it is infrequently utilized in public health. The integration of EMMs is one solution for healthcare organizations in allowing the opportunity to incorporate business functions across healthcare settings. EMMs have also been cited as an effective approach to solving community issues.

Interoperability. Interoperability defines the degree to which a particular system is compatible and can interact with other systems as a means of sharing information (MedPAC, 2004). One of the primary benefits of health IT (which the healthcare system is in desperate need of) is its ability process, share, channel, and access medical and health information on individuals both quickly and remotely. Interoperability is a critical

component in ensuring this communication can occur and is a major application of a provider's infrastructure that must be considered when implementing an EHR system. Additionally, interoperability is a critical component in the meaningful use of electronic health records.

The constituents who play a role in IT investment decisions should assess the level of which the system can provide the above-mentioned applications of health information technology. The use of these individual components of health IT collectively in telehealth have provided healthcare professionals the ability to integrate specialists in the delivery of care incorporating teleradiology, telepsychiatry, telesurgery, teledermatology, and telehomecare services in the delivery of remote care. Without the ability for administrative, financial, and clinical functionality and an infrastructure that can support both administrative and clinical applications, health IT will remain a passive tool in healthcare and will be limited in the return on investment it has the potential to provide.

Social networking. Social networking is a Web 2.0 tool that has been utilized heavily in education as a means to engage students and provide an opportunity for students, particularly at a distance, to have an interactive social community providing students at a distance a close knit networking system outside of the realm of the online learning environment. Common social networking sites include Facebook and MySpace. Each has a focus on connecting individuals' though use of common themes or interests such as the high school an individual went to or research interests such as professional organizations that the individual is associated with. These same benefits of social networking are also applicable in the healthcare setting and include sharing information,

best practices, and improved health outcomes (Kamel Boulos & Wheeler, 2007). Effken and Abbott (2009) reported that utilizing social networking in a rural setting provided additional information and decreased isolation for school nurses. Social networking is yet another health IT that breaks down geographic boundaries and provides the opportunity for healthcare professionals who may be in remote areas to connect with other healthcare professionals. Particularly in rural areas, social networking may serve as a tool to enhance current information sources and education available ultimately impacting health outcomes of rural residents.

Distributed e-learning. E-learning occurs through electronic means and provides increased learning opportunities not only for healthcare professionals but also patients. The benefits of distributed e-learning for healthcare professionals include the ability to share knowledge and information with others within the healthcare field. This is particularly useful for those professionals practicing in rural health care settings as often they are geographically and often financially limited in the amount of interaction with urban counterparts or healthcare professionals outside of their region. Another advantage, particularly in areas that struggle to recruit and retain qualified healthcare professionals (e.g., rural areas) is the ability of e-learning to provide training and education. Effken and Abbott (2009) acknowledge the use of e-learning as a way to train the healthcare workforce in rural areas, without requiring them to leave home, thus assisting in addressing the current workforce shortage issues. Additionally, the healthcare professionals who utilize e-learning for training and education also instinctively gain information and communication technology skills which will benefit them in practice settings (Effken & Abbott, 2009).

E-learning can also be utilized to provide patients the opportunity to engage more within their own health. Healthcare professionals may use e-learning platforms to inform patients on current medical conditions or chronic illnesses, provide best practices and techniques to managing health conditions, and educate on how to measure and evaluate progression through medical stages of treatment. The intent is that individuals will gain more self-confidence and awareness about their knowledge of the medical condition and treatment and will feel equipped with the tools provided to successfully manage their medical conditions. This will also provide the opportunity for individuals to take greater responsibility in their health outcomes.

Benefits of Health IT

In an era of emerging technologies, it is important to not only stay abreast on the most recent innovations that have hit the market but also the effectiveness of those innovations in achieving the anticipated objectives and outcomes specified. As identified in Rogers' (2003) *Diffusion of Innovation,* adoption considerations will include the innovation's relative advantage, compatibility, complexity, trialability, and observability. When assessing the adoption of health IT, one must consider not only the benefits the innovation will provide to the healthcare provider and professionals who are using them but also to the patients of which the providers and professionals serve. Among these benefits include improved patient safety and quality of care, clinical efficiencies, the reduction of the healthcare delivery system's fragmentation, decreased healthcare costs, and the standardization of healthcare content and communication. The potential benefits have also been recognized by credible leaders in the healthcare profession. The Institute of Medicine (IOM) (2001), an unbiased nongovernment organization whose mission is to

provide objective advice on health related issues, recognized the use of information technology as one of the four potential solutions to improving our current healthcare system and addressing issues such as healthcare costs, medical errors, and patient follow up.

Improves patient safety and quality of care. Two of the most important issues in any type of healthcare setting are patient safety and quality of care. Based on applicable standards of care, healthcare providers and professionals should ensure a safe environment for the patient. In 2000, medical errors resulted in annual deaths of 44,000-98,000 people (MedPAC, 2004; Miller et al., 2005).

Decreases current healthcare costs. Health IT also provides an approach to circumventing increasing healthcare costs and the inconsistencies in quality of care. UnitedHealth Center for Reform and Modernization (2011) ascertained that benefits of utilizing telemedicine and telehealth could lead to "reduced readmissions to hospitals, unnecessary visits to physician offices, improvement of medication compliance, and a stronger communication between patients and healthcare professionals" (p. 46). This will particularly be advantageous to rural healthcare providers in providing quality care as their resources are already sparse. In addition, this will allow specialists and physicians the ability to follow-up with the patient eliminating the need for patients in remote areas to drive great distances for a face-to-face office visit. It also increases the ability to assess home care and provide education and guidance along the patient's recovery.

Challenges to the Adoption and Use of Health IT

The majority (over half) of urban and rural physicians indicated that costs associated with equipment, reimbursement, and administrative challenges are significant

barriers impeding the adoption of health IT (UnitedHealth Center for Reform and Modernization, 2011). In addition to acquisition costs healthcare providers must also consider the costs to maintain and upgrade the system as needed as well as ensure the system is both private and secure. This does not include the costs associated with technology training, education, and support for healthcare professionals who will utilize the associated health IT. The technology skill set of the workforce as well as the training and education needed to effectively utilize health IT are often overlooked or disregarded and has resulted in work-arounds, misuse, or resistance to use of health IT that has been implemented.

Web connectivity and the access to hi-speed or broadband Internet is another challenge to the adoption of many health IT applications. One of the major benefits to health IT is telecommunication which utilizes some type of technology to expand current channels of communication and the ability of healthcare providers to provide additional information and education. Health IT that utilizes these features is also referred to as information and communication technologies (ICT).

The low rate of adoption is a cause for concern and should be explored to better understand the approaches that could be developed to assist with greater adoption and use of health IT particularly in rural areas. While the benefits of health IT are apparent, less than one-third of primary care physicians reported using telemedicine applications other than for digital imaging and laboratory systems (UnitedHealth Center for Reform and Modernization, 2011).

Electronic Health Records

As a nationwide effort to promote and support Health Information Technology, The Office of the National Coordinator for Health Information Technology (ONC) was created in 2004 to "support the adoption of health information technology and the promotion of nationwide health information exchange to improve health care" (U.S. HHS ONC, 2010, para. 1). The ONC's mission includes:

> the development of a nationwide health IT infrastructure that allows health care providers and hospitals to use and exchange patient information electronically that (a) ensures secure and protected patient health information; (b) improves health care quality; (c) reduces health care costs; (d) improves coordination of care among different medical entities; (e) facilitates health research; early detection, prevention, and management of chronic diseases; and (f) improves efforts to reduce health disparities. (Office of the National Coordinator for Health Information Technology, 2013, para. 2)

Attempting to promote the use of health IT as well as to increase the level of adoption within the United States, the federal government has established incentives for those health care providers and facilities that integrate the use of electronic health records (EHRs). From 2011-2016, doctors and other providers can earn up to $44,000 from Medicare or $63,750 from Medicaid, and hospitals can earn millions of dollars, if they can demonstrate they are making "meaningful use" of EHR systems (Health Affairs & Robert Wood Johnson Foundation, 2010).

Even though incentives to increase adoption of EHRs have been established, research suggests nonhospital, rural and/or small Medicaid/Medicare providers are at risk

of missing these benefits either because of non-inclusion in the program or because of small numbers of Medicaid/Medicare patients (Cartwright-Smith et al., 2010). Research on barriers to EHR adoption is extensive and includes financial concerns, technology issues, policy concerns, and organizational factors.

Financial concerns have been the most frequently cited antecedent in EHR adoption (Schoenman, 2007; Simon et al., 2007). The costs of purchasing software systems in solo and small physician practices are substantial (Street & Cossman, 2008). In addition, participants described limited resources available to support the training and professional development of health care professionals as overlooked or undervalued (Falkenburg, 2004; Simon et al., 2007; Terry, Brown, Denomme, Thind, & Stewart, 2012). Professional development alone is a huge expense to any organization. However, without training on how to utilize EHR systems, EHR systems run the risk of being utilized at surface level rather than at a clinical level (Medicare Payment Advisory Commission, 2004). Without meeting the criteria of meaningful use, rural providers will not be able to receive federal incentives in place to support EHR adoption.

Technology issues include specific EHR software and hardware utilization, ease of use and flexibility, appropriateness of software for specialized providers, vendor dissatisfaction, equipment malfunctions, and insufficient user training on the EHR system. Failure to consider these antecedents can impact health care professionals' attitudes toward EHR adoption and decrease the probability of moving toward a level of meaningful use. Another major challenge to rural health care providers' implementing an EHR system is the complexity associated with EHR system selection and adoption. A lack of knowledge about EHR systems in general and about specific systems may

discourage or delay EHR system adoption (Chen & Skinner, 2008; De Veer, Fleuren, Bekkema, & Francke, 2011; Gans, Kralewski, Hammons, & Dowd, 2005).

Policy concerns have also been cited as challenges to the adoption of EHRs, such as security and confidentiality of patient information. Many consumer advocates express concerns about pervasive risks to confidentiality that electronic data sharing may pose for the privacy rights of patients. Such barriers can hinder the motivation and attitudes of health care professionals' willingness to adopt for fear of violating Health Insurance Portability and Accountability Act (HIPAA) regulations. In addition, the consideration of how EHRs will be utilized across departments and systems will be essential to identifying potential risks of abuse and privacy breaches as well as identifying how different EHR systems will interact with one another (Schoenman, 2007). The proliferation of software packages and the lack of a single national standard create integration challenges across provider sites.

Organizational barriers include physician motivation, staff attitudes towards technology and EHRs, the size of the provider, and the lack of resources available to support health care professionals in the adoption and use of the EHR system. The identification of such barriers will be critical in this study due to the limited scope of research conducted in rural settings. Further insight will assist in developing resources and training materials specific to the needs of these providers in hopes of increasing adoption and quality care in such settings.

Concerns Specific to Rural Healthcare Providers

Rural healthcare faces similar challenges of its urban counterparts in EHR adoption however; factors unique to these areas further complicate the process of

adoption and EHR meaningful use. Research indicates that rural providers typically lag behind in the adoption of EHR compared to urban counterparts and large hospitals (Menachemi et al., 2005). Street and Cossman (2008) found that about 40% of Mississippi doctors were currently utilizing EHRs in primary practice. In addition to these physicians, another 25% were in the initial process of adopting EHRs (Street & Cossman, 2008). These numbers seem promising however further identification of the adoption of rural providers is needed.

Rural healthcare provider constraints such as limited financial resources and a lack of adequate workforce can present challenges to the successful adoption and implementation of EHRs without which a majority of the state of Mississippi may witness increased difficulty to accessing affordable and quality healthcare. Fifty-six percent of rural physician income is from Medicare and Medicaid; with rural providers serving an older, poorer population than urban physicians, having a greater amount of families who earn below the federal poverty level and higher levels of alcohol and substance abuse (UnitedHealth Center for Health Reform and Modernization, 2011). Rural residents are also more likely to be uninsured or have healthcare coverage from an employer.

Rural individuals are also less likely to have access to surgeons and specialized doctors such as dentists and mental health professionals. This raises concern as men in rural areas are reportedly more prone to committing suicide than urban men and rural residents have higher levels of untreated depression than their urban counterparts. Additionally, the UnitedHealth Center for Health Reform and Modernization's (2011)

working report indicates that more than 40% of our war veterans will come home to rural areas with post-traumatic stress disorder and traumatic brain injury (p. 12).

Meaningful Use

When the federal incentive program was established by Congress in 2009, it was decided that in order for a health care facility or physician to receive any incentives, users would not only have to purchase a EHR system but it would need to ensure its use of the EHR system was classified as meaningful use. The Centers for Medicare and Medicaid Services (CMS) define meaningful use and relative criteria, the requirements of meeting meaningful use which are broken down into seven stages, clinical quality measure reporting, and the timeline of the Electronic Health Record (EHR) incentive Medicare and Medicaid services. Meaningful use is comprised of three standards determined by CMS which include:

1. using a certified EHR in a meaningful manner, such as eprescribing,
2. using a certified EHR technology for electronic exchange of health information to improve quality of health care, and
3. using a certified EHR technology to submit clinical quality and other Measures. (CMS, 2010, p. 3)

This definition is quite ambiguous. Common threads within each component can be combined to generally describe meaningful use such as the use of a certified electronic health record system and technology which allows for the exchange of health information with the purpose of improving quality care and submitting clinical quality and other measure reporting (CMS, 2010). Meaningful use has been established in multiple stages with implementation objectives for health care providers and hospitals at each stage.

There are seven stages of meaningful use, with each additional stage year increasing the expected utilization in an effort to use the EHR system to its fullest extent.

Eligible Entities

There are two types of eligible entities for the incentive programs. The first entity is eligible professionals (EPs) who are "non-hospital based physicians and include doctors of medicine, osteopathy, dental surgery, dental medicine, podiatric medicine, photometry, and chiropractors" (Cartwright-Smith et al., 2010, p. 2). The second entity eligible to participate includes acute care and critical access hospitals (CAHs). Acute hospitals include "those that are located in one of the 50 states or the District of Columbia, and are not paid under the Inpatient Prospective Payment System (IPPS)" (Cartwright-Smith et al., 2010, p. 2). Critical access hospitals (CAHs) are "small rural hospitals with 25 inpatient beds or less, offer 24-hr emergency care, and are usually at least 35 miles from the nearest hospital or 15 miles in areas with difficult roads or terrain" (UnitedHealth Center for Health Reform and Modernization, 2011, p. 64). CAHs are also eligible to receive not only incentive payments for EHR use but also incentive payments for the cost of acquiring EHRs (Cartwright-Smith et al., 2010).

Stages of Implementation

Within the EHR adoption model, CMS has identified three stages with goals at each stage. Stage 1 includes the use of EHR for data capturing and sharing and spans from 2011-2013. This stage requires providers to meet a number of objectives in addition to ensuring at least 80% of patients have some type of electronic health record in a certified EHR system. Stage 2 builds upon stage 1 requirements and furthers meaningful use through advanced clinical processes. Stage 2 also has specific objectives

connected to such as the utilization of a health information exchange and providing "quality improvement at the point of care" (Missouri Health Information Technology Assistance Center, 2011, para. 8). Stage 3 entails the operation and sustainability of an EHR system that is fully operational and focuses on improved outcomes. This would include improved safety and quality of care, the accessibility of EHRs to patients for self-management, and the ability to utilize the health information exchange for across-the healthcare-continuum patient health information. Stage 2 and 3 still remain vague and will be further defined in upcoming years.

Within the realm of these three stages, Davis (2009) proposes an eight-stage progression of EHR adoption in an attempt to assist providers in developing specific plans of action and strategies in order to meet CMS' meaningful use requirements. Stages progress upward from stage zero with stage zero encompassing entities with no ancillaries installed or use of EHRs to stage seven which is fully functioning electronic medical records with data warehousing in use (Davis, 2009). Measures of meaningful use up to stage three would ensure effective compliance with 2011 and 2012 incentive program requirements that include:

> The adoption and use of laboratory, radiology, and pharmaceutical information systems, a clinical data repository, rudimentary clinical data decision support for functions such as drug/drug interaction checking, electronic medication administration records, nursing documentation (for vital signs, flow sheets, and care plans) with templates that can be modified to track specific patient indicators, and clinical documentation for other clinicians to document patient care such as physical or respiratory therapists. (Davis, 2009, p. 4)

Davis identified that most of stage 1 requirements, which are to be met in 2011-2012, are easily met; similarly stage two requirements can be easily met with the exception of ensuring that data stored in the EHR system is in coded formats. The main challenge of the 2011 measurements is the adoption of clinical data decision support (CDSS) which provides patient specific information to the healthcare professional(s) utilizing the EHR system and include effective measurement documentation (Berner, 2009; Davis, 2009). The adoption and implementation of an effective CDSS has remained slow in the EHR adoption process. The 2013 measurements (stage two) become more stringent than those required of 2011 therefore it is essential to identify which stage of adoption providers are currently at the challenges they face in moving to the next stage of meaningful use. Without support and resources needed to sequentially move through the meaningful use stages, providers will fall short of meeting requirements and will face ineligibility for incentive payment and, within future years, receive payment reductions as a result of non-compliance. Stage three measurements (2015) will build upon the previous two stages and will be determined in future rule making.

Meaningful Use Objectives

In order for each eligible entity to successfully meet the objectives of the three proposed stages, requirements for each stage have been established. There are 25 meaningful use objectives established for EPs and 24 meaningful use objectives established for eligible hospitals and CAHs. EPs are expected to meet 20 of the 25 objectives and eligible hospitals and CAHs are expected to meet 19 of the 24 objectives. Each respective group has a set of core objects (15 for EPs and 14 for eligible hospitals

and CAHs) which are mandatory to satisfy the requirements of meaningful use. Additionally, each group has 10 menu set objectives to select from with a requirement of implementing either 5 of these menu sets (EPs) and 4 of these menu sets (eligible hospitals and CAHs). Stage 1 specification sheets for these objectives for EPs (CMS, 2011b) and eligible hospitals and CAHs (CMS, 2011c) are located on CMS's website. In addition to meeting the specified objectives, EPs and eligible hospitals and CAHs are also required to meet clinical reporting measures (6 for EPs, 15 for eligible hospitals and CAHs).

Timeline

The timeline for the adoption and utilization of EHR systems span from the fall of 2010 to 2021 with major milestones throughout the continuum to ensure providers are meeting meaningful use in a manner that is compliant with the EHR incentive programs of CMS. To sum the CMS incentive program timeline (CMS, 2011d), beginning in 2010 CMS developed and provided a list of certified EHR technologies available, in 2011 registration for the incentive program began and states could opt to launch Medicaid programs. Incentive payments also started in May of 2011 with a deadline of November 30th for eligible entities to participate in the program for fiscal year 2011 and receive financial payments. The last year to initiate participation into the incentive program is 2014 with penalties for those entities not using EHR systems in meaningful ways starting in 2015. The Medicare incentive program ends in 2016; and 2016 is also the last year to initiate participation in the Medicaid incentive program that ends in 2021.

Technology Attitudes and Skills

When exploring the adoption and usage of EHR, to understand the technology attitudes and skills is also important including particular interest to information and communication technology (ICT) skills needed by health care professionals in order to train and assist health care professionals in the adoption and integration of EHRs. ICT skills needed by health care professionals should be aligned closely and compliment the meaningful use criteria to ensure that health care professionals utilize EHRs effectively and in meaningfully defined ways. Additionally, current ICT skill levels of the professionals in the field should be considered to assist in the development of training modules and professional development opportunities available to increase ICT competencies specific to EHR usage.

In a 2008 study that explored hospital characteristics of clinical information system use, it was found that insufficient user training, unfriendly technology, or unaligned technology with physician/organizational routines negatively impacted the Clinical Information Technology score of the hospital (Amarasingham et al., 2008). In addition, user satisfaction with EHR systems can significantly impact an individual's attitude towards technology which can have significant impact on their adoption and usage (Miller et al., 2005). Because insufficient training and unfriendly technology can impact the adoption rates of EHRs, it is necessary to explore the current levels of satisfaction with professional development and EHR system user-friendliness to determine if the level of support needed to integrate EHRs is available.

Healthcare professionals in the 21st century must also be equipped with the skill set needed to utilize health information technologies. With the advancement in

technologies present in today's healthcare settings, computer competencies are a necessity (Hobbs, 2002; Miller et al., 2005; Wen-chin, 2006). Developing technology competencies is often difficult particularly because research indicates that nurses tend to feel computers are impersonal and take away from patient centered care (Miller et al., 2005). Additionally, McGonigle and Mastrian (2012) identify that developing technology competencies is further complicated by the varying levels of competencies held by the current nursing workforce. It is therefore essential to determine the types of attitudes held by nurses as well as nurses' level of computer skills and comfort using various health IT and information and communication technologies (ICT).

Summary

Chapter II provided an overview of the Unified Theory of Acceptance and Use of Technology (UTAUT); which serves as the theoretical framework for this study. Current literature surrounding healthcare reform was identified providing a foundational understanding of the current challenges faced by healthcare providers today; and the current state of our national healthcare. The healthcare reform discussed provides a broad perspective to the last half of century of our nation's healthcare with regard to the growth in healthcare cost for individuals as well as healthcare facilities. Other acts and reform that arguably impacted our current healthcare challenges include the privacy act of 1974, the Digital Imaging and Communications in Medicine (DICOM), the Health Insurance Portability and Accountability Act (HIPAA) 1996, HIPPA security rule, Medicare Improvements for Patients and Providers Act of 2008, Information Collection and Patients' Rights, Health Information Technology for Economic and Clinical Health Act 2009, and the American Recovery and Reinvestment Act (ARRA) of 2009. The

intent, though, is to understand that over the past five decades our healthcare system and industry have undergone substantial changes contributing to the complexity of our current system and the challenges it faces in ensuring equitable, accessible, safe healthcare for all citizens.

As identified by the Institute of Medicine, Health Resources and Services Administration, and Healthy People 2020, health information technologies (health IT) provides the opportunity to improve the quality and safety of patient care in delivering healthcare services. Over the last two decades there has been a vast growth in the creation and development of health IT providing numerous types of information and communication technologies that can change the way healthcare service is currently provided and transform how providers interact with other providers and patients.

One particular health IT that is frequently cited in the literature and is emphasized by the Centers for Medicare and Medicaid Services (CMS) is electronic health records (EHRs). EHRs provide a venue to promote self-regulatory health providing individuals opportunities to manage and become actively engaged and responsible for their own outcomes. Though EHRs have the potential to significantly impact the delivery of healthcare the current technology use of healthcare professionals is critical to the ability to effectively utilize and integrate EHR applications within the healthcare setting. Further, the relationship between electronic health record adoption and implementation, the state of healthcare in the United States and the technology skills of healthcare professionals are all integral components to the adoption, implementation, and meaningful use of EHRs.

While the potential benefits seem relatively apparent, the adoption and implementation of EHRs has been particularly slow in rural healthcare settings. Limited research has been conducted in rural healthcare settings to understand the barriers to adoption, with those specific to this population being emphasized. Without an understanding of the barriers that impede the adoption and meaningful use of EHRs, including those unique or amplified in the rural healthcare settings, the probability of user buy-in, acceptance, and adoption are low.

Technology skills and attitudes play a significant role in the behavior or intention of healthcare professionals to utilize health IT, particularly the use health IT in meaningful ways. Understanding current technology skills as well as preconceived attitudes on the use of computers and technology in healthcare is critical to the development of relevant support and resources. This understanding will help move healthcare professionals through the adoption cycle with the ultimate goal of achieving meaningful use.

Chapter III will discuss the research design for this project and include descriptive information about participants, instrumentation, data collection procedures and data analyses that were conducted.

CHAPTER III

METHODOLOGY

Chapter III includes the research design and statistical analyses utilized in this study. The chapter begins by reintroducing the purpose and research questions for this study. It also includes information on the participants of the study, the criterion for inclusion within the study, characteristics of the population, instrumentation support and description including scoring, the procedures that guided the research study including the dissemination of the instrument, protections to human subjects, data collection and analysis, limitations of the study, and the data analyses that were utilized with respect to each research question.

Purpose of the Study

The purpose of this study was to assess the impact of technology attitudes and skills of Mississippi's rural health clinics nurses to (a) determine the current stage of EHR adoption and integration, (b) identify factors associated with EHR integration and usage that impede and/or facilitate the diffusion process, (c) ascertain current technology attitudes, and (d) understand current technology use of practicing nurses in rural health clinics. Specific research questions that were answered include:

RQ1: Was there a statistically significant difference between practice ownership and the current stage of EHR use?

RQ2: Were there factors associated with EHR integration and usage that impeded the diffusion process? If so, do they differ by type of practice ownership?

RQ3: Were there factors associated with EHR integration and usage that facilitated the diffusion process? If so, do they differ by type of practice ownership?

RQ4: Was there a statistically significant relationship between technology attitudes and the age of the nurse?

RQ5: Was there a statistically significant relationship between technology attitudes and the number of years of nursing experience?

RQ6: Was there a statistically significant difference between technology attitudes and the current stage of EHR use?

Research Design

This research project utilized a non-experimental research design. Polit and Beck (2012) identify characteristics of non-experimental design to include (a) the collection of data without intervention and (b) the process of detecting casual relationships. These characteristics best fit the observational nature of this study. Supporting this research design is also Burns and Grove's (2009) description of quantitative research in which four types of quantitative research are identified (1) descriptive, (2) correlational, (3), quasi-experimental, and (4) experimental (p. 45). The two types of quantitative research applied to this non-experimental study were descriptive and correlational research. One of the major determinants of which type of research to conduct is the level of existing knowledge the researcher has prior to conducting a study. Descriptive studies are often conducted when little information is known about a particular subject and one seeks to describe and better understand this particular subject as it applies in a specific situation (Burns & Grove, 2009). Prior to this study, there was no existing knowledge on EHR

meaningful use by Mississippi's rural health clinic nurses. Before one can determine the resources and support needed to increase meaningful use of EHRs, one must first have and understanding of the current state of rural health clinics' EHR use. This study serves as a basis to provide descriptive information for future studies to build upon.

The second type of quantitative research employed is correlational research which seeks to determine if linear relationships exist between specific variables (Burns & Grove, 2009). Correlational research is important because it provides an understanding of how a particular variable relates to another variable. This is significant because it allows a researcher to better understand the nature of a particular phenomenon. In addition to identifying linear relationships, correlational research also provides the ability to determine the type (positive or negative) and degree (strength) of the linear relationship (Burns & Grove, 2009, p. 46). For example, if the age of a rural healthcare nurse impacts their technology attitude, a researcher may be able to better understand why technology is or is not effectively adopted. These relationships, if significant, can be imperative to understanding why a particular phenomenon occurs.

First and foremost, this study sought to identify the current state of electronic health record meaningful use in Mississippi's rural health clinics. Rather than intervening, the researcher simply collected data to provide a better understanding of the current state of EHR meaningful use. Second, the study wanted to explore existing relationships between the EHR stages of meaningful use, and practice ownership and technology attitudes. Third, technology attitudes were also correlated with the age of the nurse and the number of years of nursing experience to determine if statistically

significant relationships exist. Finally, data collected determined the factors, if any, that impeded or facilitated the adoption and usage of EHR.

Participants

Participants in this study included nurses currently practicing in a Mississippi rural health clinic that, at the time of the study, provided all of the following services chronic disease management, diabetes education, and family medicine. A stratified random sampling method was utilized to ensure geographic equity and diverse sample collection. Using the directory of Mississippi health facilities (MSDH, 2010), the researcher was able to derive a total of 163 rural health clinics that are geographically dispersed across the state. Rural health clinics are at the greatest need of support and operate on limited resources; therefore, this healthcare facility type has been selected for this study. In combination with this directory, the Mississippi Rural Health Association (MRHA) (2010) also provided a directory of Mississippi rural health clinics that had specific information about each rural health facility. This information included (a) medical director and office manager contact information, (b) office numbers and hours of operation, (c) physical mailing address for the clinic, and (d) available services with respect to each individual clinic. Due to the variation in services provided and in order to further narrow the scope of the study, the researcher narrowed the rural health clinic population down to 53 rural health clinics. Criteria for inclusion included that the rural health clinic provided the following three services: chronic disease management, diabetes education, and family medicine. This criterion was selected because chronic diseases and diabetes are higher in rural areas than its urban counterparts. EHR adoption and meaningful use also have the potential to significantly impact the diagnosis, treatment,

and continuum of care for patients managing chronic conditions and diabetes with the ability to improve these individuals' quality of care. Further, EHR adoption and meaningful use provide the capability for health records to be more accessible and easily portable, particularly for primary care through means of entering, sharing, managing, and communicating through the use of information and communication technologies.

Nurses were solicited for the study given that these professionals provided a large percentage of healthcare services in rural areas, have frequent interaction with both patients and physicians, and most importantly heavily interacted with electronic health record systems in daily clinical practice. Of the 53 rural health clinics selected for inclusion of the study, each clinic was contacted by phone and asked to report the number of current nurses working at their establishment. Based on the numbers self-reported, the study included a sample size of 240 nurses. Nurses from all levels of licensure (i.e., LPN, RN, APRN, NP) as well as Certified Nursing Assistants (CNAs) and Medical Assistants (MAs) were solicited for participation. CNAs and MAs practice under the supervision of a LPN or RN and are an integral part of the rural healthcare workforce composition. CNAs and MAs were deemed an integral part of the rural healthcare workforce, particularly in rural medically underserved areas of the state; therefore, these individuals were also included within the study.

The typical composition of nurses varies however the age range for most nurses is between the ages of 25-65. Data from the Department of Health and Human Services Office of Minority Health indicated that typically white females are the predominate race and gender, with males representing roughly 6% of the nursing population, African Americans representing 4.2% of nurses, 3.1% Asian, Native American, or Pacific

Islanders, and 1.7% reporting Hispanic or Latino ethnicities (as cited by MinorityNurse.com, 2010).

The study was designed to contain an unobtrusive data collection process with recognition to the importance of long-term relationship building with participants and rural health clinics involved in the study. By structuring the research process in this manner, the study developed and maintained a good relationship with site contacts allowing for future collaboration and participation in research.

Instrumentation

A questionnaire (Appendix A) was disseminated to participants that incorporated items developed by the researcher, items from the Medical Group Management Association (2004) Assessing Adoption of Effective Health Information Technology questionnaire (Appendix B), and items from June Kaminski (1996-2012) Pretest for Attitudes Towards Computers in Healthcare (P.A.T.C.H. Assessment Scale v.3) (Appendix C). These instruments were identified in the literature and selected based on their respective ability to obtain information needed to answer the research questions of this study. Permission was granted from the Medical Group Management Association (Appendix D) and June Kaminski (Appendix E) to utilize the instruments identified above.

Data was collected directly from rural health clinic nurses through the dissemination of a questionnaire. The utilization of a questionnaire provides the opportunity to quickly capture current attitudes of technology and levels of EHR use. This is essential particularly because of the time sensitivity associated with the CMS incentive program for EHR meaningful use. Additionally, the prompt turnaround of data

collected enabled the researcher to provide rural health clinics as well as key constituents pertinent data to help drive decisions on support and resources necessary to achieve levels of meaningful use as defined by the Centers for Medicare and Medicaid.

By employing the questionnaire to a small sample of the rural health clinic nursing population, findings provided insight to the larger rural health clinic population. The dependent variables for this study included the current stage of meaningful use of the rural health facility and technology attitudes. The independent variables included the EHR features that potentially benefit the practice, barriers that have slowed or prevented implementation of EHR practice, and the current technology attitude towards computers in healthcare. Status variables included age, gender, race, ethnicity, current position held, number of years practicing as a nurse, and highest level of education.

The questionnaire also incorporated advice and expertise of key informants, as well as experts in healthcare and/or EHRs. Key contacts within the healthcare and rural healthcare community are seen as essential for access to, and participation of, rural health clinic nurses. Their participation, based on specific knowledge (i.e., as a rural health clinic nurse, nursing faculty, and/or EHR or nursing informatics expert) provided initial credibility to and relevance of the questionnaire prior to widespread use. During administration of the questionnaire, key contacts also provided endorsement for the study. After data was collected, analyzed, and reported, these constituents provided additional credibility and validity to the results via discussion and interpretation.

The instrument included the following sections demographic information, healthcare facility information, electronic health record information, technology skills, and technology attitudes. Each section is discussed in detail below.

Demographic Information

The first section of the questionnaire was utilized to obtain demographic information from the nurses about their background, as well as the healthcare facility. Questions included obtaining consent to participate in the study and provided information on the participants age (open ended), gender (male/female), race and ethnicity (American Indian of Alaska Native/Asian/Black or African American/Native American or Other Pacific Islander/White/Hispanic or Latino/Not Hispanic or Latino), current position held (open ended), years of experience as a nurse (open ended), and the highest level of education obtained (open ended). The final two questions provided information on the majority owner of the practice (Government/Management Services Organization or Physician Practice/Hospital or integrated delivery system/Insurance company of HMO/physicians/University or academic medical institution/Other), and the current stage of meaningful use (Do not use EHR/Stage 1/Stage 2/Stage 3), as defined by CMS. Question 8, "What best describes the majority owner of the practice," is the only item in this section not developed by the researcher and was selected from section three, question 25 of the Medical Group Management Association (2004) Assessing Adoption of Effective Health Information Technology questionnaire. Data collected from question 8 identified the majority practice owner that allowed the researcher to determine differences, if any, among provider type.

Electronic Health Records

The second section was utilized to gain insight into current applications of electronic health records that are available, the potential benefits of EHR and barriers that have slowed and/or impeded the adoption of EHR into practice. All items within this

section were selected from section one (question 14) and section two (questions 15 and 16) of the Medical Group Management Association (2004) Assessing Adoption of Effective Health Information Technology questionnaire. The first question asked participants to select from a list of functions and report whether the function was "available" or "not available" in their EHR system at their practice. The list of applications included patient demographics, presenting complaints, past medical history, physical exam/review of systems, visit/encounter notes, laboratory results, procedure/operative notes, patient medications/prescriptions, problem lists, referrals to specialists, consult/reports from specialists, clinical guidelines and protocols, drug reference information, drug formularies, drug interaction warnings, immunization tracking, and integration with practice billing systems.

The second question asked the participant to rate each of the following EHR features on its potential benefits to the practice. Potential benefits included improved: clinical outcomes, work flow, patient communications, claim submission process, charge capture, accuracy for coding evaluation and management procedures, drug refill capabilities, access to medical record information, and physician recruitment. Potential benefits also included reduced: medication errors, transcription costs, medical records staff expenses, medical records storage costs, and medical records transportation cost. Participants were asked to rate these potential benefits using a five-point Likert scale to determine the level of importance with the scale range from 1 to 5 using the following categories 5- extremely important, 4- important, 3- some value, 2- marginal value, and 1- no value.

The third question asked the participant to rate each of the following barriers that have slowed or prevented implementation of EHR in medical group practices. The list of barriers included lack of capital resources to invest in an EHR, insufficient return on investment (ROI) from an EHR, lack of support from physician practices, lack of support from practice non-physician providers, lack of support from practice clinical staff, lack of support from practice administration, and security and privacy concerns. Participants were asked to rate these barriers using a five-point Likert scale to determine the level of difficulty in EHR adoption with the scale range from 1 to 5 using the following categories 5- implementation extremely difficult, 4- makes implementation difficult, 3- complicates implementation to some degree, 2- minor impact on implementation, and 1- not a problem.

This instrument did not report evidence of validity or reliability; hence, the researcher was responsible for ensuring that questions were both valid and reliable for nurses in the rural health clinic setting. A panel of experts including nursing faculty and practitioners in rural health clinics from Alabama, Mississippi, and Louisiana were recruited to serve as an expert panel for this study. These individuals measured the instruments validity and were asked, though not limited to the following questions:

- Does the survey contain appropriate language, particularly with regard to electronic health records, meaningful use, and information and communication technologies,
- Is the instrument both reading level appropriate and relevant to healthcare information technology,
- Are the responses appropriate,

- Are there any obtrusive or offense items or any items that you would suggest be omitted from the study, and
- Are there any items you would recommend for inclusion on the instrument.

Once these questions were reviewed and revised, a pilot study was conducted randomly selecting participants who were nurses in rural health clinics. Reliability statistics were calculated using the responses from the pilot study and actual study and their respective Cronbach's alphas are listed below in Table 1.

Table 1

Reliability Statistics for Electronic Health Record (EHR) Features and Barriers

Subscale	Pilot Study	Actual Study
EHR Features	.94	.95
EHR Barriers	.95	.97

Technology Skills

The third section of the instrument was developed by the researcher to determine self-reported levels of technology skills and training the participant has. This section included six questions that asked participants to self-report their level of computer skills, the type of training, if any, they have had for technology use, their level of comfort with basic business software use, information and communication technologies (ICT), and the Internet and their level of precaution in utilizing online technologies.

Question 1 asked participants to identify their level of technology skill using the following categories excellent, above average, average, below average, poor. Question 2

asked participants if they had any type of training or previous experience specific to technology use (yes/no) and if so, what types of training or previous experience they had using the following categories courses on specific technologies, workshops or conferences provided at your current practice, workshops or conferences offered at local, state, regional, or national level, self-taught, none, or other. If participants selected the answer "other," they were asked to list other types of training or previous experience.

Questions 3-5 asked participants to identify how comfortable they were with the following: (a) information and communication technologies specifically electronic mail (email), instant messaging (IM), mobile phone and text messaging, really simple syndication (RSS), blogs, podcasts, online virtual communities, and social networks; (b) basic business software use including basic word processing skills, using a spreadsheet, and using a presentation software; and (c) Internet use to include publish and sharing content online, participating in a chat room, participating in an online computer game, searching online for general information, and searching online for journals from professional organization sites or medical databases. For each of these questions, participants were asked to rate these information and communication technologies using a five-point Likert scale to determine their level of comfort with each. The scale ranged from 1 to 5 using the following categories 5- extremely comfortable, 4- somewhat comfortable, 3- no opinion, 2- somewhat uncomfortable, and 1- extremely uncomfortable.

Question 7, the final question of this section, solicited information regarding safe use of online technologies and asked individuals to report whether or not they take precaution when using these technologies. This question also utilized a five-point Likert

scale ranging from 1 to 5 with the following categories 5- extremely comfortable, 4- somewhat comfortable, 3- no opinion, 2- somewhat uncomfortable, and 1- extremely uncomfortable.

Similar to the electronic health record section of this study, this section does not provide evidence of validity or reliability. Because these questions were developed by the researcher based on previous research and literature surrounding technology skills of nursing professionals, questions were pilot tested simultaneously with the above mentioned section by a randomly selected group of nurses in the rural health clinic setting. A panel of experts included nursing faculty and practitioners in rural health clinics from Alabama, Mississippi, and Louisiana who were recruited to serve as an expert panel for this study. These individuals measured the instruments validity and were asked, though not limited to, the following questions:

- Does the survey contain appropriate language, particularly with regard to electronic health records, meaningful use, and information and communication technologies,
- Is the instrument both reading level appropriate and relevant to healthcare information technology,
- Are the responses appropriate,
- Are there any obtrusive or offense items or any items that you would suggest be omitted from the study, and
- Any items you would be recommend for inclusion on the instrument.

Once these questions were reviewed and revised, a pilot study was conducted by randomly selecting participants who were nurses in rural health clinics. Reliability

statistics were calculated using the responses from the pilot study and actual study, and their respective Cronbach's alphas are listed below in Table 2.

Table 2

Reliability Statistics for Level of Comfort with Technology

Subscale	Pilot Study	Actual Study
Information and Communication Technologies	.71	.82
Basic Business Software	.78	.83
Internet Use	.68	.80

Technology Attitudes

The final section of the questionnaire assessed technology attitudes held by nurses in rural health clinic settings. This section utilized June Kaminski's (1996-2012) Pretest for Attitudes Towards Computer use in Healthcare, commonly referred to as the P.A.T.C.H. assessment scale v.3. Kaminski's 50-item instrument was identified in the literature provides a thorough assessment of technology attitudes which includes emerging technologies utilized in healthcare today. The author granted permission to utilize the instrument for this study that can be referenced in Appendix E. The 50-item instrument solicits the overall computer attitude for an individual however, in this version (v.3) of the instrument, the author included statements related to "social media, eHealth, electronic health records, and mobile technology" (Nursing Informatics Competencies: Self-Assessment, 2012, para. 1). The P.A.T.C.H. instrument can be delivered both online

and via a hard copy however, for the purposes of this research project, the instrument was only disseminated through postal mail with a hard copy.

The instrument scale was a five-point Likert scale with a scale range 1 to 5 using the following categories 1- agree strongly, 2- agree, 3- not certain, 4- disagree, and 5- disagree strongly. The author provided a detailed description of how to tally the 50 items to get a total technology attitude score. Participants' scores were grouped into the following technology attitude categories 0-17 shows a positive indication of cyberphobia, 18-34 shows some uneasiness about using computers, 35-52 shows moderate comfort in using computers, 53-69 shows comfort in using user-friendly computer applications, 70-86 shows an overall confidence in a variety of computer programs, and 87-100 shows the individual is very confident and holds positive views of using computers in healthcare. The author reported reliability for the instrument. The author also reported a positive significant correlation ($r = 0.66$, $p < 0.01$) between the Attitudes toward Computers Scale and the P.A.T.C.H. scores (Nursing Informatics Competencies: Self-Assessment, 2012). Reliability scores were also calculated using responses from the pilot study and actual study with the respective Cronbach's alphas for each listed below in Table 3.

Table 3

*Reliability Statistics for Pretest for Attitudes Towards Computer use in Healthcare, commonly referred to as the P.A.T.C.H. assessment scale v.*3

Subscale	Author Provided	Pilot Study	Actual Study
P.A.T.C.H. assessment scale v.3	.85	.97	.95

Procedures

Institutional Review Board approval was obtained prior to the dissemination of the research instrument (Appendix F). The researcher also initiated contact with the executive director of the Mississippi Rural Health Association (MRHA) to obtain support prior to the initiation of the study. MRHA's letter of support was included within the IRB proposal. The researcher compiled the instrument using individually developed items along with those used with permission of the Medical Group Management Association and June Kaminski. In order to determine the sample population the researcher created a spreadsheet of the 163 rural health clinics found within the state of Mississippi as identified by the Mississippi State Department of Health. The researcher then utilized the Mississippi Rural Health Directory to determine the types of available services offered at each rural health clinic. The stratified random sample was comprised of the 53 identified rural health clinics that provided all three of the following services chronic disease management, diabetes education, and family medicine. The researcher then called each of these clinics to identify the number of nurses employed at each facility. This number included licensed nurses (LPNs, RNs, APRNs, and NPs), certified nursing assistants (CNAs), and medical assistants (MAs) serving in a nursing role. Of the 53 rural health clinics selected, all 53 were reached. Based on the number of self-reported nurses from these contacts, the sample population for this study was 240. The instrument was sent by postal mail to the selected rural health clinics throughout the state.

After securing IRB approval, the researcher contacted these clinics again to establish a point of contact for each location. The clinic contact was typically one of the following individuals: the office manager, the clinical coordinator, or the director of

nurses. The identified point of contact at each site was sent a packet that included an appropriate number of the following materials. Each participant received an informed consent document that provided the participant with information on the purpose of the study, study procedures, benefits and risks, incentives, and the minimum age required to participate in the study. In order to ensure consent was obtained, question 1 on the questionnaire stated, “I have read the attached consent agreement and agree to participate in the study." The informed consent document (Appendix G) was stapled to the questionnaire to ensure that all individuals who received an informed consent also received a questionnaire or vice versa. In addition, each stapled copy of the informed consent and questionnaire was placed with a copy of the MRHA letter of support (Appendix H) inside a letter size self-addressed return envelope with postage included, providing the individuals the opportunity to return the questionnaire both confidentially and without any additional expense from the participant. The questionnaires consisted of both closed form and open-ended items and took no longer than twenty minutes to complete.

An initial two week period was given to each facility to provide sufficient time for each contact to receive the packet, distribute the questionnaires to the nurses, and allow nurses time to complete and return the completed survey. After this allotted period, the researcher contacted each site’s point of contact to provide a reminder of the study and request that solicitation for participation be requested again to ensure the maximum level of completed questionnaires are attained. In a final attempt to secure completed questionnaires, the researcher selected the seven largest rural health clinics as self-reported by the number of nurses at the respective clinic and made site visits. These

included Community Medical Center in Lucedale (*N* = 12), Central Mississippi Family Health Clinic in Meridian (*N* = 12), Family Medical Group of Union in Union (*N* = 10), Clark Clinic and Morton Family Medical Clinic in Morton (*N* = 10), Sunflower Rural Health Clinic in Ruleville (*N* = 32), and Louisville Medical Associates, LTC in Louisville (*N* = 10).

At each site visit, the researcher met with the point of contact and nurses to thank them for their participation and request any additional nurses who have not yet completed their questionnaire do so. This also allowed for the opportunity to talk with nurses to discuss their feelings on the study and better understand how the use of technology and electronic health records is impacting their day-to-day operations.

Confidentially was ensured throughout this process and all data collected and reported remained anonymous. Personal information inadvertently obtained was treated with confidentiality. Completed questionnaires were kept in a secure file cabinet in the researchers' University office until the data had been entered, checked for accuracy, and analysis was conducted.

Data Analysis

Pearson's chi-squared test, Pearson Product Moment Correlation, multivariate analysis of variance, and analysis of variance were utilized to analyze each research question as discussed in the following sections. The Statistical Package for the Social Sciences, also known as SPSS, was utilized for data analysis. Below is the breakdown of analyses performed by the researcher for this study. These procedures are broken down by each research question.

RQ1: Was there a statistically significant difference between practice ownership and the current stage of EHR use?

The first research question attempted to determine if there was a statistically significant difference between the type of practice ownership of a rural health clinic and the current stage of EHR meaningful use. A review of the literature indicated that the type of practice ownership could play a significant role in the purchase, adoption, implementation, and use of EHR systems. For example, a rural health clinic that is majorly owned by a hospital system is more likely to have the access to resources that are not available at rural health clinics majorly owned by physicians. Determining if these differences existed and if they are statistically significant, would confirm the degree to which practice ownership impacts the current stage of EHR use. This question sought to identify differences among two or more groups (practice ownership) with a dependent variable that was categorical (current stage of EHR use), thus a Pearson's chi-squared test was used as the analysis procedure to determine if there was a statistically significant difference by the type of practice ownership.

RQ2: Were there factors associated with EHR integration and usage that impeded the diffusion process? If so, do they differ by type of practice ownership?

The second research question sought to investigate the factors that impeded the diffusion process and whether these factors differed by the type of practice ownership. Item 12 on the questionnaire listed the commonly reported barriers associated with the adoption and use of EHRs. Additionally, these factors were also among those cited in the needs assessment conducted of healthcare constituents across the state. Determining the factors identified by nurses practicing in rural health clinics, and whether these factors

were different by the type of practice ownership would be beneficial in understanding unique factors, if any, that were specific to nurses and to the types of rural practices within Mississippi. A multivariate analysis of variance (MANOVA) was used for the analysis of this research question.

RQ3: Were there factors associated with EHR integration and usage that facilitated the diffusion process? If so, do they differ by type of practice ownership?

Correspondingly, the third research question solicited information from participants to investigate the facilitating factors associated with the diffusion process and whether these differed by the type of practice ownership. Item 11 of the questionnaire provided a list to the participants to rate EHR features on its potential benefit to practice. These benefits were among those cited in literature and in the needs assessment conducted of healthcare constituents across the state. This research question sought to determine whether these potential benefits were reportedly different by the type of practice ownership. Better understanding of whether different types of providers identify different benefits of EHRs to practice can assist in facilitating the diffusion process of EHR meaningful use in rural health clinics. A multivariate analysis of variance (MANOVA) was used for the analysis of this research question.

RQ4: Was there a statistically significant relationship between technology attitudes and the age of the nurse?

Research question four sought to determine if a relationship existed between the technology attitudes and age of the nurse. Research indicates that older nurses tend to have perceptions that are more negative than those of younger nurses, and thus, tend to be more resistant or use technology less in the delivery healthcare. Because both variables

were interval, a Pearson Product Moment Correlation was utilized to determine whether technology attitude was correlated with age.

RQ5: Was there a statistically significant relationship between technology attitudes and the number of years of nursing experience?

Research question five sought to identify whether or not there was an associative relationship between the technology attitude of a nurse and the number of years of nursing experience an individual possessed. In general, most individuals do not like or adopt well to change. Adoption theory indicates that in order for a change to occur, such as the utilization of an innovation (EHR), the innovation must provide one or more of the following: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). The research question sought to determine if the number of years of nursing experience was correlated with technology attitude. It would be theorized that individuals who hold more experience are comfortable with established practices (e.g. more patient interaction) and less likely to hold a high attitude toward computer use in healthcare. Because research question 5 also included two variables that were interval, a Pearson Product Moment Correlation was utilized to determine whether technology attitude was correlated with the number of years of nursing experience.

RQ6: Was there a statistically significant difference between technology attitudes and the current stage of EHR use?

Research question six sought to determine if there was a statistically significant difference between technology attitudes (the independent variable) and current stage of EHR use (dependent variable). Individuals who have high technology attitudes as measured by Kaminski (1996/2012) are individuals who recognize the contributions of

computers in society and view computers in healthcare as idealistic. The statistical test that was utilized to determine if there was a statistically significant difference was an analysis of variance (ANOVA).

Summary

This chapter has provided an overview of the research methodology utilized for this study. Participants were clearly described and the selection criterion for participation in the study was identified. In addition, the psychometric properties for all measures utilized within the study were provided.

A critical part of responsibly collecting, analyzing, and reporting accurate and meaningful data is ensuring that the project is both ethically sound, protects human subjects and provides valid and reliable measures. Procedures for the project were described in a logical manner and included the approval of The University of Southern Mississippi's Institutional Review Board (IRB). Securing IRB approval ensures that proper protocol in conducting research with human subjects is observed. Evidence of the validity and reliability measures being used in the study were also described in detail.

Chapter IV will provide the results of the study including descriptive statistics, statistical analyses, and ancillary findings.

CHAPTER IV

RESULTS

Building on the foundation of the research design presented in Chapter III, Chapter IV provides the results of the study including demographic information and descriptive statistics for the participants of the study. Following demographic and descriptive information, Chapter IV addresses each of the six research questions proposed in the study and is accompanied by the results of the respective statistical procedure utilized to appropriately address each. Ancillary findings conclude the chapter leading to the findings of the study reported and discussed in Chapter V. The purpose of this study was to assess the impact of technology attitudes and skills of Mississippi's rural health clinics nurses to (a) determine the current stage of EHR adoption and integration, (b) identify factors associated with EHR integration and usage that impede and/or facilitate the diffusion process, (c) ascertain current technology attitudes, and (d) understand current technology use of practicing nurses in rural health clinics.

Fifty-two of the invited fifty-three rural health clinics employing a total of 229 health professionals agreed to participate in the study with one clinic ($N = 11$) opting out of participation due to intense workloads. These individuals' backgrounds ranged from licensed nurses (LPNs, RNs, APRNs, and NPs), certified nursing assistants (CNAs), and medical assistants (MAs). Of the 229 questionnaires deployed, a total of 47 questionnaires were completed and returned. A total of three questionnaires were excluded from the study as two participants did not meet the criteria for an eligible health professional (i.e., receptionist, switchboard operator) and one participant indicated no interest in participating in the study and returned a blank questionnaire. As a result, a

total of 44 questionnaires were qualified for analyses. One limitation was the inability to get an accurate count of the number of health professionals serving in a nursing capacity in the rural health clinic settings. Concerns arose regarding the accuracy of self-reported total number of rural health clinic nurses at each rural health clinic based on follow up conversations and on-site visit observations. For this reason, the researcher believed that the reported number of nurses working within the participating clinics was inaccurate, and therefore, no return rate will be reported.

Demographic Data

The first section of the questionnaire solicited demographic information from the participants about their background and healthcare facility. Questions included obtaining consent to participate in the study, and to provide information on the participants' age (open ended), gender (male/female), race and ethnicity and race (American Indian of Alaska Native/Asian/Black or African American/Native American or Other Pacific Islander/White/Hispanic or Latino/Not Hispanic or Latino), current position held (open ended), years of experience as a nurse (open ended), and the highest level of education obtained (open ended). The final two demographic questions solicited information on the participant's healthcare facility and included the identification of the majority owner of the facility's practice and the current stage of meaningful use as defined by CMS (Table 6). Of these (9) questions, six were closed form (consent, gender, ethnicity and race, current position, practice ownership and current stage of EHR meaningful use) and three were open ended (age, years of nursing experience, and highest level of education).

All participants agreed to participate in the study ($N = 44$). The age range of the 44 participants included in the data analyses were between 20-62; with a mean age of 39.

All participants were female with the predominant race reported as Caucasian (86.4%). Additionally, only one participant (2.3%) indicated a Hispanic or Latino ethnicity. Nurses from all levels of licensure (i.e., LPN, RN, APRN, NP), as well as Certified Nursing Assistants (CNAs) and Medical Assistants (MAs), were solicited for participation. CNAs and MAs practice under the supervision of a LPN or RN and are an integral part of the rural healthcare workforce composition. Most of the participants (45.5%) were licensed nurses with the majority (69.2%) reporting some college or an associate degree as their highest level of education. Of the 38 participants reporting, the average number of years of nursing experience reported within their respective position was 14.37 (*SD* = 10.01). Most reporting nurses worked in a practice that was predominantly run by physicians (48.6%) or a hospital/integrated delivery system (37.8%). In regards to the current stage of electronic health record meaningful use, most participants either reported, "no use/did not report EHR use" (31.8%) or "stage 2" (31.8%). Table 4 provides descriptive statistics for participant's age. Table 5 provides frequency data on participants' gender, race, ethnicity, position held at the respective rural health clinic, and highest level of education. Table 6 provides frequency data on the type of practice ownership and the current stage of electronic health record meaningful use at the respective rural health clinic of which the reporting participants worked at.

Table 4

Descriptive Statistics for Participants' Age (N = 41)

Subscale	Minimum	Maximum	Mean	Std. Deviation
Age	20	62	39	10.40

Table 5

Frequencies for Gender, Race, Ethnicity, Position Held and Highest Level of Education

Variable	Levels	Frequency	Percent
Gender	Female	44	100
Race	Black or African-American	6	13.6
	White	38	86.4
Ethnicity	Hispanic	1	2.3
Position Held	CAN	1	2.3
	LPN	20	45.5
	RN	12	27.3
	NP	3	6.8
	MA	4	9.1
	Other	4	9.1
Highest Level of Education	HS Diploma/GED	2	5.1
	Associate Degree	28	71.8
	Bachelor Degree	7	15.9
	Masters Degree	1	2.3
	Specialist	1	2.3

Note. Nurses from all levels of licensure where solicited to participate and include: Licensed Practical Nurses (LPNs), Registered Nurses (RNs), Advanced Practice Registered Nurses (APRNs), and Nurse Practitioners (NPs). Certified nursing assistants (CNAs) and Medical Assistants (MAs) were also solicited for participation. CNAs and MAs practice under the supervision of a LPN or RN and are an integral part of the rural healthcare workforce composition.

Table 6

Frequencies for Type of Practice Ownership and Electronic Health Record Meaningful Use Stage

Variable	Level	Frequency	Percent
Type of Practice Ownership	Government	2	5.4
	Hospital/Integrated delivery system	14	37.8
	University or academic medical institution	1	2.7
	Management Services Organization (MSO) of Physician Practice Management Company (PPMC)	1	2.7
	Physicians	18	48.6
	Other	1	2.7
Electronic Health Record Meaningful Use Stage	Does not use/Did not report use	14	31.8
	Stage 1	9	20.5
	Stage 2	14	31.8
	Stage 3	7	15.9

Descriptive Statistics

Descriptive data was collected to better understand the (1) functions, features, and barriers of the participant's respective electronic health record system, (2) computer skill levels and the type of technology training participants had received, (3) technology comfort levels with information communication technologies, word processing, spreadsheets, presentation software, and Internet use specific to online searches, and (4)

the level of precaution taken when using online technology. Descriptive information is also included for the 50 items that solicited responses regarding participants' technology attitudes. Each of these descriptive sections is discussed below.

Specific to EHR functionality, participants were asked to identify whether the provided functions were available on the electronic health record system at their rural health clinic. Participants could select either 1- Available or 2- Not Available for the following eighteen (18) functions of electronic health records (Table 7). Of these functions, those that were most available within the participants' EHR systems included patient demographics (*N* = 33), past medical history (*N* = 33), physical exam/review of systems (*N* = 33), visit/encounter notes (*N* = 33), laboratory results (*N* = 33), and problem lists (*N* = 33). The least available EHR system functions reported were clinical guidelines and protocols (*N* = 21) and integration with practice billing systems (*N* = 21). Table 7 provides an overview of descriptive data reported on the functions of the electronic health record systems available to the healthcare providers at their respective rural health clinics.

Table 7

Frequencies for Functions of Electronic Health Record Systems

EHR System Function	Level	Frequency	Percent
Patient demographics	Available	33	100
Past medical history	Available	32	100
Physical examination of systems	Available	33	100
Visit/encounter notes	Available	33	100
Laboratory results	Available	33	100

Table 7 (continued).

EHR System Function	Level	Frequency	Percent
Problem lists	Available	33	100
Presenting complaint	Available	32	100
Patient medications/prescriptions	Available	32	97.0
Referrals to specialists	Available	31	100
Procedure/operative notes	Available	30	96.8
	Not available	1	3.2
Radiology/imaging results	Available	30	93.8
	Not available	2	6.3
Drug interaction warnings	Available	30	90.9
	Not available	3	9.1
Consult/reports from specialists	Available	25	86.2
	Not available	4	13.8
Drug reference information	Available	24	88.9
	Not available	3	11.1
Drug formularies	Available	23	79.3
	Not available	6	20.7
Immunization tracking	Available	23	79.3
	Not available	6	20.7
Clinical guidelines and protocols	Available	21	84.0
	Not available	4	16.0
Integration with practice billing systems	Available	21	77.8
	Not available	6	22.2

The next question was specific to EHR features and asked participants to rate the potential benefit of fourteen EHR features to the participant's practice. The question used a 5-point Likert scale using the following categories: 1- No Value, 2- Marginal Value, 3- Some Value, 4- Important, and 5- Extremely Important. The following features of electronic health record were solicited: clinical outcomes, work flow, patient communications, claim submission process, charge capture, accuracy for coding evaluation and management procedures, drug refill capabilities, access to medical record information, physician recruitment, medication errors, transcription costs, medical records staff expenses, medical records storage costs, and medical records transportation cost. The two features that had the highest mean score, indicating the most potential to benefit practice, were improved access to medical record information (M = 4.24, SD = 1.02) and improved clinical outcomes (M = 4.15, SD = 1.03). The two features that had the lowest mean score, indicating some value to the practice, were reduced medical transportation cost (M = 3.82, SD = 1.13) and reduced transcription costs (M = 3.73, SD = 1.28). Table 8 provides an overview of descriptive data reported on the features of the electronic health record system and their potential benefit to the participant's practice at their respective health clinic.

Table 8

Descriptive Statistics for Features of Electronic Health Record System

EHR System Features	N	Mean	Std. Deviation
Improved access to medical record information	34	4.24	1.02
Improved clinical outcomes	33	4.15	1.03

Table 8 (continued).

EHR System Features	N	Mean	Std. Deviation
Improved accuracy for coding evaluation and management procedures	31	4.00	1.13
Improved drug refill capabilities	34	4.00	1.13
Reduced medical records storage costs	33	4.00	1.17
Improved claim submission process	29	4.00	1.16
Reduced medication errors	33	4.00	1.12
Improved patient communications	32	3.91	1.17
Improved work flow	34	3.88	1.27
Reduced medical records staff expenses	33	3.85	1.09
Improved charge capture	30	3.83	1.23
Reduced medical records transportation cost	33	3.82	1.13
Reduced transcription costs	33	3.72	1.28

Note. The minimum score was 1.00 and the maximum score was 5.00 for all variables.

The next question was specific to EHR barriers and asked participants to rate the level of which the (15) EHR barriers slowed or prevented implementation of EHRs into practice. The question used a 5-point Likert scale using the following categories: 1- Not a Problem, 2- Minor Impact on Implementation, 3- Complicates Implementation to Some Degree, 4- Make Implementation Difficult, and 5- Implementation Extremely Difficult. The following barriers of electronic health record were solicited: concern about physician ability to input into the computerized medical record, concern about loss of productivity during transition to the EHR system, lack of capital resources to invest in an EHR, practice staff does not have skills/training to use EHR, insufficient return on

investment (ROI) from an EHR, inability to easily input historic medical record data into the EHR system, lack of support from practice physicians, insufficient time to select, contract, install and implement an EHR, inability to integrate the EHR with practice's billing/claims submission system, lack of support from practice administration, lack of support from practice nonphysicians, inability to evaluate, compare and select the appropriate EHR system, available EHR software does not meet the practice's needs, lack of support from practice clinical staff, and security and privacy concerns. The barriers identified as the most challenging in implementing EHR systems included concern about physician ability to input into the computerized medical records (M = 3.30, SD = 1.32) and concern about the loss of productivity during transition to the EHR system (M = 3.19, SD = 1.27). Barriers that reported the lowest mean scores were lack of support from practice clinical staff (M = 2.74, SD = 1.38) and security and privacy concerns (M = 2.63, SD = 1.50). Based on participants' responses, all barriers solicited had some type of impact on EHR implementation. Table 9 provides an overview of descriptive data reported on the barriers associated with implementing an electronic health record system at their respective health clinic.

Table 9

Descriptive Statistics for Barriers to Implementing an Electronic Health Record System

EHR System Barriers	N	Mean	Std. Deviation
Concern about physician ability to input into the computerized medical record	27	3.30	1.32
Concern about loss of productivity during transition to the EHR system	27	3.19	1.27

Table 9 (continued).

EHR System Barriers	N	Mean	Std. Deviation
Lack of capital resources to invest in an EHR	26	3.12	1.28
Concern about physician ability to input into the computerized medical record	27	3.30	1.32
Concern about loss of productivity during transition to the EHR system	27	3.19	1.27
Lack of capital resources to invest in an EHR	26	3.12	1.28
Practice staff does not have skills/training to use HER	27	3.11	1.37
Insufficient return on investment (ROI) from and HER	24	3.08	1.18
Inability to easily input historic medical record data into the EHR system	27	3.07	1.27
Lack of support from practice physicians	27	3.07	1.38
Insufficient time to select, contract, install and implement an HER	25	3.00	1.55
Inability to integrate the EHR with practice's billing/claims submission system	25	3.00	1.35
Lack of support from practice administration	27	3.00	1.59
Lack of support from practice nonphysicians	27	2.96	1.37
Inability to evaluate, compare and select the appropriate EHR system	26	2.96	1.51
Available EHR software does not meet the practice's needs	27	2.93	1.36
Lack of support from practice clinical staff	27	2.74	1.38
Security and privacy concerns	27	2.63	1.50

Note. The minimum score was 1.00 and the maximum score was 5.00 for all variables.

Following questions soliciting information about EHR functions, features, and barriers, participants were asked to self-report computer skills, whether any type of technology training was received, and the type of training if applicable. Of the 44 participants, almost half of the respondents (40.9%) self-reported an average technology skill level. The remainder of the participants fell equally on one of two sides of the average with one half of the participants self-reporting above average or excellent skills (29.5%) and the other half self-reporting below average or poor skills (29.6%). Almost all participants reported receiving some type of technology training (86.4%). Interestingly, most respondents (40.6%) reported self-teaching or self-guided learning for the type training technology received. Another 24.6% of participants reported taking courses on specific technology, and 23.2% of participants reported receiving technology training at local, state, regional, or national workshops of conferences. Table 10 provides an overview of descriptive data reported for computer skill level and technology training, if any, the participants' received.

Table 10

Frequencies for Computer Skill Level and Technology Training

Variable	Level	Frequency	Percent
Computer Skills	Excellent	7	15.9
	Above average	6	13.6
	Average	18	40.9
	Below average	9	20.5
	Poor	4	9.1

Table 10 (continued).

Variable	Level	Frequency	Percent
Technology Training	Yes	38	86.4
	No	6	13.6
Type of Technology Training	Courses on specific technology	17	24.6
	Self-taught or self-guided learning	28	40.6
	None	1	1.4
	Workshops or conferences at current practice	16	23.2
	Workshops or conferences at local, state, regional, or national level	4	5.8
	Other	3	4.3

Four questions were then asked to better understand participants' level of competency with:

1. Information and communication technologies (i.e., mobile phone and text messaging, electronic mail, social networks, online [virtual] communities, really simple syndications [RSS], blogs, and podcasts).
2. Basic business software (i.e. word processing, spreadsheets, and presentation software.

3. Internet use (specific to online searches [one item interested in general online searches and the second item focused on online searches within professional journals and/or medical databases], publishing and sharing content online, participating in an online computer game, and participating in an online chat room).
4. Whether or not precautions were taken when using online technology.

These four questions utilized a 5-point Likert scale using the following categories: 1- Strongly Disagree, 2- Somewhat Disagree, 3- Neither Agree/Disagree, 4- Somewhat Agree, and 5- Strongly Agree.

For the information and communication technologies (ICT) question, participants were asked how competent there were with the following mediums: electronic mail, instant messaging, mobile and text messaging, Really Simple Syndication, blog, podcast, online (virtual community), and social networks. Participants reported the most competence with mobile phone and text messaging (M = 4.74, SD = .49) and electronic mail (M = 4.38, SD = .91). Participants were less competent with blogs (M = 2.88, SD = 1.16) and podcasts (M = 2.70, SD = 1.01). Specific to competencies with basic business software, participants were most competent with word processing (M = 4.28, SD = .91) and least competent with presentation software (M = 3.05, SD = 1.40).

Specific to Internet use for online searching, participants were more competent searching the Internet for general information (M = 4.63, SD = .58) than they were searching within professional journals or medical databases (M = 4.30, SD = .77). Participants were neutral in regards to their level of competence publishing and sharing content online (M = 3.65, SD = 1.27) and participating in an online computer game (M =

3.21, *SD* = 1.30); and were the least competent with participating in a chat room (*M* = 2.86, *SD* = 1.51). Finally, participants reported taking precaution when using online technologies (*M* = 4.68, *SD* = .52). Table 11 provides additional descriptive statistics on the above-mentioned categories.

Table 11

Descriptive Statistics for Information and Communication Technologies, Basic Business Software, and Internet Use

Category	N	Minimum	Maximum	Mean	Std. Deviation
Information and Communication Technologies (ICT)					
Mobile and text messaging	43	3.00	5.00	4.74	.49
Electronic mail	42	2.00	5.00	4.38	.91
Instant messaging	42	2.00	5.00	4.17	.99
Social networks	43	1.00	5.00	4.00	1.27
Online (virtual) community	42	1.00	5.00	3.31	1.24
Really simple syndication (RSS)	39	1.00	5.00	3.21	.80
Mobile and text messaging	43	3.00	5.00	4.74	.49
Electronic mail	42	2.00	5.00	4.38	.91
Business Software					
Word Processing	43	2.00	5.00	4.28	.91
Spreadsheets	43	1.00	5.00	3.16	1.38
Presentation software	43	1.00	5.00	3.05	1.40

Table 11 (continued).

Category	N	Minimum	Maximum	Mean	Std. Deviation
Internet Use					
Searching online for general information	43	3.00	5.00	4.63	.58
Searching online for journals from professional organization sites or medial databases	43	3.00	5.00	4.30	.77
Publishing and sharing content online	43	1.00	5.00	3.65	1.27
Participating in an online computer game	43	1.00	5.00	3.21	1.30
Participating in a chat room	43	1.00	5.00	2.87	1.51

The final section of the instrument provided fifty (50) statements relative to computers in healthcare in which participants self-reported their level of agreement with each statement. These statements utilized a 5-point Likert scale with the following categories: 1- Disagree strongly, 2- Disagree, 3- Not Certain, 4- Agree, and 5- Agree Strongly. The highest level of agreement was found for the following five statements: (1) The computer is a powerful enabling tool (M = 4.62, SD = .54), (2) In healthcare, computers could save a lot of paperwork (M = 4.37, SD = .72), I like to use the Internet to research health and nursing information (M = 4.16, SD = .90), Nurses should be involved in the planning of national Electronic Health Records (M = 4.10, SD = 1.01), and Computers are great tools for patient education (M = 4.09, SD = .81). The lowest level of agreement was found for the following four statements: (1) I feel alarmed when I think

of using a computer (*M* = 1.90, *SD* = 1.01), (2) I will never feel relaxed about using a computer (*M* = 1.86, *SD* = 1.10), People who like computers are introverted and antisocial (*M* = 1.84, *SD* = .75), and I don't intend to own a home computer (*M* = 1.62, *SD* = .91). Each question as well as the minimum, maximum, mean score, and standard deviation are reported in Table 12 below.

Table 12

Descriptive Statistics for items from the Pretest for Attitudes Toward Computers in Healthcare (P.A.T.C.H.) Assessment developed by June Kaminski

Items on Instrument	Minimum	Maximum	Mean	Std. Deviation
The computer is a powerful enabling tool.	3.00	5.00	4.62	.54
In healthcare, computers could save a lot of paper.	2.00	5.00	4.37	.72
I like to use the Internet to research health and nursing information.	1.00	5.00	4.16	.90
Nurses should be involved in the planning of national Electronic Health Records.	1.00	5.00	4.10	1.01
Computers are great tools for patient education.	2.00	5.00	4.09	.81
Computers can help me to be creative.	2.00	5.00	4.07	.81
I would love to be a proficient user of computers.	1.00	5.00	4.07	1.01
Computers are everywhere, it is natural for them to be used in healthcare.	2.00	5.00	4.02	.74

Table 12 (continued).

Items on Instrument	Minimum	Maximum	Mean	Std. Deviation
Computers help me to keep up to date with nursing issues, knowledge, and research.	2.00	5.00	3.93	.94
I feel confident that I can master using a computer.	1.00	5.00	3.86	1.01
I enjoy using technology to communicate with colleagues (email, etc.)	1.00	5.00	3.83	1.00
Computers can be great problem-solving tools.	2.00	5.00	3.84	.75
Personalized Electronic Health Records streamline access to information an interdisciplinary communication about patients.	3.00	5.00	3.71	.71
I would enjoy learning course work using a computer program.	2.00	5.00	3.70	1.04
I feel I am a skilled typist.	1.00	5.00	3.67	1.27
I have excellent finger dexterity.	1.00	5.00	3.65	1.04
I regularly use a computer at home.	1.00	5.00	3.63	1.31
I can easily master the content of a computer lesson.	2.00	5.00	3.53	.96
I use health care apps on my cellphone or SMART phone.	1.00	5.00	3.51	1.30
The future promise of computers in healthcare excites me.	2.00	5.00	3.51	.83
I relate well to technology and machines.	1.00	5.00	3.47	1.08

Table 12 (continued).

Items on Instrument	Minimum	Maximum	Mean	Std. Deviation
Social media tools enrich health care professional communication and collaboration.	2.00	5.00	3.46	.71
I am in control when I use a computer.	1.00	5.00	3.41	.98
I can let me creativity flow when writing using a computer.	1.00	5.00	3.30	1.06
Bedside computers will irritate patients.	1.00	5.00	2.98	.96
It takes longer to chart on the computer than on paper.	1.00	5.00	2.95	1.23
Patients should not look for health and illness information on the Internet.	1.00	5.00	2.93	1.18
Computers in healthcare will create more work for nurses.	1.00	5.00	2.86	1.13
Computers are just another object that takes me away from my patients.	1.00	5.00	2.86	1.07
Hand written charting is much more complete than electronic documentation.	1.00	5.00	2.76	1.01
Electronic charting restricts how nurses record patient care.	1.00	5.00	2.72	1.03
Online support groups are a waste of time and have no value for patients.	1.00	5.00	2.71	.89
I feel ambivalent about computers and technology.	1.00	5.00	2.68	.94

Table 12 (continued).

Items on Instrument	Minimum	Maximum	Mean	Std. Deviation
Using technology in practice interferes with my ability to be caring to my patients.	1.00	5.00	2.67	1.07
Listening to people using computer jargon intimidates me.	1.00	5.00	2.60	1.12
Computers are frustrating to use.	1.00	5.00	2.57	1.23
Nursing related online groups, forums, and email discussion lists are a waste of time.	1.00	5.00	2.55	.80
Computers are impersonal and dehumanizing.	1.00	5.00	2.45	1.02
I resent the thought of having to use computers in my nursing practice.	1.00	5.00	2.43	.86
I know more about computers than most faculty or administrators.	1.00	4.00	2.30	.86
Computers will someday put health professionals out of a job.	1.00	4.00	2.26	.93
I feel a computer course in nursing is totally unnecessary.	1.00	5.00	2.19	1.12
Working with computers is boring and tedious.	1.00	4.00	2.17	.76
Computers are too complicated for me to learn well.	1.00	5.00	2.07	1.03
I feel restless and confused when I think of using a computer.	1.00	4.00	2.05	1.07
Machines and I don’t mix.	1.00	5.00	2.02	1.11
I feel alarmed when I think of using a computer.	1.00	5.00	1.90	1.00

Table 12 (continued).

Items on Instrument	Minimum	Maximum	Mean	Std. Deviation
I will never feel relaxed about using a computer.	1.00	5.00	1.86	1.10
People who like computers are introverted and antisocial.	1.00	4.00	1.83	.75
I don't intend to own a home computer.	1.00	4.00	1.62	.91

Statistical Tests

The variables studied were age, nursing experience, practice ownership, current EHR meaningful use stage, EHR barriers that impede implementation, EHR features that improve practice, and technology attitudes. This research project utilized a non-experimental research design that allowed the researcher to determine relationships that exist between the EHR stages of meaningful use, and practice ownership, and technology attitudes. Technology attitudes were also correlated with the age of the nurse and the number of years of nursing experience to determine if statistically significant relationships exist. Finally, data collected determined the factor(s) that impeded or facilitated the adoption and usage of EHRs. Data within this section will be reported in accordance with the ordering of the six research questions.

RQ1: Was there a statistically significant difference between practice ownership and the current stage of EHR use?

The first research question utilized a Pearson chi-square analysis to determine whether there was a statistically significant difference between the type of practice ownership of a rural health clinic and the current stage of meaningful use. This chi-

square analysis determined whether the current stage of EHR meaningful use at a rural health clinic is statistically significant based on the clinics' type of practice ownership (government, hospital/integrated delivery system, university or academic medical institution, management services organization or physician practice management company). As evidenced by Table 13 below, the level of EHR meaningful use did not differ by type of practice ownership, χ^2, (15, N = 37) = 21.06, p = .14. Results of this analysis would conclude that the stage of EHR meaningful use is not significantly different by the type of practice ownership of the respective rural health clinic.

Table 13

Frequencies and Percentages of Practice Ownership by Meaningful Use Stage

Practice Ownership	Does not use/ Did not report	Stage 1	Stage 2	Stage 3	Total
Government	.0% (n = 0)	14.3% (n = *1)*	.0% (n = 0)	14.3% (n = *1)*	5.4% (n = 2)
Hospital/ Integrated delivery system	63.6% (n = 7)	42.9% (n =3)	42.9% (n =3)	14.3% (n =1)	37.8% (n = 14)
University or academic medical institution	.0% (n = 0)	14.3% (n =1)	.0% (n = 0)	.0% (n = 0)	2.7% (n = 1)
Management Services Organization or Physician Practice Management Company	.0% (n = 0)	.0% (n = 0)	8.3% (n = 1)	.0% (n = 0)	2.7% (n = 1)
Physicians	36.4% (n = 4)	14.3% (n = 1)	66.7% (n = 8)	71.4% (n = 5)	48.6% (n = 18)
Other	.0% (n = 0)	14.3% (n =1)	.0% (n = 0)	.0% (n = 0)	2.7% (n = 1)

Observations from the data provided in Table 13 indicated a large number of participants who worked in a practice setting that was owned by a physician or hospital/integrated delivery system. As a result, a second Pearson chi-squared test was then performed specifically for these two practice settings to determine if there was a statistically significant difference found between the primary types of practice ownership in our sample and current stage of EHR use. The second analysis revealed no significant difference between the refined practice ownership variables (Physicians and Hospital/Integrated delivery system) and current level of EHR meaningful use, χ^2, (3, N = 32) = 6.36, p = .10. Results indicated that the level of EHR meaningful use of a rural health clinic was not significantly different regardless of whether the practice was owned by physicians or a hospital/integrated delivery system. See Table 14 correlation data for additional information.

Table 14

Correlation Table of Practice Ownership (Hospital/Integrated delivery system and Physicians) by Meaningful Use Stage

Practice Ownership	Does not use/ Did not report	Stage 1	Stage 2	Stage 3	Total
Hospital/ Integrated delivery system	63.6% (n = 7)	75.0% (n =3)	27.3% (n =3)	16.7% (n =1)	43.8% (n = 14)
Physicians	36.4% (n = 4)	25.0% (n = 1)	72.7% (n = 8)	83.3% (n = 5)	56.3% (n = 18)

RQ2: Were there factors associated with EHR integration and usage that impeded the diffusion process? If so, do they differ by type of practice ownership?

The second research question investigated the factors that impeded the diffusion process and whether these factors differed by the type of practice ownership. This was conducted to determine whether any factors serving as barriers to the diffusion process were specific to a particular type of practice ownership. A multivariate of analysis was utilized to analyze this research question and the results found no statistically significant difference between factors that impeded the EHR diffusion process by the type of practice ownership (Physicians and Hospital/Integrated delivery system) of the rural health clinic, $F(1, 13) = .713$, $p = .743$. This indicates that regardless of the type of practice ownership a rural health clinic has, barriers that impede the EHR diffusion process are not significantly different.

Specific to rural health clinics that the practice ownership was identified as primarily Hospital/Integrated delivery system, the five barriers that were most significant in impeding the diffusion process were (1) concern about loss or productivity during transition to the EHR system ($M = 3.83$, $SD = 1.47$), (2) inability to evaluate, compare, and select the appropriate EHR system ($M = 3.50$, $SD = 1.38$), (3) inability to easily input historic medical record data into the EHR system ($M = 3.50$, $SD = .84$), (4) inability to integrate the EHR with practice's billing/claims submission system ($M = 3.50$, $SD = 1.38$), and (5) lack of support from practice administration ($M = 3.50$, $SD = 1.64$). For physicians, the top six barriers impeding to the diffusion of EHR systems were (1) concern about the physician's ability to input into the computerized medical record ($M = 3.23$, $SD = 1.36$), (2) lack of support from practicing physicians ($M = 2.92$, $SD = 1.50$), (3) inability to integrate the EHR with practice's billing/claims submission systems ($M = 2.91$, $SD = 1.51$), (4) practice staff does not have the skills/training to use EHR ($M =$

2.85, *SD* = 1.14), (5) lack of support from practice nonphysicians (*M* = 2.85, *SD* = 1.46), and (6) concern about loss of productivity during transition to the EHR system (*M* = 2.85, *SD* = .99). The only two barriers reported the highest for both practice ownership types were concern about loss of productivity during the transition to the EHR system and inability to integrate the EHR with billing/claims submission systems. Additionally, it is observed that more participants worked in a rural health clinic owned by physicians than in a hospital/integrated delivery system setting. Means and their respective standard deviations are reported in Table 15 below.

Table 15

Descriptive Information for EHR Barriers by Type of Practice Ownership

EHR Barrier	Practice Ownership	N	Mean	SD
Lack of capital resources to invest in an EHR	Hospital/Integrated delivery system	6	3.33	.52
	Physicians	12	2.75	.1.42
Insufficient return on investment (ROI) from an EHR	Hospital/Integrated delivery system	4	3.25	.50
	Physicians	12	2.83	.1.19
Lack of support from practice physicians	Hospital/Integrated delivery system	6	3.00	.89
	Physicians	13	2.92	1.50
Lack of support from practice nonphysicians	Hospital/Integrated delivery system	6	2.83	1.17
	Physicians	13	2.85	1.46
Lack of support from practice clinical staff	Hospital/Integrated delivery system	6	2.50	1.38
	Physicians	13	2.77	1.48

Table 15 (continued).

EHR Barrier	Practice Ownership	N	Mean	SD
Lack of support from practice administration	Hospital/Integrated delivery system	6	3.50	1.64
	Physicians	13	2.54	1.51
Security and privacy concerns	Hospital/Integrated delivery system	6	2.67	1.86
	Physicians	13	2.46	1.51
Inability to integrate the EHR with practice's billing/claims submission system	Hospital/Integrated delivery system	6	3.50	1.38
	Physicians	11	2.91	1.51
Available EHR software does not meet the practice's needs	Hospital/Integrated delivery system	6	2.83	1.17
	Physicians	13	2.77	1.36
Practice staff does not have skills/training to use HER	Hospital/Integrated delivery system	6	3.17	1.47
	Physicians	13	2.85	1.14
Insufficient time to select, contract, install and implement an EHR	Hospital/Integrated delivery system	6	3.00	1.67
	Physicians	12	2.67	1.37
Inability to easily input historic medical record data into the EHR system	Hospital/Integrated delivery system	6	3.50	.84
	Physicians	13	2.69	1.18
Inability to evaluate, compare and select the appropriate EHR system	Hospital/Integrated delivery system	6	3.50	1.38
	Physicians	13	2.67	1.56

Table 15 (continued).

EHR Barrier	Practice Ownership	N	Mean	SD
Concern about loss of productivity during the transition to the EHR system	Hospital/Integrated delivery system	6	3.83	1.47
	Physicians	13	2.85	.99
Concern about physician ability to input into the computerized medical record	Hospital/Integrated delivery system	6	3.00	1.10
	Physicians	13	3.23	1.36

After investigation of the multivariate of analysis, there were no statistically significant differences between factors that impeded the EHR diffusion process by the type of practice ownership (Physicians and Hospital/Integrated delivery system) of the rural health clinic. Levene's test for equality of variances for each of the fifteen barriers was not significant, therefore equality of variances was assumed. The *t*-test for equality of means (2-tailed) explored whether the mean scores reported for each of the two practice ownerships differed. No mean scores reported statistically significant differences indicating that barriers that impede the diffusion process do not differ by practice ownership type.

RQ3: Were there factors associated with EHR integration and usage that facilitated the diffusion process? If so, do they differ by type of practice ownership?

The third research question investigated the factors that facilitated the diffusion process and whether these factors differed by the type of practice ownership. A multivariate of analysis was utilized to analyze this research question and the results

found no statistically significant difference between features that facilitated the EHR diffusion process by the type of practice ownership (Physicians and Hospital/Integrated delivery system) of the rural health clinic, $F(7, 13) = 1.946$, $p = .191$. This indicates that regardless of the type of practice ownership a rural health clinic possesses, features that facilitate the EHR diffusion process are not significantly different.

Among the 13 features, the six that reported the highest mean scores for hospital/integrated delivery systems were (1) reduced medical records storage costs ($M = 4.43$, $SD = .79$), (2) improved claim submission process ($M = 4.14$, $SD = .69$), (3) improved clinical outcomes ($M = 4.00$, $SD = 1.15$), (4) improved charge capture ($M = 4.00$, $SD = 1.41$), (5) improved drug refill capabilities ($M = 4.00$, $SD = .58$), and (6) improved access to medical record information ($M = 4.00$, $SD = 1.15$). For physicians, the three features with the highest mean scores included (1) improved access to medical record information ($M = 4.11$, $SD = 1.13$), improved clinical outcomes ($M = 3.94$, $SD = 1.14$), and (3) improved accuracy for coding evaluation and management procedures ($M = 3.80$, $SD = 1.15$). The two features that were reported within the highest mean scores for both groups were improved clinical outcomes and improved access to medical record information. The lowest mean scores for hospital/integrated delivery systems included (1) improved work flow ($M = 3.57$, $SD = 1.51$) and (2) improved patient communications ($M = 3.43$, $SD = 1.27$); while the lowest mean scores for physicians were reported for improved charge capture ($M = 3.53$, $SD = 1.30$) and reduced transcription costs ($M = 3.47$, $SD = 1.55$). Table 16 provides descriptive information for the features that facilitate the diffusion process for EHR systems by practice ownership.

Table 16

Descriptive Information for EHR Features by Type of Practice Ownership

Feature	Practice Ownership	N	Mean	SD
Improved clinical outcomes	Hospital/Integrated delivery system	7	4.00	1.15
	Physicians	17	3.94	1.14
Improved work flow	Hospital/Integrated delivery system	7	3.57	1.51
	Physicians	18	3.67	1.37
Improved patient communications	Hospital/Integrated delivery system	7	3.43	1.27
	Physicians	16	3.75	1.23
Improved claim submission process	Hospital/Integrated delivery system	7	4.14	.69
	Physicians	14	3.79	1.48
Improved charge capture	Hospital/Integrated delivery system	7	4.00	1.41
	Physicians	15	3.53	1.30
Improved accuracy for coding evaluation and management procedures	Hospital/Integrated delivery system	7	3.71	1.38
	Physicians	15	3.80	1.15
Improved drug refill capabilities	Hospital/Integrated delivery system	7	4.00	.58
	Physicians	18	3.78	1.40
Improved access to medical record information	Hospital/Integrated delivery system	7	4.00	1.15
	Physicians	18	4.11	1.13

Table 16 (continued).

Feature	Practice Ownership	N	Mean	SD
Reduced medication errors	Hospital/Integrated delivery system	7	3.86	1.21
	Physicians	17	3.76	1.25
Reduced transcription costs	Hospital/Integrated delivery system	7	3.86	1.07
	Physicians	17	3.47	1.55
Reduced medical records staff expenses	Hospital/Integrated delivery system	7	3.86	.69
	Physicians	17	3.76	1.25
Reduced medical records storage costs	Hospital/Integrated delivery system	7	4.43	.79
	Physicians	17	3.71	1.31
Reduced medical records transportation cost	Hospital/Integrated delivery system	7	3.86	.69
	Physicians	17	3.71	1.31

After investigation of the multivariate of analysis, there were no statistically significant differences between features that facilitated the EHR diffusion process by the type of practice ownership (Physicians and Hospital/Integrated delivery system) of the rural health clinic. Levene's test for equality of variances for eleven of the twelve features was not significant, therefore equality of variances was assumed. One variable, improved drug refill capabilities, violated Levene's test for equality of variances, $F(1, 23) = 8.61$, $p = .01$, and therefore, equal variances will not be assumed for this item. The *t*-test for equality of means (2-tailed) explored whether the mean scores reported for each

of the two practice ownerships differed. No mean scores reported statistically significant differences indicating that features that facilitate the diffusion process do not differ by practice ownership type.

RQ4: Was there a statistically significant relationship between technology attitudes and the age of the nurse?

In order to answer research question four, a technology attitude score was computed. To compute this new variable, technology attitude (tech_att), June Kaminski's (1996/2012) Pretest for Attitudes Towards Computer use in Healthcare (P.A.T.C.H.) assessment scale v.3 was utilized (Kaminski, 1996/2012). These questions were summed to calculate an attitude toward computers in healthcare score for each individual. The instrument scale was a five-point Likert scale with a scale range 1 to 5 using the following categories 1- agree strongly, 2- agree, 3- not certain, 4- disagree, and 5- disagree strongly. The author provided a detailed description of how to tally the 50 items to get a total technology attitude score which is calculated based on a participant answering all 50 items and summing these scores based on the author's scoring tool (Appendix C). This score was then utilized to determine each participant's attitude towards computers in healthcare using the author's score interpretations tool (Appendix C). The score interpretations tool provides a range for scores and a description for the attitude towards technology that falls within the score range.

The instrument scale is a five-point Likert scale with a scale range of 1 to 5 using the following categories 1- agree strongly, 2- agree, 3- not certain, 4- disagree, and 5- disagree strongly. Participants' scores are grouped into the following technology attitude categories: 0-17 shows a positive indication of cyberphobia, 18-34 shows some

uneasiness about using computers, 35-52 shows moderate comfort in using computers, 53-69 shows comfort in using user-friendly computer applications, 70-86 shows an overall confidence in a variety of computer programs, and 87-100 shows the individual is very confident and holds positive views of using computers in healthcare.

For this section's descriptive information and analysis, two participants were removed due to lack of sufficient data to calculate a realistic attitude score. For those participants who skipped items or had incomplete data within this section, the mean score was calculated for each of the fifty items and the respective mean item score was utilized to substitute for missing or incomplete data. Table 17 provides the descriptive statistics for the computed technology attitude scores for the participants. The range of technology attitude scores was 31-92.50 with a mean score of 66.48 (*SD* = 13.26). This mean score falls within the 53-69 category which provides the following interpretation of an individual in this category, "Feels uncomfortable using user-friendly computer applications. Aware of the usefulness of computers in a variety of settings. Has a realistic view of current computer capabilities in healthcare" (Kaminski, 1996/2012, p. 5).

Table 17

Descriptive Statistics for Participants' Technology Attitudes (N = 42)

Subscale	Minimum	Maximum	Mean	Std. Deviation
Score	31	92.50	66.48	13.26

Research question four explored the relationship of the age of the participant (nurse) and his/her respective technology attitude to determine if a statistically significant

relationship existed. A Pearson Product Moment Correlation was utilized to determine whether technology attitude correlated with age. Correlation statistics are reported in Table 18. There was a negative correlation reported for the relationship of technology and age however, it was not statistically significant, $r(38) = -.182$, $p = .273$. This implies that there is no relationship between the age of a nurse and his/her respective technology attitude. The correlation statistic is listed in Table 18 below.

Table 18

Correlation Statistics of Technology Attitudes by Age of Participant

Variable	Statistics	Age
Technology Attitude	Pearson Correlation	-.182
	Sig. (2-tailed)	.273
	N	38

Note: **. Correlation is significant at the 0.01 level (2-tailed).

RQ5: Was there a statistically significant relationship between technology attitudes and the number of years of nursing experience?

Research question five explored the relationship of the number of years of nursing experience and his/her respective technology attitude to determine if a statistically significant relationship existed. A Pearson Product Moment Correlation was utilized to determine whether technology attitude correlated with nursing experience. A negative correlation between the number of years of nursing experience and technology attitudes was found; however, this correlation was not statistically significant, $r(35) = -.238$, $p = .169$. Correlation statistics are reported in Table 19.

Table 19

Correlation Statistics of Technology Attitudes by Years of Nursing Experience

Variable	Statistics	Years of Nursing Experience
Technology Attitude	Pearson Correlation	-.238
	Sig. (2-tailed)	.169
	N	35

Note: **. Correlation is significant at the 0.01 level (2-tailed).

RQ6: Was there a statistically significant difference between technology attitudes and the current stage of EHR use?

Research question six sought to determine whether there was a statistically significant difference between technology attitudes and the current stage of EHR meaningful use. The statistical test utilized to answer this research question was a one-way analysis of variance. This tested for a statistically significant difference between the current stage of meaningful use by technology attitude scores. The descriptive statistics are listed below in Table 20. As a note, mean scores appear to be lower for those individuals who have reported some type of EHR use as opposed to those who have reported no use. Further, technology attitude scores remained somewhat consistent when some level of EHR meaningful use was reported (see Table 20 for additional information).

Table 20

Descriptive Statistics for current stage of EHR meaningful use and Technology Attitudes

Current Stage of EHR Meaningful Use	N	SD	Mean
Does not use/Did not report EHR use	13	18.25	68.41
Stage 1	9	7.94	65.45
Stage 2	13	12.10	65.99
Stage 3	7	13.26	65.99

The results of the One-Way ANOVA indicate there was no statistically significant difference in technology attitude score by current stage of EHR meaningful use, $F(3, 38) = .127$, $p = .94$. Therefore participants in each stage of EHR meaningful use did not have a significantly different technology attitude score.

Summary

The data analyses presented within this chapter indicate no statistically significant differences between the current stage of EHR meaningful use by practice ownership. In addition, EHR barriers that impede the diffusion process as well as features that facilitate the EHR diffusion process are not statistically different by practice ownership. Further, no statistically significant relationships existed between technology attitudes and the (1) age of a nurse, (2) number of years of nursing experience, or (3) current stage of EHR meaningful use. Chapter V will discuss the results reported within Chapter IV and how these results will impact rural health clinics and their adoption of EHRs.

CHAPTER V

DISCUSSION

This study investigated Mississippi's rural health clinics' level of electronic health record meaningful use, barriers and features associated with EHR adoption and usage, and the technology attitudes of rural health clinic nurses to better understand the unique needs of this population. A thorough review of the literature indicated that effective use of health IT, which included electronic health records, could dramatically improve healthcare, increase patient safety, and decrease health costs within the United States. Still, adoption has been slow and presents unique challenges to healthcare providers, particularly in rural settings. Additional insight from literature suggests that technology attitudes held by rural health clinic nurses may impact the adoption and usage of EHRs (Hobbs, 2002; Moody et al., 2004; Wen-chin, 2006). Chapter V concludes this study and includes a discussion of the findings from Chapter IV in greater detail. Limitations of this study will also be provided along with recommendations for policy and practice. Finally, recommendations for future research will be provided.

Conclusions and Discussion

Healthcare providers will not likely be successful at adopting and implementing health IT when multiple barriers exist, specific to health IT (Bailey, 2009). This study was conducted to help improve the success of rural health clinics by adding to the body of knowledge pertaining to the technology attitudes and skills of rural health clinic nurses and the level of adoption of electronic health records in Mississippi. Specifically, the researcher assessed the impact of technology attitudes and skills of Mississippi's rural health clinics nurses to (a) determine the current stage of EHR adoption and integration,

(b) identify factors associated with EHR integration and usage that impede and/or facilitate the diffusion process, (c) ascertain current technology attitudes, and (d) understand current technology use of practicing nurses in rural health clinics. This study built upon existing knowledge of rural health clinic electronic health record adoption and implementation, and helped provide an understanding of how the technology attitudes and skills of rural health clinic nurses impacted the adoption process, if at all.

The researcher collected data from nurses (or those serving in a nursing capacity) who were currently practicing in a Mississippi rural health clinic that, at the time of the study, provided all of the following services chronic disease management, diabetes education, and family medicine. The variables studied were age, nursing experience, practice ownership, current EHR meaningful use stage, EHR barriers that impede implementation, EHR features that improve practice, and technology attitudes. This research project utilized a non-experimental research design. The exploratory design allowed the researcher to determine relationships that exist between the EHR stages of meaningful use, and practice ownership and technology attitudes. Technology attitudes were also correlated with the age of the nurse and the number of years of nursing experience to determine if statistically significant relationships exist. Finally, data collected determined the factor(s) that impede or facilitate the adoption and usage of EHRs. Findings will be interpreted and discussed in accordance with the ordering of the research questions.

RQ1: Was there a statistically significant difference between practice ownership and the current stage of EHR use?

A Pearson's chi-squared test indicated that the current stage of electronic health record use was not statistically different based on the type of practice ownership of a rural health clinic, χ^2, (15, N = 37) = 21.06, p = .14. Research question one identified that the two prominent types of practice ownership within the study were hospital/integrated delivery systems and physicians. While the use of health IT in the medical field can help (a) decrease health disparities, medical errors and costs, (b) improve the quality and continuum of care for patients, and (c) increase accessibility of health services to both patients and providers (Castro, 2009; IOM, 2011; U.S. HHS ONC, 2010) dually noted are the inflated challenges to medical facilities (e.g., health clinics) that are located in rural areas (UnitedHealth Center for Reform Modernization, 2011).

This study found no difference in the current stage of meaningful use regardless of the type of practice ownership reported. This finding contradicts the current literature as physician run rural health clinics have been cited as having less health IT adoption and integration due to financial constraints. Financial concerns have been the most frequently cited antecedent in EHR adoption (Schoenman, 2007) and costs of purchasing software systems in solo and small physician practices are substantial (Street & Cossman, 2008). Further, the Medicare Payment Advisory Commission (2004) confirmed that solo physicians in rural areas bear more financial burden than hospital settings, and therefore, are less likely to adopt health IT. Findings from this study may indicate a difference from current literature based on the new meaningful use mandates shifting EHR use in healthcare facilities from a primarily voluntary to compulsory state. EHR adoption rates, which typically lag in rural areas (Bailey, 2009), were quite diverse in this study with 23 participants reporting Stage 1 or below and 21 participants reporting Stage 2 or higher.

Again, this shift from low adoption rates to varied levels of meaningful use may be a result of recent legislation which will impact future Medicare and Medicaid compensation based on meaningful use.

The increased adoption and integration of health information technology, as well as the usage of technology in the personal lives of health professionals, has begun to change the way in which medicine is practiced. Over the last ten years the explosion of hand-held mobile devices, growth of access to home computers, and interest in web 2.0 technologies (i.e., social networking) has modified the way individuals think and use technology which in turn has impacted the use of technology in healthcare settings. This may also lend insight into the differences found that were incongruent with the literature.

RQ2: Are there factors associated with EHR integration and usage that impede the diffusion process? If so, do they differ by type of practice ownership?

A multivariate analysis of variance (MANOVA) indicated that the barriers that impede the meaningful use of electronic health records were not significantly different based on the type of practice ownership of the rural health clinic, χ^2, (3, N = 32) = 6.36, p = .10. Barriers that were included in the study have been identified as the main barriers to the adoption and implementation of health IT. However, it was hypothesized that specific barriers may have more impact than others depending on the type of practice ownership of the rural health clinic. The findings indicated that barriers that impede the diffusion of EHR adoption did not differ significantly by the type of practice ownership. This contradicts the literature as typically the main two practice ownerships (i.e., hospital/integrated delivery systems and physicians) face different barriers. While the barriers reported are common antecedents of health IT adoption, the literature indicates

that barriers may be different or impact a practice differently depending on the type of practice ownership (MedPAC, 2004; UnitedHealth Center for Reform and Modernization, 2011). For example, though financial barriers are the most frequently reported antecedent in EHR adoption (Schoenman, 2007), hospital/integrated delivery systems tend to have more financial resources than do its solo physician counterparts (Bailey, 2009; Street & Cossman, 2008).

Though no statistically significant differences for barriers by practice ownership were found, descriptive information for this research question would indicate some differences in the major barriers by practice ownership. The only two barriers reported the highest for both practice ownership types were concern about loss of productivity during the transition to the EHR system and an inability to integrate the EHR with billing/claims submission systems. Rural health clinics that the practice ownership was identified as primarily Hospital/Integrated delivery system were most concerned with loss of productivity, inability to evaluate, compare and select the appropriate EHR system, EHR system communication with other systems and ease of use, and the lack of support from practice administration. These barriers are among the most commonly cited in the literature (Castro, 2009; De Veer et al., 2011; Gans et al., 2005). For physicians, the major barriers impeding the diffusion of EHR systems were physicians' ability to interact with the system, lack of skills/training of practice staff, lack of support from practice physicians and nonphysicians, EHR system communication with other systems, and loss of productivity. This is consistent with literature surrounding EHR barriers with regards to physician practices (Simon et al., 2007; Terry et al., 2012).

Anecdotal data reported during on-site data collection included the lack of user-friendliness of current EHR systems and perceived disconnect with patients when using EHRs. One clinic site discussed particular ways that they utilized to enter information into the EHR system indicating that they have one individual who scans all records into the system for them. This work around would not meet meaningful use standards therefore further exploration of EHR actual use and the challenges associated with delivering care in conjunction with using EHR systems should be explored to ensure EHRs are being used meaningfully and seamlessly integrate into current delivery of patient care.

Other clinics in this study as well as individuals from the pilot study and panel of experts indicated that the current systems take away from the ability to deliver a personal care. Elaborating on this, these individuals described the challenges of being able to observe patient behaviors and connect with them individually as the use of EHR systems. The use of EHRs required nurses to spend a large portion of time viewing and entering data on the computer. In addition, some systems would prompt nurses to answer other non-related questions or were cumbersome (i.e., entering more than one chief compliant would result in having to go back to the beginning screen and start over again) making the interaction with the patient less personal. The usage of EHRs was also described as taking away from some of the key characteristics of being a nurse that the individuals favored. In fact, one nurse stated, “If I wanted to work on a computer and not interact with people, I would not have become a nurse.”

RQ3: Are there factors associated with EHR integration and usage that facilitate the diffusion process? If so, do they differ by type of practice ownership?

A multivariate analysis of variance (MANOVA) indicated the features that facilitate EHR adoption and meaningful use was not significantly different based on the type of practice ownership of the rural health clinic, $F(7, 13) = 1.946$, $p = .191$. Features that were included in the study have been identified as the main advantages of the adoption and implementation of health IT. Because EHR systems are robust and include numerous features that could facilitate adoption and use, the researcher sought to determine if specific features were more advantageous based on the type of practice ownership of the rural health clinic. The findings indicate that features that facilitate the diffusion of EHR adoption did not differ significantly by the type of practice ownership.

Though no statistically significant differences for EHR features by practice ownership were found, descriptive information for this research question would indicate some differences in the major features by practice ownership. Both practice ownerships (hospital/integrated delivery system and physicians) agreed that the most advantageous EHR features were improved clinical outcomes and improved access to medical record information. Participants from hospital/integrated delivery systems identified the following features as most advantageous: reduced costs (medical record storage), increased access to medical record information, improved clinical outcomes, and improved claim submission processes and charge capture drug refill capabilities. This is consistent with features that motivated EHR use (Gagnon et al., 2006; Terry et al., 2012).

For physicians, the three most advantageous features included improved access to medical record information, improved clinical outcomes, and improved accuracy for coding evaluation and management procedures. This is consistent with literature surrounding solo or small group practices (Miller et al., 2005).

RQ4: Is there a statistically significant relationship between technology attitudes and the age of the nurse?

A Pearson Product Moment Correlation was conducted to determine whether technology attitudes correlated with the age of the nurse. Within the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003) age is a moderating variable. While there was a negative correlation between technology attitude and the age of the nurse, results indicated that this relationship was not significant, $r(38) = -.182$, $p = .273$. Research previously conducted on whether age is significantly correlated with technology attitudes indicates there is a significant relationship (Dillion et al., 2005; Eley et al., 2008; Moody et al., 2004). Of particular note is that these relationships were usually negative, indicating that the older the nurse, the less high his/her respective technology attitude would be. However, most current nursing professionals utilize technology within their personal lives, and this may not have been a realistic setting for nurses that were included in previous research. This may indicate that although negative correlations previously existed, the increase in general use of technology may indicate that age does not impact current nurses' technology attitudes.

RQ5: Is there a statistically significant relationship between technology attitudes and the number of years of nursing experience?

A Pearson Product Moment Correlation indicated no relationship between technology attitudes and the number of years of nursing experience an individual had, $r(35) = -.238$, $p = .169$. Within the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003) experience is a moderating variable. While there was a negative correlation between technology attitude and the number of years of

nursing experience, results indicated that this relationship was not significant. Research previously conducted on whether the number of years of nursing experience is significantly correlated with technology attitudes has indicated a significant relationship (Hinson et al., 1994; Kowitlawakul, 2011). Of particular note is that these relationships were negative, indicating that as the years of experience increased, the respective nurse's technology attitude decreased. Similar to research question 5 which dealt with the impact of age on technology attitudes, previous literature may not be relevant to today's nursing workforce. Because nurses are more likely to interact with technology in not only the professional setting but also in their personal lives, the relationship of experience and its impact on technology attitudes may no longer be significant.

RQ6: Is there a statistically significant difference between technology attitudes and current stage of EHR use?

An analysis of variance (ANOVA) indicated there was no significant difference in technology attitudes based on the current level of EHR meaningful use, $F(3, 38) = .127$, $p = .94$. This indicates that an individual's technology attitude was not different regardless of whether that individual had no experience with EHRs or used EHRs at the highest stage of meaningful use. It is very important to understand how attitude impacts technology use. The study of technology attitudes has continued to remain a critical component in theoretical frameworks and adoption processes as it has been considered a major driver in the adoption of usage of technology in healthcare (Dillion et al., 2005; Hobbs, 2002) and have been linked to the success of health IT integration (Schaper & Pervan, 2007).

Additionally, many healthcare providers assumed that EHR systems were customizable and mature enough to perform specific duties regardless of the type of practice that integrated the system. As a result, many practices immediately purchased systems without seeing the operational capacity of the system which resulted in increased implementation time, costs, and a lack of confidence (or self-efficacy) of EHRs. Such experiences may alter an individual's confidence or attitude toward adopting and utilizing EHRs and thereby impact the technology attitude of a health professional.

Anecdotal data obtained during on-site visits and with individuals from the pilot study and panel of experts that lends insight into technology attitudes included previous experiences with EHR systems. Some nurses participating in the study worked at multiple sites (i.e., full time at a rural health clinic and weekends at a hospital) which provided them with various levels and types of exposure to EHRs. One nurse described an extremely difficult transition at the specialist office she worked at indicating that the system did not meet the needs of the specialists' office in which she worked. The system also did not provide relative application to their practice and limited, if any, support was given by the IT providers leaving them with no system expert. This overwhelmed already overworked nurses with additional responsibilities to their current workloads such as trying to learn how to use the system, trying to figure out how they could get the information into the system that was specific to their office, and receiving appropriate time-sensitive support. These negative experiences deterred individuals from wanting to adopt EHRs and impacted their attitudes about adopting technology in their practice.

Limitations

The first limitation to this study was the rural setting in which the research was conducted. Rural areas particularly in Mississippi have been identified as those with grave healthcare professional shortages. Questionnaire response rates are typically lower in rural areas than they are in urban counterparts however, this study investigated health clinics in rural health settings, as these clinics tend to have less support and resources. In addition to the reduced number of nurses within the rural areas of Mississippi, the researcher also narrowed the scope of the study to only include those rural health clinics that provide all of the three following services chronic disease management, diabetes education, and family medicine.

Another substantial limitation of this study was the low response rate from the identified sample population. Because of an initial low response rate from mailed surveys, the researcher made on-site visits to six of the 53 clinics. This provided additional participation and completed surveys; however, length of the instrument and a lack of time to complete the survey during on-site visits continued to deter participation. Larger sample sizes may have resulted in significantly different results. Due to the small sample, caution should be taken when generalizing these findings to a larger rural health clinic population.

The final limitation was the inability to get an accurate count of the number of health professionals serving in a nursing capacity in the rural health clinic settings. Communication was initiated with each of the 53 rural health clinics; however, numbers reported throughout the project tended to shift, usually in a declining nature. Additionally, when site visits were made, the numbers of nurses working were

significantly lower than the number of nurses reported. This may have been a result of site contacts reporting the total number of nurses employed at the clinic rather than the normal number of staffed nurses (e.g., Administrative, On-call, Per requested needed (PRN), and Part-time nurses). Due to validity concerns for sample size, no return rates were calculated and reported.

Recommendations for Policy and Practice

Integrated effectively, health IT can be a major contributor to the improvement of rural healthcare. However, the adoption and lifecycle of any technology can be challenging if not effectively integrated into practice. As evidenced within the literature, the increased adoption and use of health information technology (health IT) has been cited as one way to reduce health disparities, medical errors, and costs; improve the quality and continuum of care for patients; and increase accessibility of health services and information to patients and health care providers (Castro, 2009; U.S. HHS ONC, 2010). Insight obtained from the findings of the study can be used as a guide for policy makers and practitioners.

Recommendations for Nurses

Even though the findings of this study are not significant, there are still a number of associations indicated that can be useful for nurses. A realization by nurses that a potential inverse relationship may exist between age and technology attitudes, as well as with nursing experience and technology attitudes could be helpful in understanding the dynamics of technology usage. As nurses gain more experience and concurrently get older, their respective attitudes towards technology tend to decrease. Consequently, it may be useful to increase professional development opportunities throughout their entire

career. Found within the Florence Nightingale Pledge is, "…I will do all in my power to maintain and elevate the standard of my profession" (American Nurses Association, 2013). As nurses, it is critical to stay abreast on current medical practices and ensure that these practices are provided to every individual who seeks health services.

Recommendations for Health Information Technology System Developers

Health information technology system developers should develop technologies that are easy to use and improves user performance. Further, these systems must be flexible, communicate with other systems (i.e., claims/billing submission systems, various EHR systems) and most importantly, designed with feedback of veteran health professionals to ensure applicability and relativeness of the interface. Systems that can reduce workload, increase access to patient medical information, and improve patient safety are vital to healthcare providers. In addition, both technical support within the EHR system and on-site are needed to ensure effective implementation.

Moreover, it is evident that health IT can provide many advantages to the healthcare industry however, before launching a particular EHR system there is an increase need for pilot testing and on-site observations to proactively address any workflow challenges or barriers to EHR adoption. Nurses interact heavily with patient medical record information both in paper and electronic formats, therefore would serve as excellent advisory members during the development of EHR functions, features, and systems.

Recommendations for Health Administrators/Practice Owners

Technology attitudes of rural health clinic nurses still remain low. According to June Kaminski's Pretest for Attitudes Towards Computers in Healthcare (P.A.T.C.H.

Assessment Scale v.3), which scores individual technology attitudes on a scale from 0 to 100, nurses within the study had a mean technology attitude score of 66. The score interpretation for the respective mean score indicates that nurses feel comfortable using user-friendly applications, are aware of the benefits using computers in various settings and have a realistic view of the current capabilities of computers in healthcare (Kaminski, 1996/2012, p. 5). The mean score interpretation indicated that the culture in which technology is being adopted could be improved as the technology attitude mean score is still quite low. Vital to the effective use of any technology is the attitudes of the individuals who will be using the technology. Rural health clinic nurses feel comfortable using user-friendly computer applications and are aware of the usefulness of computers in the healthcare setting. However, these individuals lack confidence in their ability to use computers in healthcare and also in the ability of technology to serve as an effective tool in healthcare. This finding suggests that training should be a major initiative in the EHR adoption and use strategic plan. Without a solid understanding of how the EHR system can positively impact their work productivity, communication with patients and providers, and the health outcomes of their patients, it will be difficult to change attitudes towards computers in healthcare.

It is also recommended that a needs assessment be conducted prior to EHR adoption to assess the technology skill levels of health professionals and their attitudes toward EHR systems. A formal needs assessment will provide a guide to developing and a strategic plan and developing initiatives for EHR adoption and meaningful use. Additionally, preliminary information from the findings of the needs assessment could help facilitate discussions with key constituents and focus groups. These approaches will

allow for the development of targeted training based on the needs and current technology skill levels of the healthcare staff.

Recommendations for Educators

Comprehensive training on multiple technologies is critical to ensuring nursing graduates have the knowledge competencies needed to work in a global, diverse healthcare workforce. Ensuring that nurse preparation programs integrate both didactic and clinical opportunities for students to work with health information technology is essential. When solicited about the type of training healthcare professionals received, the most commonly reported response was self-training indicating a need for more formal training. While critical thinking and the ability to problem solve should be within future health professionals skill sets, ensuring that technology competencies have been obtained will be vitally important to graduates making a smooth transition into the healthcare workforce.

Recommendations for State Officials

This study has provided a foundational starting point for a better understanding of the current meaningful use of EHRs in rural health clinics and the technology attitudes of the nurses within these settings. Data generated by the study indicated that rural health clinics are at various stages of EHR adoption and use.

Based on the mean score of for technology attitudes of rural health clinic nurses, there is a need for education and training opportunities to increase individuals' self-confidence and technology skill sets. One suggestion may be to require continuing edit units (CEUs) at the RN or LPN level. Additionally, CEUs for advanced nurses could incorporate health informatics/health IT contact hours as currently the only requirements

are 20 of the 40 hours must be face-to-face contact hours and two hours must concern the use of controlled substances. This may also indicate to nursing professionals the increase importance of knowledge competencies in health IT.

Finally, it is vital to include nurses in the decision making, planning, adoption, and continuous evaluation processes of EHRs. When nurses are not included in decision making processes they often feel as if they are not valued or respected in the delivery of healthcare. Nurses experience, knowledge, and skill sets add a level of expertise that would complement any decision making group. Daily responsibilities of nurses require the use of EHRs making their buy-in critical to the successful integration of an EHR.

Recommendations for Future Research

Future studies could expand the current study to include all rural health clinics and federally qualified health centers (e.g., migrant and community health centers, homeless programs) to determine levels of adoption and EHR meaningful use and the technology attitudes and skill levels. In addition, the study could be expanded across all health professionals including physicians, specialized practitioners, and administrators and office staff to provide a multidimensional understanding of technology attitudes and skills of Mississippi's health professionals as well as their levels of adoption and meaningful use of EHRs. This study may also be replicated and conducted in surrounding states (i.e., Louisiana, Alabama, Florida) to determine regional similarities and differences. By conducting a regional study, researchers may be able to identify early adopters and laggards and identify, if any, features or barriers of the adoption and meaningful use of EHRs.

On-site observations may also strengthen future studies and allow researchers to better understand the features, barriers, and utilization of electronic health records. Particularly, on-site visits that shadow health professionals in their daily use of EHRs may provide a realistic visual of actual EHR system use as opposed to self-reported use. Observations will provide a better understanding of how these systems impact workflow, how health professionals interact and integrate EHRs, and the barriers that challenge providers in providing care. Observations could also help determine if technology is utilized in a manner that leads to more efficient use of time and improved accuracy of information collected. Unless a technology is integrated in a meaningful way, it will be used merely on a surface level or not used at all.

Concurrently, the identification of the type of electronic health record system currently in place and specific barriers and facilitators of the respective EHR system should be explored. While the current study provided much needed descriptive information, it lacked specificity regarding the EHR system in place at the healthcare facility. This information may lend insight into the most common systems providing insight to those who have yet to purchase or use an EHR system. In addition, frequent EHR uses and practice in rural health clinics could be observed and explored which could be utilized for training and professional development; as well as EHR barriers that healthcare professionals face so that practicing partners, state constituents, etc. could better understand the needs of EHR users and work with IT developers to address these issues.

Finally, future research may possibly consider the length of the instrument and on-site observations. Determining the most important items needed to assess technology

attitudes and skills and level of adoption of meaningful use of EHRs could reduce the length and instrument completion time, thereby increasing the potential for participation. While the current instrument was able to obtain a substantial amount of descriptive data, the length of the instrument was a major deterrent thus reducing participation and corresponding applicability and generalizability of the study. Future studies might also solicit information regarding the type of EHR system the rural health clinic was currently using and how many EHR systems they previously used. This will provide the ability to better understand the prominent EHR systems in place and offer insight into the technology attitudes held by health professionals.

Summary

The need for EHR adoption and meaningful use in rural health clinics within the state of Mississippi is vital to ensuring equitable, efficient, and safe delivery of care. Over the last five years numerous studies have been conducted on the adoption strategies, barriers, and motivators to EHR adoption. Results from this study indicated that there was a broad gamut of levels of EHR meaningful use with some rural health clinics in the state still at a level of no adoption. Further, technology attitudes indicated that rural health clinic nurses did not feel confident about using technology nor in the technology itself. In order to protect health providers who are already serving underrepresented citizens, it is critical that we as a state ensure that support mechanisms and resources are in place to ease the transition to EHRs. There is still a great deal of work to be done but this study represents one step towards identifying barriers and motivators of EHR use and provides an overview of current levels of EHR meaningful use within rural health clinics.

APPENDIX A

QUESTIONNAIRE

ABOUT YOU...

1. I have read the attached *Consent Agreement* and Agree to Participate in this study.

- ❑ - No, thank you. (Please discontinue the survey)
- ❑ - Yes. (Please continue)

2. What is your age?

3. Please indicate your gender: ❑ - Male ❑ - Female

4. Please indicate your race and ethnicity below:

❑ - American Indian or Alaska Native ❑ - Asian ❑ - Black or African American ❑ - Native Hawaiian or Other Pacific Islander

❑ - White ❑ - Hispanic or Latino ❑ - Not Hispanic or Latino

5. What position do you currently hold?

❑ - CNA ❑ - LPN ❑ - RN ❑ - APRN ❑ - NP ❑ - MA

❑ - Other _____

6. How many years have you been a nurse?

7. What is your highest level of education?

8. * What best describes the majority owner of the practice? (Check only one box)

- ❑ - Government
- ❑ - Hospital/integrated delivery system (IDS)
- ❑ - Insurance company or HMO
- ❑ - University or academic medical institution
- ❑ - Management Services Organization (MSO) or Physician Practice Management Company (PPMC)
- ❑ - Physicians
- ❑ - Other _____

Please answer the following with regards to your healthcare facility. If your facility does not use EHRs, please skip to question #13.

9. Select the current stage of Electronic Health Record (EHR) meaningful use using the descriptions below.

❑ Stage 1	❑ Stage 2	❑ Stage 3
Stage 1: Data capture and sharing	**Stage 2: Advance clinical processes**	**Stage 3: Improved Outcomes**
Electronically capturing health information in a standardized format	More rigorous health information exchange (HIE)	Improving quality, safety, and efficiency, leading to improved health outcomes
Using that information to track key clinical conditions	Increased requirements for e-prescribing and incorporating lab results	Decision support for national high-priority conditions
Communicating that information for care coordination processes	Electronic transmission of patient care summaries across multiple settings	Patient access to self-management tools
Initiating the reporting of clinical quality measures and public health information	More patient-controlled data	Access to comprehensive patient data through patient-centered HIE
Using information to engage patients and their families in their care		Improving population health

EHR USE

10. * If your practice has implemented EHR, identify the specific functions currently available from the system:

Available	Not Available		Available	Not Available	
❑	❑	(a) Patient demographics	❑	❑	(j) Problem lists
❑	❑	(b) Presenting complaint	❑	❑	(k) Referrals to specialists
❑	❑	(c) Past medical history	❑	❑	(l) Consult/reports from specialists
❑	❑	(d) Physical exam/review of systems	❑	❑	(m) Clinical guidelines and protocols
❑	❑	(e) Visit/encounter notes	❑	❑	(n) Drug reference information
❑	❑	(f) Procedure/operative notes	❑	❑	(o) Drug formularies
❑	❑	(g) Laboratory results	❑	❑	(p) Drug interaction warnings
❑	❑	(h) Radiology/imaging results	❑	❑	(q) Immunization tracking
❑	❑	(i) Patient medications/prescriptions	❑	❑	(r) Integration with practice billing systems

11. * Rate each of the following EHR features on its potential benefit to your practice. Use the scale of: 5 = extremely important, 4 = important, 3 = some value, 2 = marginal value, 1 = no value.

a. Improved clinical outcomes	5❑ 4❑ 3❑ 2❑ 1❑
b. Improved work flow	5❑ 4❑ 3❑ 2❑ 1❑
c. Improved patient communications	5❑ 4❑ 3❑ 2❑ 1❑
d. Improved claim submission process	5❑ 4❑ 3❑ 2❑ 1❑
e. Improved charge capture	5❑ 4❑ 3❑ 2❑ 1❑
f. Improved accuracy for coding evaluation and management procedures	5❑ 4❑ 3❑ 2❑ 1❑
g. Improved drug refill capabilities	5❑ 4❑ 3❑ 2❑ 1❑
h. Improved access to medical record information	5❑ 4❑ 3❑ 2❑ 1❑
i. Improved physician recruitment	5❑ 4❑ 3❑ 2❑ 1❑
j. Reduced medication errors	5❑ 4❑ 3❑ 2❑ 1❑
k. Reduced transcription costs	5❑ 4❑ 3❑ 2❑ 1❑
l. Reduced medical records staff expenses	5❑ 4❑ 3❑ 2❑ 1❑
m. Reduced medical records storage costs	5❑ 4❑ 3❑ 2❑ 1❑
n. Reduced medical records transportation cost	5❑ 4❑ 3❑ 2❑ 1❑

12. * Rate each of the following barriers that have slowed or prevented implementation of EHR in medical group practices. Use the scale of: 5 = implementation extremely difficult, 4 = makes implementation difficult, 3 = complicates implementation to some degree, 2 = minor impact on implementation, 1 = not a problem.

a. Lack of capital resources to invest in an EHR	5❑ 4❑ 3❑ 2❑ 1❑
b. Insufficient return on investment (ROI) from an EHR	5❑ 4❑ 3❑ 2❑ 1❑
c. Lack of support from practice physicians	5❑ 4❑ 3❑ 2❑ 1❑
d. Lack of support from practice nonphysician providers	5❑ 4❑ 3❑ 2❑ 1❑
e. Lack of support from practice clinical staff	5❑ 4❑ 3❑ 2❑ 1❑
f. Lack of support from practice administration	5❑ 4❑ 3❑ 2❑ 1❑
g. Security and privacy concerns	5❑ 4❑ 3❑ 2❑ 1❑
h. Inability to integrate the EHR with practice's billing/claims submission system	5❑ 4❑ 3❑ 2❑ 1❑
i. Available EHR software does not meet the practice's needs	5❑ 4❑ 3❑ 2❑ 1❑
j. Practice staff does not have skills/training to use EHR	5❑ 4❑ 3❑ 2❑ 1❑
k. Insufficient time to select, contract, install and implement an EHR	5❑ 4❑ 3❑ 2❑ 1❑
l. Inability to easily input historic medical record data into the EHR system	5❑ 4❑ 3❑ 2❑ 1❑
m. Inability to evaluate, compare and select the appropriate EHR system	5❑ 4❑ 3❑ 2❑ 1❑
n. Concern about loss of productivity during transition to the EHR system	5❑ 4❑ 3❑ 2❑ 1❑
o. Concern about physician ability to input into a computerized medical record	5❑ 4❑ 3❑ 2❑ 1❑

TECHNOLOGY COMPETENCIES

13. On a whole, how would you rate your computer skills?

❑ - Excellent ❑ - Above average ❑ - Average ❑ - Below average ❑ - Poor

14. Have you had any training or previous experience with computers? (Check all that apply)

❑ - Yes ❑ - No

If yes, please check all that apply.

❑ - Courses on specific technology ❑ - Workshops or conferences provided at your current practice

❑ - Self-taught or self-guided learning ❑ - Workshops or conferences at local, state, regional, or national level

❑ - None ❑ - Other *(If other please list the types)*

_____

_____

TECHNOLOGY COMPETENCIES (continued)

Indicate your level of agreement to the following statements, using the following scale

5 - Strongly Agree 4 - Somewhat Agree 3 - Neither Agree/Disagree
2 - Somewhat Disagree 1 - Strongly Disagree

15. Information and communication technologies...

electronic mail (email)	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
instant messaging (IM)	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
mobile phone and text messaging	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
Really Simple Syndication (RSS)	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
blog	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
podcast	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
online (virtual) community	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
social networks (i.e. Facebook)	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑

16. Basic computer use level of comfort with...

basic word processing skills	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
use of a spreadsheet (like Excel) for financial analysis	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
use of presentation software (like Powerpoint)	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑

17. Internet use to...

publish and share content online (i.e. photos, audio, and video)	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
participate in a chat room	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
participate in a online computer game	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
search online for general information	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑
search online for journals from professional organization sites or medical databases	5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑

18. I take precaution when using online technologies (i.e. utilize privacy settings to protect my information). 5 ❑ 4 ❑ 3 ❑ 2 ❑ 1 ❑

TECHNOLOGY ATTITUDES **

Each indicator is to be rated using the five point Likert scale below. Choose the response that best reflects your attitude for each statement.

5 - Agree Strongly 4 - Agree 3 - Not certain 2 - Disagree 1 - Disagree Strongly

1. The computer is a powerful enabling tool.	5❑ 4❑ 3❑ 2❑ 1❑
2. In healthcare, computers could save a lot of paperwork.	5❑ 4❑ 3❑ 2❑ 1❑
3. Machines and I don't mix.	5❑ 4❑ 3❑ 2❑ 1❑
4. I feel I am a skilled typist.	5❑ 4❑ 3❑ 2❑ 1❑
5. I feel alarmed when I think of using a computer.	5❑ 4❑ 3❑ 2❑ 1❑
6. I have excellent finger dexterity.	5❑ 4❑ 3❑ 2❑ 1❑
7. I regularly use a computer at home.	5❑ 4❑ 3❑ 2❑ 1❑
8. I would love to be a proficient user of computers.	5❑ 4❑ 3❑ 2❑ 1❑
9. Bedside computers will irritate patients.	5❑ 4❑ 3❑ 2❑ 1❑
10. I will never feel relaxed about using a computer.	5❑ 4❑ 3❑ 2❑ 1❑
11. Computers can help me to be creative.	5❑ 4❑ 3❑ 2❑ 1❑
12. I would enjoy learning course work using a computer program.	5❑ 4❑ 3❑ 2❑ 1❑
13. Computers are frustrating to use.	5❑ 4❑ 3❑ 2❑ 1❑
14. Listening to people using computer jargon intimidates me.	5❑ 4❑ 3❑ 2❑ 1❑
15. Computers will someday put health professionals out of a job.	5❑ 4❑ 3❑ 2❑ 1❑
16. I am in control when I use a computer.	5❑ 4❑ 3❑ 2❑ 1❑
17. I relate well to technology and machines.	5❑ 4❑ 3❑ 2❑ 1❑
18. I feel confident that I can master using a computer.	5❑ 4❑ 3❑ 2❑ 1❑
19. I can let my creativity flow when writing using a computer.	5❑ 4❑ 3❑ 2❑ 1❑
20. Computers in healthcare will create more work for nurses.	5❑ 4❑ 3❑ 2❑ 1❑
21. Computers can be great problem-solving tools.	5❑ 4❑ 3❑ 2❑ 1❑
22. Computers are too complicated for me to learn well.	5❑ 4❑ 3❑ 2❑ 1❑
23. Computers are impersonal and dehumanizing.	5❑ 4❑ 3❑ 2❑ 1❑
24. The future promise of computers in healthcare excites me.	5❑ 4❑ 3❑ 2❑ 1❑
25. I feel restless and confused when I think of using a computer.	5❑ 4❑ 3❑ 2❑ 1❑
26. I don't intend to own a home computer.	5❑ 4❑ 3❑ 2❑ 1❑

TECHNOLOGY ATTITUDES ** (continued)

Each indicator is to be rated using the five point Likert scale below. Choose the response that best reflects your attitude for each statement.

5 - Agree Strongly 4 - Agree 3 - Not certain 2 - Disagree 1 - Disagree Strongly

27. I feel a computer course in nursing is totally unnecessary.	5❑ 4❑ 3❑ 2❑ 1❑
28. People who like computers are introverted and antisocial.	5❑ 4❑ 3❑ 2❑ 1❑
29. I know more about computers than most faculty or administrators do.	5❑ 4❑ 3❑ 2❑ 1❑
30. Working with computers is boring and tedious.	5❑ 4❑ 3❑ 2❑ 1❑
31. I can easily master the content of a computer lesson.	5❑ 4❑ 3❑ 2❑ 1❑
32. I feel ambivalent about computers and technology.	5❑ 4❑ 3❑ 2❑ 1❑
33. Computers are everywhere, it is natural for them to used in healthcare.	5❑ 4❑ 3❑ 2❑ 1❑
34. I like to use the Internet to research health and nursing information.	5❑ 4❑ 3❑ 2❑ 1❑
35. It takes longer to chart on the computer than on paper.	5❑ 4❑ 3❑ 2❑ 1❑
36. I enjoy using technology to communicate with colleagues (email, etc.)	5❑ 4❑ 3❑ 2❑ 1❑
37. Computers help me to keep up to date with nursing issues, knowledge, research.	5❑ 4❑ 3❑ 2❑ 1❑
38. Computers are just another object that takes me away from my patients.	5❑ 4❑ 3❑ 2❑ 1❑
39. I resent the thought of having to use computers in my nursing practice.	5❑ 4❑ 3❑ 2❑ 1❑
40. Using technology in practice interferes with my ability to be caring to my patients.	5❑ 4❑ 3❑ 2❑ 1❑
41. Patients should not look for health and illness information on the Internet.	5❑ 4❑ 3❑ 2❑ 1❑
42. Social media tools enrich health care professional communication and collaboration.	5❑ 4❑ 3❑ 2❑ 1❑
43. I use health care apps on my cellphone or SMART phone.	5❑ 4❑ 3❑ 2❑ 1❑
44. Nursing related online groups, forums, and email discussion lists are a waste of time.	5❑ 4❑ 3❑ 2❑ 1❑
45. Electronic charting restricts how nurses record patient care.	5❑ 4❑ 3❑ 2❑ 1❑
46. Personalized Electronic Health Records streamline access to information and interdisciplinary communication about patients.	5❑ 4❑ 3❑ 2❑ 1❑
47. Online support groups are a waste of time and have no value for patients.	5❑ 4❑ 3❑ 2❑ 1❑
48. Computers are great tools for patient education.	5❑ 4❑ 3❑ 2❑ 1❑
49. Hand written charting is much more complete than electronic documentation.	5❑ 4❑ 3❑ 2❑ 1❑
50. Nurses should be involved in the planning of national Electronic Health Records.	5❑ 4❑ 3❑ 2❑ 1❑

APPENDIX B

MEDICAL GROUP MANAGEMENT ASSOCIATION CENTER FOR RESEARCH

ASSESSING ADOPTION OF EFFECTIVE HEALTH INFORMATION

TECHNOLOGY QUESTIONNAIRE

Medical Group Management Association Center for Research

Assessing Adoption of Effective Health Information Technology Questionnaire

With support from the Department of Health and Human Services Agency for Health Research and Quality, the Medical Group Management Association Center for Research (MGMA CFR) is assessing the application of health information technologies in medical group practices.

All information in this survey will be kept strictly confidential. All submitted data and related material that identify a specific organization or individual will be safe guarded and will not be published or voluntarily released within the public domain without written permission.

Please complete by
Monday, January 31, 2005.

Section One: Current level of information technology adoption

1. What best describes the patient appointment system currently used in your practice? *(Check only one box)*
   - [1] Manual appointment calendar maintained by practice staff
   - [2] Computerized appointment calendar maintained by practice staff
   - [3] Computerized appointment calendar with input by practice staff as well as input by patients using Internet portal
   - [4] Other _____

2. What best describes the referral authorization system currently used in your practice? *(Check only one box)*
   - [1] Manual system utilizing telephone or fax contacts with payers and paper documentation
   - [2] Hybrid system with telephone or fax contacts with payers and computerized electronic tracking
   - [3] Computerized system directly linked to HMO/PPO and other payer authorization systems and computerized electronic tracking
   - [4] Combination of the responses above
   - [5] Other _____

3. What best describes the referral tracking system currently used in your practice? *(Check only one box)*
   - [1] Manual system that tracks if a consult was requested and if a consulting physician's report was received
   - [2] Computerized system that tracks if a consult was requested and if a consulting physician's report was received
   - [3] Computerized system that tracks if a consult was requested and if a consulting physician's report was received and can receive an electronic version of the consulting report for inclusion into the patient medical record
   - [4] Combination of the responses above
   - [5] Practice does not track referrals
   - [6] Other _____

4. What best describes the clinical laboratory order entry system currently used in your practice? *(Check only one box)*
   - [1] Manual system using paper documents, fax and telephone requests
   - [2] Computerized system where practice staff use computer terminals, PDAs or other electronic means to order laboratory tests
   - [3] Computerized system where practice physicians use computer terminals, PDAs or other electronic means to order laboratory tests
   - [4] Combination of the responses above
   - [5] Other _____

5. What best describes the clinical laboratory results system currently used in your practice? *(Check only one box)*
   - [1] Manual system using paper documents, fax and telephone responses
   - [2] Computerized system where practice staff use computer terminals, PDAs or other electronic means to receive laboratory test results
   - [3] Computerized system where practice physicians use computer terminals, PDAs or other electronic means to receive laboratory test results
   - [4] Combination of the responses above
   - [5] Other _____

6. What best describes the radiology/imaging order entry system currently used in your practice? *(Check only one box)*
   - [ ] 1 Manual system using paper documents, fax and telephone requests
   - [ ] 2 Computerized system where practice staff use computer terminals, PDAs or other electronic means to order radiology/imaging procedures
   - [ ] 3 Computerized system where practice physicians use computer terminals, PDAs or other electronic means to order radiology/imaging procedures
   - [ ] 4 Combination of the responses above
   - [ ] 5 Other _____

7. What best describes the radiology/imaging results system currently used in your practice? *(Check only one box)*
   - [ ] 1 Manual system using images on film or paper
   - [ ] 2 Computerized system where practice staff use computer terminals, PDAs or other electronic means to receive radiology/imaging procedures
   - [ ] 3 Computerized system where practice physicians use computer terminals, PDAs or other electronic means to receive radiology/imaging procedures
   - [ ] 4 Combination of the responses above
   - [ ] 5 Other _____

8. What best describes the prescription writing system currently used in your practice? *(Check only one box)*
   - [ ] 1 Manual system using paper documents, fax and telephone requests
   - [ ] 2 Computerized system where practice staff use computer terminals, PDAs or other electronic means to write a prescription
   - [ ] 3 Computerized system where practice physicians use computer terminals, PDAs or other electronic means to write a prescription
   - [ ] 4 Combination of the responses above
   - [ ] 5 Other _____

9. What best describes the prescription refill system currently used in your practice? *(Check only one box)*
   - [ ] 1 Manual system using paper documents, fax and telephone communications
   - [ ] 2 Computerized system where practice staff use computer terminals, PDAs or other electronic means to communicate with a pharmacy to refill a prescription
   - [ ] 3 Computerized system where practice physicians use computer terminals, PDAs or other electronic means to communicate with a pharmacy to refill a prescription
   - [ ] 4 Combination of the responses above
   - [ ] 5 Other _____

10. What best describes the drug interaction warning system currently used in your practice? *(Check only one box)*
    - [ ] 1 Manual system using publications (Physicians Desk Reference, package inserts, reports from pharmaceutical companies, etc.)
    - [ ] 2 Computerized system using computer terminals, PDAs or other electronic means
    - [ ] 3 Combination of the responses above
    - [ ] 4 Practice does not routinely screen for drug interactions
    - [ ] 5 Other _____

11. Describe the health/medical records system used by your medical practice for current patients. If your organization uses multiple technologies choose the system used for the majority of your patients' medical records. *(Check only one box)*
    - [ ] 1 Paper medical records/charts filed in record cabinet
    - [ ] 2 A scanned image of a paper medical record/chart filed electronically using a document imaging management system (DIMS)
    - [ ] 3 A dictation and transcription system for physician visit notes, combined with a DIMS for information received on paper, all stored electronically
    - [ ] 4 EHR accessible through a computer terminal that stores patient medical and demographic information in a relational data base
    - [ ] 5 Other _____

12. As of today, what is your degree of electronic health record implementation? *(Check only one box)*
    - [ ] 1 Fully implemented for all physicians and all practice locations
    - [ ] 2 Implementation in process or EHR is fully implemented for a portion of practice physicians or locations
    - [ ] 3 Implementation planned in next 12 months
    - [ ] 4 Implementation planned in next 13 to 24 months
    - [ ] 5 Not implemented

13. If your practice has implemented an electronic health record, complete the following: *(Skip to question 15 if you do not have an EHR.)*

    a) What was the approximate per physician purchase and implementation cost for the system? $ _____
    b) What was the approximate per physician, per month maintenance cost for the system? $ _____
    c) How much more were the implementation costs than the initial vendor estimate? Percent more: _____%

14. If your practice has implemented EHR, identify the specific functions currently available from the system: *(Skip to question 15 if you do not have an EHR.)*

Available	Not Available		Available	Not Available	
O	O	a) Patient demographics	O	O	j) Problem lists
O	O	b) Presenting complaint	O	O	k) Referrals to specialists
O	O	c) Past medical history	O	O	l) Consult/reports from specialists
O	O	d) Physical exam/review of systems	O	O	m) Clinical guidelines and protocols
O	O	e) Visit/encounter notes	O	O	n) Drug reference information
O	O	f) Procedure/operative notes	O	O	o) Drug formularies
O	O	g) Laboratory results	O	O	p) Drug interaction warnings
O	O	h) Radiology/imaging results	O	O	q) Immunization tracking
O	O	i) Patient medications/prescriptions	O	O	r) Integration with practice billing system

Section Two: Assessment of current EHR features

15. Rate each of the following EHR features on its potential benefit to your practice. Use the scale of: 5 = extremely important, 4 = important, 3 = some value, 2 = marginal value, 1 = no value. *(Circle the appropriate number)*

5 4 3 2 1 a) Improved clinical decision-making
5 4 3 2 1 b) Improved work flow
5 4 3 2 1 c) Improved patient communications
5 4 3 2 1 d) Improved claim submission process
5 4 3 2 1 e) Improved charge capture
5 4 3 2 1 f) Improved accuracy for coding evaluation and management procedures
5 4 3 2 1 g) Improved drug refill capabilities
5 4 3 2 1 h) Improved access to medical record information
5 4 3 2 1 i) Improved physician recruitment
5 4 3 2 1 j) Reduced medication errors
5 4 3 2 1 k) Reduced transcription costs
5 4 3 2 1 l) Reduced medical records staff expenses
5 4 3 2 1 m) Reduced medical records storage cost
5 4 3 2 1 n) Reduced medical records transportation cost

16. Rate each of the following barriers that have slowed or prevented implementation of EHR in medical group practices. Use the scale of: 5 = makes implementation extremely difficult, 4 = makes implementation difficult, 3 = complicates implementation to some degree, 2 = minor impact on implementation, 1 = not a problem. *(Circle the appropriate number)*

5 4 3 2 1 a) Lack of capital resources to invest in an EHR
5 4 3 2 1 b) Insufficient return on investment (ROI) from an EHR
5 4 3 2 1 c) Lack of support from practice physicians
5 4 3 2 1 d) Lack of support from practice nonphysician providers
5 4 3 2 1 e) Lack of support from practice clinical staff
5 4 3 2 1 f) Lack of support from practice administration
5 4 3 2 1 g) Security and privacy concerns
5 4 3 2 1 h) Inability to integrate the EHR with practice's billing / claims submission system
5 4 3 2 1 i) Available EHR software does not meet the practice's needs
5 4 3 2 1 j) Practice staff does not have skills/training to use an EHR
5 4 3 2 1 k) Insufficient time to select, contract, install and implement an EHR
5 4 3 2 1 l) Inability to easily input historic medical record data into the EHR system
5 4 3 2 1 m) Inability to evaluate, compare and select the appropriate EHR system
5 4 3 2 1 n) Concern about loss of productivity during transition to the EHR system
5 4 3 2 1 o) Concern about ability of physicians to input into a computerized medical record

17. Rate each of the following items on its importance in making your EHR decision easier. Use the scale of: 5 = extremely important, 4 = important, 3 = some value, 2 = marginal value, 1 = no value. *(Circle the appropriate number)*

5 4 3 2 1 a) Accreditation of HER vendors
5 4 3 2 1 b) Standardized EHR vendor contracts
5 4 3 2 1 c) Standardized EHR vendor requests for proposal (RFP)
5 4 3 2 1 d) Standardized questions to ask EHR vendors
5 4 3 2 1 e) List EHR product integration capabilities with various practice management billing systems
5 4 3 2 1 f) Educational programming on selection and implementation of EHR systems

18. If you have implemented EHR, have you observed a benefit in regard to the cost or availability of professional liability insurance? *(Check only one box)*

- [1] Insurance premiums offered to your physicians are lower
- [2] Access to insurance was improved
- [3] Both occurred
- [4] Neither occurred

19. Rate the impact of the following possible federal government actions in your decision to implement EHR. Use the scale of: 5 = extremely important, 4 = important, 3 = some value, 2 = marginal value, 1 = no value. *(Circle the appropriate number)*

5 4 3 2 1 a) Ease the self-referral (Stark law) prohibitions to allow increased technology sharing
5 4 3 2 1 b) Publish industry, agreed-upon, EHR and related technology standards
5 4 3 2 1 c) Provide low interest loans for the purchase of an EHR
5 4 3 2 1 d) Provide tax credits for investment in EHR
5 4 3 2 1 e) Include use of an EHR as a "pay-for-performance" incentive for Medicare reimbursement
5 4 3 2 1 f) Provide grant money to assist in the purchase of an EHR

20. How do your practice's physicians communicate with patients outside the office? *(The answers should total to 100 percent.)*

Telephone _____% Fax _____% Letter _____% E-mail _____%

21. To receive a summary of results of this questionnaire, please provide your e-mail address: _____

Section Three: Demographic description of your practice

22. What type of practice best describes your medical group?

- [1] Multispecialty
- [2] Single specialty (please specify specialty): _____

23. How many full-time equivalent (FTE) physicians practice in your medical group?
FTE physicians _____

24. How many FTE nonphysician providers practice in your medical group?
FTE nonphysician providers _____

25. What best describes the majority owner of the practice? *(Check only one box)*

- [1] Government
- [2] Hospital/integrated delivery system (IDS)
- [3] Insurance company or HMO
- [4] Management Services Organization (MSO) or Physician Practice Management Company (PPMC)
- [5] Physicians
- [6] University or medical school
- [7] Organizational component of an academic medical institution
- [8] Other _____

26. Which of the following statements best describes your medical practice? *(Check only one box)*

- [1] Free standing, independent medical group
- [2] Medical group component of IDS
- [3] Federally Qualified Health Center, Community Health Center or similar practice
- [4] Medical school faculty practice plan
- [5] Medical school clinical science department
- [6] Other academic practice
- [7] Other _____

If you have questions, please call Sonny Lange, MGMA project manager, toll-free 877.275.6462, ext. 245.

Thank you for participating in this important project.

APPENDIX C

P.A.T.C.H. ASSESSMENT SCALE V.3

PRETEST FOR ATTITUDES TOWARD COMPUTERS IN HEALTHCARE

P.A.T.C.H. Assessment Scale v.3
Pretest for Attitudes Toward Computers in Healthcare

Directions:
Each indicator is to be rated using a five point Likert scale.
Choose the response that best reflects your attitude for each statement.

SCALE:

1. Agree Strongly	2. Agree	3. Not certain	4. Disagree	5. Disagree Strongly

1. The computer is a powerful enabling tool.
2. In healthcare, computers could save a lot of paperwork.
3. Machines and I don't mix.
4. I feel I am a skilled typist.
5. I feel alarmed when I think of using a computer.
6. I have excellent finger dexterity.
7. I regularly use a computer at home.
8. I would love to be a proficient user of computers.
9. Bedside computers will irritate patients.
10. I will never feel relaxed about using a computer.
11. Computers can help me to be creative.
12. I would enjoy learning course work using a computer program.
13. Computers are frustrating to use.
14. Listening to people using computer jargon intimidates me.
15. Computers will someday put health professionals out of a job.
16. I am in control when I use a computer.
17. I relate well to technology and machines.
18. I feel confident that I can master using a computer.
19. I can let my creativity flow when writing using a computer.
20. Computers in healthcare will create more work for nurses.

21. Computers can be great problem-solving tools.
22. Computers are too complicated for me to learn well.
23. Computers are impersonal and dehumanizing.
24. The future promise of computers in healthcare excites me.
25. I feel restless and confused when I think of using a computer.
26. I don't intend to own a home computer.
27. I feel a computer course in nursing is totally unnecessary.
28. People who like computers are introverted and antisocial.
29. I know more about computers than most faculty or administrators do.
30. Working with computers is boring and tedious.
31. I can easily master the content of a computer lesson.
32. I feel ambivalent about computers and technology.
33. Computers are everywhere, it is natural for them to used in healthcare.
34. I like to use the Internet to research health and nursing information.
35. It takes longer to chart on the computer than on paper.
36. I enjoy using technology to communicate with colleagues (email, etc.)
37. Computers help me to keep up to date with nursing issues, knowledge, research.
38. Computers are just another object that takes me away from my patients.
39. I resent the thought of having to use computers in my nursing practice.
40. Using technology in practice interferes with my ability to be caring to my patients.
41. Patients should not look for health and illness information on the Internet.
42. Social media tools enrich health care professional communication and collaboration.
43. I use health care apps on my cellphone or SMART phone.
44. Nursing related online groups, forums, and email discussion lists are a waste of time.
45. Electronic charting restricts how nurses record patient care.

46. Personalized Electronic Health Records streamline access to information and interdisciplinary communication about patients.

47. Online support groups are a waste of time and have no value for patients.

48. Computers are great tools for patient education.

49. Hand written charting is much more complete than electronic documentation.

50. Nurses should be involved in the planning of national Electronic Health Records.

P.A.T.C.H. Assessment Scale Version 3 Scoring Tool

Record your final score for each of the statements as outlined below, then add your final scores for both columns for your final score out of 100. Then refer to the interpretations.

A. Rating Chosen	A. Score	B. Rating Chosen	B. Score
1 2 3 4 5	2 1.5 1 0.5 0	1 2 3 4 5	0 0.5 1 1.5 2
A. STATEMENT	**A. YOUR SCORE**	**B. STATEMENT**	**B. YOUR SCORE**
1		3	
2		5	
4		9	
6		10	
7		13	
8		14	
11		15	
12		20	
16		22	
17		23	
18		25	
19		26	
21		27	
24		28	
29		30	
31		32	
33		35	
34		38	
36		39	
37		40	
42		41	
43		44	
46		45	
48		47	
50		49	
TOTAL A:	TOTAL B:	FINAL= A____ + B ____ = _____	

P.A.T.C.H. Assessment Scale v 3
Score Interpretations

Find the Range that contains the Score You Achieved on the P.A.T.C.H. Scale

http://nursing-informatics.com/niassess/index.html

0 to 17 points	Positive indication of Cyberphobia. Beginner stage in experience with computer basics or applications. Ambivalence or anxiety may occur, related to the use of computers in healthcare. May appreciate help learning basic computer skills.
18 to 34 points	Indicates some uneasiness about using computers. Very basic knowledge of computer basics and applications. Unsure of usefulness of computers in healthcare.
35 to 52 points	Moderate comfort in using computers. Has basic knowledge of computers and applications. Limited awareness of applications of computer technology in healthcare.
53 to 69 points	Feels comfortable using user-friendly computer applications. Aware of the usefulness of computers in a variety of settings. Has a realistic view of current computer capabilities in healthcare.
70 ti 86 points	Confident of ability to use a variety of computer programs. Sees computers as beneficial in the development of society. Enthusiastic view of the potential of computer use in healthcare.
87 to 100 points	Very confident that they can learn to use a computer to boost creativity, and perform routine functions. Recognizes the unique value of using information technology in society. Idealistic, positive view related to computer applications in healthcare.

Nursing Informatics Competencies Self Assessment and Plan of Action

Each nurse and student has a unique level of computer literacy in the various computer applications available.

1. Take a few minutes now to assess your level of computer literacy.

2. Then, type out a plan of action to help develop your desired level of computer literacy in the following applications. You do not need to include all of these – focus on the ones that interest YOU.

Rating Scale:

A. No experience, Novice
B. Some experience, Advanced Beginner
C. Comfortable user, Competent
D. Skilled User, Proficient

APPLICATIONS	RATING	PLAN OF ACTION
Word Processing		
Graphic Programs		
Databases		
Spreadsheets		
Power Point Presentations		
Educational Software		
Desktop Publishing		
World Wide Web		
E-mail		
Discussion Mailing Lists		
Social Media Applications		
Chat Rooms, Forums		
Decision Support Systems		
Nursing Information Systems		
Hospital Information Systems		
Community Information Systems		

APPLICATIONS	RATING	PLAN OF ACTION
Electronic Health Records		
Electronic Medication System		
E-health Systems		
Tele-health Systems		
Web site Design		
Multimedia Design		
Flash Animation		
Research Software		
Electronic Portfolios		
Webcasting		
Videoconferencing		
Virtual Reality, Simulation		
Internet Radio/Video/TV		
E-learning		
PDA, Smart Phones		
Digital Camera and Photo Manipulation		
Educational Games		
Artificial Intelligence		

NURSING INFORMATICS COMPETENCIES GOALS

In the space below, write out five goals for yourself, related to learning Nursing Informatics theory and application. Try to make these fairly short-term, i.e. within the next five years.

GOAL 1.

GOAL 2.

GOAL 3.

GOAL 4.

GOAL 5.

APPENDIX D

MEDICAL GROUP MANAGEMENT ASSOCIATION CENTER FOR RESEARCH

COPYRIGHT PERMISSION

Fwd: Ticket #5536-10058211: Solution Suggested (Copyright request form)
1 message

>>> "Medical Group Management Association - MGMA" <infocenter@mgma.com> 1/10/2012 5:16 PM >>>
A solution for your issue has been suggested.
Solution: Hello Jennifer,
Permission is granted to use the "Assessing Adoption of Effective Health Information Technology" questionnaire for your dissertation.
Please include the following credit line:
Used with permission from the Medical Group Management Association, 104 Inverness Terrace East, Englewood, Colorado 80112. 877.ASK.MGMA. www.mgma.com. Copyright 2004.

Thank you for your interest in our material!
Charlyn Treese
Copyright Specialist
MGMA Information Center
104 Inverness Terrace East
Englewood, CO 80112
www.mgma.com

Ticket Information:
Ticket #: 10058211
Date Created: 01/05/2012 09:07 PM MDT
Summary: Copyright request form
Details: Data from form "Copyright request Form" was received on 1/5/2012 9:05:26 PM.
Copyright request Form Field Value
User Name: Jennifer Styron Title: Instructor
Organization or Institution: University of South Alabama
Address: University of South Alabama College of Nursing
5721 USA Drive N. HAHN #4083
City/ST/ZIP: Mobile, AL 36688
Phone: (504) 782-1342 E-mail Address: jstyron@usouthal.edu

What material:
I would like permission to utilize the Medical Group Management Association

Center for Research Assessing Adoption of Effective Health Information Technology questionnaire.

Where and when:
I am a doctoral student at The University of Southern Mississippi and am preparing my dissertation proposal, Factors impacting Adoption of Healthcare Technologies in Mississippi, and would like to utilize your instrument to answer to of my four research questions:

RQ1: What is the current stage of adoption of EHR among providers?
RQ2: Are there factors associated with EHR integration and usage that impede and/or facilitate the diffusion process?

I would also like to modify the instrument to include a demographic section at the beginning and a section of information and communication technology (ICT) skills at the end of the study. These two pieces will be developed by me, will be tested for validity and reliability separately, and will be utilized to obtain information needed for my other two research questions.

The dissertation will take place over the 2012 academic calendar year. I am hoping to defend my proposal early this spring (February-March) and secure Institutional Review Board approval to conduct my study. I will then disseminate the modified questionnaire late spring/early summer (April-June), collect the data, and hopefully defend my dissertation late summer/early fall. (Aug-Oct).

This study will take place in Mississippi with a particular focus on rural health providers. The intent of this study is to gain significant understanding of how educators, vendors, and community and state agencies can 1) understand the current state of EHR integration by these providers; 2) assist providers with the resources needed to progress through the stages of adoption; and, 3) train current and future health care professionals in essential technology competencies needed to meaningfully integrate EHRs so that providers will be able to better serve these priority populations.

Number of copies/circulation A random sampling method will be utilized to ensure geographic equity and diverse sample collection. Participants will be selected from one of the following health facilities (a) 166 hospitals, (b) 159 rural health clinics, (c) home health agencies, (d) 56 ambulatory surgical facilities, (e) 57 portable x-ray providers, (f) 7 rehabilitation agencies, and (g) 38 psychiatric residential treatment facilities. Various health care professionals will be solicited for the study to ensure that clinician and staff perspectives on the use of EHR adoption are also considered.

Email "Copyright request form" originally sent to mailto:infocenter@mgma.com from mailto:jstyron@usouthal.edu on 1/5/2012 9:05:26 PM.

APPENDIX E

JUNE KAMINSKI COPYRIGHT PERMISSION

RE: Re: P.A.T.C.H. Assessment Scale v.3

June Kaminski Faculty, Nursing Informatics Consultant, Writer, Researcher, Designer, & Curriculum Developer
To: Jennifer Styron, June Kaminski
Date: April 8, 2012
You replied to this message:
Hi Jennifer,

Your proposal sounds interesting. Yes, you may use my P.A.T.C.H. scale in your research. Could you send me a copy of the finished instrument when you have it ready? I would also love to read your final dissertation.

Thanks,
June Kaminski

On 04/07/12 9:29 AM, Jennifer Styron wrote:

Hi June,

Thanks so much for connecting with me on LinkedIn! Now that I can email you without character limits (lol), I'd like to introduce myself. My name is Jennifer Styron and I'm an ITD student at The University of Southern Mississippi. I also work in the research and development office at the College of Nursing at University of South Alabama. Though my background has previously been on educational technology, I started studying factors that impede/facilitate the use of electronic health records about a year ago and have selected a similar topic for my dissertation. I've included some information on my dissertation and would like to request permission to add your P.A.T.C.H. assessment scale v.3 questionnaire to my current instrument.

I received permission to utilize the Medical Group Management Association Center for Research Assessing Adoption of Effective Health Information Technology questionnaire to answer two of my four questions:
RQ1: What is the current stage of adoption of EHR among providers?
RQ2: Are there factors associated with EHR integration and usage that impede and/or facilitate the diffusion process?

I would like to combine your instrument with this one to answer my third research question which is:
RQ3: What are the current technology attitudes of nurses in rural healthcare facilities in

the state of Mississippi?

My questionnaire will also include a demographic section at the beginning and a section about information and communication technology (ICT) skills at the end of the study. These two pieces will be developed by me, will be tested for validity and reliability separately, and will be utilized to obtain information needed for my final question.
RQ4: What are the information and communication technology (ICT) skill levels, relative to EHR, of nurses in rural healthcare facilities in the state of Mississippi?

The dissertation will take place over the 2012 academic calendar year. I am hoping to defend my proposal in late spring (May) and secure Institutional Review Board approval to conduct my study. I will then disseminate the modified questionnaire late spring/early summer (June-August), collect the data, and hopefully defend my dissertation in early fall. (Aug-Oct).

This study will take place in Mississippi with a particular focus on nurses in rural healthcare facilities. The intent of this study is to gain significant understanding of how educators, vendors, and community and state agencies can 1) understand the current state of EHR integration by these providers; 2) assist providers with the resources needed to progress through the stages of adoption; and, 3) train current and future health care professionals in essential technology competencies needed to meaningfully integrate EHRs so that providers will be able to better serve these priority populations.

A random sampling method will be utilized to ensure geographic equity and diverse sample collection. Participants will be selected from the 163 rural health clinics in the state of Mississippi.

If granted permission, I will also add any credit line to your instrument and within my dissertation that you would like me to. Here is what I was thinking you'd like me to add.
Used with permission from June Kaminski, Copyright 1996-2011.
I'm open to adding anything credit line you'd like, so if you prefer a different format or information, please let me know and I'd be happy to revise accordingly.

Please let me know if you have any questions, need any additional information, or would like to chat further about this project. Thanks in advance for your time and consideration of this request.

Sincerely,

Jennifer Styron
jstyron@usouthal.edu

APPENDIX F

INSTITUTIONAL REVIEW BOARD APPROVAL

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.6820 | Fax: 601.266.4377 | www.usm.edu/irb

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **12061901**
PROJECT TITLE: **The Impact of Technology Attitudes and Skills of Rural Health Clinic Nurses on the Level of Adoption of Electronic Health Records in Mississippi**
PROJECT TYPE: **Dissertation**
RESEARCHER/S: **Jennifer Styron**
COLLEGE/DIVISION: **College of Education & Psychology**
DEPARTMENT: **Curriculum, Instruction, & Special Education**
FUNDING AGENCY: **N/A**
IRB COMMITTEE ACTION: **Expedited Review Approval**
PERIOD OF PROJECT APPROVAL: **06/28/2012 to 06/27/2013**

Lawrence A. Hosman, Ph.D.
Institutional Review Board Chair

APPENDIX G

INFORMED CONSENT FORM

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Electronic Health Record Adoption and Technology Attitudes and Use

CONSENT AGREEMENT

Dear Rural Health Professional,

As a nurse working in a rural health clinic, you are being asked to participate in a research study that seeks to identify current stages of meaningful use of Electronic Health Records (EHRs) and technology attitudes among health professionals. The purpose of this study is to investigate the perceptions of EHRs and identify appropriate resources and support needed to effectively integrate EHRs in rural health clinics.

The study is being conducted by an Instructional Technology and Design doctoral student at The University of Southern Mississippi located in Hattiesburg, Mississippi. Participation is completely voluntary and may be discontinued at any time without penalty. By completing and returning this survey, you are indicating your consent to participate in this study. All data will remain anonymous, and any personal information inadvertently gained will be kept confidential.

The benefits of this study include a greater understanding of Mississippi's rural health clinics current stage of EHR adoption and may identify factors (both benefits and barriers) that significantly impact the adoption and meaningful use of EHRs. Results may also lend insight into the current technology attitudes and skills of nurses in rural health clinics.

There are minimal risks associated with this study, such as breech of confidentiality and discomfort in sharing personal information. Please feel free to respond to only those questions that you are comfortable answering.

This study has been approved by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about your rights as a research subject should be directed to the chair of the Institutional Review Board at The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS, 39406-0001, (601) 266-6820.

The attached questionnaire should not take longer than 20 minutes to complete. Please send the completed questionnaire back to the research team in the attached pre-paid envelope. Should you have any other questions regarding this study, please feel free to contact me at jstyron@usouthal.edu.

Thank you for your time and effort.

Jennifer Styron

Jennifer Styron, M.Ed.
Instructor, Community/Mental Health
University of South Alabama, College of Nursing
5721 USA Drive N., HAHN #4083
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PLEASE RETAIN THIS PAGE FOR YOUR RECORDS

APPENDIX H

MISSISSIPPI RURAL HEALTH ASSOCIATION LETTER OF SUPPORT

MISSISSIPPI
RURAL HEALTH
ASSOCIATION

31 WOODGREEN PLACE | MADISON, MS 39110
601.898.3001 | 888.810.4313
MISSISSIPPIRURAL@BELLSOUTH.NET
WWW.MSRHA.ORG

May 18, 2012

Dear Rural Health Professional:

The Mississippi Rural Health Association (MRHA) encourages you to complete the *Electronic Health Record Adoption and Technology Attitudes and Use Assessment*, a survey tool developed by Jennifer Styron, M.Ed., who is an Instructor in the College of Nursing at University of South Alabama. MRHA believes that this tool is an important means to analyze the current state of electronic health record (EHR) adoption and the technology attitudes and use of healthcare professionals practicing in rural health clinic settings.

Research has identified advantages and challenges to EHR adoption as well as the support needed to assist end users in moving through the EHR adoption process. However, there is limited research focused on rural healthcare settings. Further, practicing nurses' technology attitudes and current use of technology are largely unknown. This is a critical component in meeting the current needs of our healthcare workforce and ensuring that support and resources are tailored to meet the specific needs of Mississippi's unique populations.

This assessment will identify the current stage of meaningful use of EHR adoption in Mississippi's rural health clinics and the technology attitudes and use of nursing professionals in these settings. Findings from this study will help inform key constituents and partnering professional organizations such as the Mississippi Rural Health Association to better understand the current progress in achieving stages of meaningful use and ensure that support and resources are tailored to meet the specific needs of nurses practicing in rural health clinics.

The Mississippi Rural Health Association fully supports this survey, and ***we encourage all nurses practicing in rural health clinics within the state to participate in this study.*** For more information about MRHA, please visit www.msrha.org. Questions and comments about the study can be directed to Jennifer Styron at jstyron@usouthal.edu.

Thank you for your participation in this important study.

Sincerely,

Ryan Kelly, MAS
Executive Director
Mississippi Rural Health Association

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