UTILIZATION AND INFLUENCE OF HEALTH INFORMATION TECHNOLOGY ON KENTUCKY ADVANCED PRACTICE REGISTERED NURSES’ CLINICAL DECISION MAKING

by

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ABSTRACT

Information technology is ubiquitous in society and industry; however, healthcare is just beginning to explore how health information technology (HIT) can be optimized to support quality care. HIT can assist with standardizing care delivery, increasing access to evidence-based medicine, improving accuracy and ease of documentation, and assisting with patient education. Advanced Practice Registered Nurses (APRNs), specifically nurse practitioners (NPs) and certified nurse midwives (CNMs), play a pivotal role in the healthcare delivery system. To be effective practitioners, providers must manage, integrate, and assimilate a multitude of knowledge with each patient encounter. HIT can serve as the channel through which the NP and CNM provides cost-effective, efficient, and quality care. However, healthcare providers have been slow to adopt and implement HIT resources. We know that adoption of HIT by healthcare providers is varied among provider and practice settings. However, few studies have examined the impact on and utilization of information technology by APRNs, specifically nurse practitioners and certified nurse midwives.

The purpose of this research was to investigate the utilization and influence of HIT on the clinical decision making of Kentucky nurse practitioners and nurse midwives (Kentucky APRNs). A descriptive cross-sectional design using survey methodology and convenience sampling was employed. Participants were asked to complete an author-modified, web-based survey tool that was based on current research. The 40-question tool was designed to explore providers’ attitudes and perceptions of technology, determine their knowledge and utilization of various electronic and traditional print medical resources, and assess the penetration of and daily usage of HIT in practice.
This study revealed information related to Kentucky APRN’s utilization and influence of HIT on clinical decision making. Establishing exploratory Kentucky APRN findings will assist in evaluating further HIT utilization in Kentucky. Findings suggested that APRNs in Kentucky are beginning to explore the benefits of HIT; however, additional research will be required to identify the true penetration and utilization of technology in Kentucky. Although additional research is needed, HIT appears to be having an overall impact on the clinical practice of Kentucky APRNs.
CHAPTER 1: BACKGROUND

Introduction

Information technology is ubiquitous in society and industry; however, healthcare is just beginning to explore how health information technology (HIT) can be optimized to support quality care (Adams, Adams, Thorogood & Buckingham, 2007; Gans, Kraleski, Hammonds & Dowd, 2005; H.R. Res. HR 3962, 2010; Mold & Peterson, 2005; Stroud, Smith & Erkel, 2009). Evolving practice standards, increased patient acuity, and fiscal demands require up-to-date, dynamic and patient centered information exchange and utilization (Adams, Mann, & Baucher, 2003; Blumenthal & Tavenner, 2010). HIT can assist with standardizing care delivery, increasing access to evidence-based medicine, improving accuracy and ease of documentation, and facilitating patient education (Mold & Peterson, 2005; Institute of Medicine, 2001, 2006; Office of National Coordinator for Health Information Technology [ONHIT], 2008). The following section describes the rationale for improving utilization of HIT by health care providers, specifically nurse practitioners and certified nurse midwives.

State of Health Information Technology

Although in its infancy, HIT, including electronic medical records (EMRs), electronic health records (EHRs), electronic personal health records (PHRs), and wireless handheld devices, is slowly being incorporated into primary care practice (Office of National Coordinator for Health Information Technology [ONHIT], 2008). Adoption of HIT varies among practice settings and provider levels (Gans, Kralewski, Hammons, & Dowd, 2005). Advanced Practice Registered Nurses (APRNs), defined for this study as nurse practitioners (NPs) and nurse midwives (CNMs), play a pivotal role in the healthcare delivery system (Institute of Medicine
NPs’ and CNMs’ diversity allows them to serve in various roles throughout the healthcare system, including administrative, health policy development, research, and direct patient care (Adams, Adams, Thorogood, & Buckingham, 2007). It is this diversity that may allow them to influence the adoption and utilization of HIT in many aspects of nursing practice (American Nurses Association [ANA], 2007); however, few studies have examined the impact on, and utilization of HIT by, APRNs (Adams et al., 2007; Andrews et al., 2005; Andrews et al., 2004; Chung & Nyguyen, 2005; Gans et al., 2005; Mold & Peterson, 2005; ONHIT, 2008; Stroud et al., 2009).

As care providers, NPs assist patients with health and wellness maintenance, and treat acute and chronic illnesses across the lifespan (National Council of State Boards of Nursing APRN Advisory Committee [NCSB], 2008). As care providers, CNMs provide care during pregnancy, acute and chronic illness of the prenatal and perinatal female, well women exams, and immunizations (Kentucky Coalition of Nurse Practitioners and Nurse Midwives [KCNPNM], 2010). Some patients may seek healthcare only when they are receiving prenatal or perinatal care; therefore, the CNM is poised to affect a positive change in health behavior and outcomes by securing appropriate referrals to future primary care providers. To be effective practitioners, NPs and CNMs must manage, integrate, and assimilate a multitude of knowledge with each patient encounter (Garritty, Emam, & Eng, 2006; Shuffitt, 2009). Health information technology can serve as the conduit through which APRN’s provide cost-effective, efficient, and quality care (Stroud et al., 2009).

Health information technologies exist that can enable providers to deliver evidence-based care (ONHIT, 2008). For example, point-of-care access devices allow providers to be connected
to various electronic information resources, including health care records, diagnostic testing results, past treatment plans, and current evidence-based practice guidelines (Adams et al., 2007; Andrews, Pearce, Ireson, & Love, 2005; Stroud, Erkel, & Smith, 2005). The resources then can be used to support, enhance, and potentially improve point-of-care clinical decision making (Andrews, Pearce, Sydney, Ireson, & Love, 2004; Stroud et al., 2009).

Healthcare systems have become so complex that the care delivery structure becomes strained, ineffective, and difficult to navigate (Erwin, 2009), in part because multiple systems are embedded within one another, each requiring multiple and complex interactions with the other (Adams et al., 2007; ONHIT, 2008). As each system evolves, it indirectly influences change in another system (Erwin, 2009; Rogers, Medina, Rivera, & Wiley, n.d.). For example, an alteration in the Medicare data exchange system effects a downstream change in care delivery including which services a patient may receive, how data are transmitted or exchanged with the existing Medicare system and what financial modification will be needed to cope with the change. These complexities influence the care delivered by providers and must be considered when incorporating HIT into everyday practice (Adams et al., 2007).

Between 70% and 86% of adult patients use information technology resources to locate healthcare information (Cohen & Stussman, 2010; Garrity, Emam, & Eng, 2006) so it is not surprising that patients expect their healthcare providers to be able to access and interpret the latest evidence-based practice relating to their current condition (Curran & Curran, 2005; Earnest, Ross, Wittevrongel, Moore, & Lin, 2004; Elwyn, Edwards & Kinnersley, 1999; Huang & Lin, 2009; Khan, Pasapula, Hayee & Al-Mishlab, 2005). Despite these patient expectations,
we know little about the extent to which NPs and CNMs utilize HIT to access the latest evidence to support or enhance their clinical decision making.

The passage of the Affordable Health Care for America Act (AHCA) enables more patients to obtain affordable care (H.R. Res. 3962, 2010). The increased demand for healthcare services has positioned nurse practitioners and certified nurse midwives to fill the gap created by the void of physicians. (Delivery Reform: The roles of primary and specialty care in Innovative new delivery models: Hearing before the United States Senate Committee on Health, Education, Labor, and Pensions, 2009; Dierick-van Daele et al., 2009; Institute of Medicine, 2006, 2010; United States Health Resources and Services Administration, 2010). AHCA also incentivizes incorporating HIT into practice by linking reimbursement to quality care delivery (H.R. Res. 3962, 2010).

Health information technology should play a vital role in assisting NPs and CNMs to manage health promotion and prevention, as well as acute episodic illnesses, for diverse patient populations (Stroud et al., 2009). The use of HIT can facilitate standardized patient centered care delivery, increase information access and exchange, improve care delivery efficiency, monitor outcome-based decision-making, and encourage dynamic utilization of up-to-date patient health information (Adams et al., 2007; ANA, 2007; Andrews et al., 2005; Bradley et al., 2009; Delivery Reform: The roles of primary and specialty care in Innovative new delivery models: Hearing before the United States Senate Committee on Health, Education, Labor, and Pensions, 2009; Gans et al., 2005; NCSB, 2008; Stroud et al., 2009). However, healthcare providers have been slow to adopt and implement HIT resources. HIT usage among primary care providers is estimated at 4% to 20%. Barriers thought to contribute to this slow evolution include cost,
patient safety concerns, workflow issues, job security, system implementation time, training requirements, privacy, and liability concerns (Adams et al., 2007; Gans et al., 2005; Mold & Peterson, 2005).

The healthcare delivery system itself is a complex adaptive system that creates a rationale for improved efficiency but also barriers to implementation (IOM, 2001; Rogers, Medina, Rivera, & Wiley, n.d). Healthcare has a simple purpose that is built around complex tenets of care. Any change in one variable affects a change in another. It is this adaptive nature that clinicians must endeavor to harness by developing systems that are evidence-based, information-centric, and driven by patient centered data, to begin to move patient care into the next century (Grossman & McGinnis, 2010). Although challenges exist, primary care providers must confront these challenges, reduce or surmount implementation barriers, and capitalize on HIT to increase patient safety, provide efficient point of care, and facilitate evidence-based practice. Lack of interoperable systems, concerns of health information security, decreased health literacy, and rising healthcare costs result in incompatible, inefficient, and error prone systems that collectively result in ineffective management of healthcare delivery (Grossman & McGinnis, 2010; IOM, 2001). The true benefits of HIT will only be realized if HIT utilization permeates the healthcare system (Blumenthal & Tavenner, 2010) so that patient data is easily available to providers at any point in the care delivery continuum.

**Problem Statement**

Adoption of HIT by healthcare providers varies among practice settings and provider levels (Gans et al., 2005). Health information technology can play a vital role in assisting APRNs to manage information overload and diverse patient populations (Stroud et al., 2009). Because
APRNs play an integral role in care delivery and are therefore poised to effect innovative HIT change, APRN-specific utilization data is needed to identify current or potential practice improvements.

**Purpose of Study**

The purpose of this research was to investigate the utilization by, and influence of HIT on the clinical decision making of, Kentucky Advanced Practice Registered Nurse practitioners and nurse midwives (Kentucky APRNs). Answering this question required that several supporting questions be answered:

1. What is the penetration of HIT used by Kentucky APRNs?
2. What type and forms of HIT assist the Kentucky APRNs in making clinical decisions?
3. What is the frequency of HIT usage by Kentucky APRNs?
4. Has access to or availability of HIT altered or influenced specific Kentucky APRNs care decisions?
5. To what extent has access to HIT assisted Kentucky APRNs in comparing effectiveness of potential therapies?

**Conceptual and Operational Definitions**

Health Information Technology is conceptualized for this study as a combination of computer science, information science, medical and nursing science designed to assist in the management and processing of healthcare data, information, and knowledge to support the delivery of healthcare.
Health information technology utilization is operationalized for this study as the act of using health care computing technology (i.e. laboratory, radiologic, electronic health records, personal health records, etc) during patient care planning, treatment, communication, and decision making. Health information technology utilization during decision making is operationalized as the act of using health care computing technology (i.e. laboratory, radiologic, electronic health records, personal health records, etc) to choose between alternative courses of action using cognitive processes during patient care planning, treatment, and communication. For the purpose of this research the term APRN is defined as including nurses who are licensed and classified by the Kentucky State Board of Nursing as a nurse practitioner (NP) or certified nurse midwife (CNM).

**Study Significance and Scope**

In the United States the supply of non-physician primary care professionals is increasing faster than that of physicians, with primary care NPs having an average annual percentage increase per capita of 9.4% compared to primary care physicians’ average annual percentage increase per capita of 1.17% (*Primary care professionals: Recent supply trends, projections, and valuation of services*, 2008). This trend is expected to continue due to limited enrollment of medical students in primary care physician programs.

In Kentucky there are approximately 10,000 licensed physicians and 4,072 licensed APRNs (Nurse Practitioners, Certified Nurse Midwives, Clinical Nurse Specialists, and Certified Registered Nurse Anesthetists) (Kentucky Board of Medical Licensure [KBML], 2009; Kentucky Board of Nursing [KBN], 2010a). According to the Kentucky Coalition for Nurse Practitioners and Nurse Midwives (2010), more than 2,700 advanced practice nurses hold active
Kentucky licenses as NPs or CNMs. Kentucky APRNs have statutory independent practice and collaborative prescribing authority (KBN, 2010a). More than 92 percent of Kentucky APRNs practice in rural or underserved areas that are designated as health provider shortage area (HPSA); and most of these areas are devoid of sufficient health information technology infrastructure (Kentucky Coalition of Nurse Practitioners and Nurse Midwives [KCNPNM], 2010; KBN, 2010b).

Although approximately 84% of Kentuckians report having some type of insurance coverage, Kentucky is ranked number 37 out of the 50 states in overall health status (National Center for Chronic Disease Prevention and Health Promotion [NCCDPHP], 2009). According to recent surveillance data, 51% of Kentuckians have smoked or are currently smoking, compared to 43.4% nationally; 36% have hypertension, compared to 29% nationally; 42% are classified as having hyperlipidemia, compared to 38% nationally; and 32% have a body mass index greater than 30 compared to 27% nationally (NCCDPHP, 2009). Therefore, Kentucky remains one of the unhealthiest states in the nation. This is of specific concern to primary care practitioners, who work with these patients on a daily basis to improve their health status. Research suggests that HIT can assist clinicians to improve patient outcomes through utilization of clinical decision making tools (Adams, Mann, & Baucher, 2003). However, this benefit will be realized only if HIT is incorporated in practitioners’ daily healthcare decision-making (Blumenthal & Tavenner, 2010).

Recently, Kentucky began developing an e-health interchange system that will establish compatible electronic systems for state mental health facilities and eventually will establish an e-health network that will allow healthcare providers who participate in the network to exchange
electronic patient medical information securely throughout the state (Commonwealth of Kentucky, 2010). This system is expected to improve patient care delivery and increase access to relevant treatment information at the point of care. Currently, the system is in the exploratory design phase (Commonwealth of Kentucky, 2010). Therefore, a unique opportunity exists for this study to establish baseline HIT utilization findings that may assist in planning, implementing, and evaluating the implementation of HIT in KY.

**Summary**

This research examined Kentucky APRN’s utilization of HIT in clinical decision-making. The significance of this study was demonstrated through the evolving role HIT plays within the healthcare delivery system (Blumenthal & Tavenner, 2010; ONHIT, 2008). HIT can inform clinical practice, facilitate exchange of information, and improve the management of healthcare delivery (Zander, 2004). The study examined the degree to which HIT was being utilized by Kentucky APRNs. Given the increasingly influential role that APRNs play in primary care, the results of this study will assist in evaluating further the current status of HIT utilization among primary practices in KY and identify areas for future education and research endeavors.
CHAPTER 2: LITERATURE REVIEW

Introduction

This chapter will examine the existing body of knowledge related to HIT utilization and its impact on quality healthcare and provider effectiveness. Articles in several electronic databases were reviewed using the information systems literature review framework (Levy & Ellis, 2006) and Lewin’s theory of change (Lewin, 1938). Because most HIT literature deals with human/machine integration and interaction, Lewin provides an excellent guiding framework for HIT research (Bozak, 2003). The following sections will describe Lewin’s theory and the current state of nursing science as it relates to HIT and APRN utilization.

Theoretical Framework: Lewin’s Change Theory

This research was guided by Kurt Lewin's theory of change (Lewin, 1938). Lewin developed a framework for describing behavior during the change process and recommended methods that may be employed to decrease resistance to change and cement the desired change. Lewin observed that the behavior of an individual is influenced by psychological, physical, and emotional factors (Lewin, 1938). Lewin's concept of directionality assists in explaining the relationship between these multiple factors, for example, whether the person moves toward or away from the change. Understanding Lewin’s theory is useful when implementing or assessing information technology utilization by healthcare providers (Bozak, 2003; Chung & Nyguyen, 2005; Hacker & Roberts, 2004; Sue, Prokosch, & Ganslandt, 2009).

Lewin observed that positive (driving) forces move the system toward change and restraining (i.e. negative) forces attempt to maintain the current state, in effect, resisting change. This constant pull between the two forces decreases the proliferation of information technology
utilization by healthcare providers since the negative forces, such as cost, complexity of the technology, and change itself, tend to be greater than the positive ones (Bozak, 2003; Chung & Nyguen, 2005; Hacker & Roberts, 2004; Suc, Prokosch & Ganslandt, 2009). To counter the restraining forces, driving forces that strengthen the rationale for change should be enhanced by change agents as part of the implementation process.

Lewin identified three internal conflicts that may occur when individuals deal with a change process (Lewin, 1938). Persons may have to decide between two positive change forces of equal strength when each of these forces provides a benefit to the individual; but the individual wants both (Suc et al., 2009; Bozak, 2003). Another conflict deals with negative forces of equal strength; these restraining forces can result when the perceived decision to change results in negative feelings or perceptions from the end users of the change. End users may see problems with the current system, but fear that the change to a new system will be as bad, or worse. A third conflict exists when persons contemplating a change experience both driving and restraining forces (Suc et al., 2009). During this conflict the change process is driven both by the perceived benefits and risks of the innovation (Suc et al., 2009).

Lewin's model has been applied for many years in the fields of business, healthcare, and information technology (Chung & Nyguen, 2005). The common sense approach of this model affords easy implementation and utilization through informal and formal organizational structures (Shuffitt, 2009). In the three-step change process suggested by Lewin, behavior is treated as an energy that is attempting to push or pull several opposing positive or negatives forces to achieve change.
Lewin conceptualized the change process as one of unfreezing, moving, and re-freezing (Suc et al., 2009; Lewin, 1938). Unfreezing, the first step in the process is attempts to overcome individual resistance and group conformity by helping individuals recognize the need for change. Unfreezing may be facilitated by increasing people’s awareness that the current behavior or situation is not effective in achieving desired goals (e.g., patient safety, desired economies, etc.). If there is sufficient buy-in to these ideas, later tendencies to go back to the previous way of doing can be lessened (Bozak, 2003; Chung & Nyguyen, 2005; Hacker & Roberts, 2004).

Moving occurs when system behavior begins to change. In this step, the system begins to establish a new equilibrium and a new level of functioning. It is essential that the group views the problem through different lenses, agrees that the status quo is ineffective to accomplish the needed goal, and that organizational leaders support the needed process. Refreezing is the most important step in the process (Chung & Nyguyen, 2005; Suc et al., 2009). For permanent change to be sustained, new values and traditions must be integrated within the system that will stabilize the restraining and driving forces to reinforce the desired behavior.

Lewin’s theory is applicable to healthcare providers and HIT change because most healthcare change processes must transform long-standing cognitive and workflow processes; altering these processes is difficult for healthcare personnel. Applying Lewin’s theory to HIT implementation will facilitate controlling the restraining forces while encouraging the driving forces. Lewin’s theory will be used as a lens through which to identify the driving and restraining forces that currently affect Kentucky APRN’s usage of HIT for clinical decision making.
Literature Review Process

A systematic review of the English language literature was conducted to assist in understanding the current impact and utilization of HIT on APRNs’ clinical practice. Using Levy & Ellis’ (2006) three-stage information systems literature review framework (Figure 1), the electronic databases of MEDLINE, CINAHL, PsycArticles, and PubMed were explored using the following keywords: health information technology, advanced practice nursing, quality care delivery, provider, utilization, patient, electronic medical record, personal health record, wireless handheld device, clinical decisions, implementation barriers, health seeking behavior, and Kentucky ARNP. The search returned 86 abstracts dealing with a multitude of HIT factors. To further refine the search process, the following inclusion criteria were established: (1) peer reviewed journals, private publications, and government publications; (2) both qualitative and quantitative analyses; (3) published after 2000; (4) HIT use in primary/acute care; (5) HIT clinical decisions; (6) HIT implementation; and (7) patient use of Internet for healthcare information. Exclusion criteria included: (1) studies not peer reviewed; (2) published before 2000; (3) does not examine HIT usage in primary/acute care; (4) does not examine implementation of HIT; (5) does not examine HIT utilization clinical decision making; and (6) does not examine patient acceptance of HIT. Using these criteria resulted in a final abstract pool of 20 articles that were chosen for review and synthesis. The review was conducted in a systematic fashion using the conceptual framework developed by Levy & Ellis. Only two articles examined HIT in Kentucky.

Several themes emerged from the literature review. The overarching theme was the potential for quality improvement through the use of HIT, specifically, the role that information
technology plays in potentially reducing errors and improving patient outcomes (Arana, Rivero, & Egberts, 2004; Institute of Medicine, 20062001). A second common theme was related to the potential barriers and opportunities surrounding healthcare provider utilization of HIT (Shekelle, Morton, & Keeler, 2006). The third common theme focused on information technology's impact on consumer healthcare expectations and demands (Cohen & Stussman, 2010; Garrity, Emam, & Eng, 2006). Each theme is explored in detail in the following sections.

FIGURE 1. Literature Review Framework

**Health Information Technology and Health Care Quality Improvement**

In the United States, the healthcare system is evolving into a national network of quality improvement initiatives (Blumenthal & Tavenner, 2010; ONHIT, 2008). The utilization of HIT is a necessary component of these quality improvement initiatives because it is expected to enhance quality of care, increase healthcare safety, and provide cost effective health services for patients. HIT also facilitates evidence-based medicine, which is expected to provide enhanced and improved patient outcomes (Blumenthal & Tavenner, 2010) and has been shown to have a
positive effect on quality care delivery (Chaudry et al., 2006; Garrido, Jamieson, Zhou, Wisenthal, and Liang, 2005; O’Connor, Crain, Rush, Sperl-Hillen, Gutenkauf & Duncan, 2005).

Chaudry et al. (2006) conducted a systematic literature review to clarify HIT’s impact on health care quality. Approximately 257 studies were reviewed, with most studies examining decision-support of EHRs. Most of the studies evaluated internally developed systems; only nine studies investigated commercially available decision support systems. The researchers concluded that practitioners’ use of HIT resulted in increased adherence to evidence-based care, decreased medication errors, and enhanced surveillance and monitoring (Chaudry et al., 2006).

Garrido, Jamieson, Zhou, Wisenthal, and Liang (2005) conducted a retrospective, serial, cross-sectional study of a Primary Care EMR’s effect on patient care quality and utilization. The researchers did not specifically state the type of provider that generated the data; however, it is inferred that the patients were primarily cared for by physicians. Health Plan Employer Data and Information (HEDIS) data were utilized to assess quality measures. Visit and HEDIS data were examined two years post implementation of the EMR to identify which services were utilized, the availability of patient medical information, and the amount of required decision making by providers (Garrido et al., 2005). Integrating clinical information systems into practice had a positive impact on patient outcomes by improving health promotion activities, reducing repetitive laboratory testing, and improving patient communication, as well as facilitating accuracy and completeness of patient medical records. Providers described quality care improvement efficiencies and increased communication as the major benefits of the EMR (Garrido et al., 2005).
Congruent with the above findings, O’Connor and colleagues (2005) reported that utilization of EHRs increased quality healthcare. The researchers examined five years of longitudinal data from 122 adult patients with diabetes mellitus to determine if patient care quality improved after implementation of an EMR system. Quality improvement was examined by assessing the frequency and results of hemoglobin A1C and lipid panel levels, as well as inpatient lifestyle behaviors. Patients being cared for by providers who utilized HIT resources at the point of care received comprehensive laboratory testing panels, followed current medical treatment guidelines, and documented more health prevention measures as completed than patients cared for by providers who did not utilize HIT. Interestingly, the providers who utilized HIT observed that improved methods of implementation must be developed to increase provider buy-in and decrease workflow alterations.

Using a pre-implementation/post-implementation design, Adams, Mann and Baucher (2003) examined the impact of computer-based documentation software (i.e. the EHR) on patient care quality. Among the measures of quality care used in the study were increased access to patient data, improved provider documentation, and access to clinical decision-making tools. Utilization of electronic systems increased standardized care delivery by increasing risk behavior assessment, improving age-appropriate screenings utilization, and increasing anticipatory guidance information provided to patients and caregivers in a pediatric care setting. Consistent with O’Connor et al.’s findings, the providers noted alteration in workflow and a perceived decrease in patient/caregiver interaction during the visit.

These findings support the seminal report from the Institute of Medicine (2001) entitled “Crossing the Quality Chasm--A New Health System for the 21st Century.” This report
discussed the resulting quality improvements on patient care delivery when HIT is incorporated into patient care decisions. The report suggested that using HIT in clinical practice increases access to current clinical-based guidelines, decreases medication errors, and assists in standardizing care delivery throughout the healthcare system (Institute of Medicine, 2006; 2001).

**Health Information Technology and Provider Utilization**

A number of studies have described the challenges and opportunities that ensue when information technology is introduced into healthcare (Adams et al., 2007; Andrews et al., 2005; Menachemi, Burkhardt, Shewchuck, Burke, & Brooks, 2006; Miller & Sim, 2004; Mold & Peterson, 2005). Common challenges include: a lack of mechanical standardization (inability to consistently map data fields and structures across platform), increased fiscal liability, a lack of interoperability among systems, alteration of provider-patient interaction and workflow, and security and privacy concerns. Information technology research has demonstrated organizational benefits; however, few studies have demonstrated financial benefits (Chaudry et al., 2006). Traditionally the substantial initial investment costs of health care technology implementation are shouldered by the implementing entity without a clear realization of financial benefit, in part because diverse information technology and variable cost prevents true standardization and utilization within the healthcare system (Menachemi et al. 2006).

Andrews and colleagues (2005) examined the information seeking behaviors of a Kentucky primary care practice based research network. Although most practitioners in the study had access to electronic data resources, they typically utilized print sources to support patient care. However, these data were not stratified by provider type. In a related study, Andrews et al. (2004) examined utilization of healthcare information in a Kentucky primary care practice-based
research network. The goal of the study was to assess the utilization of HIT by all provider categories, including physicians, NPs, and physician assistants. The data collected were not stratified by provider type, but revealed that although most practices had Internet access, less than 25% utilized EHRs, with more than half of the respondents citing limited financial resources as a barrier to adoption (Andrews et al., 2004).

Semi-structured interviews were conducted with 26 physician providers who practiced in an acute care facility in Hawaii to ascertain healthcare provider perceptions when implementing an EMR (Scott, Rundall, Vogt, & Hsu, 2005). More than half of the respondents indicated that they were less than satisfied with their current EMR and that provider input was not elicited by the organization when selecting the EMR package. Approximately 88% of the providers reported major software functionality issues. However, more than 60% of the providers stated that the software assisted them in identifying questionable clinical decisions and helped raise awareness of current clinical guidelines (Scott et al., 2005). Like other studies described earlier, providers reported decreased patient-provider interaction.

Edsal & Alder (2005) examined physicians’ satisfaction with, and utilization of, an EMR system in one practice using a survey methodology. A sample of 408 physicians was surveyed. Common themes identified from the survey results suggested that clinician involvement in the implementation and decision processes was a key element in successful implementation and utilization of the technology. The researchers reported that utilization might be increased if the proposed solution were introduced in such a way as to illustrate to the clinician the benefits of the proposed solution in reducing future provider documentation time; however, this study did not specifically examine the role of NPs or CNMs.
Miller, Sim, & Newman (2003) explored individual provider practices and small practice physician experiences when implementing EMR Systems. The results indicated that providers who utilized HIT for diverse practice activities realized a financial benefit faster than those who implemented stand-alone or single use systems. Lessons learned during implementation that would assist the practice in obtaining benefits from the implementation included thoughtful examination of existing technologies prior to implementation, involvement of clinical staff and selection of technology, adequate training on new technology, and using a systematic process when implementing the technology. The authors concluded that including each of these in the implementation should result in increased provider buy-in and utilization.

**Patient Utilization and Expectations of Healthcare Technology**

Understanding how patients are utilizing information technology is essential to improving patient centered healthcare delivery while meeting patient expectations. A considerable body of knowledge exists that tests different forms of consumer health information technology (CHIT) in various settings (Or & Karsh, 2009). This literature demonstrates the influence that CHIT has on patient expectations and demands. Indeed, meeting patients’ expectations of HIT use is a major motivation for providers to incorporate HIT into their daily practice.

In a systematic review of 52 studies measuring CHIT acceptance by patients, numerous variables were reported that affect patient perceptions and acceptance of CHIT (Or & Karsh, 2009). Included in the systematic review were studies of health related Internet sites that patients were using to obtain health information, and use of web-based personal health records and secure patient-provider email communication. The results of this review suggest that CHIT may improve patient quality of life and well-being and increase treatment regimen adherence. The
authors noted that patients’ perceptions were frequently cited as one of the acceptance variables. For example, Or (2008) examined patients’ use of CHIT in a cross-sectional secondary analysis of data obtained from 101 patient interviews. The results indicated that higher perceived usefulness resulted in increased self-reported patient satisfaction when utilizing CHIT. Patients’ perceived ease of use influenced the rate at which patients were adopting CHIT. However, Or and Karsh (2009) also identified, as a gap in extant knowledge, the little attention in the literature given to task and social factor variables that also might influence patient acceptance of CHIT. A survey of more than 300 patients attending a colorectal surgery clinic in the United Kingdom (UK) revealed that, although more than 35% of the UK residents had access to the Internet, few respondents used the Internet to obtain medical information (Khan, Pasapula, Hayee & Al-Mishlab, 2005). Age had a direct correlation with using the Internet to seek health information (i.e., the younger the patient, more likely it was that they would seek information from the Internet). Therefore, healthcare providers should adapt their practice to accommodate these increasingly informed consumers. The extent to which this result can be generalized beyond the UK is unknown.

In a study of congestive heart failure patients’ attitudes toward access of personal health records (PHRs), patients reported their experience as useful when attempting to understand their treatment regimen and medical care (Earnest et al., 2004). However, some patients expressed concern about the security of personal health information. Patients reported that personal health records increased participation in medical treatment, increased their feelings of being empowered to control disease process, and increased their awareness of patient health status. The authors
concluded that increased access to personal medical information enhanced patient knowledge of health status and treatment participation.

The abundance of health information available via various electronic sources can allow patients greater control in obtaining healthcare advice (Mold & Peterson, 2005). However, more informed patients create the need for better informed and technology savvy providers (Delivery Reform: The roles of primary and specialty care in Innovative new delivery models: Hearing before the United States Senate committee on Health, Education, Labor, and Pensions, 2009; Elwyn et al., 1999). In these times of healthcare innovation, pay-for-performance, and increasing patient expectations, providers must be willing to adapt their practice to patient expectations and demands (Blumenthal & Tavenner, 2010; Khajouei & Jaspers, 2008; O’Brien, 2008).

A Knowledge Gap

The use of HIT can facilitate standardized patient centered care delivery, increase information access and exchange, improve care delivery efficiency, monitor outcome-based decision-making, and encourage dynamic utilization of up-to-date patient health information (Adams et al., 2007; Andrews et al., 2005; Bradley et al., 2009; Gans et al., 2005; NCSB, 2008; Stroud et al., 2009). However, several studies reported, as incidental findings, decreased provider-patient interaction during the visit due to the utilization of HIT. Healthcare providers have been slow to adopt and implement HIT resources. Several barriers may have contributed to this slow evolution including cost, workflow issues, provider training commitment, and decreased patient/provider interaction (Adams et al., 2007; Gans et al., 2005; Mold & Peterson, 2005).
This literature review, which is summarized in Table 1, did not discover HIT utilization data specific to NPs or CNMs; therefore, further studies examining the impact on and utilization of HIT by NPs’ and CNMs’ decision making are needed. Figure 2 depicts the current knowledge gap and where the study will inform nursing science. Although challenges exist, all care providers—including NPs and CNMs—must confront these challenges, reduce implementation barriers, and capitalize on HIT utilization to increase patient safety, provide efficient point of care, and facilitate evidence-based practice. These benefits will only be realized if HIT utilization permeates the healthcare system (Blumenthal & Tavenner, 2010).

**FIGURE 2. Pathway to Informing Nursing Science**
<table>
<thead>
<tr>
<th>Article</th>
<th>Design</th>
<th>Conclusion</th>
</tr>
</thead>
</table>
| **Chaudry, Wang, Wu, Magilone, Mojica, Roth, Morton, and Shekelle (2006)** | • systematic literature review  
• clarify HIT's impact on health care quality  
• 257 studies reviewed studies evaluated internally developed systems  
• nine studies investigated commercially available decision support systems | • HIT Utilization  
• increased adherence to evidence-based care  
• enhanced surveillance and monitoring  
• decreased medication errors |
| **Garrido, Jamieson, Zhou, Wisenthal, and Liang (2005)** | • retrospective, serial, cross-sectional design of Primary Care EMR utilization (2 yrs post implementation)  
• provider and administrative data analyzed (HEDIS)  
• examined which services were utilized  
• availability of patient medical information  
• amount of required decision making | • clinical information systems had positive impact on patient outcomes by  
• improving health promotion activities  
• reducing repetitive laboratory testing  
• facilitating accuracy and completeness of medical records  
• improvement efficiencies |
| **O'Connor and colleagues (2005)** | • longitudinal data  
• 122 adults DM patients  
• patient care quality post EMR  
• frequency and results of labs/lifestyle behaviors | • EMR improved quality  
• increased comprehensive lab panel  
• EBP guidelines  
• health prevention measures  
• **Barriers**  
• provider perceived impact on care  
• alteration in workflow  
• decrease in patient/caregiver visit interaction |
| **Adams, Mann, and Baucher (2003)** | • pre/post design  
• impact of computer based documenting on care quality  
• measures of quality care  
• increased access to patient data  
• improved provider documentation  
• access to clinical decision-making tools | • increased standardized care delivery  
• increased risk behavior assessment  
• improved age-appropriate screenings utilization  
• increased anticipatory guidance  
• **Barriers**  
• provider perceived impact on care  
• alteration in workflow  
• decrease in patient/caregiver visit interaction |
<table>
<thead>
<tr>
<th>Article</th>
<th>Design</th>
<th>Conclusion</th>
</tr>
</thead>
</table>
| Institute of Medicine (2001) Seminal Report Crossing the Quality Chasm | • Technical Report | • Information technology  
  o increases access to current clinical-based guidelines  
  o decreases medication errors  
  o assists in standardizing care delivery |
| Andrews and colleagues (2005; 2004) | • survey methodology  
  o information seeking behaviors of a Kentucky primary care practice based research network  
  o 27-item author developed questionnaire  
  o assess the utilization of information technology by all provider categories | • low utilization of technology  
 • most practitioners in the study had access to electronic data resources  
 • typically utilized print sources to support patient care  
 • difficult to ascertain provider type specific utilization  
 • less than 25% utilized electronic medical records  
 • **Barrier**  
  o financial investment  
  o more than half citing limited financial resources |
| Scott, Rundall, Vogt, & Hsu, (2005) | • semi-structured interview  
  o 26 physicians  
  o acute care facility  
  o assess provider perceptions when implementing EMR | • improved clinical decisions  
  o 60% stated that the software assisted in identifying questionable clinical decisions  
  o helped raise awareness of current clinical guidelines  
 • **Barriers**  
  o provider input essential for success  
  o 50% were less than satisfied with their current EMR  
  o provider input not elicited by the organization  
  o 88% reported major software functionality issues  
  o providers reported decreased patient-provider interaction |
| Edsal & Alder, (2005) | • survey methodology  
  o providers' satisfaction with and utilization of EMR | • providers' satisfaction with and utilization of EMR  
 • provider input essential for success  
 • utilization may increase with proper implementation/buy-in  
 • must demonstrate tangible provider benefit |
<table>
<thead>
<tr>
<th>Article</th>
<th>Design</th>
<th>Conclusion</th>
</tr>
</thead>
</table>
| Miller, Sim, & Newman (2003) | • implementing electronic medical records  
  o individual and group practice  
  o diversity of IT use  
  o increased ROI  
  o stand-alone or single use systems not cost effective | • lessons learned  
  o thoughtful examination of existing technologies prior to implementation  
  o involvement of clinical staff and selection of technology  
  o adequate training on new technology  
  o using a systematic process when implementing the technology |

**Patient utilization and expectations of healthcare technology**

<table>
<thead>
<tr>
<th>Article</th>
<th>Design</th>
<th>Conclusion</th>
</tr>
</thead>
</table>
| Or & Karsh, (2009) | • systematic review  
  o CHIT acceptance by patients  
  o 52 studies measuring numerous variables | • CHIT use improved  
  o quality of life  
  o well-being  
  o treatment regimen adherence |
| Or (2008) | • cross-sectional secondary analysis  
  o use of consumer health information technology  
  o 101 patient interviews | • perceptions make a difference  
  o perceived usefulness  
  o increased satisfaction  
  o perceived ease of use  
  influences technology adoption |
| Khan, Pasapula, Hayee, & Al-Mishlab, (2005) | • A survey methodology  
  o UK internet use for healthcare information  
  o 300 patients attending a colorectal surgery clinic  
  o few used the Internet to obtain medical information  
  o Age correlate with use | • younger the patient the greater likelihood of use |
| Earnest et al., (2004) | • attitudes toward access of electronic personal health records  
  • congestive heart failure patients  
  • themes  
  o increased participation in medical treatment  
  o empowerment to control disease process  
  o and increased awareness of patient health status | • increased access to personal medical information  
  o increases treatment participation  
  o enhances patient knowledge in health status  
  o useful to understand  
  o treatment regimen  
  o medical care  
  • **Barriers**  
  o personal health records  
  o security concern |
Summary

Health information technology (HIT) can play a vital role in assisting healthcare providers to manage health promotion and prevention, as well as acute episodic illnesses, for diverse patient populations. The use of HIT has been shown to facilitate standardized patient centered care delivery, increase information access and exchange, improve care delivery efficiency, monitor outcome based decision-making, and encourage dynamic utilization of up-to-date patient health information. Although challenges exist, primary care providers as well as healthcare stakeholders, must confront these challenges, reduce implementation barriers, and capitalize on HIT utilization to increase patient safety, provide efficient point of care, and facilitate evidence-based practice. Importantly, none of the research cited focused on NPs.
CHAPTER 3: METHODOLOGY

Introduction

This chapter discusses the methods used to investigate the utilization and influence of HIT on Kentucky APRNs’ clinical decision making. Examining this topic requires that several supporting questions be answered during the study. They include: (1) What is the penetration of HIT used by Kentucky APRNs? (2) What type and forms of HIT assist the Kentucky APRNs in making clinical decisions? (3) What is the frequency of HIT usage by Kentucky APRNs? (4) Has access to or availability of HIT altered or influenced specific Kentucky APRNs care decisions? and (5) To what extent has access to HIT assisted Kentucky APRNs in comparing effectiveness of potential therapies?

Setting and Sample

According to the Kentucky Coalition for Nurse Practitioners and Nurse Midwives (2010), more than 2700 advanced practice nurses hold active Kentucky licenses as NPs or CNMs. Using convenience sampling; an Internet-based membership listserv was used to recruit participants. A pool of 1048 NPs and CNMs subscribes to the KCNPNM list serve and approximately 250 respondents were expected to respond through the online survey link. There are 73 female nurses for each male nurse in Kentucky; however, APRN gender data is publically unavailable (KBN, 2010a). No special attempt was made to achieve a consistent ratio of female to male APRN’s. An announcement containing a brief explanation of the study was posted to the KCNPNM listserv inviting participation in a survey to assess HIT impact and utilization. Instructions on how to access the survey were contained in the announcement. Inclusion criteria included nurses who: (1) were currently licensed Kentucky APRNs or CNMs; (2) practiced in Kentucky; (3) were
members of the KCNPNM; and (4) subscribed to the KCNPNM list serve. Exclusion criteria included nurses who: (1) were not currently licensed Kentucky APRNs or CNMs; (2) did not practice in Kentucky; (3) were not members of the KCNPNM; and/or (4) did not subscribe to the list serve.

**Design**

A descriptive cross-sectional design using a survey methodology was utilized. A survey methodology allows for cost-effective and timely data collection of a large population (Kazdin, 2003). However, survey validity must be considered and controlled through the use of a properly developed survey instrument (DeVellis, 2003; Dillman, 2000).

**Instrumentation**

Data were collected using an author-modified questionnaire based on current research articles describing the utilization and impact of HIT on primary care clinical practice (Adams, Adams, Thorogood & Buckingham, 2007; Andrews et al., (2005; 2004); Garrity, Emam & Eng, 2006; Huang & Lin, 2009; Stroud, Erkel & Smith, 2005; Stroud, Smith & Erkel, 2009) and a modified version of Dillman’s (2000) tailored survey design methodology.

Dillman (2000) developed a general 5-step method of survey design and implementation that is known to achieve high response rates. According to Dillman, there is no one technique that will assure a high response rate, but the use of several implementation elements can make high response rates achievable. The Tailored Design consists of five elements including: (1) a respondent-friendly questionnaire; (2) up to five contacts with the questionnaire recipient; (3) inclusion of stamped return envelopes; (4) personalized correspondence; and (5) a token financial incentive that is sent with the survey request. Dillman noted that, when using the
Internet survey method, some of these steps may not apply. Therefore, this study utilized only the first two steps in Dillman’s methodology.

The survey instrument was adapted from a 27-question survey (Andrews et al., 2004) that explores providers’ attitudes toward and perceptions of technology, determines their knowledge and utilization of various electronic and traditional print medical resources, and assesses the penetration of clinical information technology in daily practice (Andrews et al., 2005; Andrews et al., 2004). The Andrews et al. survey did not include demographic assessments (since their study was conducted within their own primary care research network) and needed updating to better align with current HIT and legislative advances. Therefore, the survey was modified to include additional closed and open ended questions to assess the penetration of current technology and additional demographic questions.

**Survey Questions and Research Linkage**

Common threads between survey questions and how those questions were linked to the domain being examined, the published literature theme, and the specific research question being answered are illustrated in Table 2. This table facilitated tool development and ensured that each question measured at least utilization or influence of HIT. Also, it ensured that each question had a connection with previously published works dealing with HIT. Demonstrating the connection between each research question and the survey items also ensured that all research questions were investigated.

Modifications were needed to Andrews et al’s., (2004) questionnaire to better align with current HIT and legislative advances. Demographic questions were added to the original tool to elicit a better understanding of the respondent population (Appendix A, questions 1-12).
Questions 13 and 14 were altered from the original instrument to better align with current meaningful use initiatives (Table 2, questions 13 and 14 items b. through u.). Question 18 was developed to measure providers’ perceived impact of HIT on their personal practice. Finally, an open response item was developed to gauge the overall impact of EMR utilization on patient and provider interaction (Table 2, question 40). The final instrument is attached as Appendix A.

### TABLE 2. Linkage Between Survey Questions and Research

<table>
<thead>
<tr>
<th>Item</th>
<th>Domain</th>
<th>Literature</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>13. In regards to your personal practice, choose the box that best describes your utilization of the following technological applications.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Electronic Medical Records</td>
<td>U</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>b. Electronic prescribing</td>
<td>U</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>c. E-mail to communicate with patients</td>
<td>U</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>d. E-mail to communicate with colleagues for purposes of patient consultation</td>
<td>U,I</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>e. Receive test results</td>
<td>U</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>f. Store test results</td>
<td>U</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>g. Drug-drug, drug-allergy, drug-formulary checks</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>h. Maintain an up-to-date problem list of current and active diagnoses based on ICD-9-CM or SNOMED CT®</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>i. Maintain active medication list</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4</td>
</tr>
<tr>
<td>j. Submit electronic data to immunization registries</td>
<td>I</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>k. Provide patients with timely electronic access to their health information (Personal Health Record updates)</td>
<td>U</td>
<td>1, 2, 3</td>
<td>2</td>
</tr>
<tr>
<td>l. Provide clinical summaries for patients</td>
<td>U</td>
<td>1, 2, 3</td>
<td>2</td>
</tr>
<tr>
<td>m. Exchange key clinical information (for example, problem list, medication list, allergies, diagnostic test results), among providers of care</td>
<td>I</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>n. Perform medication reconciliation</td>
<td>I</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>o. Provide summary care record for each transition of care and referral</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>p. Clinical decision support including diagnostic test ordering</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>q. Incorporate clinical lab-test results into EHR as structured data</td>
<td>I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>r. Generate lists of patients by specific conditions to use</td>
<td>U, I</td>
<td>1, 2, 3</td>
<td>2, 3, 4, 5</td>
</tr>
</tbody>
</table>
for quality improvement, reduction of disparities, and outreach

14. If you do NOT use or are NOT interested in using the following computerized tools for patient care, please check any of the following reasons why.

<table>
<thead>
<tr>
<th>Tool</th>
<th>U, I</th>
<th>1, 2</th>
<th>3, 4, 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Electronic Medical Records</td>
<td></td>
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<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>d. E-mail to communicate with colleagues for purposes of patient consultation</td>
<td>U,I</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>e. Receive test results</td>
<td></td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>f. Store test results</td>
<td></td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>g. Drug-drug, drug-allergy, drug-formulary checks</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>h. Maintain an up-to-date problem list of current and active diagnoses based on ICD-9-CM or SNOMED CT®</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>i. Maintain active medication list</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4</td>
</tr>
<tr>
<td>j. Submit electronic data to immunization registries</td>
<td></td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>k. Provide patients with timely electronic access to their health information (Personal Health Record updates)</td>
<td>U</td>
<td>1, 2</td>
<td>3</td>
</tr>
<tr>
<td>l. Provide clinical summaries for patients</td>
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<td>1, 2</td>
<td>3</td>
</tr>
<tr>
<td>m. Exchange key clinical information (for example, problem list, medication list, allergies, diagnostic test results), among providers of care</td>
<td>I</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>n. Perform medication reconciliation</td>
<td></td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>o. Provide summary care record for each transition of care and referral</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>p. Clinical decision support including diagnostic test ordering</td>
<td>U,I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>q. Incorporate clinical lab-test results into EHR as structured data</td>
<td>I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>r. Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, and outreach</td>
<td>U, I</td>
<td>1, 2, 3</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>s. Send reminders to patients per patient preference for preventive/ follow up care</td>
<td>U, I</td>
<td>1, 2, 3</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>t. Maintain active medication allergy list</td>
<td>U, I</td>
<td>1, 2, 3</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>u. Record and chart Vital Signs including Body Mass Index (BMI)</td>
<td>U, I</td>
<td>1, 2, 3</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>Index (BMI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>15. Please indicate which best describes your use of a hand-held electronic device or digital personal assistant.</td>
<td>I</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>16. If you use a hand-held electronic device or PDA, in what ways to use it in your practice? (Select all that apply)</td>
<td>U, I</td>
<td>1,2</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>16a. If you use a hand-held electronic device in your practice, please select the applications that you use most frequently</td>
<td>U, I</td>
<td>1,2</td>
<td>2, 3, 4, 5</td>
</tr>
<tr>
<td>17. If you do not currently use a hand-held device or PDA do you expect to begin using one?</td>
<td>U</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18. Which best describes your use of the computer to record notes (select only one)?</td>
<td>U</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18a. I believe the use of computer note taking (select all that apply):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Improves patient care quality</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>b. Decreases patient care quality</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>c. Increases preventive health testing/screening/treatment</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>d. Decreases preventive health testing/screening/treatment</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>e. Improves efficiency of patient visit</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>f. Decreases efficiency of patient visit</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>g. Improves referral follow-up/tracking</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>h. Decreases referral follow-up/tracking</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>i. Improves patient/provider interaction</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>j. Decreases patient/provider interaction</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>k. Has a positive impact on overall patient care</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>l. Has a negative impact on my overall patient care</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>m. Has no impact on overall my patient care</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>19. Do you have an e-mail account to use for your practice?</td>
<td>U</td>
<td>2</td>
<td>1,2</td>
</tr>
<tr>
<td>20. I use e-mail to receive regular mailings (i.e. newsletters)</td>
<td>U</td>
<td>2</td>
<td>1,2</td>
</tr>
<tr>
<td>21. I use e-mail to receive e-mail from professional list services.</td>
<td>U</td>
<td>2</td>
<td>1,2</td>
</tr>
<tr>
<td>22. I believe the use of handheld computers for electronic prescribing would substantially reduce medical errors and improve the quality of care.</td>
<td>I</td>
<td>1</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>23. My patients discuss information with me about their condition that they have obtained from the Internet.</td>
<td>I</td>
<td>1, 2</td>
<td>2, 4, 5</td>
</tr>
<tr>
<td>Question</td>
<td>Code</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>23a. The information that my patient obtained from the internet influences my plan of care</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24. My patients discuss information with me about their treatment they have obtained from the Internet.</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24a. The information that my patient obtained from the internet about their treatment influences my plan of care.</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25. Patients who are using the Internet are more informed compared to those who do not use the Internet.</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>26. I believe that the use of e-mails from Patient enhances my clinical practice.</td>
<td>I, U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>27. I think the use of e-mail to communicate with patients is useful to:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Answer questions where no visit is necessary</td>
<td>I, U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. Schedule appointments</td>
<td>I, U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Renew prescriptions</td>
<td>I, U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>d. Communicate results of medical tests</td>
<td>I, U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>28. I recommend the following types of Internet resources to patients:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Internet support groups</td>
<td>U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. Consumer health information</td>
<td>U</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>29. How often do you seek information from colleagues to care for your patients?</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>30. How often do you seek information from print sources to care for your patient?</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>31. How often do you seek information from online sources to care for your patient?</td>
<td>I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>32. From the list below, select and rank barriers you believe to be most significant regarding the seeking and accessing of health information for patient care (ranked from 1 to 4 with one being the most significant barrier)</td>
<td>B</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>33. How often do you use Internet resources for professional use?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Literature searches (PubMed, etc.)</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. Full text journals</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Clinical guidelines</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>d. Evidence based medicine related information</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>e. Patient education materials</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>f. Alternative medicine Information</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>g. Medical textbooks</td>
<td>U, I</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
h. Drug information | U, I | 1, 2 | 1, 2, 3, 4, 5
i. Services to filter medical literature | U, I | 1, 2 | 1, 2, 3, 4, 5
j. Services that summarize medical literature | U, I | 1, 2 | 1, 2, 3, 4, 5
k. Clinical calculators (including any decision support tools) | U, I | 1, 2 | 1, 2, 3, 4, 5
l. Professional organizations | U, I | 1, 2 | 1, 2, 3, 4, 5
m. Listserv | U, I | 1, 2 | 1, 2, 3, 4, 5

35. **What kind of medical library access you have? (Please select of apply)**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Literature</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain:</td>
<td>U-utilization</td>
<td>I-impact</td>
</tr>
<tr>
<td>Literature:</td>
<td>1-Health information technology and health care quality improvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-Health information technology and provider utilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-Patient utilization and expectations of healthcare technology</td>
<td></td>
</tr>
<tr>
<td>Research Question:</td>
<td>(1) What is the penetration of HIT used by Kentucky APRNs?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) What type and forms of HIT assist the Kentucky APRNs in making clinical decisions?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) What is the frequency of HIT usage by Kentucky APRNs?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Has access to or availability of HIT altered or influenced specific Kentucky APRNs care decisions?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5) To what extent has access to HIT assisted Kentucky APRNs in comparing effectiveness of potential therapies?</td>
<td></td>
</tr>
</tbody>
</table>

36. **If you have access to medical library, how often you use any of the services?**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Literature</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain:</td>
<td>U-utilization</td>
<td>I-impact</td>
</tr>
<tr>
<td>Literature:</td>
<td>1-Health information technology and health care quality improvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-Health information technology and provider utilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-Patient utilization and expectations of healthcare technology</td>
<td></td>
</tr>
<tr>
<td>Research Question:</td>
<td>(1) What is the penetration of HIT used by Kentucky APRNs?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) What type and forms of HIT assist the Kentucky APRNs in making clinical decisions?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) What is the frequency of HIT usage by Kentucky APRNs?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Has access to or availability of HIT altered or influenced specific Kentucky APRNs care decisions?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5) To what extent has access to HIT assisted Kentucky APRNs in comparing effectiveness of potential therapies?</td>
<td></td>
</tr>
</tbody>
</table>
Pilot Testing

Pilot testing of the survey was conducted using a convenience sample of 10 APRNs to assess its content validity, identify potential question design problems, estimate completion time, and evaluate survey delivery functionality (van Teijlingen & Hundley, 2001). Inclusion criteria for the pilot sample consisted of the following: (1) a currently practicing NP or CNM who did not reside in Kentucky; and (2) familiarity with research methodology. Exclusion criteria included: (1) an APRN not currently practicing as an NP or CNM; (2) a KY resident; and (3) lack of familiarity with research methodology. The convenience sample, which was selected through the researcher’s existing professional networks, included 10 APRNs who met the inclusion criteria. Those 10 APRNs were asked to complete the instrument and provide feedback. The majority used HIT in their everyday practice. Each participant was sent via email a hyperlink to the survey and asked to evaluate each survey for: (a) functionality of survey operation; (b) the question design; (c) the question flow; (d) the understandability of the question; (e) the ability of the question to measure HIT practice utilization and impact; and (f) how long it took to complete the survey. Participants were also asked to provide comments about their experiences completing the survey.

Data were analyzed to identify any changes that were needed in the instrument and to obtain an average completion time. Nine of ten respondents completed the survey. Two persons provided free text comments about question comprehension. The feedback provided an opportunity for survey questions to be clarified and flow issues to be resolved. All respondents agreed that the tool had face and construct validity (Table 2). The mean completion time was 17 minutes, with most respondents completing the survey in less than 15 minutes. Preliminary
internal consistency using Cronbach’s alpha resulted in an alpha of 0.74, which is acceptable for new tools (Cronbach & Shavelson, 2004).

The modified survey was also reviewed for content validity by the 9 APRNs, who evaluated the tool using subjective criteria based on their individual experiences. Specifically, the APRNs evaluated whether the tool accurately assessed access to information technology; utilization of technology in care decisions; and barriers to utilization of information technology (Field, 2005). Each APRN provided feedback about the content validity of the instrument and indicated that in their expert opinion each items accurately represent the domains of APRN practice and reflects health information technology utilization.

**Branching Logic**

Branch logic was used to create the actual survey. Branching Logic allows a survey respondent to navigate through the survey based on their responses to previous questions in the survey, or based on data that are specific to that person (Sapsford, 2007). Branching logic is composed of several subsets including skip logic, conditional logic, and unconditional branching (navigates to next question regardless of answer). These mechanisms were employed during survey design to facilitate and enhance the respondent’s navigation and improve survey functionality. For example, when respondents indicated that they did not use an EMR, then skip logic was employed; therefore, the respondent was not presented with questions dealing with the functionality of EMRs. Conditional logic was applied to questions when a respondent may have indicated they felt the EMR was useful; in that case, they were directed to questions dealing with why they felt it was useful. Unconditional branching was used to direct the respondent through the survey when a specific answer was not dependent on the next set of questions to be
answered. As a result of these logical subroutines, a respondent may not have been exposed the total battery of questions.

**Participant Protection**

The research was conducted under the authority and with the approval of the University of Arizona Institutional Review Board (UA-IRB). All appropriate human subjects protections and precautions were taken to ensure participant safety. Participants were fully informed of the risks and benefits of study participation (Appendix B; C.). Participants were informed that their participation in the study was voluntary and posed little if any risk to them; however, completion of the survey required approximately 15-20 minutes of their time. Data were collected using web-based survey software with the data housed in an off-site secure data center furnished by the survey software vendor. No names, personal identifiers, or code numbers were used. Anonymity was assured by removing IP routing information from the data prior to collection and analysis. Results were reported in aggregate form.

**Data Collection and Analysis**

Data were collected using web-based survey software that allowed easy participant completion. A hyperlink to the survey document was posted to the KCNPNM list serve and was available for a four-week period. Data were analyzed for distribution normality. Descriptive statistics and nonparametric tests using IBM SPSS Statistics version 19.0 (IBM SPSS Statistics Version 19, 2010) were employed. Nonparametric techniques are utilized most frequently with nominal and ordinal level data and when no assumptions of the population distribution can be demonstrated. Specifically, they are useful with small sample sizes, can be employed with observations from different populations, and can accommodate irregular sample distributions.
These techniques have wide generalizability in scope which adds robustness to the resulting inferences. Missing data were compensated for by using multiple imputation (MI), which is the most accurate method for compensating for missing data in most survey scenarios (Shrive, Stuart, Quan, & Ghali, 2006).

**Summary**

This chapter described the methods used for the study. A descriptive cross-sectional design using a survey methodology was employed and allowed for cost-effective and timely data collection. Using convenience sampling, an Internet-based membership listserv was utilized to recruit participants who were asked to complete a 15-20 minute author developed survey instrument. Data were analyzed using descriptive statistics and nonparametric tests using IBM SPSS Statistics version 19.0 (IBM SPSS Statistics Version 19, 2010).
CHAPTER 4: RESULTS

Introduction

This chapter presents the results of research investigating the influence of HIT on Kentucky advanced practice registered nurses’ clinical decision making. Several supporting questions were examined during the study and included: (1) What is the penetration of HIT used by Kentucky APRNs? (2) What type and forms of HIT assist the Kentucky APRNs in making clinical decisions? (3) What is the frequency of HIT usage by Kentucky APRNs? (4) Has access to or availability of HIT altered or influenced specific Kentucky APRNs care decisions? and (5) To what extent has access to HIT assisted Kentucky APRNs in comparing effectiveness of potential therapies? The following sections describe the results of the study.

Tool Reliability

Internal consistency results of an $\alpha = 0.74$ were achieved during the pilot study. Tool reliability, specifically internal consistency were evaluated revealing $\alpha = 0.73$.

Description of Sample and Demographics

Sample

Study participants consisted of currently licensed Kentucky APRNs who were current members of the Kentucky Coalition for Nurse Practitioners and Nurse Midwives (KCNPNM) and subscribed to the list serve. According to the KCNPNM (2010) 1048 members subscribe to the list serve. Convenience sampling was used and 250 participants (24% of listserv population) began the web-based survey tool that was designed to assess HIT impact and utilization; however, only 214 (86%) respondents completed the entire tool.
Demographic data were collected to assist in answering the research questions and to assess the penetration of HIT utilization by Kentucky APRNs. Descriptive statistics were calculated for age, ethnicity, gender, clinical specialty, years of practice, practice setting, and type of nursing degree. Descriptive statistics and some nonparametric tests were used to investigate relationships among the remaining variables.

Of the 214 respondents with usable data, the majority were certified as family nurse practitioners (FNP) (66%, n=140) and adult nurse practitioners (14%, n=29). The rest of the respondents held certification in various specialties, including pediatric nurse practitioner (PNP) and dual certification as FNP and PNP (8%, n=18); certified nurse midwife (4%, n=9), acute care nurse practitioner (3%, n=7), women's health nurse practitioner (3%, n=7), and psychiatric nurse practitioner (2%, n=4). Most respondents practiced in metropolitan areas (79%, n=168); with 99% (n=212) engaging in daily clinical practice. Family practice environments were the most prevalent practice site (36%, n=77), followed by specialty clinics (15%, n=32), Acute Care/Urgent Clinic (9%, n=9), Internal Medicine (5%, n=11), Gynecology (5%, n=11), retail clinics (3%, n=7), and women’s health clinics (2%, n=5).

The majority of the respondents classified their gender as female (93%, n= 198); 7% (n=16) classified their gender as male. Their ages ranged from 25 to 65 years old (Table 3).
TABLE 3. Age Range of Respondents

<table>
<thead>
<tr>
<th>Age Range</th>
<th>f</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-29</td>
<td>11</td>
<td>5%</td>
</tr>
<tr>
<td>30-34</td>
<td>27</td>
<td>13%</td>
</tr>
<tr>
<td>35-39</td>
<td>16</td>
<td>7%</td>
</tr>
<tr>
<td>40-44</td>
<td>11</td>
<td>5%</td>
</tr>
<tr>
<td>45-49</td>
<td>27</td>
<td>13%</td>
</tr>
<tr>
<td>50-54</td>
<td>52</td>
<td>24%</td>
</tr>
<tr>
<td>55-59</td>
<td>50</td>
<td>23%</td>
</tr>
<tr>
<td>60-64</td>
<td>14</td>
<td>6%</td>
</tr>
<tr>
<td>65 or more</td>
<td>7</td>
<td>3%</td>
</tr>
</tbody>
</table>

Most respondents (95%, n=203) were Caucasian; only 5% (n=11) reported various other ethnicities. Table 4 denotes respondents’ self-reported ethnic classifications.

TABLE 4. Ethnic Classifications

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>f</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>203</td>
<td>95%</td>
</tr>
<tr>
<td>Asian</td>
<td>5</td>
<td>2%</td>
</tr>
<tr>
<td>Native American</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td>5</td>
<td>2%</td>
</tr>
</tbody>
</table>

Educational preparation varied. Seventy-eight percent (n=167) entered advanced nursing practice with a Masters degree; 20% (n=42) with a bachelor's degree; and 2% (n=2) with a doctorate degree. Of these who entered with a doctorate degree, one respondent earned a Doctor of Philosophy (PhD) degree and one respondent earned a Doctor of Nursing Practice (DNP) degree. Of the respondents who entered without an earned doctorate, 12% (n=25) went on to obtain a doctorate degree including: DNP (n=10); PhD (n=8); and Doctor of Nursing Science
(n=7). Only 3% (n=7) of the respondents are still currently practicing with only a Bachelors degree.

Only two providers reported that they did not engage in weekly clinical practice with patients. On average, the majority of the respondents saw more than 60 patients in clinic each week. Table 5 summarizes the range of patients cared for in the clinic by providers each week.

TABLE 5. Average Number of Patient Visits per Week

<table>
<thead>
<tr>
<th>Pts per week</th>
<th>f</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10</td>
<td>2</td>
<td>1%</td>
</tr>
<tr>
<td>10-19</td>
<td>11</td>
<td>5%</td>
</tr>
<tr>
<td>20-29</td>
<td>33</td>
<td>16%</td>
</tr>
<tr>
<td>30-39</td>
<td>16</td>
<td>7%</td>
</tr>
<tr>
<td>40-49</td>
<td>25</td>
<td>11%</td>
</tr>
<tr>
<td>50-59</td>
<td>25</td>
<td>11%</td>
</tr>
<tr>
<td>60+</td>
<td>100</td>
<td>47%</td>
</tr>
<tr>
<td>I do not see patients</td>
<td>2</td>
<td>1%</td>
</tr>
</tbody>
</table>
Figure 3 illustrates the varied years of clinical practice.

**FIGURE 3. Years of Clinical APN Practice**

**Influence of Health Information Technology**

Respondents were asked to describe their utilization of several HIT applications (laboratory, radiologic, electronic health records, personal health records, etc.) during patient care planning, treatment, communication, and decision making. These findings will be presented in the following sections by supporting research question. The overarching research question will be addressed during the discussion of the findings in Chapter 5.
Penetration, Frequency, and Types of HIT Used by Respondents

High-speed Internet access was utilized by 91% (n=196) of the respondents; only 8% (n=18) did not utilize or have access to this service. Electronic medical records were utilized by 64% (n=137) of the respondents, with 36% (n=76) indicating that they were currently not using EMRs. However, 35% (n=27) of these persons indicated that they would begin using EMRs within one year. Of those not currently using EMRs, 73% (n=36) described the monetary investment required as the greatest barrier to implementation and utilization. Only 46% (n=98) of the respondents were currently utilizing electronic prescribing as a component of their clinical practice. Of those not utilizing electronic prescribing, 58% (n = 45) reported that the monetary investment required prevented them from utilizing this in their practices.

Several HIT applications were frequently utilized by respondents during patient care. Respondents used various components of the EMR (n=137) including: maintaining an up-to-date problem list (47%, n=64), medication interactions and medication formulary checks (74%, n=101), maintaining an active medication list (60%, n=82), exchanging key clinical information between providers (46%, n=63), receiving discrete clinical laboratory data (43%, n=59), maintaining an active medication allergy list (63%; n=86), and recording vital signs including body mass index (59%, n=81). Clinical decision support tools (CDTs) were not used by the majority (57%, n = 78) of respondents. Only 11% (n=13) of these respondents indicated that they planned to use CDTs within one year.

Only 25% (n=53) of the respondents currently used, or planned to use, technology to send reminders to patients about health prevention appointments and follow-up clinic visits. Less than 30% (29%) generated lists of patients with specific conditions to use for quality
improvement, reduction of disparities, and outcome analysis. Of the 71% \( (n=153) \) not utilizing this reporting feature, 45% \( (n=69) \) indicated that the monetary investment required was too great for their practice.

**Handheld Wireless Device/PDA**

Examination of these data suggests that 49% \( (n=106) \) of the respondents used some type of wireless handheld electronic device or personal digital assistant for their practice. Of these, 27% \( (n=29) \) used medical calculator applications; 25% \( (n=27) \) accessed various electronic references; 18% \( (n=19) \) accessed clinical practice guidelines; 3% \( (n=3) \) accessed medical records; and the remainder used the device for various purposes including prescription writing and billing. The applications that were accessed most frequently via electronic handheld devices included Epocrates standard edition \( (29\%, n=31) \), Epocrates deluxe or essentials \( (27\%, n=29) \), and Skyscape tools \( (14\%, n=15) \). Among the other applications mentioned were Tarascon, Lexi Comp Drugs and Medscape.

Over half \( (51\%, n=108) \) of the participants did not use handheld wireless devices in their daily practice. Of these, 38% \( (n=41) \) did not expect to begin using these devices within the next 24 months. Twenty-Four percent \( (n=26) \) reported that they would begin using these devices within the next 24 months. Thirty eight percent \( (n=41) \) stated that they were unsure whether or not they would begin using these devices in their practice.

**Electronic Mail Applications**

Electronic mail was used by most respondents in their practice \( (77\%; n=164) \). However, no statistically significant relationship was found between practices that used or had an EMR and practices that had or used email to communicate with patients \( (X^2(4,n=164)=54.19, p=.21) \). Only
23% (n= 50) did not currently utilize electronic mail. Receiving electronic announcements or research from professional list services was the most common rationale for implementing electronic mail applications in respondents’ practices (58%; n= 95); but 55% (n= 90) indicated that they used electronic mail to receive regular mailings such as newsletters from various organizations.

Electronic mail was perceived as very useful to answer patient questions when no office visit was necessary by 53% (n = 87). However, 13% (n=21) responded that this form of communication was not useful when communicating with patients that did not require an office visit. Electronic appointment scheduling was seen as useful by 51% (n=84) of the participants and not useful by 16% (n=26). Using electronic mail for prescription renewal was viewed as useful by 58% (n=95) and as not useful by 28% (n= 46). More respondents (40%, n=66) indicated that communicating results of medical tests that did not require an office visit through electronic mail to patients was useful than those who disagreed (22%, n=36). The latter cited privacy and security concerns as their rationale for not using this technology.

**Access to HIT Influenced Care Decisions and Comparing Therapy Effectiveness**

Respondents were asked several questions related to how HIT influenced their care decisions. Data were analyzed from respondents who were currently using electronic medical records or electronic note taking in their daily patient care process. The results are summarized in Table 6.


TABLE 6. Use of EMR for Note Taking/Patient Care

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Improves patient care quality</td>
<td>3</td>
<td>2%</td>
<td>10</td>
<td>7%</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>59</td>
<td>43%</td>
<td>11</td>
</tr>
<tr>
<td>Increases preventive health testing/screening/treatment</td>
<td>4</td>
<td>3%</td>
<td>7</td>
<td>5%</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>58</td>
<td>42%</td>
<td>17</td>
</tr>
<tr>
<td>Improves efficiency of patient visit</td>
<td>3</td>
<td>2%</td>
<td>23</td>
<td>17%</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>52</td>
<td>38%</td>
<td>14</td>
</tr>
<tr>
<td>Improves referral follow-up/tracking</td>
<td>3</td>
<td>2%</td>
<td>7</td>
<td>5%</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>51</td>
<td>38%</td>
<td>19</td>
</tr>
<tr>
<td>Improves patient/provider interaction</td>
<td>3</td>
<td>2%</td>
<td>40</td>
<td>29%</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>19%</td>
<td>30</td>
</tr>
<tr>
<td>Has a positive impact on overall patient care</td>
<td>1</td>
<td>1%</td>
<td>12</td>
<td>8%</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45</td>
<td>33%</td>
<td>20</td>
</tr>
<tr>
<td>The use of handheld devices for electronic prescribing would reduce medication errors</td>
<td>3</td>
<td>2%</td>
<td>16</td>
<td>12%</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39</td>
<td>29%</td>
<td>0</td>
</tr>
</tbody>
</table>

(Number and % of Respondents Reporting Each Response)

Access to Electronic Resources for Clinical Effectiveness

Survey participants were asked to evaluate how often they used Internet resources for professional use. Various resources were ranked by respondents based on frequency accessed using a 6-point scale from never to daily. Table 7 summarizes these findings.
TABLE 7. HIT Utilization for Clinical Effectiveness

<table>
<thead>
<tr>
<th>Clinical Information Seeking</th>
<th>Daily</th>
<th>Few times week</th>
<th>Few times month</th>
<th>Almost Never</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>f %</td>
<td>f %</td>
<td>f %</td>
<td>f %</td>
</tr>
<tr>
<td>Alternative Medicine Information</td>
<td>2</td>
<td>1%</td>
<td>31 14%</td>
<td>55 26%</td>
<td>114 53%</td>
</tr>
<tr>
<td>Clinical Decision Tools</td>
<td>28</td>
<td>13%</td>
<td>44 21%</td>
<td>47 22%</td>
<td>67 31%</td>
</tr>
<tr>
<td>Clinical Guidelines</td>
<td>16</td>
<td>7%</td>
<td>71 33%</td>
<td>89 42%</td>
<td>35 16%</td>
</tr>
<tr>
<td>Pharmaceutical Information</td>
<td>79</td>
<td>37%</td>
<td>70 33%</td>
<td>51 24%</td>
<td>12 6%</td>
</tr>
<tr>
<td>Evidence Based Medicine</td>
<td>21</td>
<td>10%</td>
<td>77 36%</td>
<td>98 46%</td>
<td>16 7%</td>
</tr>
<tr>
<td>Full Text Journals</td>
<td>8</td>
<td>4%</td>
<td>42 20%</td>
<td>68 32%</td>
<td>87 41%</td>
</tr>
<tr>
<td>Listserv</td>
<td>47</td>
<td>22%</td>
<td>49 23%</td>
<td>68 32%</td>
<td>33 15%</td>
</tr>
<tr>
<td>Literature Searches</td>
<td>12</td>
<td>6%</td>
<td>56 26%</td>
<td>88 41%</td>
<td>51 24%</td>
</tr>
<tr>
<td>Patient Education Materials</td>
<td>26</td>
<td>12%</td>
<td>84 39%</td>
<td>77 36%</td>
<td>25 12%</td>
</tr>
<tr>
<td>Professional Organization Sites</td>
<td>16</td>
<td>7%</td>
<td>59 28%</td>
<td>101 47%</td>
<td>28 13%</td>
</tr>
<tr>
<td>Summarized Medical Literature</td>
<td>14</td>
<td>7%</td>
<td>23 11%</td>
<td>56 26%</td>
<td>65 30%</td>
</tr>
<tr>
<td>Filtered Medical Literature</td>
<td>5</td>
<td>2%</td>
<td>19 9%</td>
<td>28 13%</td>
<td>94 44%</td>
</tr>
</tbody>
</table>

(Frequency of Respondents Reporting each Response)

**Internet Influence on Patient Care and Effectiveness**

Patients discussed information they obtained from the Internet about their health conditions with survey respondents always or most of the time (n = 75, 36%) or sometimes (n = 137, 64%). However, 51% (108) of the respondents stated that the information the patient obtained from the Internet about their condition did not influence their plan of care. Only 20% (n=44) indicated that this information had some influence on their plan of care. No statistically significant relationship was found between the patients who discussed information with their...
providers that they found on the Internet and the treatment decisions rendered by the providers
\( X^2(4, n=108) = 79.77, \ p = .31 \).

According to the results, 76\% \ (n=162) of the respondents’ patients discussed information about treatment that they had obtained from the Internet with their provider sometimes; and 23\% \ (n=50) discussed information obtained from the Internet about their treatment with their healthcare provider most of the time or always. A majority \ (52\%, \ n=112) of the respondents reported that the information about treatment obtained from the Internet would not influence their plans of care; but 22\% \ (n=47) indicated that it would influence their decisions. Some participants reported that they sometimes recommended Internet support groups \ (34\%, \ n=74)\. More reported that they recommended consumer health information \ (56\%, \ n=120)\ for their patients to obtain additional information on their health condition. However, 32\% \ (n=69) of the respondents never recommended Internet support groups for their patients; and 22\% \ (n=47) rarely or never recommended consumer health information websites for their patients. Most providers agreed \ (67\%, \ n=143) with the statement "Patients who are using the Internet are more informed compared to patients who do not use the Internet".

**HIT’s Impact on Personal Practice**

Survey participants were asked to rate, using a 3-point scale ranging from no impact to major impact, the impact of information technology on their clinical decisions. The results are summarized in Table 8.
TABLE 8. HIT Impact on Practice

<table>
<thead>
<tr>
<th>HIT Impact on Practice</th>
<th>No Impact</th>
<th>Minor Impact</th>
<th>Major Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$f$</td>
<td>$%$</td>
<td>$f$</td>
</tr>
<tr>
<td>Knowledge about treatments</td>
<td>5</td>
<td>2%</td>
<td>66</td>
</tr>
<tr>
<td>Knowledge about medications</td>
<td>0</td>
<td>0%</td>
<td>43</td>
</tr>
<tr>
<td>Knowledge about screening tools</td>
<td>21</td>
<td>10%</td>
<td>113</td>
</tr>
<tr>
<td>Knowledge about diagnostic testing</td>
<td>5</td>
<td>2%</td>
<td>96</td>
</tr>
<tr>
<td>Knowledge about disease prevention</td>
<td>11</td>
<td>5%</td>
<td>123</td>
</tr>
<tr>
<td>Knowledge about health promotion behaviors</td>
<td>11</td>
<td>5%</td>
<td>112</td>
</tr>
<tr>
<td>Knowledge of current clinical guidelines</td>
<td>5</td>
<td>2%</td>
<td>58</td>
</tr>
<tr>
<td>Management of patient diagnosis</td>
<td>7</td>
<td>3%</td>
<td>89</td>
</tr>
<tr>
<td>Management of test results</td>
<td>14</td>
<td>6%</td>
<td>82</td>
</tr>
<tr>
<td>Prescription of medications</td>
<td>5</td>
<td>2%</td>
<td>52</td>
</tr>
</tbody>
</table>

*(Frequency and Percent of Respondents Reporting each Response)*

Respondents were asked what type of device that they used to track their clinical work for billing purposes. Twenty-five percent ($n=54$) indicated that they were recording information on the computer. Billing codes were generated automatically by the electronic medical record for 24% ($n=52$) of the respondents. Paper charting or super bills were used to record this information by 24% ($n=52$) of the study respondents, and 2% ($n=4$) used handheld devices to record clinical billing information.

Respondents were given the option to comment about the impact of the EMR on the patient-provider relationship. Two themes emerged from their responses: (1) Proper placement of equipment and (2) inclusion of end-users in EMR selection and implementation. Most respondents indicated that as long as the electronic medical record equipment was properly placed within the patient care environment there did not seem to be a negative impact on the patient-provider relationship. The negative impact of EMR utilization on the patient-provider relationship...
relationship could be mitigated or reduced if the end-users were included in EMR selection and decision-making.

**Barriers to Accessing Electronic Health Information**

Respondents were asked to rank order the barriers that they believed to be the most significant in terms of seeking and accessing health information for patient care. Items were ranked from 1 to 4 with 1 being the most significant barrier. The time it takes to search databases was the most significant barrier, with 46% ($n=98$) of the respondents choosing this as the number one barrier, followed by knowledge of sources with (22%, $n=47$), cost of accessing external articles (21%, $n=45$) and format of information (11%, $n=24$).

**Print Sources Utilized for Patient Care**

Information was collected about participants’ use of hard copy or print resources to identify and establish patterns of information seeking behavior while conducting patient care. This baseline data will assist the investigator in establishing common use print resources that may be available in an electronic format. Two print resources were used most often by the study participants. Professional newsletters were utilized a few times per month by 53% ($n=114$) of the study participants to assist them with planning care for their patient. Print journals were utilized a few times per month by 53% ($n=114$) of the study respondents to assist them with planning patient care.

**Summary**

This chapter presented the results of the study entitled Influence of Health Information Technology on Kentucky Advanced Practice Registered Nurses Clinical Decision-Making. Results were outlined based on the supporting questions of the study. Study participants
demographics were presented. Nurse practitioner usage of health information technology, print resources, electronic mail applications, and Internet resources were discussed. Specific barriers to utilization of HIT identified by study respondents were outlined. The implication of these findings will be discussed in Chapter 5.
CHAPTER 5: DISCUSSION

The purpose of this descriptive study was to investigate and describe the influence of HIT on Kentucky APRN clinical decision making. A hyperlink to the author-modified questionnaire was posted on a professional organization listserv for study participant completion. This chapter will discuss the results and their implications then suggest additional areas of future inquiry.

Penetration of HIT in Kentucky APRNs

Demographic Conclusions

Most (66%, n=140) survey respondents were certified as Family Nurse Practitioners who practiced in family practice/primary care clinics (36%; n=77) located in metropolitan areas (79%, n=168). The lack of respondents practicing in rural settings (21%, n=46) somewhat limits the findings of study. However, this could also indicate that rural practitioners do not have easy access to information technology or email listservs. According to the Kentucky office of health information technology (2010), only 59 of 120 Kentucky counties currently possess high speed Internet service or have the capacity for users to easily access and exchange bandwidth rich data. This fact may help explain why respondents tended to be from Metropolitan areas. Therefore, additional data collection methods may be needed to assess more accurately the penetration of HIT throughout Kentucky.

Most respondents were female (93%, n=198) and Caucasian (95%, n=203), which is consistent with the Kentucky board of nursing licensure statistics for nurse practitioners and certified nurse midwives in Kentucky. That the respondents were most likely to be between 50 and 60 years old is consistent with an aging Kentucky nurse practitioner and certified nurse
midwife population. This could become problematic in sustaining the workforce unless an additional influx of APRNs occurs. One could hypothesize that the large number of older APRNs might account for the limited utilization of electronic clinical decision support tools.

The majority of currently practicing Kentucky APRNs entered the profession as Masters prepared nurses. Fourteen percent ($n=23$) of these later obtained a doctorate degree (PhD or DNP). This finding is exciting as it seems to suggest that more Kentucky advanced practice nurses are returning to school to obtain a doctorate degree than in the past. These findings suggest the possibility for greater understanding of HIT since most nursing doctoral programs are information-centric and incorporate technology use as part of the curricula (American Association of Colleges of Nursing [AACN], 2006).

Ninety-nine percent of the respondents engaged in current clinical practice and provided care for more than 60 patients per week. Most providers (47%) provided care for an average of 100 patients per week. These findings are consistent with current patient-provider trends, which suggest that more patients are accessing care, which results in increased patient loads. Decreased reimbursement may further constrain the amount of time for each patient visit (Blumenthal & Tavenner, 2010; Erwin, 2009; Grossman & McGinnis, 2010).

**Influence of HIT on Healthcare Quality and Provider Utilization**

More than half of the respondents are currently using some type of electronic medical record that includes a variety of integrated medication support tools. Assessing medication interaction and reconciliation is one of the most used features. This feature is linked to several of the meaningful use criteria (Department for Health and Human Services [DHHS], 2010), which are intended, not only to increase patient safety, but also to improve patient outcomes and reduce
medication errors. These criteria are intended to facilitate the adoption and interoperability of healthcare information systems to allow the free exchange of patient information to increase patient safety (DHHS, 2010). One of the most commonly cited healthcare safety issues is related to medication errors that include medication interaction and reconciliation. For example, one provider may place a patient on a medication that causes drowsiness, and then the same patient goes to another provider and is prescribed another medication that causes drowsiness. The combination of these two medicines may result in a decreased level of consciousness or awareness for the patient, thereby causing a potential negative outcome. If these providers utilized electronic medical reconciliation, this potential negative outcome could have been prevented.

Of those not utilizing these features, more than half reported that the financial investment required to implement or maintain these systems was the main barrier to acquisition. Unfortunately, few respondents are prescribing medications. Some of those who are doing so are using stand-alone systems that are not integrated with an EMR, which may present challenges for future data integration with an EMR or with health information exchanges. More than half of the respondents indicated that they are conducting medication formulary checks and maintaining active medication and medication allergy lists that decrease the risk of medication overdose or reaction. When these safety checks are introduced, patients typically have fewer adverse medication-related outcomes.

Clinical decision support tools (CDTs) were used by only 43% \( (n=59) \) of the 137 respondents who were using EMRs. These utilization findings were consistent with those of Simon et al. (2007). Simon and colleagues conducted a survey of 1384 physicians in
Massachusetts to assess the utilization and functionality of electronic health records or EMRs. They discovered that of 387 physicians using EMRs in Massachusetts, only 31% were utilizing CDT tools.

Unfortunately, the majority of the respondents to the current research indicated that they did not plan to implement CDTs in their practice within the next year. Not only do CDTs allow providers to have access to the most recent evidence; it increases the likelihood of the patient experiencing an improved clinical outcome (Institute of Medicine, 2006). By combining CDTs with additional functionality that is integrated within the EMR such as electronic prescribing, providers may increase medication effectiveness and adherence (Blumenthal & Tavenner, 2010).

The use of several other HIT applications were explored including: exchanging key clinical information between providers, receiving discrete clinical laboratory data, and recording vital signs, which includes body mass index within the EMR. These applications are intended to increase patient safety and health promotion activities by identifying potential risk behaviors and treatment related decisions (Blumenthal & Tavenner, 2010). Unfortunately, only 59% of the respondents reported electronically capturing vital signs during the clinical visit, which can result in decreased access by other providers to needed clinical information. Less than half of the respondents currently exchanged clinical information with other providers via the EMR. This free exchange of data facilitates information flow by allowing the providers access to clinical information from previous visits that were conducted by several different providers. It is of concern that only 45% (n=61) of respondents were currently receiving clinical laboratory data within the EMR. These data are extremely important because their availability allows the provider to have historical references as well as graphical representations of the patients’ past
laboratory values. These features are intended to increase patient safety by decreasing replication of clinical laboratory tests as well as diagnostic and radiology exams. However, these results are consistent with the findings of Chaudry et al. (2006), who reported that providers who engaged in utilization of electronic clinical information had the ability to improve patient safety and efficiency.

The Center for Medicare Services (CMS) incentivizes providers who incorporate health information technology into their practice; however, a minimum threshold of use must be met. If providers fail to meet these criteria, they lose access to several financial and clinical incentives. For example, only one quarter of the respondents currently use or plan to use HIT to send reminders to their patients about health prevention appointments and follow-up clinic visits such as monitoring for hyperlipidemia or diabetes mellitus. Better use of HIT to notify and remind patients of these health promotion activities should not only decrease the propensity of developing the disease state but also decrease the overall cost of health care to the patient by prevention of disease development or early diagnosis and treatment (Bradley et al., 2009). Health promotion and prevention activities improve the overall well-being of the patient and therefore should be more frequently utilized by providers.

Unfortunately, less than half of the respondents are currently utilizing the technology to generate a list of patients with specific medical conditions or diagnoses. These lists are utilized for health promotion activities, billing reconciliation, quality improvement projects, and outcome analysis. Of the 153 respondents who were not utilizing this feature, just under half (45%) indicated that the monetary investment required for this reporting feature was the greatest barrier to utilization.
Handheld Wireless Devices

Over half of the respondents indicated that they did not use a wireless handheld device in their daily practice for patient care management. Of these, 38% indicated they did not plan to use these devices in their practice within next 24 month period. Only 18% used these devices to access up-to-date clinical practice guidelines. This is of concern because most clinical decisions are made in patient care areas; however, these clinics could be using another form of technology to access clinical guidelines. Additional research and questionnaire refinement would be required to fully assess these relationships.

The most prevalent use of handheld wireless devices was for evaluation and calculating medication dosages. This result is consistent with findings of Lindquist, Johansson, Peterson, Saveman, & Nilsson (2008), who conducted a systematic review of PDA utilization among healthcare professionals in the clinical setting. The authors discovered that most studies indicated that most users were using these devices to retrieve medication information. Also, when utilized in the clinical setting for reference material, PDAs appeared to improve clinical decision making; however, additional research is required to fully investigate these relationships (Lindquist et al., 2008).

Electronic Mail Applications

Most of the respondents used electronic mail applications (E-mail) in their daily practice. This technology has robust features and potential to improve patient interaction yet it is utilized most often for business and personal communication. No statistically significant relationship was identified between providers who were currently using an EMR and those practices that were currently using e-mail to communicate with patients.
More than half of the survey respondents indicated that e-mail for patient communication would be very useful to answer questions where no face-to-face exam was necessary. The feature cited most frequently as useful by respondents was electronic prescription renewals. These findings are consistent with those of Katz, Moyer, Cox, & Stern (2003), who conducted a randomized controlled trial of patient and provider email communications and discovered that patients who communicated with their provider via email were less likely to require a face-to-face visit. Not only does this feature increase patient safety by accessing additional features of the EMR such as medication or action checking, but it also allows health care costs to be reduced because e-mail communications are not currently reimbursable and reduces the demand of time required by the provider to provide additional care for their patient (Chaudry et al., 2006).

**Perceived Usefulness of HIT for Care Decisions and Therapy Efficacy**

Most respondents believed that utilizing an EMR for note taking or patient care would ultimately improve patient care quality and increase adherence to preventive health treatment testing and screening. More than three quarters of the respondents indicated that the use of EMR would have a positive impact on the overall patient care. These findings are congruent with the current literature findings which suggest that increased utilization of EMR increased patient safety and outcomes (Adams et al., 2003; Blumenthal & Tavenner, 2010; IOM, 2001; O’Brien, 2008). Unfortunately, most providers do not consistently utilize the same type or format of technology across the healthcare system. Therefore, the lack of fully interoperable and interconnected systems makes it difficult to achieve the full value of EMRs.
Influence of Internet Information on Patient Care Decisions

Over half of the respondents’ patients discussed information about their health conditions or treatments that they obtained from the Internet. However, over half of the respondents indicated that the information patients obtained from the Internet and shared with the provider about their health condition or treatment did not impact their care decision planning. Although patients are seeking additional information about their health condition or treatment from the Internet, very few respondents reported assisting patients in navigating the Internet to find reputable information sources. These findings are of concern due to potential health literacy problems and require further investigation to ascertain the impact of these findings on practice. Only 34% indicated that they recommended validated and reliable Internet sources, such as support groups or consumer health information sites, to their patients. However, most providers agreed that patients who were using the Internet were more informed than those who were not. This finding suggests that most providers do not view the Internet as a useful patient care resource or that they are unaware of which sources to recommend.

Access to Electronic Health Information and Resources for Clinical Efficacy

Less than half of respondents indicated that they conducted online literature searches or reviewed current clinical guidelines when making patient care treatment decisions. However, nearly three-fourths of respondents indicated that health information technology facilitated their knowledge of current clinical guidelines. These findings seem to suggest that, although Kentucky APRNs are not consistently utilizing electronic resources for review of current clinical guidelines for conducting literature reviews for the latest patient care and treatment information; when they do engage in this behavior, health information technology appears to have a major impact on
their clinical knowledge. However, additional research in this area is required to explore the rationale behind these findings.

Nurse practitioners utilized evidence-based medicine information at least a few times per month (82%, \( n=175 \)), with 36% \( (n=77) \) of those accessing this information a few times per week. The number using evidence-based medicine information was higher than the number using current clinical guidelines; therefore, it appears that KY APRNS are beginning to incorporate evidence-based medicine into their practice. These findings seem consistent with Chandra et al. (2006) who reported that clinicians who consistently utilized health information technology and electronic resources for making clinical decisions demonstrated a positive impact on patient care. However, additional exploration is required to assess the specific impact of these findings on Kentucky APRN practice.

Only 13% of the respondents utilized clinical decision support tools daily. This is a troubling finding because CDTs are designed to assist the provider in assimilating and utilizing the most current clinical information when contacting patient care. For example, most clinical decision tools analyze the patient's clinical information (i.e.: BMI) and suggest a clinical course such as a diagnostic screening tool or a specific treatment for a specific diagnoses. These tools’ clinical efficacy has been demonstrated by numerous research studies and can increase patient safety and care efficiency, but only if they are implemented and utilized correctly (Adams et al., 2003; Edsal & Alder, 2005; Garrido et al., 2005). Several factors could explain the limited utilization of CDT including: limited survey penetration, limited availability, or lack of usable format. Although it appears that Kentucky APRNs need to improve the utilization of these tools, additional research is required to formulate an accurate assessment of these findings.
HIT Impact on Personal Practice

Examination of these data on the impact of information technology and personal practice revealed some troubling findings. Although most Kentucky APRNs felt that HIT had a major impact on their knowledge of treatments, medications, and diagnostic testing, they indicated that HIT had an impact only on their knowledge of screening tools, disease prevention, and health promotion behaviors. Knowledge of screening tools, diagnostic testing, and health promotion behaviors are the backbone of nurse practitioner and certified nurse midwifery practice. Patient care suffers when Kentucky APRNs fail to increase their knowledge and utilize current clinical information about these screening and prevention behaviors. Perhaps these data suggest the reason why Kentucky is ranked number 37 of 50 states in health status; however, no definitive correlation between these data can be established. Further research is needed to explore the relationship between Kentucky APRNs’ utilization of screening tools, disease prevention tools, and health promotion behaviors and its impact on their patient care delivery.

These findings also revealed that, although Kentucky APRNs may not have availed themselves of the most current clinical knowledge when it comes to health promotion behaviors and screening tools, they consistently reported that HIT had a major impact on their management of patient diagnosis, test results, and prescription of medication. More than half of the respondents indicated that HIT had a major impact on their management of patient diagnosis and test results. The fact that most of the respondents felt that HIT had a major impact on their practice is congruent with Leung et al. (2003). These researchers conducted a randomized control trial to investigate the role of electronic clinical decision support tools on learning evidenced based
medicine in medical students and discovered that students who used electronic CDTs were more likely to retain and use evidence-based medicine than those who were in the control group.

**Barriers to Utilization of HIT**

Most respondents indicated that the time it takes to search databases was the most significant factor that limited them from utilizing HIT evidence based practice (EBP) resources in practice. Lack of knowledge of the available resources was also a significant barrier, as well as the cost of accessing those resources. These results suggest that, although Kentucky APRNs sometimes accessed this information for clinical application, a better method of information accessibility is needed. One solution that may mitigate this barrier would be to incorporate direct search capabilities linked to available sources into most EMR interfaces (Adams et al., 2003; Blumenthal & Tavenner, 2010; Garrido et al., 2005). Providing additional monetary incentives for accessing this type of information might be helpful to improve information accessibility. Another solution might be to connect the Kentucky APRNs with a data source that delivers abstracted or concise clinical guidelines and comparative treatments. However, additional research is needed to explore this phenomenon and develop potential solutions.

Another significant finding when examining barriers to utilization seems to indicate that poor placement of equipment and exclusion of end-users in EMR selection and implementation greatly reduced the utilization of HIT. Respondents indicated that poor placement of the equipment could create an artificial barrier between the provider and the patient, thereby inhibiting free exchange of information. Another important idea that emerged from these data was that all users should be well-trained on the user interface and program navigation to decrease the likelihood of the clinician focusing more on the technology and less on the patient. These
findings are consistent with O’Connor et al. (2005), who interviewed physicians two years after EMR implementation and discovered that lack of training resulted in provider perceptions of decreased provider-patient interaction.

Exclusion of end-users when selecting an EMR appeared to be a significant factor in clinician utilization. The respondents felt strongly that their inclusion in the selection and implementation process was of paramount importance for the technology to permeate the health care system. These findings are consistent with other studies (e.g., Edsal & Alder, 2005; Miller et al., 2003; Scott et al., 2005) that indicated that provider inclusion is critical for EMR satisfaction and adoption. Therefore Kentucky APRNs, as well as nursing informatics professionals, should make every attempt to include end-users early in the process when purchasing and implementing new technologies in the clinical arena.

**Limitations**

This study has several limitations, including low penetration to rural areas of Kentucky, using a convenience sample of APRNs who had established information technology access and resources, and reliability of the survey tool. Future studies could overcome the low penetration to rural Kentucky areas by conducting an additional study using random selection. For example, the survey could be provided to randomly selected Kentucky APRNs from a list of all Kentucky APRNs who are licensed with the Kentucky Board of Nursing (KBN). The likelihood of obtaining equal respondents from metropolitan and rural areas would be increased using this methodology. The limitations of a convenience sample could be overcome by utilizing the same process. Licensee data could be obtained from the Kentucky Board of Nursing and statistical randomization applied to increase the likelihood of a representative sample. Those selected
would be provided a link to the survey, data will be collected, and results analyzed. However this assumes that these APRNs have Internet access.

Also, additional data could be obtained using phone interviews, focus groups, or mailing paper surveys to all Kentucky APRNs listed with KBN. Paper surveys or phone interviews could assist in reducing the sampling bias of Kentucky APRNs who are technology-centric versus those who are technology challenged. The latter method should provide the best chance of garnering a more robust sample.

Additional studies are required to assess the reliability of the survey tool. Cronbach alpha of the pilot study ($\alpha =0.74$) as well as the current study ($\alpha=0.73$) suggests stable internal consistency of the instrument. These findings indicate acceptable levels of reliability for a new instrument. Additional studies would facilitate establishing patterns of reliability.

The original questionnaire by Andrews et al. (2004) was developed to measure HIT utilization in primary care and may not have been tested in other practice settings. Therefore, data obtained from a setting other than primary care may not be robust or meaningful. Because this research focused on primary care, additional exploration is needed to ascertain the applicability of the current instrument in different practice settings.

**Conclusion**

Although it appears that Kentucky APRNs are utilizing HIT within their practice setting, most are not utilizing systems effectively or aren’t maximizing the capabilities of technology—either by choice or because the applications are not available to them, to promote positive patient outcomes. There appears to be low penetration of the technology to rural counties in Kentucky.
Although additional research with a more representative rural sample is needed, Kentucky appears to be moving in the right direction to increase high-speed access to these rural areas.

Additional funds are required to facilitate the free exchange of clinical information between software packages as well as improve the utilization of these technologies within the clinical setting. Kentucky APRNs should begin to identify funding sources such as HRSA, HITECH, or state and local grants that may allow them to develop better access to the latest clinical guidelines, screening tools, health promotion activities, and patient care resources to facilitate positive outcomes for their patients. Additional research is needed in this area specifically to begin to link utilization of current clinical guidelines to specific patient outcomes.

Clinicians should be involved with the selection and implementations of new clinical systems to not only increase the utilization of these technologies, but also to not impede the provider-patient relationship. This delicate balance of information exchange is critical to gleaning the information needed to provide informed care decisions for the patient. Also, proper placement and form (physical size and weight) of the technologies to be utilized is of key to ensuring provider utilization and acceptance.

**Summary**

This study revealed information related to Kentucky APRNs’ utilization and influence on clinical decision making. It informed nursing practice by examining the degree to which HIT is utilized by Kentucky APRNs. Establishing exploratory Kentucky APRN findings will assist in evaluating further HIT utilization in Kentucky. Findings also identified areas for future education and research and established preliminary tool reliability and validity for use in other research studies.
Although, findings indicated Kentucky APRN are utilizing HIT for providing patient care, no definitive conclusion could be reached as to the availability of HIT in rural areas due to the low number of rural respondents completing the survey. These findings support the findings of others that utilization of an EMR is facilitated with early involvement of the end users prior to implementation of the system. For the benefits of health information technology to permeate the health care system, we must have increased penetration of health information technology in clinical practice.

Clinicians must remain vigilant in their acquisition and utilization of the latest patient clinical information to make informed clinical decisions to increase the likelihood of positive patient outcomes. These data suggest that APRNs in Kentucky are beginning to explore the benefits of this technology; however, additional research will be required to identify the true penetration and utilization of technology in Kentucky. Also, additional research is needed on a national level to have data to assess where APRNs in the United States fall in relation to Kentucky APRNs when comparing HIT utilization rates. Although additional research is needed to further investigate these findings, HIT appears to be having an overall impact on the practice of Kentucky APRNs.
APPENDIX A: SURVEY INSTRUMENT
NOTE: This survey utilizes branching-logic to facilitate question flow and navigation; therefore, respondents will only be presented with the questions that are relevant to their previous answer. For example, if the respondent indicates that they use an electronic medical record (EMR), then they would not be presented with the question dealing with why they do not use EMR in their practice.

1. Are you currently licensed in the state of Kentucky as an advanced registered nurse practitioner?
   1. Yes
   2. No

2. Please select your clinical certification.
   1. family nurse practitioner
   2. acute care practitioner
   3. certified nurse midwife
   4. adult nurse practitioner
   5. women’s health nurse practitioner
   6. psychiatric nurse practitioner
   7. clinical nurse specialist
   8. certified registered nurse anesthetist
   9. I currently do not hold certification as an APRN
   10. Other ________________________________

3. Do you currently engage in clinical practice with patients?
   1. Yes
   2. No

4. Select your practice setting
   1. family practice
   2. acute care/urgent care clinic
   3. specialty clinic
   4. internal medicine clinic
   5. womens health clinic
   6. OB/GYN
   7. retail clinic
   8. school clinic
   9. Other ________________________________

4a. Please enter specialty designation
   1. 
   2. Specialty type ________________________________
4b. My practice setting is located within a(n)

1. Rural area
2. Metropolitan area
3. Other

4c. Enter the county in which you practice.

5. How many years have you engaged in clinical practice as an advance registered nurse practitioner?

1. 0-1
2. 2-4
3. 5-9
4. 10-14
5. 15-19
6. 20-24
7. 25-29
8. 30 or more

6. Select your age range from below.

1. <19
2. 20-24
3. 25-29
4. 30-34
5. 35-39
6. 40-44
7. 45-49
8. 50-54
9. 55-59
10. 60-64
11. 65 or more
12. I prefer not to answer

7. What is your gender?

1. Male
2. Female
3. I prefer not to answer
8. How do you commonly describe your ethnicity?

1. Caucasian
2. Asian
3. African-American
4. Hispanic
5. Native American
6. I prefer not to answer
7. Other ____________________________________________

9. Please select the degree that you held when you initially became licensed as an advanced registered nurse practitioner.

1. BSN
2. MSN
3. Doctorate

9a. Please select your doctorate degree designation

1. PhD
2. EdD
3. DNS
4. DScN
5. DNP
6. ND
7. DMD/DDS
8. Other

10. Please select the highest degree that you have obtained as an advanced registered nurse practitioner.

1. BSN
2. MSN
3. Doctorate

10a. Please select your doctorate degree designation

1. PhD
2. EdD
3. DNS
4. DScN
5. DNP
6. ND
7. DMD/DDS
8. Other
11. On average, how many patients do you see per week?

1. 1-4
2. 5-10
3. 10-19
4. 20-29
5. 30-39
6. 40-49
7. 50-59
8. 60+
9. I do not see patients in clinic

12. On average how many hours per week do you devote to patient care?

1. 1-9
2. 10-19
3. 20-29
4. 30-39
5. 40-49
6. 50+
7. I do not devote any of my time to patient care

13. In regards to your personal practice, choose the box that best describes your utilization of the following technological applications:

<table>
<thead>
<tr>
<th>Technology</th>
<th>I’m not using</th>
<th>I have no interest in using</th>
<th>I would like to use</th>
<th>I plan to use within the year</th>
<th>I’m currently using</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Medical Records</td>
<td></td>
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<tr>
<td>Electronic prescribing</td>
<td></td>
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<td>E-mail to communicate with patients</td>
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<tr>
<td>E-mail to communicate with colleagues for purposes of patient consultation</td>
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<tr>
<td>Receive test results</td>
<td></td>
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</tr>
<tr>
<td>Store test results</td>
<td></td>
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</tr>
<tr>
<td>Review and store radiographic images</td>
<td></td>
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<tr>
<td>Drug-drug, drug-allergy, drug-formulary checks</td>
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</tr>
<tr>
<td>Maintain an up-to-date problem list of current and active diagnoses based on ICD-9-CM or SNOMED CT ®</td>
<td></td>
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<tr>
<td>Maintain active medication list</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<td>-------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Submit electronic data to immunization registries</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide patients with timely electronic access to their health information (Personal Health Record updates)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Provide clinical summaries for patients</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>Exchange key clinical information (for example, problem list, medication list, allergies, diagnostic test results), among providers of care</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Perform medication reconciliation</td>
<td>✔️</td>
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<tr>
<td>Provide summary care record for each transition of care and referral</td>
<td>✔️</td>
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<tr>
<td>Clinical decision support including diagnostic test ordering</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>Incorporate clinical lab-test results into EHR as structured data</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, and outreach</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Send reminders to patients per patient preference for preventive/ follow up care</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Maintain active medication allergy list</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Record and chart Vital Signs including Body Mass Index (BMI)</td>
<td>✔️</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>Desktop Computer</td>
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<tr>
<td>Laptop Computer</td>
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<td>Tablet Computer</td>
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<tr>
<td>High Speed Internet access</td>
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<tr>
<td>Dial-up Internet access</td>
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<tr>
<td>Wireless Internet access</td>
<td>✔️</td>
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<td>✔️</td>
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</tbody>
</table>
14. If you do NOT use or are NOT interested in using the following computerized tools for patient care, please check any of the following reasons why.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Security/privacy concerns</th>
<th>Benefits not clear</th>
<th>Monetary investment required</th>
<th>Could detract from NP/patient relationship</th>
<th>Lack of knowledge about</th>
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<tbody>
<tr>
<td>Electronic Medical Records</td>
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</table>
### 15. Please indicate which best describes your use of a hand-held electronic device or personal digital assistant.

1. No, I do not use a hand-held device or PDA
2. Yes, I use a hand-held electronic device or PDA mostly for personal activities
3. Yes, I use a hand-held electronic device or PDA is an integral part of my everyday practice

### 16. If you use a hand-held electronic device or PDA, in what ways to use it in your practice? (Select all that apply)

1. medical records
2. electronic references
3. medical calculators
4. practice guidelines
5. prescription writing
6. billing
7. I do not use it for practice
8. Other

### 16a. If you use a hand-held electronic device in your practice, please select the applications that you use most frequently

1. Epocrates®
2. Epocrates® Deluxe or Essentials
3. Skyscape®
4. Tarascon®
5. Monthly Prescribing Reference®
6. Other
17. If you do not currently use a hand-held device or PDA do you expect to begin using one?

1. Yes, expect to in the next 12 months
2. Yes, expect to in the next 24 months
3. No, do not expect to been the next 24 months
4. Not sure

18. Which best describes your use of the computer to record notes (select only one)?

1. I am doing that now
2. I expect to in the next 12 months
3. I expect to in the next week or months
4. I do not expect to the next 12 months
5. I do not expect in the next 24 months
6. Not sure
7. I do not use the computer to enter notes

18a. I believe the use of electronic medical record note taking:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improves patient care quality</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Decreases patient care quality</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Increases preventive health testing/screening/treatment</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Decreases preventive health testing/screening/treatment</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Improves efficiency of patient visit</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Decreases efficiency of patient visit</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Improves referral follow-up/tracking</td>
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<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Decreases referral follow-up/tracking</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Improves patient/provider interaction</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Decreases patient/provider interaction</td>
<td>☐</td>
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<td>☐</td>
</tr>
<tr>
<td>Has a positive impact on overall patient care</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Has a negative impact on my overall patient care</td>
<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Has no impact on overall my patient care</td>
<td>☐</td>
<td>☐</td>
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</tr>
</tbody>
</table>

19. Do you have an e-mail account to use for your practice?

1. No
2. Yes
20. I use e-mail to receive regular mailings (i.e. newsletters)

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly Agree

21. I use e-mail to receive e-mail from professional list services.

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly Agree

22. I believe the use of handheld computers for electronic prescribing would substantially reduce medical errors and improve the quality of care.

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly Agree

23. My patients discuss information with me about their condition that they have obtained from the Internet.

1. Never
2. Sometimes
3. Most the time
4. Always

23a. The information that my patient obtained from the internet influences my care plan of care

1. Strongly Disagree
2. Disagree
3. No Opinion
4. Agree
5. Strongly Agree
24. My patients discuss information with me about their treatment they have obtained from the Internet.

1. Never  
2. Sometimes  
3. Most the time  
4. Always  

24a. The information that my patient obtained from the internet about their treatment influences my care plan of care.

1. Strongly Disagree  
2. Disagree  
3. No Opinion  
4. Agree  
5. Strongly Agree  

25. Patients who are using the Internet are more informed compared to those who do not use the Internet.

1. Strongly disagree  
2. Disagree  
3. No Opinion  
4. Agree  
5. Strongly Agree  

26. I believe that the use of e-mails from Patient enhances my clinical practice.

1. Strongly disagree  
2. Disagree  
3. Agree  
4. Strongly Agree  
5. I do not use email in my practice  

27. I think the use of e-mail to communicate with patients is useful to:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not useful</th>
<th>Useful</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer questions where no visit is necessary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule appointments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renew prescriptions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicate results of medical tests</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
28. I recommend the following types of Internet resources to patients:

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet support groups</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
<tr>
<td>Consumer health information</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
<td>❑</td>
</tr>
</tbody>
</table>

29. How often do you seek information from colleagues to care for your patients?

1. Never
2. Rarely
3. Several times a week
4. Daily

30. How often do you seek information from print sources to care for your patient?

1. Never
2. Rarely
3. Several times a week
4. Daily

31. How often do you seek information from online sources to care for your patient?

1. Never
2. Rarely
3. Several times a week
4. Daily

32. From the list below, select and rank barriers you believe to be most significant regarding the seeking and accessing of health information for patient care (ranked from 1 to 4 with one being the most significant barrier):

- Time it takes to search
- Format of information
- Cost of accessing external articles
- Knowledge of sources
33. How often do you use Internet resources for professional use?

<table>
<thead>
<tr>
<th>Resource</th>
<th>Never</th>
<th>Almost never</th>
<th>Few times per month</th>
<th>Few times per week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature searches (PubMed, etc.)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Fulltext journals</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Clinical guidelines</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Evidence based medicine related information</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Patient education materials</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Alternative medicine Information</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Medical textbooks</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Drug information</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Services to filter medical literature</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Services that summarize medical literature</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Clinical calculators (including any decision support tools)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Professional organizations</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Listserv</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
</tbody>
</table>

34. How often do you use print resources for professional use?

<table>
<thead>
<tr>
<th>Resource</th>
<th>Never</th>
<th>Almost never</th>
<th>Few times per month</th>
<th>Few times per week</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug references (PDR)</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Medical textbooks</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Handbooks</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Medical statistic information</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Health statistic information</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Provider directory</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Print services to filter medical literature</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Print services that summarize medical literature</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Print journals</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Professional newsletters</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
</tbody>
</table>
35. What kind of medical library access you have? (Please select of apply)

1. Small medical library within office setting
2. Hospital medical library
3. Large university medical library
4. Library via the Internet
5. No immediate access to medical library

36. If you have access to medical library, how often you use any of the services?

1. Never
2. Rarely
3. Several times a week
4. Daily

37. Please indicate how the use of information technology has impacted your practice

<table>
<thead>
<tr>
<th>Knowledge about and treatments</th>
<th>No impact</th>
<th>Minor impact</th>
<th>Major impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge about medications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge about screening tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge about diagnostic testing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge about disease prevention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge about health promotion behaviors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of current clinical guidelines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of patient diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of test results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescription of medications</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

38. How do you track your clinical work for billing purposes? (Select all that apply)

1. Record on handheld devices
2. Billing codes are generated automatically as part of clinical record process
3. Record on computer
4. Use billing service
5. Record on paper
6. Other
39. How do you track patient contacts when on call? (Select all that apply)

1. Record on hand held devices
2. Record on computer
3. Record on paper
4. Other

40. In your opinion, what is the overall impact of EMR utilization on patient/provider interaction?

Thank You for your Time!
APPENDIX B: DISCLOSURE DOCUMENT
The University of Arizona Consent to Participate in Research

Utilization and Influence of Health Information Technology on Kentucky Advanced Practice Registered Nurses Clinical Decision Making

Principal Investigator: Jason T. Shuffitt, MSN APRN

Sponsor:

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to participate.

You may or may not benefit as a result of participating in this study. Also, as explained below, your participation may result in unintended or harmful effects for you that may be minor or may be serious, depending on the nature of the research.

1. Why is this study being done?
The purpose of this research is to investigate the influence of health information technology on Kentucky advanced practice registered nurses’ clinical decisions.

2. How many people will take part in this study?
Approximately, 250 participants are needed to complete the data collection.

3. What will happen if I take part in this study?
You will be asked to complete a survey that asks questions about your use of information technology in clinical practice.

4. How long will I be in the study?
It will take approximately 15-20 minutes to complete the questionnaire about your use of information technology in clinical practice.

Can I stop being in the study?

Your participation is voluntary. You may refuse to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you and you will not lose any of your usual benefits. Your decision will not affect your future relationship with The University of Arizona. If you are a student or
employee at the University of Arizona, your decision will not affect your grades or employment status.

6. What risks, side effects or discomforts can I expect from being in the study?
There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can choose not to answer the question or withdraw from the survey. Your survey responses will be strictly confidential, and data from this research will be reported only in the aggregate.

7. What benefits can I expect from being in the study?
There are no direct benefits to you for participating, but this study may benefit your practice by defining current information technology use by APRN’s in Kentucky. There is no cost to take part in this study and no payment or gift will be made to you for participating.

8. What other choices do I have if I do not take part in the study?
You may choose not to participate without penalty or loss of benefits to which you are otherwise entitled.

9. Will my study-related information be kept confidential?
Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law.

Also, your records may be reviewed by the following groups (as applicable to the research):
- Office for Human Research Protections or other federal, state, or international regulatory agencies
- The University of Arizona Institutional Review Board or Office of Responsible Research Practices
- The sponsor supporting the study, their agents or study monitors

10. What are the costs of taking part in this study?
There is no cost to take part in this study, and no payment or gift will be made to you for participating.

11. Will I be paid for taking part in this study?
No payment or gift will be made to you for participating. By law, payments to subjects may be considered taxable income.

12. What happens if I am injured because I took part in this study?
If you suffer an injury from participating in this study, you should seek treatment. The University of Arizona has no funds set aside for the payment of treatment expenses for this study.
13. What are my rights if I take part in this study?
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study.

You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled.

An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

14. Who can answer my questions about the study?
For questions, concerns, or complaints about the study you may contact Jason Shuffitt, MSN at jshuffitt@nursing.arizona.edu.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or orcr.vpr.arizona.edu/irb.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact Jason Shuffitt, MSN at jshuffitt@nursing.arizona.edu.
Hello Fellow Providers:

My name is Jason Shuffitt and I am pursuing my Doctor of Nursing Practice degree at the University of Arizona, Tucson. As a Kentucky Advanced Practice Registered Nurse you are eligible to participate in a survey to investigate the influence of health information technology on Kentucky APRNs’ clinical decision making.

Approximately 250 respondents are needed for the study. The survey asks questions about your use of information technology in clinical practice. It will take approximately 15-20 minutes to complete the questionnaire.

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you cannot answer them or withdraw from the survey. Your survey responses will be strictly confidential and data from this research will be reported only in the aggregate. Your information will be encrypted and will remain confidential. Although there are no direct benefits for participating, this study may benefit your practice by developing constructs of current utilization of information technology by APRN’s in Kentucky.

Thank you for your time and I appreciate your participation in the survey. Please email me at jshuffitt@nursing.arizona.edu if you have any questions about the survey.

Please follow the link below to be taken to the survey informed consent page and complete the survey:

--------------------------SURVEY HYPERLINK WILL BE INSERTED HERE--------------------------
APPENDIX D: UA IRB APPROVAL
HSPP Correspondence Form

Date: 12/16/10
Investigator: Jason Shuffitt, Doctoral Student
Advisor: Judith Effken, Ph.D., R.N.
Project No./Title: 10-0949-02 Utilization and Influence of Health Information Technology on Kentucky Advanced Practice Registered Nurses Clinical Decision Making
Current Period of Approval: 12/16/10 – 12/15/11

Submit the “FORM: Continuing Review Progress Report” no later than 45 days prior to the end of the approval period listed above.

IRB Committee Information
IRB2 – IRB00001751
Expedited Review – New Project
Administrative Action
FWA Number: FWA00004218

<table>
<thead>
<tr>
<th>Documents Reviewed Concurrently</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application for Human Research (received 12/14/10)</td>
<td>Appr</td>
</tr>
<tr>
<td>Consent Form (version 12/14/10)</td>
<td>Appr</td>
</tr>
<tr>
<td>VOTF (received 12/14/10)</td>
<td>Appr</td>
</tr>
<tr>
<td>Site Authorization: Recruitment Authorization from Kentucky Coalition of Nurse Practitioners &amp; Nurse Midwives</td>
<td>Appr</td>
</tr>
<tr>
<td>Recruitment Materials: Survey Announcement</td>
<td>Appr</td>
</tr>
<tr>
<td>Data Collection Instruments: Survey Instrument</td>
<td>Appr</td>
</tr>
<tr>
<td>Other (define): CV - Shuffitt</td>
<td>Appr</td>
</tr>
</tbody>
</table>

Determination
Approved as submitted effective 12/16/10

Comments
- Attached are stamped approved consent documents. Use copies of these documents to document consent.

Regulatory Determination(s)
Criteria for Approval has been met (45 CFR 46.111)
Eligible for Expedite Approval (45 CFR §46.110)
Expedite Approval (45 CFR 46.110 Category 7)
Waiver of Documentation of Informed Consent (45 CFR 46.117(c)(2)): the research involves no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context (conducting anonymous online survey).

Reminder: No changes to a project may be made prior to IRB approval except to eliminate apparent immediate hazard to subjects.

Arizona's First University — Since 1885
Form version: 10/01/2010
Elaine G. Jones, PhD, RN
Co-Chair, IRB 2 Committee
UA Institutional Review Board

12/16/10

Date

cc: Unit Reviewer
REFERENCES


