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Exploring and Understanding Factors that Affect the Adoption of Personal Health Records Among Healthcare Providers

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Submitted in partial fulfillment of therequirements for the degree of Doctor of Philosophy

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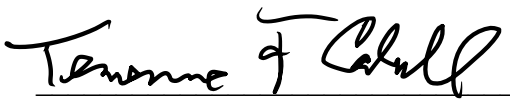
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DEDICATION

I dedicate this dissertation with gratitude to my dad Abdulaziz Samarkandi, my mom Hayat Badur who provides me continuous support and tremendous love.

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ABSTRACT

Exploring and Understanding Factors Affect the Adoption of Personal Health Records Among Healthcare Providers

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Statement of the problem: Lately, there has been increasing recognition of the importance of PHRs in achieving healthcare transformation in the U.S. Regardless significant consumer interest and expected benefits, generally adoption of PHRs remains relatively low. For the continuing development of patient PHRs, exploring factors that affect the behavior intentions of healthcare providers to adopt PHRs is significant. The Purpose of this study was to create a valid tool entitled “Personal Health Record Assessment Survey” (PHRAS) then implement this tool in the population to understand the predictive relationship, if any, that may exist between perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health-promoting role model, perceived usefulness and perceived ease of use regarding the behavioral intent to adopt PHR among healthcare providers.

Methods: The study design was descriptive, exploratory, cross-sectional and correlational research design to determine the behavioral intention of healthcare providers to use PHRs. The sample consisted of 300 participants who identified as healthcare providers.

Results: Reliability for the whole tool with all factors combined was excellent (Cronbach's alpha .91). Correlations were statistically significant and showed positive findings across all eight independent variables. The relationship perceived ease of use and the adoption of PHRs (for their medical practice) was not significant. The two factors that were significant in the regression model subjective norms and perceived credibility. The healthcare provider's use of PHRs for their own health management was significantly associated with encouraging their patients to use PHRs. Significant differences existed between in adoption and use of PHRs by health care providers who use and who don't use for themselves.

Conclusions: The findings of the study suggest that healthcare providers are more likely to use a system if they feel it is secure and safe to use, and there are no privacy issues when using it. Also, if it is promoted by their health care organization, and when their physician recommends it. If their friends or colleagues are using PHRs, they will be more likely to use PHRs also. Further research is needed to gain more understanding of the factors related to ePHRs adoption by healthcare providers.

Chapter I

INTRODUCTION

Health information technology supports the transformations of the nations of health care systems in how care is delivered, how is paid for care, and how patients are engaged in their own wellness and health care. The Health Information and Technology for Economic and Clinical Health (HITECH) Act of the American Recovery and Reinvestment Act of 2009 promotes the adoption and meaningful use of health information technology to improve patient care, reduce medical errors, lower health care costs, and improve the public's health (Bloomrosen et al., 2011). The use of health information technology is becoming increasingly important in medical providers' efforts to support decision-making and to promote quality health care delivery. Health information technology is the area of information technology involving the design, evolution, creation, use, and maintenance of information systems for the healthcare industry.

The electronic medical record (EMR) is the fundamental component of the health IT infrastructure. The National Alliance for Health Information Technology (NAHIT) (2008) defined the EMR as "an electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one health care organization" (p.6). It is an individual's official

digital health record that is created by their caregiver, and it comes in a variety of shapes and sizes. The (HITECH) Act of the American Recovery and Reinvestment Act of 2009 mandated that all medical providers digitize medical records. The Act requires physicians and hospitals, under financial penalties, to transfer each patient's secure paper-based medical records to an electronic system (Blumenthal, Abrams, & Nuzum, 2015).

The Personal Health record (PHR) is a collection of health-related information that is documented and maintained by the individual that is linked to the existing Electronic medical record (EMR). The Health Insurance Privacy and Portability Act (HIPPA) stipulates that patients must be permitted to review and amend their medical records. The PHR is a rising health information technology that patients can access and that allows them to participate in their own health care. However, Wen, Kreps, Zhu, and Miller (2010) analyzed data from the 2007 Health Information National Trends, and they found that 86% of respondents considered electronic PHRs important, but only 9% had used them.

There is no universal definition of a personal health record (PHR) that has been agreed upon yet (Studeny & Coustasse, 2014). The Office of National Coordinator for Health Information Technology (ONC) (2013) defined the PHR "as an electronic record of an individual's health information by which the individual controls access to the information and may have the ability to manage, track, and participate in his or her own health care" (p. 1). Another definition promoted by the American Health Information Management Association [AHIMA] (2005) is similar, but it stresses that the PHR is not

simply a patient view on EHR data. The PHR is a digital, universally available, lifelong resource of health information that individuals need to make health decisions. Patients own and control the information in the PHRs, which comes from the caregiver and the individual. The PHR is kept in a safe and private environment, with the individual determining the rights of access. The PHR is different from and does not substitute the legal record of the health care provider. The functionality of PHRs differ, but they have one essential goal, which is to provide people greater access to healthcare data and allow them to engage in their own health management (Halamka, Mandl, & Tang, 2008). In general, the PHR is separate from the EMR, and it enables patients to track their health information that is provided by the health care provider.

PHRs have been positioned as a tool to empower consumers to play a larger and more active role in wellness and self-care (Hassol et al., 2004). The National Coordinator for Health Information Technology and the Administrator of the Centers for Medicare and Medicaid Services (CMS) identified PHRs as a top priority. Realizing that consumer engagement in health promotion and disease management is essential to quality improvement and health care cost containment strategies (Pagliari, Detmer, & Singleton, 2007). Gruman (2010) defined patient engagement as, actions individuals take to get the maximum benefit from the healthcare services available to them. Also, a 2013 Health Affairs Health Policy Brief defines patient engagement as “a broader concept that combines patient activation with interventions designed to increase activation and promote positive patient behavior, such as obtaining preventive care or exercising regularly” (p. 1). Patient engagement is desirable and important for

health information systems as it concentrates on the behaviors of the people themselves rather than the actions of health professionals. It is clear that PHRs have the potential, if designed appropriately and adopted widely, to reduce costs and simultaneously improve quality and safety of care (Kaelber, Jha, Johnston, Middleton, & Bates, 2008).

Health care providers play an important role in introducing PHRs to patients in healthcare settings and have a great role to engage and encourage the patient to use PHRs. According to, the Medical Dictionary for the Health Professions and Nursing (2012) healthcare providers refer to any health professionals who have access to EMR during the provision of care to patients or health consumers such as doctors, nurses, PT, and others offering specialized health care services. The study conducted by Serocca (2008), found that 25 percent of ambulatory care physicians were unfamiliar with PHRs and 60 percent were unaware of whether any of their patients maintained PHRs. As the health care professionals represent very important users of PHRs, understanding of their behavior intention toward PHRs is necessary for PHRs adoption that could more effectively enhance the adoption by patients. Thus, for the ongoing development of patient PHRs, exploring factors that affect the behavior intentions of healthcare providers to adopt PHRs is critical and needed.

Background and History. The idea of patient access to their medical records is not new; people used to receive and save a copy of their record. PHRs can be hard copy (paper records), documents on a disk or USB drive, or an online record (web-based) that could be connected to a health care provider (Waegemann, 2005). Archer

et al. (2011) reported that among the 47% of patients who maintained health records, 87% stated that the information was on paper. The difference is that HIT now enables individuals to keep their health information electronically.

Kim, Jung, and Bates (2011) summarized that the history of PHRs implementation and application is relatively short. The term PHR started to be accepted as a different concept from EMR in 1995 and 1996. In the middle of the 20th century, as the use of EMR became increasingly common, the term “personal” was added to EHR. Computerized PHRs have occurred for more than a decade, and it became common in late 2007 when large technology companies such as Microsoft and Google began to offer PHRs products.

Even though most patients may not be aware of PHRs, approximately 70 million people in the US today have access to some form of it (Kaelber et al., 2008). Also, the national survey by CHCF (2010) indicates that 40% of people who do not have PHRs express interest in using one, and nearly half of caregivers are interested in using a PHRs. Currently, patients have some choices as to the format of the PHRs, and there are many PHRs products in the marketplace: between 100 to 200 PHRs products in the US (Kaelber & Pan, 2008). Several large health systems such as large hospitals, ambulatory care facilities, insurers, and health plans offer patients a PHRs to securely access their test results, schedule their appointments, order refills for their medications, and email their providers (Reti, Feldman, Ross, & Safran, 2010). In general, with the support of the HITECH Act, the PHR is needed to integrate and exchange health information between health care providers and consumers. The PHR system has

become an important tool in health care to achieve quality and safety improvements, reducing the costs of health care.

Types of PHR. There are three possible approaches of PHRs, including: First, the stand-alone formats that self-maintained PHR and sometimes created online. Second, integrated PHR with EMR that can import information from different sources. Third, sponsored PHR, that is institution-centered in which the patients have access to specific health care records that are provided by a consumer's insurance company, a providers of a given healthcare agency, or a patient's employer (Tang & Lansky, 2005; Detmer, Bloomrosen, Raymond, & Tang, 2008; Tang, Ash, Bates, Overhage, & Sands, 2006; Thede, 2008; HIMSS, 2007).

The first type is a standalone PHR. Tang et al. (2006) explained that in standalone PHR individuals can create PHR using commercially available applications that are based on stand-alone systems or Web-based systems. In this type the patients fill in information from their own records; the PHR is a stand-alone application that does not connect with any other system. The patients typically use this type of PHRs to track their health progress over time by adding diet or exercise information. Sometimes, a standalone PHR can also accept data from external sources, including providers and laboratories.

The second type of PHRs is a tethered or connected PHR, which is linked to a specific health care organization's EMR system. It is the most common approach today. Several large delivery systems that operate an EHR system provide such portals and reach an increasing percentage of their eligible patients (Tang & Lansky, 2005). A

tethered PHR provides the patient with a portal or view into the data and their own health information that is stored in their provider's EMR (Thede, 2008; Detmer et al., 2008). In spite of the fact that this approach could offer reasonably rich interactions between patients and providers, the information is originally limited to a specific organization's medical record (Tang & Lansky, 2005).

The last type of PHRs is sponsored by a health plan or an employer. This approach is getting more popular. This type includes data from a patient's health insurance claim, also it may contain laboratory and pharmacy health data. Besides that, the consumer can add more health information through a Web-based system (Thede, 2008; Detmer et al., 2008). Overall, a PHR typically refers to an electronic record: either a standalone product, the one that is connected with the provider's electronic health record, or the sponsored PHRs by a health organization.

The Fundamental Characteristics and Content of PHR. Multiple PHRs models have been addressed in the literature and several studies have used web-based portals that were different in style, but most of them shared the same goal and concept (Byczkowski, Munafo, & Britto, 2014; Masys, Baker, Butros, & Cowles, 2002; Logue & Effken, 2012; Winkelman, Leonard, & Rossos, 2005; Bartlett et al., 2012).

Tang and Lansky (2005) stated that the PHR should be lifelong and comprehensive, accessible from any place at any time, provide health management tools, private and secure, and the patients determine who can access their PHR. In addition, Kahn, Aulakh, and Bosworth (2009) highlighted the importance of interoperability, data security, consumer control, and fair access as some principles of

developing a web-based PHR. Generally, PHR is a consumer-centric tool that can enhance consumers' ability to actively manage their own health and health care (Detmer et al., 2008).

PHR can include a very wide range of health information, including problem list, medication and medical history, consultation, progress notes, treatment plans, X-ray and imaging reports, laboratory results, immunization records, and other personal health information (Do, Barnhill, Heermann-Do, Salzman, & Gimbel, 2011). Additionally, the PHR encourages communications and dialogue between patient and health care professionals such as physicians, nurses, pharmacists. In the study by Wagholikar (2013), that aimed to characterize a framework to incorporate various online PHR for providing effective self-managed and collaborative care, the author explained the solution of collaborative PHR platform that can be accessed by the patients from a web-enabled device with a web browser that offers common purpose and features. The PHR platform provides the patients as well as their care providers with a universal view of health information. Furthermore, the caregivers have the ability to add clinical notes to the patient's PHR, and the patients can integrate with their provider through the platform. Also, the platform offers communication methods between patients and caregivers that include video, voice, and text. Many PHRs also provide linkages to convenience tools such as requesting appointments, requesting prescription renewals, and asking billing questions.

On the other side of an individual's personal data, PHR might include demographic information and other relevant information about family members,

caregivers, and home and work environments that are related to the patient's health (Tang et al., 2006). The PHR sponsored by health insurances may include medical and pharmacy claims data and allow patients to record additional information through a separate portal of claims-based record, and some insurers provide features to facilitate data sharing with physicians (Grossman, Zayas-Cabán, & Kemper, 2009).

Example of PHR systems. Today, there are several examples of PHRs system that have different capabilities based on a significant type of PHR system. According to Grossman et al. (2009), Aetna, CIGNA, United HealthCare, and WellPoint are four examples of national insurance companies who provide PHR to their consumers. CIGNA has incorporated the Quicken Health Expense Tracker into the PHR for its members at myCigna.com. UnitedHealth Group (UHG) also offers a PHR to its members named myOptumHealth.com. In addition, Grossman et al. (2009) highlighted Walmart as a large employer that is offering a PHR to employees that is automatically filled initially with insurer claims data as an example of the employer-sponsored PHR type.

Do et al. (2012) administered a study that aimed to evaluate a PHR that linked to the military health system, that was offered by Microsoft HealthVault and Google Health infrastructure based on user predilection. The study showed that recently PHR has been considered as empowering tools for patient activation, and adopting standards in design can improve the usability for both patients and providers. The evaluation showed that both compared PHR systems met information privacy and security requirements

while offering the opportunity for military beneficiaries to access and share their health information on the Internet (Do et al., 2012).

Another new potential platform of the PHR is smartphones and tablet applications. The application can be applied in the future targeting patients, as the use of mobile devices continues to grow. According to the study by Kharrazi, Chisholm, Vannasdale, & Thompson (2012) that evaluated the function, content, and security of stand-alone mobile PHR applications for the three different smartphone platforms: iOS, BlackBerry, and Android. The finding of the study considered the PHR as a long-term patient empowerment tool that can be utilized by new advancements in mobile technology.

Problem Statement

The need to cut health care cost and increase quality by engaging patient in their health by using the PHRs justifies the need for a more effective active approach among patients to get the potential benefits of the PHRs. In recent years, there has been increasing recognition of the importance of Personal Health Records (PHRs) in accomplishing healthcare transformation in the U.S. Despite significant consumer interest and anticipated benefits, overall adoption of personal health records (PHRs) remains relatively low. According to the national survey by CHCF (2010,) only 7% of the American population are using the PHRs to manage their disease. It is clear, PHRs are not being utilized to their predicted extent in the clinical setting. That there isn't much new information to substantiate or increase these statistics, and hence the adoption of PHRs in the U.S. is still in its initial stages. There are a number of factors that may

contribute to the lack of utilization of PHRs, so it is important to investigate some of the reasons why.

Need for this Study

There is considerable literature concerning the impact of PHRs on improving the patient experience of health care, outcomes, and cost. PHRs can be a powerful tool to generate consumer support in achieving the triple aim of health care that is improving outcomes, providing better patient care, and lowering cost (Baudendistel et al., 2015). PHRs systems have the potential to empower consumers to play a larger and more active role in self-care and their health management (Wagner, 2014; Beckjord, Rechis, & Hesse, 2012; Hassol et al., 2004). PHRs have the prospective to facilitate a transformative improvement in health care delivery, if designed appropriately, successfully implemented, and adopted widely (Kaelber et al., 2008; Assadi, & Hassanein, 2017). A study conducted by Kaelber and Pan (2008) showed that if 80 % of the population were to use PHRs, the United States could save up to $21 billion annually. The most recent national survey by the California Healthcare Foundation (CHCF, 2010) found that PHRs are still not widely used. Even though most patients may not be aware of PHR, approximately 70 million people in the US today have access to some form of it (Kaelber et al., 2008). Moreover, the study of Ford, Hesse, and Huerta (2016) indicates PHR technology is likely to achieve significant adoptions by 2020 that is 75% of US adults will use PHR.

It is important to understand the benefits of PHRs to the patients, depending on the patient's active role in his/her health management. That is, to focus on providers as

the users of the PHR systems, and explore aspects including the constructs for behavioral intention to use the PHR to understand the needs of different user segments. Health care providers play an important role in introducing PHR to patients in healthcare settings and have a great role to support and encourage the patient to use PHRs (Tang et al., 2006; Assadi, & Hassanein, 2017). According to the Medical Dictionary for the Health Professions and Nursing (2012) healthcare providers refer to any health professionals who have access to EMR during the provision of care to patients or health consumers such as doctors, nurses, PT, and others offering specialized health care services. The study of Serocca (2008), found that 25 % of ambulatory care physicians were unfamiliar with PHRs and 60 % were unaware of whether any of their patients maintained PHRs. As the health care professionals represent very important users of PHRs, understanding of their behavior intention toward PHRs is necessary for PHRs adoption that could more effectively enhance the adoption by patients. To date, there is limited research that examines variables such as the perceived usefulness, perceived ease of use, and self-efficacy of PHRs among healthcare providers in their medical setting or for their own healthcare management. There are few studies have examined some particular health care professionals' group such as nurses PHRs use for their own personal health management. It is important to research this area because when health care provides express intention and acceptance to use PHRs for their own health management, they will encourage their patients to use PHRs (Gartrell et al., 2015). Health care providers support the changing roles of their patients to be more active in their own health care by encouraging them to maintain their records. Thus, for the

ongoing development of patient PHRs, exploring factors that affect the behavior intentions of healthcare providers to adopt PHRs is critical and needed.

Purpose of the Study

The purpose of this study is two-fold. First, to determine the reliability (Cronbach alpha) of the newly created "Personal Health Record Assessment Survey (PHRAS)" that was validated using a Delphi panel of experts. The tool addresses nine key constructs discussed in the literature in relation to personal health records (PHRs) adoption by health care providers. Second, the validated and reliable survey tool was used in the population of interest in order to help to identify and understand the predictive relationship, if any, that may exist between 1) perceptions of knowledge, 2) attitudes, 3) subjective norms, 4) self-efficacy, 5) perceived credibility, 6) perceived health-promoting role model, 7) perceived usefulness and 8) perceived ease of use regarding the 9) behavioral intent to adopt PHR among healthcare providers. Also, to determine if there is a difference in the adoption and use of PHRs by health care providers who use and who don't use for themselves. The literature has identified many factors that may slow the adoption of PHRs, only a small number of studies have been done to investigate these factors and what their relationship is to the adoption of this technology among healthcare providers. Studies, such as Gartrell et al. (2015) and Chung, and Wen (2016) work, have investigated some factors, but only in one group of providers that were nurses. Healthcare providers such as doctors, nurses, physician assistants, PT, and others offering specialized health care service have a direct role to encourage people to be more proactive in their own health care. The use of PHRs from

the health care professional perspective has not been fully discussed yet in a particular study.

Variables

The outcome variable was the behavioral intent to adopt PHRs. The predictor variables include perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health-promoting role model, perceived usefulness, perceived ease of use of the PHRs.

Research Questions

The overarching research interest framing the dissertation study was as follows:

Do perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health promoting role model, perceived usefulness and perceived ease of use of the PHRs affect the health care providers' PHRs adoption and use, utilizing my conceptual framework?

The following section provides an overview of several research questions, these questions were formulated to explore each construct of the theoretical framework. These questions will guide the research process in exploring the problem:

RQ.1. Is there relationship between ***perceived usefulness*** of the PHRs and the behavioral intentions to adopt it by healthcare providers?

RQ1. a. Will a relationship exist between perceived usefulness and the likelihood to adopt for their medical practice?

RQ1. b. Will a relationship exist between perceived usefulness and the likelihood to adopt for their own health management?

RQ.2. Is there a relationship between ***perceived ease of use*** of the PHRs and the behavioral intentions to adopt it by healthcare providers?

RQ2. a. Will a relationship exist between perceived ease of use and the likelihood to adopt for their medical practice?

RQ2. b. Will a relationship exist between perceived ease of use and the likelihood to adopt for their own health management?

RQ.3. Is there a relationship between healthcare providers' ***attitudes*** toward PHRs system and the behavioral intentions to adopt it?

RQ.4. Is there relationship between perceptions ***of knowledge*** of the PHRs and behavioral intentions to adopt it by healthcare professionals?

RQ.5. Is there relationship between ***subjective norms*** and healthcare providers' behavioral intentions to adopt PHRs?

RQ.6. Is there relationship between ***self-efficacy*** and healthcare providers' behavioral intentions to adopt PHRs?

RQ.7. Is there relationship between ***perceived credibility*** and healthcare providers' behavioral intentions to adopt PHRs?

RQ.8. Is there relationship between healthcare providers' ***perceived health-promoting role model*** and the behavioral intentions to adopt PHRs?

RQ.9. What ***factors*** will best predict the probability of the behavior intend to adopt PHRs among healthcare providers?

RQ.10. Is there relationship between ***healthcare provider's use PHRs for their own health management*** and ***encouraging their patients to use PHRs***?

RQ.11. Will a significant difference exist in adoption and use of PHRs by healthcare providers ***who use*** and ***who don't use*** for themselves?

Research Hypotheses

For each research question, that were developed around the gaps in the literature a directional hypothesis was addressed in this quantitative study:

H.1. There is a positive relationship between perceived usefulness of the PHRs and the behavioral intentions to adopt it by healthcare providers.

H1. a. A positive relationship exists between perceived usefulness and the likelihood to adopt for their medical practice.

H1. b. A positive relationship exists between perceived usefulness and the likelihood to adopt for their own health management.

H.2. There is a positive relationship between perceived usefulness of the PHRs and the behavioral intentions to adopt it by healthcare providers.

H2. a. A positive relationship exists between perceived ease of use and the likelihood to adopt for their medical practice.

H2. b. A positive relationship exists between perceived ease of use and the likelihood to adopt for their own health management.

H.3. There is a positive relationship between healthcare providers' attitudes toward PHRs system and the behavior intend to adopt PHRs system.

H.4. There is a positive relationship between perceptions of knowledge of the PHRs and the behavioral intentions to adopt it by healthcare professionals.

H.5. There is a positive relationship between subjective norms and healthcare providers' behavior intend to adopt PHRs.

H.6. There is a positive relationship between self-efficacy and healthcare providers' behavioral intentions to adopt PHRs.

H.7. There is a positive relationship between healthcare providers' perceived health-promoting role model and the behavioral intentions to adopt PHRs.

H.8. There is a positive relationship between perceived credibility and healthcare providers' behavioral intentions to adopt PHRs.

H.9. A statistically significant regression model will describe the factors that predict the probability of the behavior intention to adopt PHRs among healthcare providers.

H.10. There is a positive relationship between healthcare providers' use of PHRs for their own health management and encouraging their patients to use PHRs.

H.11. There is a significant difference in adoption and use of PHRs by healthcare providers who use and who don't use for themselves.

Significance of the Study

Since the use of PHRs for health management and self-care is a reasonably new, little is known as the adoption of the PHRs by patients and caregivers in the U.S. is in its primary stages. The literature supports the positive side for the use of the PHRs, suggesting that it would be beneficial for both Patients and health care providers, but this has not been widely used for some reasons. PHRs are consumer-centric tools that can strengthen consumers' ability to actively manage their own health care as previously stated in the literature. Accordingly, a study that explores the health care providers' adoption of PHRs for their own health management, and for their patients would be extremely beneficial and significant.

Theoretical Discussion and Conceptual Framework

This research will be framed within three theoretical and conceptual frameworks, which are the technology acceptance model by Davis et al. (1989), the theory of Planned Behavior (TPB) of Ajzen (1991), and self-efficacy theory (SET) of Bandura's (1995). These three theoretical and conceptual frameworks provided the contextual

theoretical lens, in order to explore the behavioral intention of the healthcare providers to adopt personal health records.

The first conceptual framework that was used for this research study is the technology acceptance model by Davis et al. (1989). The TAM measures behaviors regarding a new technology which can identify how users will act to accept and use a new technology (Davis et al.,1989). The concepts of the perceived usefulness and perceived ease of use in the TAM are much the same as the structure of Rogers' perceived relative advantage and low complexity in the DOI theory. The usefulness section of the model attempts to measure a provider's perceived benefit of the adoption of PHRs. The technology barriers part includes ease of use or the patient's ability to comfortably use technology. These two structures predict the individuals' attitude toward using the PHRs. Overall, TAM could be applied to examine the factors that may have an influence on the health care provider's intent to use a PHRs.

The second conceptual framework, that was used in my research study is the theory of Planned Behavior (TPB) of Ajzen (1991). The theory predicts an individual's intention to involve in behavior at a certain time and place. It proposes that individual behavior is driven by behavior intentions, where behavior intentions are a result of three elements: a person's attitude toward behavior, subjective norms, and perceived behavioral control (Ajzen, 1991). Generally, the greater the strength of these three functions, the greater the strength of an individual's desire to do a particular behavior, or one's intention (Ajzen, 2002). The attitudes, subjective norms, and perceived behavioral control would be applied to predict the healthcare provider's adoption of the PHR.

The third theoretical framework, which was used in this research study, is the self-efficacy theory of Bandura's (1995). The self-efficacy is part of the social cognitive theory of Bandura's (1986). The self-efficacy theory of Bandura's (1995) indicated human motivation as the basis for attaining positive results. The self-efficacy construct could be applied to analyze the PHRs use and adoption. That is, the PHRs have the potential to impact the level of self-efficacy of individuals and help them in engaging in health care. The self-efficacy framework could help to determine the willingness to adopt a personal health record that is the desired positive behavior. In general, each theory provides its own set of predictors and outcomes, a further conceptual framework will be explained more in detail in the following section.

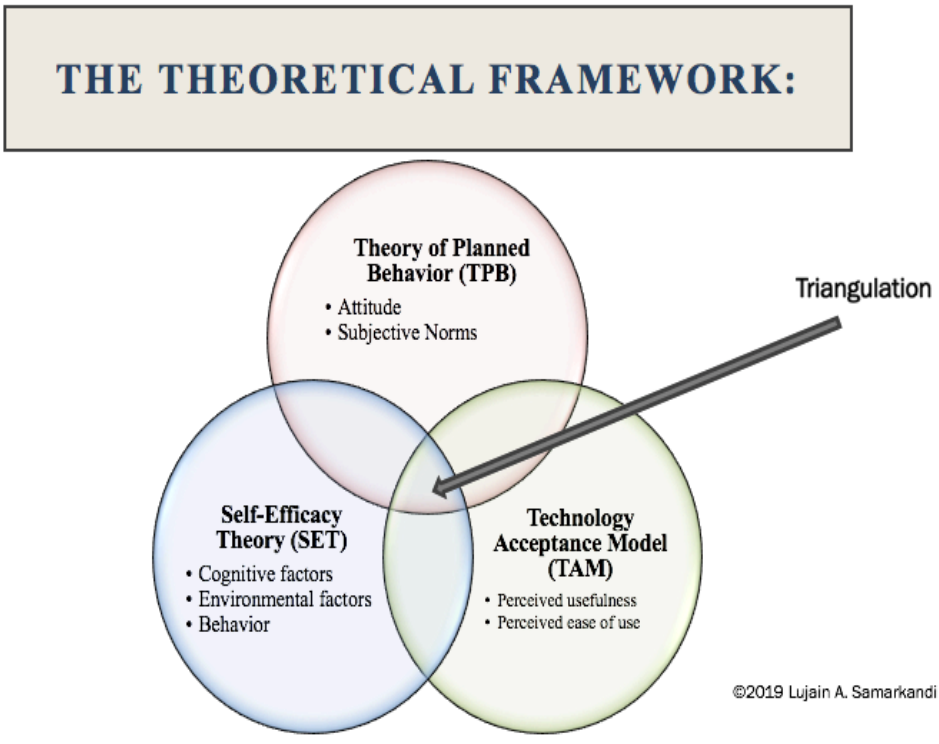

Figure 1. Theoretical framework. The above figure illustrates the theoretical framework, incorporating the factors from literature review into theories.

In the same way, Venkatesh *et al*. (2003) reviewed eight user acceptance models and then developed the Unified Theory of Acceptance and Use of Technology. The competing theories that UTAUT put into consideration include the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Diffusion of Innovation theory, Theory of Planned Behavior (TPB), Model of PC Utilization (MPCU), Social Cognitive Theory (SCT), and Combined Technology Acceptance Model and Theory of Planned Behavior. The model proposes that Performance Expectancy (perceived usefulness), Effort Expectancy (perceived ease of use), Social Influence (subjective norm) and Facilitation Conditions (control beliefs) have an influence on actual use. All these factors have been addressed in the developed theoretical framework. However, the UTAUT does not include self-efficacy as direct determinants, while self-efficacy had been modeled as indirect determinants of intention fully mediated by perceived ease of use (Venkatesh ,2000). The benefit of the developed theoretical framework that is the self-efficacy construct can further explain the behavior intention to adopt PHRs.

Self-developed Conceptual model

During the development of this research, PI developed conceptual framework with eight factors that can relate to the adoption of PHRs by healthcare providers. It utilized different aspect of three particular theories and some themes from the literature review. The conceptual framework was used as guidelines to formulate the research questions.

First, the Technology Acceptance Model by Davis et al. (1989) to determine a healthcare provider's attitude toward using the PHR. According to the definition of a PHRs, it can provide a better understanding of the intentions of individuals to adopt PHRs to access, control and share their health information. Perceived Usefulness refers to the degree to which a person believes that using a particular system would enhance his or her job performance (Davis et el.,1989). Perceived Ease of Use refers to the degree to which a person believes that using a particular system would be free from the effort (Davis et al.,1989). Numerous studies that involve healthcare professionals have evaluated the relationships within TAM or extended TAM (Chung et al., (2016); Garterell et al., (2015); Kowitlawakul, (2011)). The literature review identified that perceived usefulness and perceived ease of use are two of the most important factors for intention to use and actual use of PHRs. Accordingly, TAM is utilized in this study to determine the relationships of *Perceived Usefulness* and *Perceived Ease of Use* in the PHRs adoption and use context. However, the TAM explain the intention to use PHRs, measures the perceptions of technology and its impact on attitude toward a behavior but does not explain aspects the type of technology, target user, and user environment (Moon, & Kim, 2001). Thus, the variables the TAM cannot fully describe the intentions of health providers to use PHRs, and it is essential to employ other factors, such as subjective norms and that provide further explanation to understand the behavioral intended of health care professionals to adopt PHRs.

Second, the Theory of Planned Behavior (TPB) of Ajzen (1991). The TPB explain attitudes, subjective norms, and perceived behavioral control in relation to intentions to

adopt technology but it does not explain the effect may possibly have on attitudes toward technology. Attitude refers to an individual's positive and negative assessment with consideration of behavior (Ajzen & Fishbein, 1980). That is, perceptions may impact behavioral intentions to adopt a PHRs in a different way by the individual's attitudes. Subjective norm refers to a person's perception of the people remarkable to him/her and his/her thoughts regarding a specific behavior (Ajzen & Fishbein, 1980). There are some studies used factors in the TPB model in the perspective of PHRs adoption and use among both patient and health care professionals, and the finding explained the factors self-efficacy, and subjective norm have a significant impact on the behavioral intention of using the PHRs system (Hui-Lung et al., (2016); Chung et al., (2016)). Additionally, the study of Jian et al. (2012), that aimed to explore factors influencing behavior and adoption of USB-based Personal Health Records (PHRs) in Taiwan. The finding showed that subjective norms change usage intention positively. Perceived behavioral control refers to the perceived ease or difficulty of performing the behavior (Ajzen, 1991). In fact, perceived behavioral control was obtained from Banduras' (1977) study on self-efficacy.

Third, the Self-Efficacy Theory of Bandura (1995). Self-efficacy refers to a person's belief in his or her ability to execute behaviors necessary to do specific performance attainments (Bandura, 1977, 1986). The main concept of the theory is that more confidence in doing a specific behavior makes it possible for an individual to become more engaged in the health care process. Particularly, computer self-efficacy is a person's judgment of the capability to use computers and represents the perception of

behavioral control of a person in the information technology field (Compeau, & Higgins, 1995). Use of PHRs in this approach support individuals by raising their self-efficacy through accessing health information that allows them to determine their ability to set goals they can achieve. The literature review highlighted the patient's intention to use a PHRs, and the patient's ability to comfortably use such technology as factors could impact the adoption of PHRs (Nokes et al., 2013). The study Iqbal et al., (2013), used TAM and TPB integration to measure the relationship between intention to use EHRs and adoption behavior among PHC physicians. The findings highlighted that the higher a physician's self-efficacy, perceived usefulness, and subjective norm levels were, the more likely health care providers would like to adopt the electronic health records system. The health care professionals should have the self-efficacy to make, use and maintain a personal health record. The self-efficacy framework could help to determine the willingness to adopt a personal health record that is the desired positive behavior.

In addition, the PI identified three particular key constructs have emerged in the literature regarding PHRs adoption and use by health care providers. First, the literature review identified privacy and security concern as one of the factors that affect the adoption of PHRs. Perceived credibility is the degree to which an individual considers that using information system (PHRs) is controlled against privacy and security risks (Ong., Lai, & Wang, 2004). Acutely, perceived credibility is a main concern for health providers, as using PHR is attached to the health of patients and health providers need to make sure that ePHRs have privacy and security before using them. Nemours studies that involved both health care providers and patients indicated that data

protection is a concern regarding PHRs adoption and use (Gaskin, Bruce, & Anoshiravani, 2016; Dontje, Corser, & Holzman, 2014; Witry, Doucette, Daly, & Levy, 2010). Therefore, perceived credibility is applied to the conceptual frameworks to enhance the understanding of the behavior intentions of health care providers to adopt PHRs.

Another factor based on literature reviews, perception of knowledge is suitable to be paralleled with the constructs in the conceptual frameworks as predictors for the behavior intention to adopt PHRs by healthcare providers. Perception of knowledge is defined as the range of one's information or understanding; the sum of what is known (ASA, 2014). Knowledge of the technology must acquire an amount of knowledge that they perceive as sufficient to make a decision of adopting the PHRs. The study of Nazi (2013), found out that lack of knowledge is one of several elements have inhibited the (My HealtheVet PHR) adoption, and use. Also, the result stated to engage clinicians and raise the adoption and use of PHRs features, greater knowledge about PHRs features is clearly needed.

The last factor incorporated from the literature is perceived health-promoting role model, which is the degree to which an individual believes that an individual has a responsibility to model personal health-promoting practices and behaviors (Rush, Kee, & Rice, 2010). In the study by Garterell et al. (2015), the perceived health-promoting role model of nurses was positively associated with PHRs use. This is critical as health care professionals can be role models for patients and be more credible and motivating to help them adopt or maintain their own health care. Lobelo, & de Quevedo (2016),

stated that physicians and health care providers' personal habits are a key, and might predict the manner in which they counsel and influence their patients' behaviors on related health habits. Therefore, it is applied to the model to provide more understanding of the behavior intentions of health care providers to adopt PHRs. Figure 2 is a diagram that was created by the PI, which includes all constructs discussed to develop the conceptual framework.

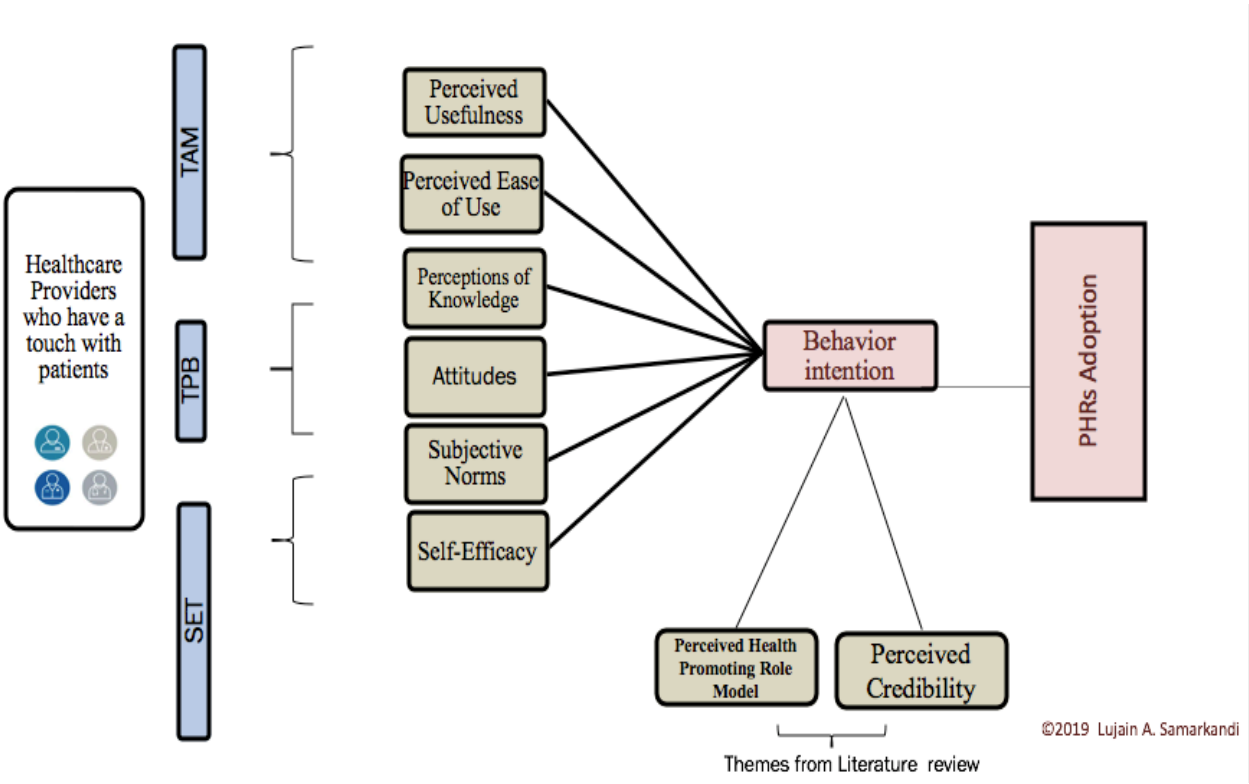

Figure 2. Self-developed Conceptual Model of Constructs.

Chapter II

REVIEW OF RELATED LITERATURE

Introduction

PHR is a consumer-centric tool that can strengthen consumers' ability to actively manage their own health (Detmer et al., 2008). Studies on PHRs focus on patients as the users of the systems, exploring aspects including patients' attitudes toward PHRs, factors in PHRs adoption, patients' needs and concerns, and usability guidelines for designing PHRs for end-users. Very few studies have been done to explorer the healthcare providers behavioral intention to adopt this technology or what other factors may cause the low adoption of PHRs. Regardless of the challenges associated with implementing the PHRs in the US healthcare system, the PHR has significant benefits to patients, health care professionals, and organizations. Several studies have concluded that more PHRs-related research is required to look toward the PHRs adopting challenge to create meaningful use of a PHR instrument (Winkelman et al., 2005; Logue & Effken, 2012). The national survey by CHCF (2010) found that PHRs are still not widely used. The purpose of this review is to synthesize the current literature that focuses on PHRs adoption from the consumer's and healthcare provider's perspectives.

The Benefits of PHR

PHRs have a major impact not only on patients but also on health care providers. The PHRs can bring potential benefits to the health care and improve health outcomes in many areas (Tang et al., 2006; Winkelman et al., 2005; Bartlett et al., 2012; Kaelber et al., 2008). First, it can provide better communication between the patient and health care provider, including improved patient-provider relationships and increased patient empowerment. Second, it can provide more information, and improve awareness of the patient. Third, it can reduce the cost of care. Fourth, it can help patients to participate in their treatment and be involved in decision-making improving patient engagement, and encouraging self-management. Last, it can enhance care safety, efficiency, coordination, and quality.

The PHRs have the chance to introduce many positive impacts in managing disease and improving patient's health. In fact, PHRs can have many benefits to the health care payers and purchasers such as insurance companies and Medicaid programs. The PHRs have the potential to reduce the cost of chronic disease, which becomes the highest cost rates in the US. According to the Centers for Disease Control and Prevention (CDC) (2009), more than 75% of all health care costs are due to chronic conditions. By making health information available when it is needed, PHRs could help improve preventive care and disease management control. For instance, PHRs could decrease duplicate testing and unnecessary testing. The meaningful use of PHRs could lower chronic disease management costs, lower wellness program costs, and lower medication costs.

Moreover, PHRs have the potential to benefit patients and improve health outcomes. According to the study by Winkelman et al. (2005) that aims to discover how patients who were living with chronic inflammatory bowel disease (IBD) could gain a benefit from web-based patient access to their electronic health records. The research team of this notable study established four themes that create a theoretical framework of the usefulness of sharing health information, that were patient feels illness ownership, patient ability to participate in communication, personalized support for patients, and enhance mutual trust between patient and caregiver.

Additionally, the PHRs can support patient empowerment and increase their knowledge. In the study by Bartlett, Simpson, and Turner (2012) the objective was to test the feasibility and acceptability of making health data from a complex chronic disease pathway (renal medicine) accessible to patients on the Internet in the UK. The results of the study proved that patient access to secondary care records concerning a complex chronic disease by the Internet is feasible and popular. Also, it increased patients' empowerment and understanding, and there was no serious negative result. Clearly, the PHRs could improve patient engagement in their health care, which can increase their understanding of their illness and improve their satisfaction.

PHRs provide more education for patients when they can find more information about ongoing documentation such as symptoms, medication and side effects of their disease. Somner, Sii, Bourne, Cross, and Shah (2013) stated that if the health care providers put the patients in control of their records and enhance more patient-centered

PHRs, that can act as both health record and self-care educational tool to transform the care for some health conditions and maximize the use of available resources.

Furthermore, the healthcare provider can benefit from PHRs to improve the quality of care. By implementing the right approach to PHRs, the caregiver can make better decisions and can reduce medical errors. Wagholikar, Fung, & Nelson (2012) conducted a specific study that described a case-based reasoning approach to improve self-care that focused on prostate cancer patients in an online PHRs perimeter. The results showed that the proposed approach could benefit prostate cancer patients and the caregiver in many obvious ways. Patients may learn about effective interventions by learning about similar patient journeys. The availability of health data could help the patient understand their treatment method and its impact. The health care provider could use the system in the decision-making process and interact with their patients. In the study of Witry et al. (2010) that aimed to examine the benefits, barriers, and use of PHRs from a physician and medical staff views. The providers highlight that number of patients groups could have significant benefits of using PHRs, and they stated out the potential advantages such as decrease errors and increase efficiency that PHRs could have for patients visiting the emergency room. The study indicates that providers mainly view PHRs as a substitute source of health information secondary to the patient's medical record, and not just a tool for patients. To sum up, the use of PHRs to manage disease can have many advantages for many different healthcare users, including patients, providers, and even healthcare payers.

The Challenges of PHR

Adopting such a system can have barriers and obstacles from different aspects of the PHRs user. Several problems have been frequently listed as the key challenges to the use of PHRs by patients and health care providers, that include: privacy and security concerns, costs, integrity, accountability, health literacy and legal and liability risk (Aleman, Senor, & Toval, 2010).

The major challenges for implementing PHRs in most health care organizations are the privacy and security issues. Henriksen, Burkow, Johnsen, & Vognild (2013) illustrated four main aspects of information security: confidentiality, integrity, availability, and quality. Those four aspects used as an evaluation of the privacy and security level of necessary information when they designed a home-based service that provides personal electronic health diary and communication. In other words, to implement a PHRs as a service it must first meet privacy and security requirements. For instance, the quality of the information means it is correct and not misleading, and confidentiality is the property that information is not made available for unauthorized persons (Henriksen et al., 2013). Their method conforms to ISO's standard for information security risk management. The results of their study concluded that it was possible to design a home-based service, which ensures the necessary level of information security and privacy.

Personal health information is very sensitive, and patients are always concerned about who can access their information from their physician. On the other hand, the health care providers concern about the assurance of privacy and security of their

patients' records, especially when they use and exchange health information with other healthcare organizations. Actually, HIPAA includes provisions encouraging electronic transactions and requires new safeguards to protect the security and confidentiality of health information; it certainly supports the vision of PHRs systems. The challenge is designing PHRs to fit the needs of a wide variety of potential users. That is, privacy is a patient's need and at the same time, the caregiver is responsible for it. Masys et al. (2002) stated, "Building systems that meet both patients' expectations for privacy and safety and their providers' expectations for convenience and usability remain a substantial challenge" (p. 190). Also, Masys et al. (2002) conducted this study when they designed the Patient-Centered Access to Secure Systems Online (PCASSO) project to apply state-of -the-art security to the communication of clinical information over the Internet. The results of the study reveal that providers rated the usability of the system low because of its complexity, and the patients rated the usability of the system favorably (Masys et al., 2002). In addition, healthcare providers perceived some unique barriers, including the potential of PHRs to make possible narcotic misuse, low levels of patient computer and health literacy, lack of patient motivation, and obstacles with PHR and electronic health record interoperability (Witry et al.,2010).

Another qualitative study by Dontje et al. (2014) aimed to examine the challenges and barriers of access to the PHRs through a patient's perception. The sample for this study included 21 adults whose average age was 64 years; the researchers did a series of 6 semi-structured participant focus groups interviews. The study identified four themes, including access issues, perceived value of the PHRs, potential usability, and

security issues. Also, some participants highlighted the difficulty of understanding the information held in the PHRs because of the use of medical terminology. In short, this study pointed out some crucial areas that patients and providers see as barriers to the use of the PHRs through the Web portal.

There are some challenges related to health disparities and barriers around health literacy to adopt PHRs. This is a major problem affecting the use of PHRs by consumers who have low computer competency and health literacy (Archer et al., 2011). This could limit the PHR's use to patients who are linked to the Internet with high computer skills and who have high health literacy level. In the descriptive study of Lober et al. (2006) that aimed to evaluate the challenges of using PHRs by a low income, older population. The results showed low feasibility of using PHRs for elderly and disabled populations related to computer and health illiteracy, computer anxiety and cognitive and physical impairments.

In addition, Sarkar et al. (2011) stated that patients with insufficient health literacy were less likely to view laboratory results, send e-mails to providers, and make medical appointments using a patient portal tethered to their electronic health record compared with patients with appropriate health literacy. In a survey study by Kim et al. (2009), that aimed to evaluate the use and utility of EHRs in low-income, elderly people. The sample of the study contained 70 low income and elderly participants who were provided with free access to Web-based PHRs system. The result showed that PHRs use was clearly limited among elderly patients because of the low computer and Internet skills, technophobia, low health literacy, and limited physical and cognitive abilities.

The Impacts of Demographic Characteristics on the Adoption of PHR

The national survey CHCF (2010) showed that the rates of PHRs use among patients who aged 45 and over are still low compared to adults under age 45. Also, it showed that the users of PHRs were predominantly under age 45, educated, higher income, and males. In fact, there are some challenges and obstacles that face personal health records adoption and use by older adults with chronic disease. According to the study by Logue & Effken (2013), they used the Personal Health Records Adoption Model to explore its impact on the older population and they developed a theoretical framework of adoption barriers and facilitators. The result shows the older populations were less confident in their ability to use online PHRs. The better understanding of the elements that influence PHRs adoption in older populations, more effective strategies may be developed to expand adoption and then improve chronic disease management. Simply providing patient access to medical records cannot be useful unless the technology is implemented in the patient's existing health and engaged to reach the objective to improve the health condition. However, the study of Taha, Czaja, Sharit, and Morrow (2013) examined the ability of middle-aged individuals and elderly to use a simulated PHRs to do several common health management tasks such as medication management, review lab and test results. The results stated that both age groups came across significant difficulties in using the PHRs to perform regular health management tasks.

A cross-sectional study by Yamin et al. (2011) was designed to examine whether PHRs adoption and use would be positively associated with demographic

characteristics such as race, sex, and age. The researchers compared adopters who activated a PHRs account online with non-adopters who see a physician offering the PHRs but do not activate an account. The result of this study showed that Blacks and Hispanics were less likely to adopt the PHRs than whites, and participants with lower annual income were less likely to adopt the PHR than those with higher annual income. Generally, the study highlighted that racial/ethnic minorities and patients with lower SES were less likely to adopt a PHRs.

In the study of Wynia, Torres, and Lemieux (2011) that aimed to explore doctors' experiences with electronic personal health records, their expectations and concerns about using them, and their ability to use PHRs in clinical practice. The study result highlight varied differences in the relative willingness to use them throughout crucial demographic groups. The most remarkable outcome is that rural physicians showed much more willingness to use electronic PHRs compared to urban or suburban physicians. Also, it stated that female physicians were considerably less willing to use PHRs than their male colleagues. Another surprising finding was that pediatricians and other primary care physicians were less willing than other specialists to use PHRs. That means, the demographic characteristics of the patients play a key role in the patient's and healthcare providers ability to adopt PHRs.

The Usability of PHR

It is important to understand how to make PHRs more useful to patients. The outcome of the study by Taha et al. (2013) specified some important factors to take into account in the design of PHRs to reach the needs of middle-aged and older adults. The

factors that influenced the PHRs use include: Internet experience, cognitive abilities, health numeracy, and age, on task performance is important to prevent an increase in health care disparities between those who are able to use a PHRs and those who are not. The study examined PHRs use to perform three common health-controlling tasks: health maintenance activities, lab/test results activities, and medication management activities by two different age groups. Kerns, Krist, Longo, Kuzel, and Woolf (2013) designed a qualitative study to examine the factors related to the user and non- user patients who were invited to use the PHRs but did not use the system, and to understand how patients prefer to use PHRs system. The researchers identified three major themes that explain how participants wanted to be engaged by PHRs. The first theme was related to their immediate and ongoing care. The second theme was related to the PHRs system that they can trust for accuracy, and have no security and privacy issues. The third theme was about advanced functional PHRs, which provide communication with their caregiver, and access to health information. The result stated some important factors for patient engagement in the advanced interactive personal health records system.

In the study of Nazi (2013), that designed to examine the experiences of physicians, nurses, and pharmacists at the Department of Veterans Affairs (VA) using a particular PHRs system to develop understandings into the interaction of technology and medical practices. Study findings highlighted the importance of clinician authorization and engagement, and the need to further examine both intended and

unintended result of use. Also, the study found PHRs have important effects on access, communication, patient self-report, and patient/provider relationships.

Another recent study by O'Leary et al. (2016) that explored patient and healthcare providers' perspectives about a hospital-based patient portal content and features perceived to be most beneficial, and challenges that portal may have. The study concluded that patients found information offered by the portal to be useful, particularly regarding team members and medicines, and showed a desire for extra details such as test results, and the capability to ask questions. Similarly, providers experienced the portal improved patient engagement, however they concerned that might result in a volume and difficulty of material that could be overwhelming for patients.

Wagner et al. (2012) examined PHRs use and outcomes in a sample of patients with hypertension. The measure of PHRs impact was by the change in biological outcome, patient empowerment, the quality of patient care, and use of medical services. The result of this study showed that no impact of the PHRs was observed because of infrequent use of a PHRs, no increase in patient activation with PHRs access or use. It is important to understand how providers and systems can best incorporate PHRs into the practice settings where the physician and patient join together to use the increased health information to reach the positive expectations of the outcomes.

The Intend to Use PHR

The qualitative study of Forsyth, Maddock, Iedema, and Lassere (2010) aimed to obtain patients' views on whether they could participate in their care by holding their

own health information, and to examine the implications for the development of a patient-held health file (PHF). PHF provide patients access to their health information. The researchers did semi-structured interviews with ten patients who were 60 years old or older. The result of this study showed that not all patients interested or demand to have understanding and participation in their medical information. Patients who were active in decision making about their own health records were interested to hold their information and take some responsibility for their health care. On the other hand, patients who were more passive in making decisions about their health did not care to hold their health information and express that their doctors communicated sufficiently. In general, the PHF could improve health outcomes for patients based on the individual's role in engaging with their health data.

Another qualitative study by Baudendistel et al. (2015) aimed to explore the attitudes of prospective users considering the patient's role in managing a patient-controlled electronic health record (PEPAs). The majority of participants were men, and the average education level was high. The study estimated the importance of patients' responsibility as a gatekeeper and access control, and addressed some factors that limit the patient's active role such as illness-related issues. A qualitative study of Woods et al. (2013) was directed to examine patients' experiences with reading their online health records, including their clinical notes. The result of the study indicated patients and their representatives had fundamentally positive experiences with sharing health record and the access of notes and test results, and it empowered patients and increased their participation in their care.

The recent study of Gaskin et al. (2016) aimed to examine parental attitudes toward allowing their children online access to their own health information. The researchers did a structured interview with the parents of 83 adolescents who were 13-18-year-old participants. The finding of the study showed most parents desired their children to have access to their own health data, were also supportive in allowing their children to select share this information with whomever they choose. The study concluded the PHRs are feasible and useful for children. Overall, the literature suggested that patient access to their health data is becoming desirable, and the PHRs may play an important role to contribute significantly to patients' health management.

The study of Wang, Ho, Chen, Chai, Tai, & Chen, (2015), aimed to examine three users' groups of electronic patient records including physicians, medical record staff (MRS), and patients by focusing on discrepant behavioral intentions to investigate attitude toward a nationwide system in Taiwan. The finding of the study indicated that physicians may be worried about patient misunderstanding and usefulness of function out of their accountability for care, the patients perceived the system more positively but they needed more adequate knowledge of the EPR functions, and the MRS marked in the middle of the groups in attitudes and tended to be more concerned about the functions. The study results showed different behavioral intentions among the three groups the minimal support from the physicians and the maximal support from the patients.

The latest study of Chung et al. (2016), designed to explore factors related to the intentions of nurses to use patient PHRs. The study most significant result explained

nurses had encouraging attitudes of using patient PHRs when it is used and recommended by supervisors and colleagues. The attitudes of nurses toward PHRs adoption directly affect their intentions to use patient PHRs. Moreover, promoting broad adoption and use of PHRs by nurses may advantage the patients overall by endorsing the use of PHRs (Gartrell et al., 2015).

Ethical/Legal Issues

While PHRs present new and exciting ways to help individuals manage their health, and the literature shows that patient access to their health data has significant benefits to both patients, healthcare professionals that make PHRs subject to certain ethical, legal issues.

Ethical. There are several ethical principles health care providers should consider regarding the PHRs use including, autonomy (the right of patients), distributive justices (benefits and burdens should be distributed fairly), beneficence (act in a way that benefits the patient), non-maleficence (do no harm) (Gillon, 1994). Respect for autonomy, requires that information regarding patient encounters be kept private, whether obtained in person or via electronic (virtual) unless the patient requests or gives permission to have personal information shared. Concerns over privacy, control of one's personal health information are at the heart of the ethics of autonomy. The principle of distributive justice has no conflict with the PHRs, that is linked to EMR. But it must be done only with defined limits to safeguard patient autonomy, including obtaining permission from the patient (Sittig & Singh, 2011). The PHR is beneficial as long as the information the patient receives is accurate, appropriate, and does not result in greater

harm than if the patient had no information at all. Along with the benefits of PHRs, the potential harms must also be considered (Layman,2008).

Legal. With new information technologies, health care is evolving from a practitioner-centric to a patient-centric model (Perlin, Kolodner, & Rosswell, 2004). The Health Information Technology for Economic and Clinical Health Act was approved by Congress in 2009, mandated that all medical providers digitize medical records. The mandate was strengthened by the passage of Obamacare in 2010. It requires physicians and hospitals, under financial penalties, to transfer your secure paper-based medical records to an “electronic” system (Blumenthal et al., 2015).

The Health Insurance Portability and Accountability Act (2003), HIPAA Privacy Rule establishes national standards to protect individuals’ medical records and other personal health information and applies to health plans, and those health care providers that conduct certain health care transactions electronically (www.hhs.gov, 2016). The (HIPPA) stipulates that patients must be permitted to review and amend their medical records. Kutkat, Hodge, Jeffry, and Bonta (2003) provided an overview of HIPAA Privacy Rule that includes: it gives patients control over the use of their health information; it defines boundaries for the use/disclosure of health records; it establishes national-level standards; it helps to limit the use of PHRs and minimizes chances of its inappropriate disclosure; it strictly investigates compliance-related issues and holds violators accountable; it supports the cause of disclosing PHRs without individual consent for individual healthcare needs, public benefit and national interests. Since, PHRs offer individuals access to their health care information and can enable

communication between patients and their health care providers or health plans, the Privacy Rule supports individuals' use of PHRs as a tool to provide access to and management for their health care information.

Chapter III

METHODOLOGY

Introduction

This dissertation was done in multiple steps. First, creation and validation of a new survey instrument took place throughout numerous rounds of the Modified Delphi Technique by a panel of experts. Consequently, subjects were recruited through healthcare organizations email-list as well as through social media platform. Reliability of the survey instrument was obtained after the participation of healthcare providers who fit the inclusion criteria of the study. Data collection process and statistical data analysis will be discussed in this chapter.

Research Design

The research design was a descriptive, exploratory, cross-sectional, correlational study. Demographic characteristics of the sample were organized and summarized over a descriptive design. The study is exploratory as it involves examining a phenomenon of interest and exploring its dimensions. This study, utilize the theory of Planned Behavior, technology acceptance model, and self-efficacy theory (Figure1) as a framework to explore the factors that may or may not influence the behavior intention of healthcare providers to adopt and use PHRs. It is cross-sectional since it involves the collection of

data at one point in time, so the data will be collected from healthcare providers at one point in time. A correlational design is used to explore if a relationship exists between perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health-promoting role model, perceived usefulness and perceived ease of use of the PHRs affect and the behavior intention of healthcare providers to adopt PHRs. It is important to note that, this study is non-experimental in nature because the research questions are not exploring a causal relationship.

Sample

Upon approval by the Seton Hall University Institutional Review Board (IRB), convenience sampling and purposive sampling from email list were used also non-purposive sampling through the snowball technique. Snowball sampling was used to get a larger population. Snowball sampling provides researchers the ability to employ a target demographic to find other participants within the same target factors through referral by the initial receivers (Goodman, 1961). This sampling technique “chain referral” or “snowballing” was continued until an adequate sample is obtained (Portney and Watkins, 2000).

Procedure

Participants were recruited by an anonymized e-mail survey link that along with Letter of Solicitation, readability statistics for the aforementioned Letter of Solicitation is on (Appendix D). the PI contacted participants who meet the inclusion criteria by e-mail. E-mail addresses were gathered from online sources such as Hospitals ،Universities websites. The PI sent a reminder email every two weeks.

Furthermore, social media ($Facebook^{TM}$, $Twitter^{TM}$, *LinkedIn*®) were used to recruit participants by posting the survey link. For $Facebook^{TM}$, the PI contacted the administration of Facebook pages to approve posting the survey link of the study. The administrators'' of the closed group asked why there was an interest in joining the group, and for some information about regarding the study. When approved, PI share a post to the page containing the link to the study. Also, the PI replied to other group members' comments on the post, and from there the link was snowballed to reach more healthcare providers. The PI did repost the survey link within two weeks to keep the post active and remained the members of the group to participate. For $Twitter^{TM}$, the PI tweeted healthcare providers (i.e. physicians, nurses, Physical therapists) requesting them to share the survey link to their followers. Also, the PI tweeted the survey link of the study by using appropriate #hashtags to reach healthcare providers and ask them to retweet the post with their followers to retrieve larger numbers. The hashtags' created with simple keywords (e.g. #MD, #Nurse, #PHRs, #Physicians) they helped users to reach the link of the survey and made the link instantly become more visible to the target population. For LinkedIn®, the PI contacted the healthcare providers network and requested to join group pages, once approved, the PI post to the group page the survey link. The PI followed the same procedures as the $Facebook^{TM}$, also, when sharing the survey link the PI include appropriate #hashtags in the brief post same procedures as $Twitter^{TM}$.

A Priori G*Power Analysis

A power analysis using the G*Power statistical software program was used to determine the number of participants needed to address the research questions. In this research, multiple regression analysis was originally designed to test whether the eight variables can be used to predict the behavioral intention to adopt PHRs. In G-power, a multiple regression omnibus (R2 deviation from zero) test was selected for a priori power calculations. The alpha was set at an acceptable level of 0.05 (Witte & Witte, 2010). This allows the researcher to state with 95% confidence that the obtained results are due to the influence of the variables studied and not to chance. The level of alpha is set to decrease the likelihood of making a Type I error. A Type I error occurs when the null hypothesis is rejected when it is, in fact, true (Witte & Witte, 2010). Power was set at an acceptable level of 80%. This allows that there is a 20% chance of making a Type II error. This is likely preventable by achieving a minimum power of at least 0.8 (Portney and Watkins, 2008). An f2 was utilized to determine the appropriate minimum sample size required to test for significance. According to Cohen's (1988) criteria, effect sizes (f2) of 0.02, 0.15, and 0.35 are considered small, medium, and large, respectively. The medium effect size was used to help determine if the results found are meaningful. The effect size for this analysis was set for 0.15 which is a medium effect size according to (Cohen,1988). Effect size indicates the practical significance of the study in that it indicates the difference between a true and hypothesized population mean (Witte & Witte, 2010). This analysis through G-Power indicated that a sample size of 109 participants was necessary given that the number of predictors is eight. The sample

sizes described here are well within the acceptable parameters for alpha, power, and effect size (Figure 5).

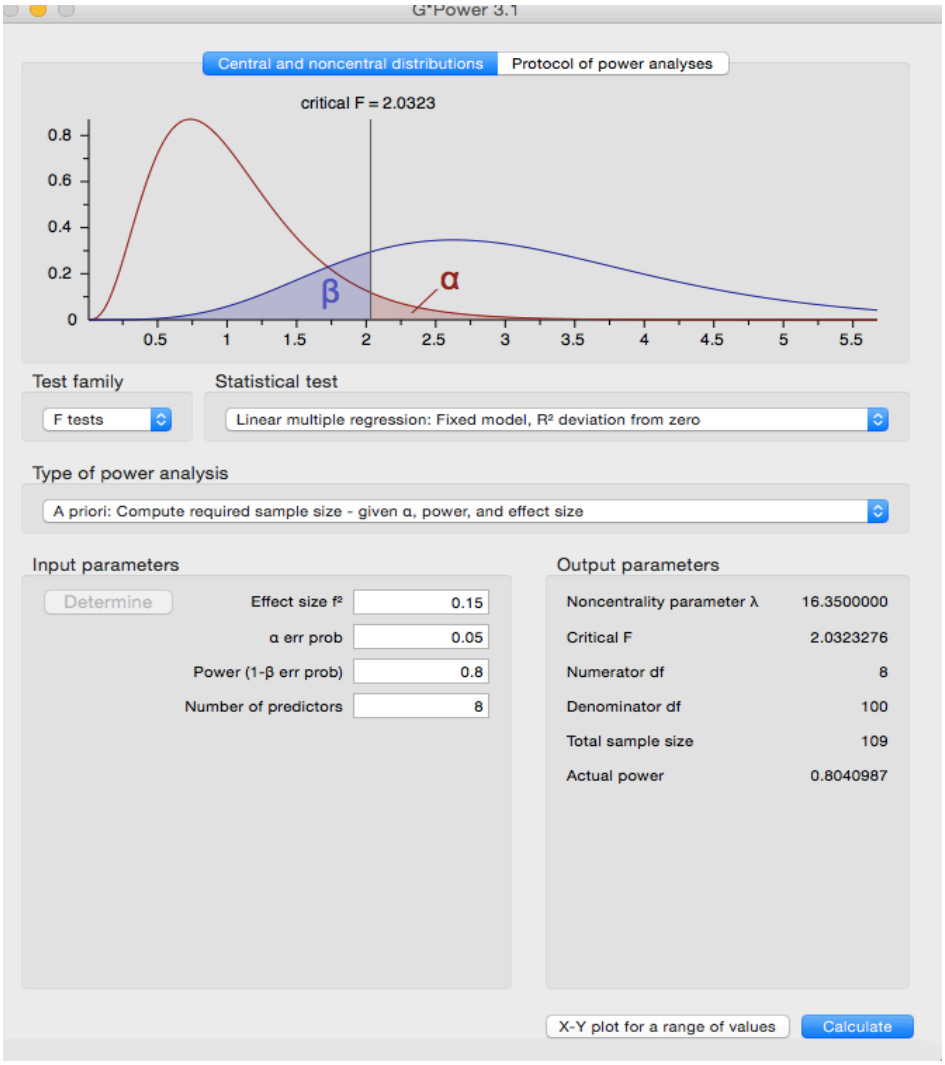

Figure 3. The statistical power analysis for Linear multiple regression. The figure illustrates the calculated sample size is 109.

Inclusion and exclusion criteria

To participate in the research study, participants had to be a Healthcare providers that have contact with patients (e.g. Medical doctor (MD), Physician Assistant (PA), Nurse Practitioner (NP), Nurse Midwife (NM), Clinical Nurse Specialist (CNS), Pharmacist, Physical therapist (PT) , Nurse-Anesthetist (NA), Occupational therapist (OT), Respiratory therapist (RT), Speech and language pathologist, etc.) and had to have access to ePHRs as well as be adults 18 years of age or older and proficient in English Language. The subjects who did not meet the inclusion criteria were excluded (Figure 4).

Inclusion Criteria	Exclusion Criteria
Health care provider who has Interactions with PHR of patients. 18 years of age or above. Proficient in English. Have access to a PHRs.	Health care provider who has No interactions with PHR of patients. Under 18 years of age Non-Proficient in English. No access to PHRs.

Figure 4. Inclusion and Exclusion Criteria *for participants for survey instrument.*

Ethical Assurances

Assurance of voluntary and anonymous nature of participation was critical impotence. Participants were free to choose not to participate entirely or stop participation at any time and that their choice to participate in this survey or not will have no impact or any other penalty or loss of benefit that they receive. Protection and confidentiality were provided throughout the duration of the research project. No personal information of participants was collected as part of this study. The responses were completely anonymous and the information provided by subjects was coded and considered as confidential. All data was stored in a protected electronic format, avoiding the possibility for anybody to personally find the information provided.

Survey Instrument

The literature indicated that there was not one particular survey tool that was prepared to measure all of the aspects included in the conceptual framework. As, no study had yet looked at this entire list of constructs and the existing studies were limited to single or a small subset of healthcare provider types, no one survey tool was found to be sufficient for the purpose of this study and is therefore why this new (PHRAS) survey tool, the PI developed. Delphi process used based on Hassan's (2000) procedure to establish the validity of the tool. The Delphi process involved three rounds of an anonymous written feedback of five experts who reviewed the survey questions and provided feedback. The Delphi technique explained more in detail in *Appendix (D).*

The survey tool aimed to measure the perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived health-promoting role model, perceived

usefulness, perceived credibility, and perceived ease of use regarding the behavior intend to adopt PHR among healthcare providers. The questions were based on what is known in the literature about PHRs adoption and use. The items were developed to be brief, simple, and understandable as possible. Some of the instrument questions were based on what has been tested in previous studies to improve validity. Other items were specific to focus on what has not been tested in the literature so far. Definitions of the constructs in this model are grounded in the literature. Some variables were found on a survey that already existing in the literature, and some variables are newly self-developed. This survey tool was reviewed by expert panel to demonstrate validity. The tool has 69 questions, the questions contain either multiple choice, Likert scale ranging from (Strongly Agree to Neutral to Disagree to Strongly Disagree), or bivariate, Yes/No answers. In the yes/no questions, subjects were also given an "I am not sure" option to choose if they are unsure in their response. Additionally, the survey included a number of open-ended and clarification questions that provide a qualitative clarification on a number of questions. Also, at the end of the survey is demographic-type questions. The survey averaged a 10 to15 minute completion time.

Data Coding and Analysis

Data were exported from SurveyMonkey® into Microsoft Excel. Then, PI transferred the creation of column variables and cases into SPSS software version 25 (IBM, 2018). The data stored on a portable USB flash memory drive. Surveys that are missing responses to greater than 30% of the questions were considered incomplete and were not used in the analysis. The data were coded from string variables into

numeric variables. The PI created a label for each variable that represents the survey statements. Demographic variables such as gender, age, level of education were coded as nominal measures. The Likert scale statements were coded on a scale from 1 to 5, based upon respondents' answers. Reverse coding of negative Likert scale items was created and then recoding to new column variables. The PI computed a variable for each construct with the total score that was summed through the compute function in the SSPS. This process involved summing the scores of each of the items according to the construct that they fell under. For instance, each of the 12 items of the perceived usefulness variable were summed to present a total perceived usefulness score. The new total variables were used for the statistical analyses. The final abridged database contained the dependent variable that was the behavioral intent to adopt PHRs, and eight independent variables included perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health-promoting role model, perceived usefulness, perceived ease of use of the PHRs.

For the demographic characteristics, descriptive statistics were calculated, including frequencies, and percentage. Correlation coefficients were used to examine the strength of the relationship between variables. The research hypotheses were tested using correlation methods, and a multivariate linear regression model method used to analyze the factors. For the ordinal-scaled variables, Spearman's rho used. In the interval-scaled variables, Pearson's r will be used. The regression method was used to determine if the independent variable has predictive strength in relation to the dependent variable. Since any single variable may or may not be a strong predictor

alone, correlations were calculated for each factor, however, the multivariate method was explored to determine if a more comprehensive predictive model can be created to describe the relationship of many factors together. These tests were reliant on the underlying assumptions associated with each. The assumption associated with each test was determined, including normality, homoscedasticity, independence of errors, collinearity. A Mann-Whitney U test conducted to analyze the differences in the responses on ePHRs adoption by health care providers who use it and who do not use it for themselves. The tests helped to determine if there are differences in the likelihood of adoption among the two groups. The test is the non-parametric alternative test to the independent sample t-test, and was used as the data is ordinal scale variables. For all statistical analysis, the α level was set at 0.05, and the β level at 0.2 with a corresponding power of .80, to protect against type II error (Portney and Watkins).

Additionally, the survey included a number of open-ended and clarification questions that provide a qualitative clarification on a number of questions. Open coding was used to analyze the responses and the frequencies of similar responses. The coding was based on data-driven coding that includes reading the data and creating new coding categories, based on what data seen most important (Elo & Kyngäs, 2008). The responses were used to identify new themes. Trustworthiness was established thorough Inter-coder agreement that was performed by peer review to analyze findings (Pitney,2004). The peer review verified data analyzed appropriately with at least 70% reviewers' agreement being reached.

Statistical Analysis	
Descriptive Statistics	Frequencies, and percentage.
Research Question 1 – Research Question 8	Correlation coefficients (Spearman's rho)
Research Question 9	Multivariate linear regression
Research Question 10	Chi-square test
Research Question 11	Mann-Whitney U test
Qualitative Responses	Open-coding (data driven coding)

Figure 5. Statistical analysis for *each research question.*

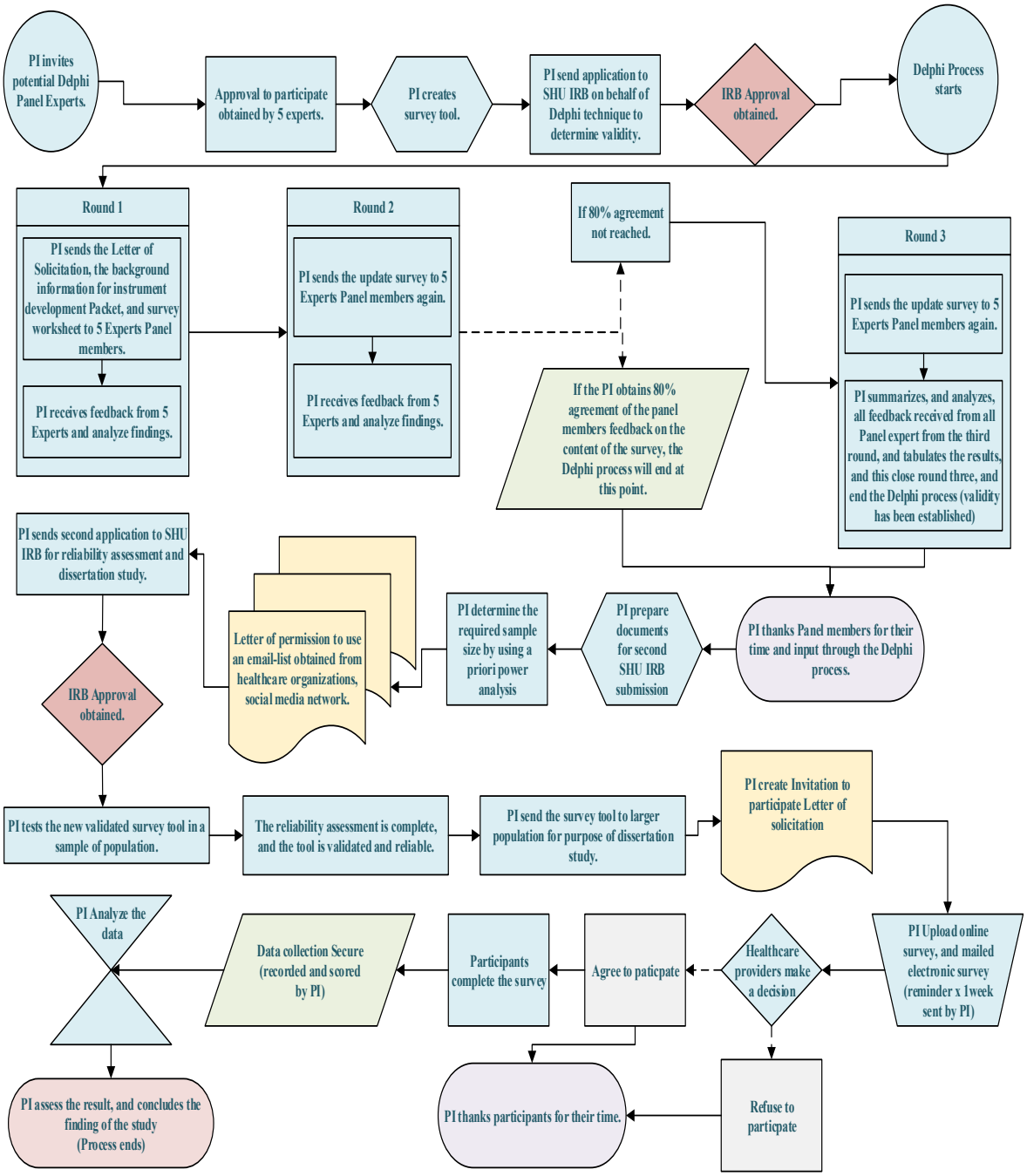

Figure 6. PI- created flowchart summary of methodology.

Chapter IV

RESULTS

This chapter presents the demographic characteristics, followed by a detailed presentation of the results of the statistical tests of the dissertation study.

Data cleaning

Data were obtained from 310 participants. Upon analysis of the response data, 4 were found to have not completed the survey. Also, responses that did not meet the inclusion criteria were excluded, 6 were found to be a health care provider who did not work/caring with patients. After removing these insufficient responses, the final data consisted of a total of 300 responses which is more than adequate as the a priori analysis required the sample size of 109 as noted in chapter 3.

Reliability and validity Assessment of the Tool

Face, and content validity were established through an expert panel review. Cronbach's alpha was conducted for reliability purposes. A Delphi process was used to validate the study instrument (*Appendix D*). To confirm validity of the tool, at least 80% agreement on each survey item was obtained through three round of Delphi expert panelists review. The internal consistency of the survey was assessed utilizing Cronbach's alpha coefficient. Cronbach's alpha is a measure of internal consistency

and is a commonly used estimate for the reliability of psychometric tests. A psychometric instrument with an alpha score of greater than 0.6 is conventionally considered to have acceptable internal consistency. Each of the scales was analyzed for internal consistency, then an overall alpha was calculated for each scale.

Reliability of the PHARS: All Factors

The Cronbach's Alpha for the PHARS survey with all variables combined is α = .914 (Table I) which is considered excellent by George and Mallery (2011). For the PHARS: All 8 Factors, there is no major fluctuation in any of the survey items if they were to be removed (Table 2). If one of the individual item statements was deleted from the survey, on the whole, the Cronbach's alpha in this column should not change significantly. If the Cronbach's alpha does change significantly, it is a suggestion that this item may be weighted differently than the others and this would show a conflict in the survey statements. The Cronbach's Alpha for the Perceived Usefulness scale variables is (α = .822), for the Perceived Ease of Use scale is (α = .844), for the Self-Efficacy scale is (α = .829), and for the Intention to Use ePHRs scale is (α = .879) that is considered good. The Subjective Norms variable scale scored an overall Cronbach's Alpha of (α = .775), and for the Altitudes scale is (α = .776), which is considered good. The Perceived Health Promoting Related Model scale scored an overall Cronbach's Alpha of (α =.603), and for the perception of knowledge (α =.619) which is considered acceptable. The Perceived Credibility scale scored an overall Cronbach's Alpha of (α = .948), which is considered very good.

Table1

Cronbach's Alpha Reliability Statistics for the PHARS: All Factors

Cronbach's Alpha	N of Items
.914	56

Table 2

Cronbach's Alpha Reliability Statistics for the PHARS: For each construct

Factors	Cronbach's Alpha	N of Items
Perceived Usefulness	.822	12
Perceived Ease of Use	.844	6
Subjective Norms	.775	5
Altitudes	.756	6
Self-Efficacy	.829	9
Intention to Use ePHRs	.879	4
Perceived Health Promoting Related Model	.603	6
Perceived Credibility	.948	4
Perception of Knowledge	.619	4

Table 3

Item-Total Statistics for the PHARS: All Factors

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item–Total Correlation	Cronbach's Alpha if Item Deleted
The ePHR can provide accurate information on patients.	198.9567	223.861	.428	.912
Using ePHR can prevent needless repetition in health care.	198.9800	221.070	.539	.911
Using ePHR can facilitate continued care.	199.6000	226.722	.180	.914
The ePHR is useful for looking at the results of lab tests or other tests.	198.9233	224.446	.387	.912
The ePHR is useful for making sure my own healthcare information is correct.	199.0133	222.100	.456	.912
PU_6recode	200.1467	226.674	.184	.914
The ePHR is useful for renewing prescription medicines.	199.3033	221.169	.442	.912
The ePHR is useful for getting a reminder when you need a test.	199.2833	219.368	.521	.911
I use ePHR to keep track of my child's health records.	199.3267	216.669	.563	.910
PU_10recode	200.1967	224.600	.288	.913
The ePHR is useful for sharing my own health information with my family.	199.3367	217.341	.516	.911
The ePHR is useful for seeing my providers' instructions for taking care of my own health.	199.1533	218.344	.597	.910
Learning how to operate an ePHR would be easy for me.	198.9967	219.582	.608	.910
It would be easy for me to become skillful at	199.1933	222.110	.564	.911

Note: This chart is only a snapshot and reflects only a part of the survey items and not include all the survey statements.

Characteristics of the Sample

The characteristics of the sample data were collected through a series of basic demographic questions that developed at the end of the PI created PHARS©. The demographic inquiries consisted of the following questions: geography, gender, age, level of education, years of experience, and occupation at a healthcare facility (Type of health care providers). The following section represents the responses tallied from all 300 participants.

Geography. Table 4 provides a global overview of the sample representing those who participated. Not surprisingly, the majority of respondents came from the US but few participants came from other regions and countries including (Canada, India, Saudi Arabia) which offer some diversity to the sample. Table 11 shows geographically, 4 countries (United States 93.3%, Saudi Arabia 5.7%, Canada.3%, India .7%). Remarkably, most of the participants came from the US, 29 states were represented, although 16.7% of responses came from providers that practiced in NJ. 10.7% of participating providers practiced in OH. 15.6% of participating providers practiced in NY. 8% of participating providers practiced in MD.

Table 4

Country/State Frequency

		Frequency	Percent
Valid	Canada	1	.3
	India	2	.7
	Saudi Arabia	17	5.7
	United States	280	93.3
	Total	300	100.0

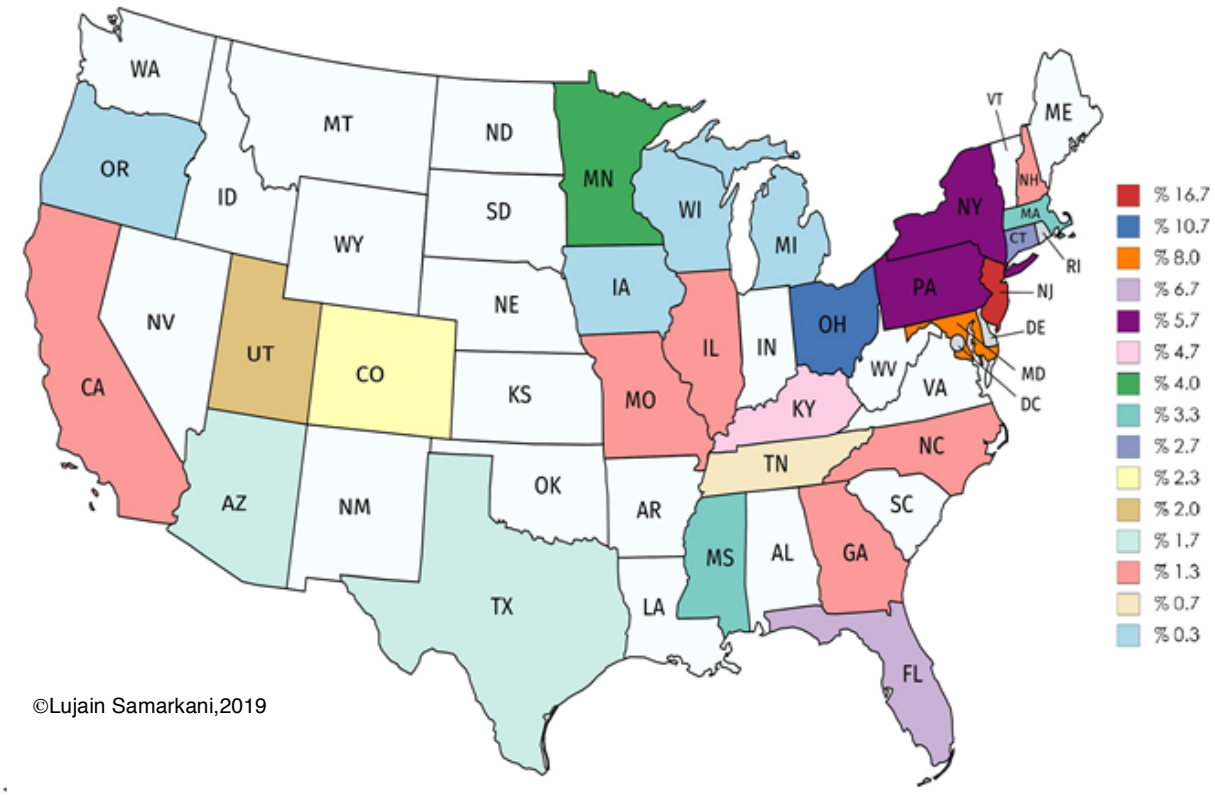

Figure 7. PI- created U.S. sample overview. (U.S Map) Adapted from "Map Chart", Retrieved from https://mapchart.net/usa.html.

Table 5

State Frequency

		Frequency	Percent
Valid	NJ	50	16.7
	NY	17	5.7
	MA	10	3.3
	NH	4	1.3
	IL	4	1.3
	AL	4	1.3
	MN	12	4.0
	UT	6	2.0
	CT	8	2.7
	CO	7	2.3
	NC	4	1.3
	OH	32	10.7
	CA	4	1.3
	AZ	6	2.0
	WY	1	.3
	TN	2	.7
	WI	3	1.0
	GA	4	1.3
	OR	1	.3
	MO	4	1.3
	MI	1	.3
	AR	5	1.7
	IA	1	.3
	KY	14	4.7
	TX	5	1.7
	PA	17	5.7
	MD	24	8.0
	FL	20	6.7
	MS	10	3.3
	Total	280	100.0

Provider Type. The largest represented group of healthcare providers was Medical Doctors (MD) (25.7%). Nurse Practitioners (NP) made up the second largest provider group (16%). Physical therapists (PT) were the third largest group of providers (8%). Respiratory therapists (RT) made up 7.3%. The sample had a wide variety of provider's type as it shown the table below.

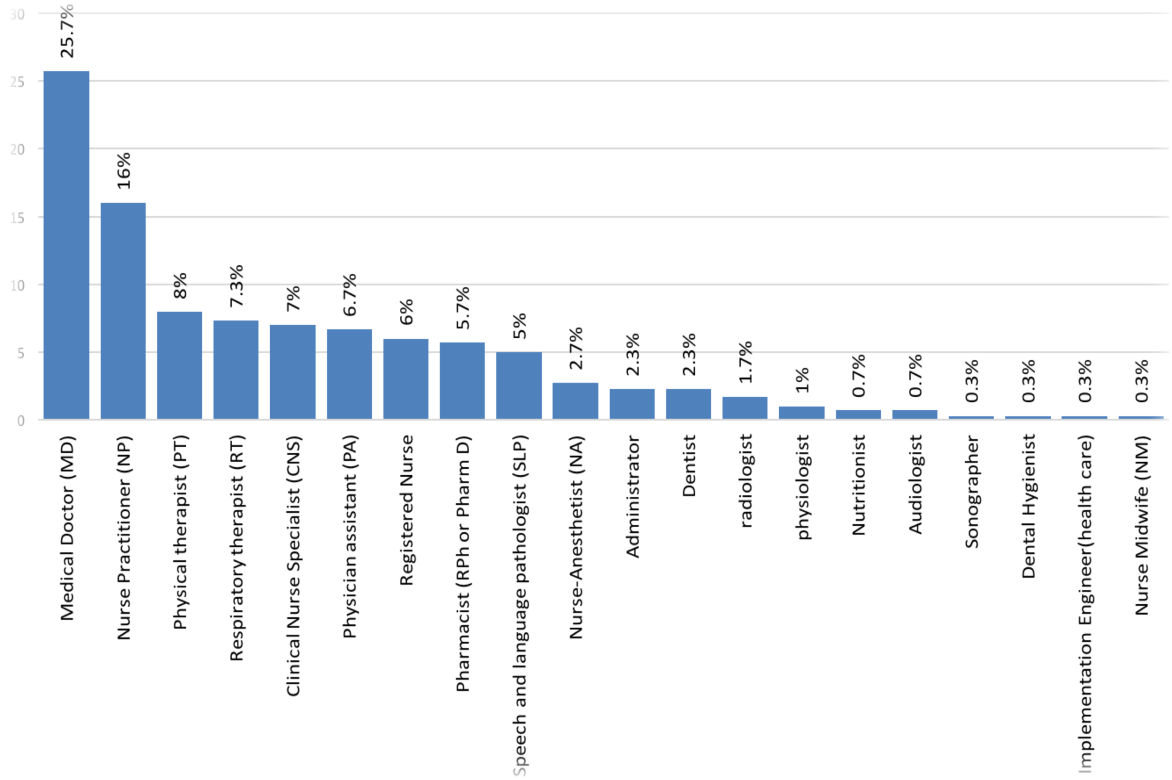

Figure 8. The parentage of each provider type in the sample.

Table 6

Occupation at healthcare facility

	Frequency	Percent
Medical Doctor (MD)	77	25.7
Respiratory therapist (RT)	22	7.3
Speech and language pathologist (SLP)	15	5.0
Administrator	7	2.3
Registered Nurse	18	6.0
radiologist	5	1.7
physiologist	3	1.0
Nutritionist	2	.7
Dentist	7	2.3
Audiologist	2	.7
Physician assistant (PA)	20	6.7
Sonographer	1	.3
Dental Hygienist	1	.3
Implementation Engineer(health care)	1	.3
Nurse Practitioner (NP)	48	16.0
Nurse Midwife (NM)	1	.3
Clinical Nurse Specialist (CNS)	21	7.0
Pharmacist (RPh or Pharm D)	17	5.7
Physical therapist (PT)	24	8.0
Nurse-Anesthetist (NA)	8	2.7
Total	300	100.0

Gender. The gender with the highest frequency was female with (62%). Then, Males represented the other 38% of participants.

Table 7

Gender

		Frequency	Percent	Cumulative Percent
Valid		1	.3	.3
	Male	113	37.7	38.0
	Female	186	62.0	100.0
	Total	300	100.0	

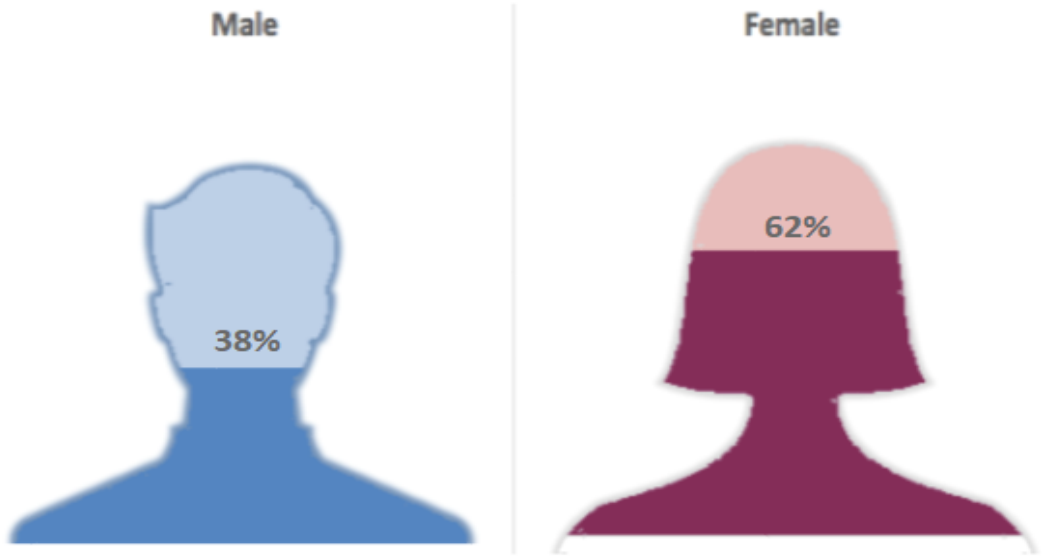

Figure 9. The parentage of male and female in the sample.

Age. The age group with the highest frequency was 31-40 years old (60.7%). Then, in second was followed by 41-50 years old (25%). The 18 to 30 and 51-60 years old made up (6.7%) and (6%). 61 years and older made up 1.3% of the participants.

Table 8

Age

		Frequency	Percent	Cumulative Percent
Valid		1	.3	.3
	18 to 30 years	20	6.7	7.0
	31 to 40 years	182	60.7	67.7
	41 to 50 years	75	25.0	92.7
	51 to 60 years	18	6.0	98.7
	Age 61 or older	4	1.3	100.0
	Total	300	100.0	

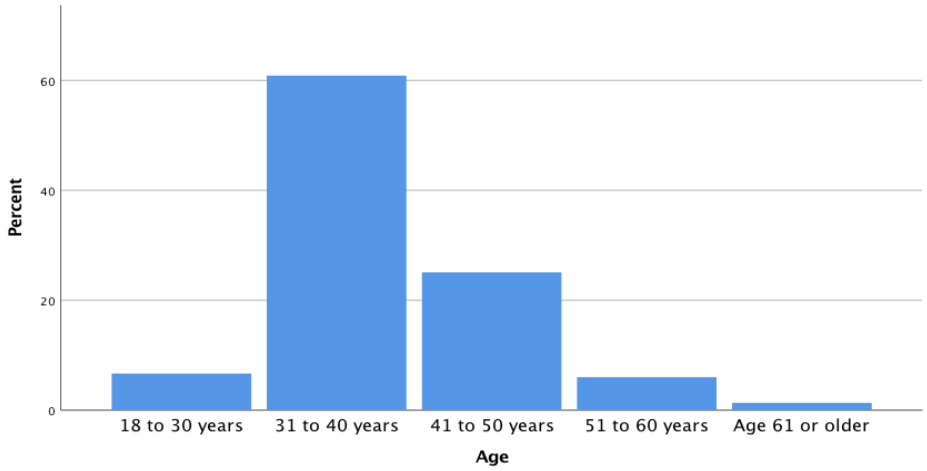

Figure 10. The parentage of age groups in the sample.

Level of Education. The level of education group with the highest frequency was graduate or professional degree with a total of 40.3%. Then, a total of 37.7% of participants reported having earned a bachelor's degree,11.7% reported having earned a master's degree, and 8.7% reported having earned a Ph.D.

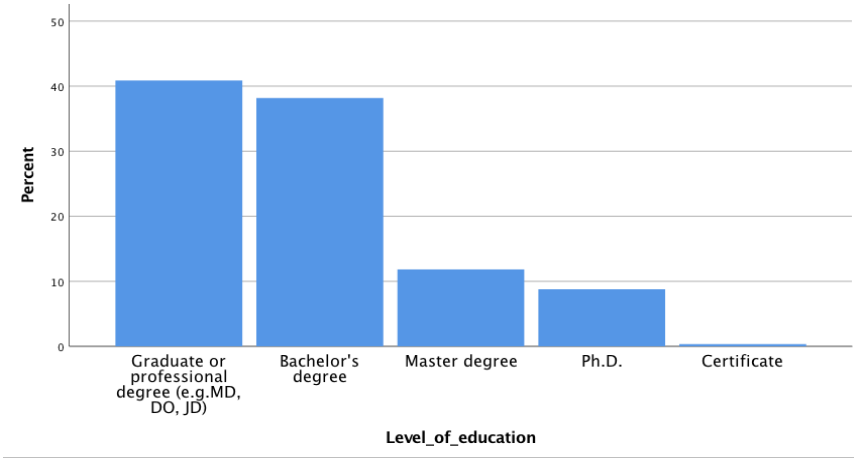

Figure 11. Percentage of years of experience of the sample.

Table 9

Level of education

		Frequency	Percent	Cumulative Percent
Valid		4	1.3	1.3
	Certificate	1	.3	1.7
	Bachelor's degree	113	37.7	39.3
	Master degree	35	11.7	51.0
	Ph.D.	26	8.7	59.7
	Graduate or professional degree	121	40.3	100.0
	Total	300	100.0	

Years of Experience. The years of experience group with the highest frequency was 6-10 years (44.7%). Then, in second was followed by 11-15 years (29%). The 16 to 20 years' group was next by (12.3%) and more than 20 years made up (9%). Lastly, 1 to 5 years made up 4.3% of the participant.

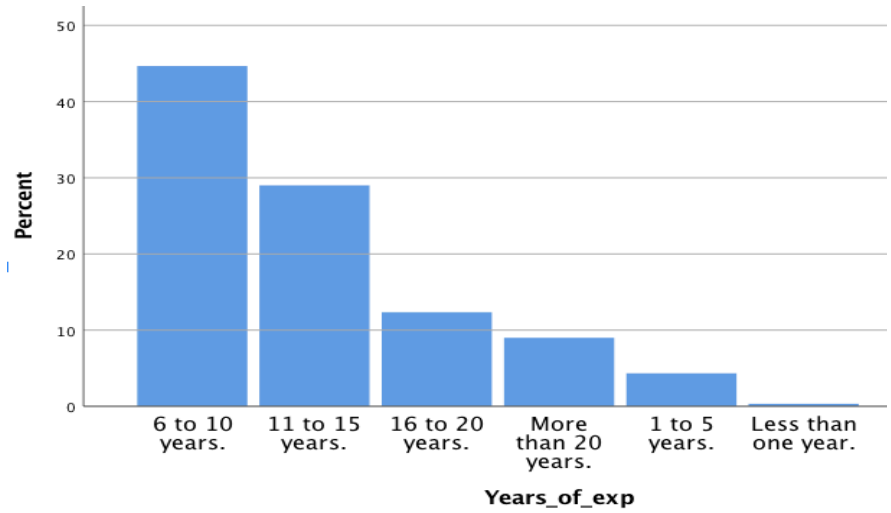

Figure 12. Frequency of years of experience of the health care provides.

Table 10

Years of experience

		Frequency	Percent
Valid		1	.3
	Less than one year.	1	.3
	1 to 5 years.	13	4.3
	6 to 10 years.	134	44.7
	11 to 15 years.	87	29.0
	16 to 20 years.	37	12.3
	More than 20 years.	27	9.0
	Total	300	100.0

Type of healthcare facility. The health care providers work at a wide variety of healthcare organizations. Hospitals had the highest frequency of 95 respondents, then the University Medical Center, an Outpatient Clinic, Acute care, Long-term care, Children Hospitals, Ambulatory care, Incentive Care Unit, Pharmacy, and others.

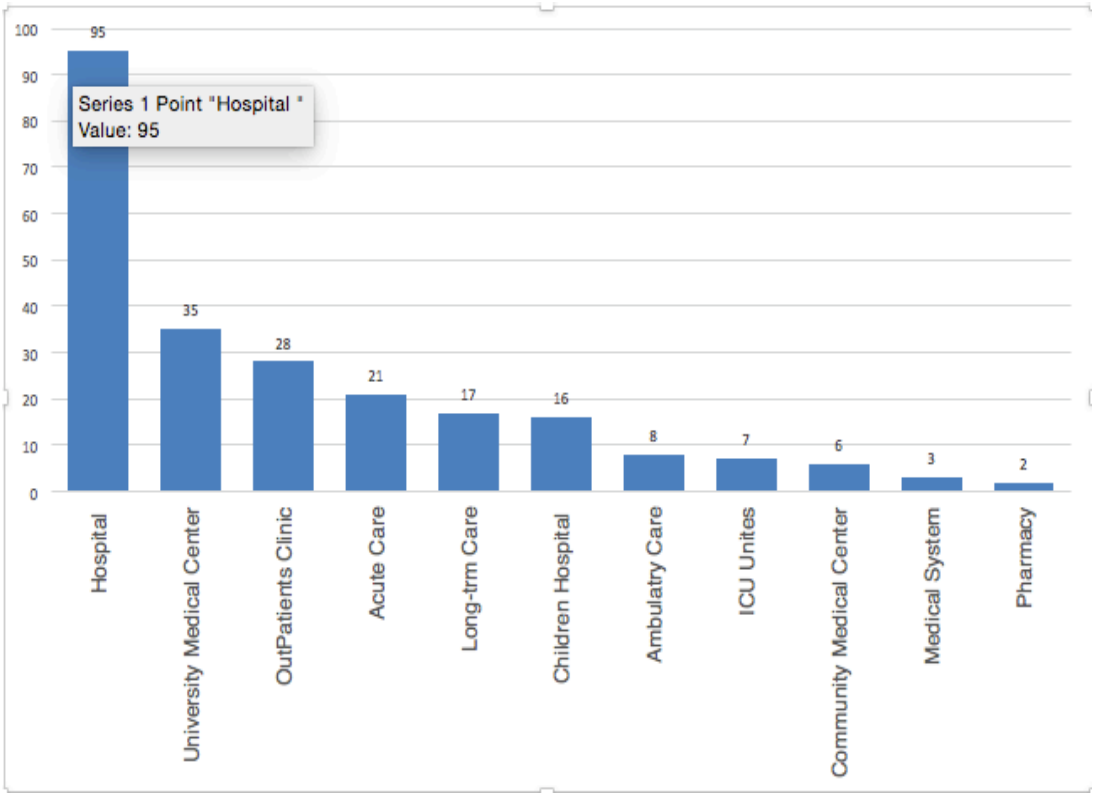

Figure 13. Frequency of healthcare facility type.

List of PHRs system. The result of the open-ended question (What PHRs system(s) are you knowledgeable about, if any, please list) reveals that Mychart system that is powered by pic is the most popular one among the participants. That might be because MyChart, from epic Systems, provides patients controlled access to the same epic medical records the healthcare providers' use, so the healthcare provider's answers were based on their medical practice experience with Epic systems. Then, in second was followed by Cerener/Powerchart system. Also, several systems were highlighted including Phonix, ePass, Myhealth, Med fusion. Many responses just call it hospital system, and Mayo-clinic hospital system was one of them.

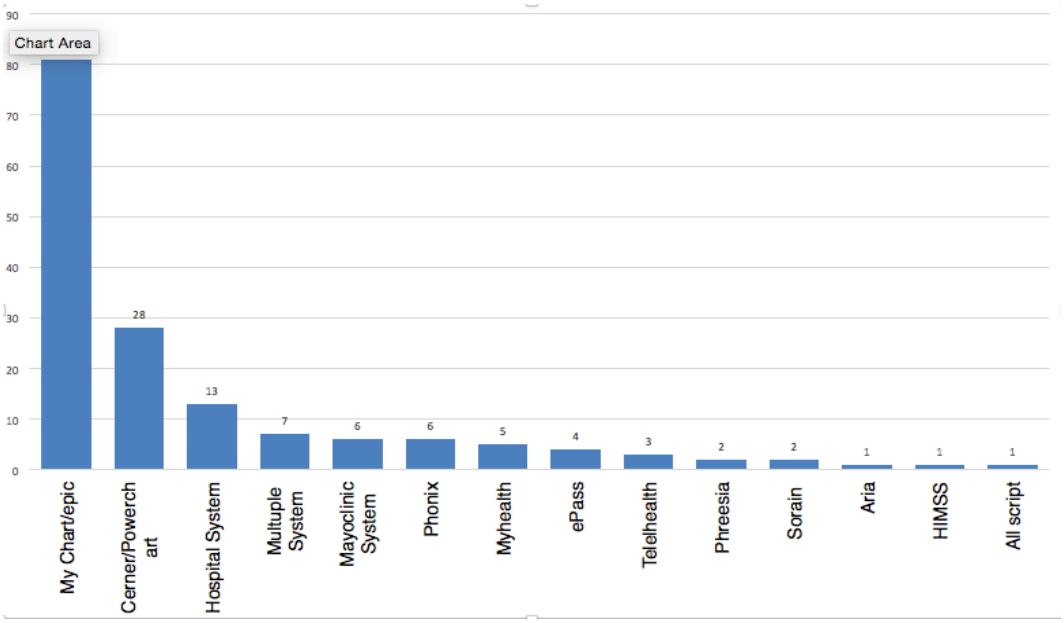

Figure 14. List of PHRs systems identified by healthcare providers.

Test of Normality

First, the PI wanted to determine if the primary data being used for statistical analysis was normally distributed.

Table 11

Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PU_Total	.134	300	.000	.978	300	.000
PEU_total	.193	300	.000	.874	300	.000
SN_Total	.192	300	.000	.901	300	.000
Attitudes_total	.174	300	.000	.964	300	.000
SE_Total	.154	300	.000	.956	300	.000
PHPRM_total	.148	300	.000	.961	300	.000
PC_total	.243	300	.000	.852	300	.000
ITU_total	.317	300	.000	.803	300	.000

a. Lilliefors Significance Correction

A significant value ($p < .05$) was observed for both the Shapiro-Wilk and Kolmogolov-Smirnov test statistics; all indicative of not having normally distributed data. Based on the results of these normality tests, in addition to the fact that the data are being measured primarily on the ORDINAL scale, the PI chose to utilize non-parametric tests.

Results of Research Questions and Hypotheses

Research Question 1

RQ1. a. Will a relationship exist between perceived usefulness and the likelihood to adopt PHRs *for their medical practice?*

RQ1. b. Will a relationship exist between perceived usefulness and the likelihood to adopt PHRs *for their own health management?*

Table 12

Correlation of RQ1

			PU_Total	adopt PHRs for their medical practice	adopt PHRs for their own health management
Spearman's rho	PU_Total	Correlation Coefficient	1.000	.239**	.281**
		Sig. (2-tailed)	.	.000	.000
		N	300	300	300
	adopt PHRs for their medical practice	Correlation Coefficient	.239**	1.000	.648**
		Sig. (2-tailed)	.000	.	.000
		N	300	300	300
	adopt PHRs for their own health management	Correlation Coefficient	.281**	.648**	1.000
		Sig. (2-tailed)	.000	.000	.
		N	300	300	300

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

Table 12 shows the Spearman *rho* correlation on the variables perceived usefulness and the adoption of PHRs (for their medical practice and for their own health

management). A **significant** correlation was found between the two variables (perceived usefulness and the adoption of PHRs for their medical practice). A weak positive correlation was found (*rho* = .239, p=. 001, p < .05), indicating a significant relationship between the two variables. Health care providers with higher perceived usefulness tend to adopt PHRs for their medical practice more. Also, a **significant** correlation was found between the two variables (perceived usefulness and the adoption of PHRs for their own health management). A medium positive correlation was found (*rho* = .648, p=. 001, p < .05), indicating a significant relationship between the two variables. Health care providers with higher Perceived Usefulness tend to adopt PHRs for their own health management more.

Research Question 2

RQ2. a. Will a relationship exist between perceived ease of use and the likelihood to adopt PHRs *for their medical practice?*

RQ2. b. Will a relationship exist between perceived ease of use and the likelihood to adopt PHRs *for their own health management?*

Table 13

Correlations of RQ2(a)

			PEU_ total	Adopt PHRs for their medical practice
Spearman's rho	PEU_total	Correlation Coefficient	1.000	.107
		Sig. (2-tailed)	.	.063
		N	300	300
	Adopt PHRs for their medical practice	Correlation Coefficient	.107	1.000
		Sig. (2-tailed)	.063	.
		N	300	300

Table 13 shows the Spearman *rho* correlation on the variables perceived ease of use and the adoption of PHRs (for their medical practice). A **not significant** correlation was found between the two variables (Perceived ease of use and the adoption of PHRs for their medical practice). No significant relationship between the two variables (*rho* = .107, p=. 063, p>.05).

Table 14

Correlations of RQ2(b)

			PEU_ total	Adopt PHRs for their own health management
Spearman's rho	PEU_total	Correlation Coefficient	1.000	.226**
		Sig. (2-tailed)	.	.000
		N	300	300
	Adopt PHRs for their own health management	Correlation Coefficient	.226**	1.000
		Sig. (2-tailed)	.000	.
		N	300	300

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

Table 14 shows the Spearman *rho* correlation on the variables perceived ease of use and the adoption of PHRs (for their own health management). A **significant** correlation was found between the two variables A weak positive correlation was found (*rho* = .226, p=. 001, p < .05), indicating a significant relationship between the two variables. Healthcare providers with higher perceived ease of use tend to adopt PHRs for their own health management more.

Research Question 3

RQ.3. Is there a relationship between healthcare providers' attitudes toward PHRs system and the behavioral intentions to adopt it?

Table 15

Correlations of RQ3

			Attitudes_ total	ITU_ total
Spearman's rho	Attitudes_total	Correlation Coefficient	1.000	.229**
		Sig. (2-tailed)	.	.000
		N	300	300
	ITU_total	Correlation Coefficient	.229**	1.000
		Sig. (2-tailed)	.000	.
		N	300	300

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

Table 15 shows the Spearman *rho* correlation on the variables attitudes and the adoption of PHRs. A **significant** correlation was found between the two variables. A weak positive correlation was found (*rho* = .229, p=. 001, p < .05), indicating a significant relationship between the two variables. Healthcare providers with higher attitudes tend to adopt PHRs more.

Research Question 4

RQ.4. Is there relationship between perceptions of knowledge of the PHRs and behavioral intentions to adopt it by healthcare professionals?

Table 16

Correlations of RQ4

			ITU_total	Knowledge_Total
Spearman's rho	ITU_total	Correlation Coefficient	1.000	-.150**
		Sig. (2-tailed)	.	.009
		N	300	300
	Knowledge_Total	Correlation Coefficient	-.150**	1.000
		Sig. (2-tailed)	.009	.
		N	300	300

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

Table 16 shows the Spearman *rho* correlation on the variables perception of knowledge and the adoption of PHRs. A **significant** correlation was found between the two variables. A weak negative correlation was found (*rho* =- .150, p=. 009, p < .05), indicating a significant relationship between the two variables. Healthcare providers with lower precipitation of knowledge tend to adopt PHRs less.

Research Question 5

RQ.5. Is there relationship between subjective norms and healthcare providers' behavioral intentions to adopt PHRs?

Table 17

Correlations of RQ5

			ITU_total	SN_Total
Spearman's rho	ITU_total	Correlation Coefficient	1.000	.296**
		Sig. (2-tailed)	.	.000
		N	300	300
	SN_Total	Correlation Coefficient	.296**	1.000
		Sig. (2-tailed)	.000	.
		N	300	300

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

Table 17 shows the Spearman *rho* correlation on the variables subjective norms and the adoption of PHRs. A **significant** correlation was found between the two variables. A weak positive correlation was found (*rho* = .296, p=. 001, p < .05), indicating a significant relationship between the two variables. Healthcare providers with higher subjective norms tend to adopt PHRs more.

Research Question 6

RQ.6. Is there relationship between self-efficacy and healthcare providers' behavioral intentions to adopt PHRs?

Table 18

Correlations of RQ6

			ITU_total	SE_Total
Spearman's rho	ITU_total	Correlation Coefficient	1.000	.235**
		Sig. (2-tailed)	.	.000
		N	300	300
	SE_Total	Correlation Coefficient	.235**	1.000
		Sig. (2-tailed)	.000	.
		N	300	300

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

Table 18 shows the Spearman *rho* correlation on the variables self-efficacy and the adoption of PHRs. A **significant** correlation was found between the two variables. A weak positive correlation was found (*rho* = .235, p=. 001, $p < .05$), indicating a significant relationship between the two variables. Healthcare providers with higher self-efficacy tend to adopt PHRs more.

Research Question 7

RQ.7. Is there relationship between perceived credibility and healthcare providers' behavioral intentions to adopt PHRs?

Table 19

Correlations of RQ7

			ITU_total	PC_total
Spearman's rho	ITU_total	Correlation Coefficient	1.000	.171**
		Sig. (2-tailed)	.	.003
		N	300	300
	PC_total	Correlation Coefficient	.171**	1.000
		Sig. (2-tailed)	.003	.
		N	300	300

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

Table 19 shows the Spearman *rho* correlation on the variables perceived credibility and the adoption of PHRs. A **significant** correlation was found between the two variables. A weak positive correlation was found (*rho* = .171, p=. 003, $p < .05$), indicating a significant relationship between the two variables. Healthcare providers with higher perceived credibility tend to adopt PHRs more.

Research Question 8

RQ.8. Is there relationship between healthcare providers' perceived health promoting role model and the behavioral intentions to adopt PHRs?

Table 20

Correlations of RQ8

			ITU_total	PHPRM_total
Spearman's rho	ITU_total	Correlation Coefficient	1.000	.169**
		Sig. (2-tailed)	.	.003
		N	300	300
	PHPRM_total	Correlation Coefficient	.169**	1.000
		Sig. (2-tailed)	.003	.
		N	300	300

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

Table 20 shows the Spearman *rho* correlation on the variables perceived health promotion related model and the adoption of PHRs. A **significant** correlation was found between the two variables. A weak positive correlation was found (*rho* = .169, p=. 003, $p < .05$), indicating a significant relationship between the two variables. Healthcare providers with higher perceived health promotion related model tend to adopt PHRs more.

Research Question 9

RQ.9. What factors will best predict the probability of the behavior intend to adopt PHRs among healthcare providers?

The outcome variable is the adoption composite scores that treated as an interval that exception, where you may use multiple linear regression on ordinal-scaled data as the study of Vickers (1999), provided justification to use ordinal sale (Likert-like scale) as an interval scale. The predictor variables are including the total score of perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health-promoting role model, perceived usefulness, perceived ease of use of the PHRs. Assumptions of multiple regression were checked to ensure that there was no violation in the data:

- Non-zero variance.
- Normal distribution of regression residuals.
    - (When the sample size is sufficiently large (>200), the normality assumption is not needed at all as the Central Limit Theorem ensures that the distribution of disturbance term will approximate normality).
- The relationship between the dependent variable and predictor variables.
- Homoscedasticity (homogeneity of variance of regression residuals):
    - The scatterplot of ZPRED vs. ZRESID does show a random pattern. There is no distinct funneling, indicating homogeneity.
- Independence of errors:

- The Durbin–Watson statistic is close to 2, which suggests that errors are reasonably independent.

Table 21

Descriptive Statistics

	Mean	Std. Deviation	N
ITU_total	16.0200	2.05435	300
PU_Total	46.2200	4.99213	300
PEU_total	23.8533	2.81393	300
SN_Total	19.0333	2.28245	300
Attitudes_total	24.0467	2.38400	300
SE_Total	37.1933	4.10350	300
PC_total	14.1700	3.19193	300
Knowledge_Total	2.8600	.75872	300

The table 21 shows descriptive statistics for each variable and the sample size.

Table 22

Correlation Coefficient of all Variables

		ITU	PU	PEU	SN	At	SE	PC	Kn
Pearson Correlation	ITU	1.000	.273	.234	.376	.280	.290	.177	-.189
	PU	.273	1.000	.467	.434	.540	.404	.115	-.313
	PEU	.234	.467	1.000	.311	.456	.449	.246	-.337
	SN	.376	.434	.311	1.000	.381	.355	.018	-.214
	At	.280	.540	.456	.381	1.000	.423	.091	-.281
	SE	.290	.404	.449	.355	.423	1.000	.170	-.273
	PC	.177	.115	.246	.018	.091	.170	1.000	-.270
	Kn	-.189	-.313	-.337	-.214	-.281	-.273	-.270	1.000
Sig. (1-tailed)	ITU	.	.000	.000	.000	.000	.000	.001	.000
	PU	.000	.	.000	.000	.000	.000	.024	.000
	PEU	.000	.000	.	.000	.000	.000	.000	.000
	SN	.000	.000	.000	.	.000	.000	.378	.000
	At	.000	.000	.000	.000	.	.000	.057	.000
	SE	.000	.000	.000	.000	.000	.	.002	.000
	PC	.001	.024	.000	.378	.057	.002	.	.000
	Kn	.000	.000	.000	.000	.000	.000	.000	.
N	ITU	300	300	300	300	300	300	300	300
	PU	300	300	300	300	300	300	300	300
	PEU	300	300	300	300	300	300	300	300
	SN	300	300	300	300	300	300	300	300
	At	300	300	300	300	300	300	300	300
	SE	300	300	300	300	300	300	300	300
	PC	300	300	300	300	300	300	300	300
	Kn	300	300	300	300	300	300	300	300

Table 22 illustrates a Pearson correlation coefficient was calculated for the relationship between the variables. Multicollinearity was checked using correlation statistics. No correlation was greater than .610 which indicates that multicollinearity is not a problem (Leech et al., 2008).

Table 23

Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.447[a]	.200	.178	1.85936	.200	9.102	8	291	.000	2.040

a. Predictors: (Constant), Knowledge, SN, PC, SE, At, PEU, PU
b. Dependent Variable: ITU

Table 23 shows there is one model, and it highlights R, the coefficient of determination, adjusted R Square, and Durbin-Watson. The coefficient of determination of R2 = .20 means that 20% of the variance in adoptions and the use of PHRs could be explained by the variability in the predictor variables. The Durbin–Watson statistic inform us about the assumption of independent errors. The value is 2.04, which lies between 1 and 3 which suggests that errors are reasonably independent. Hence, the assumption has been met.

Table 24

ANOVA for Regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	252.366	8	31.570	9.102	.000[b]
	Residual	1009.514	291	3.468		
	Total	1261.880	299			

a. Dependent Variable: ITU
b. Predictors: (Constant), Kn, SN, PC, SE, At,PHPRM, PEU, PU

Table 24 shows us that the overall multi-linear regression model was statistically significant F (8, 291) =9.42, p=. 0001<. 001).

Table 25

Regression Model Parameter

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.870	1.896		3.095	.002		
	PU_Total	.017	.029	.040	.574	.566	.559	1.790
	PEU_total	.001	.049	.001	.020	.984	.620	1.613
	SN_Total	.250	.055	.278	4.564	.000	.740	1.351
	Attitudes_total	.078	.058	.090	1.346	.179	.609	1.642
	SE_Total	.055	.032	.110	1.734	.084	.689	1.450
	PHPRM_total	-.013	.055	-.015	-.238	.812	.718	1.392
	PC_total	.086	.036	.133	2.383	.018	.882	1.134
	Knowledge_Total	-.082	.161	-.030	-.510	.611	.774	1.292

a. Dependent Variable: ITU_total

Table 25 provides estimates of the model parameter (the beta value) and the significance of these values.

B0 = 5.870 = Y-intercept

B1 = .017= this doesn't seem to predict PHRs adoption

B2 =.001= this doesn't seem to predict PHRs adoption

B3 = .250 = slope, gradient. This indicates a positive relationship that is as Subjective norms increases, PHRs adoption increase too.

B4= .078= this doesn't seem to predict PHRs adoption.

B5 = .055= this doesn't seem to predict PHRs adoption.

B6 = -.013= this doesn't seem to predict PHRs adoption.

B7 = .086 = slope, gradient. This indicates a positive relationship that is as Perceived Credibility increases, PHRs adoption increase too.

B8 =-.082 = this doesn't seem to predict PHRs adoption.

Based on an assessment of the variables overall, the initial regression equation was:

Adoption of PHRs =.017 (Perceived Usefulness) - .001(Perceived Ease of use) + .250 (Subjective Norms) + .078(Attitudes) + .055 (Self efficacy) + .086 (Perceived credibility)-.013(Perceived Health Promoting Related Model) - .082(Perception of Knowledge)

However, a closer assessment of variables individually revealed that Subjective Norm and Perceived Credibility are significant which is reflected in the true equation below:

Adoption of PHRs =.250 (Subjective Norms) +.086 (Perceived credibility)

Also, table 4 provides the Variance Inflation Factor (VIF) indicate the variance inflation factor of the regression. VIF values are below 10 that indicate no multi-collinearity to be present (Field, 2013).

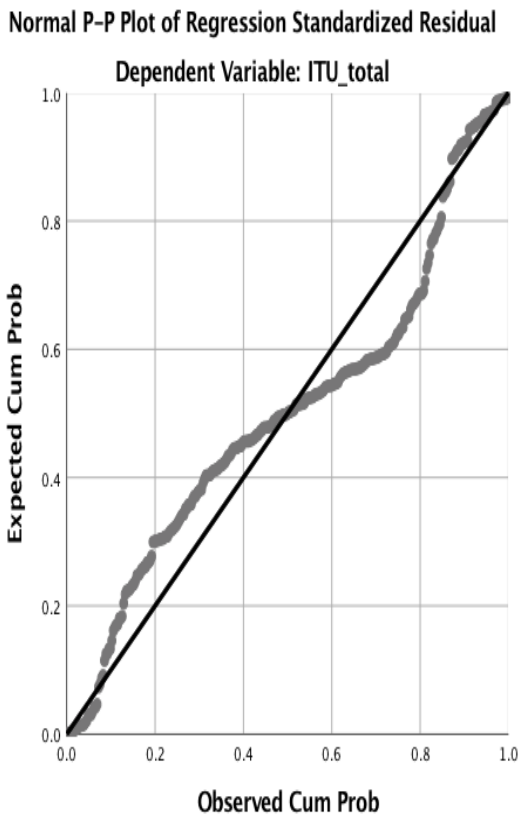

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Figure 15. The normal P-P plot. It demonstrates that data points lie in not reasonably straight diagonal line from bottom left to top right suggesting some deviation from normality (Pallant, 2013).

Table 26

Regression Residuals

			Statistic	Std. Error
Unstandardized Residual	Mean		.0000000	.10607610
	95% Confidence Interval for Mean	Lower Bound	-.2087503	
		Upper Bound	.2087503	
	5% Trimmed Mean		.0302037	
	Median		.0013812	
	Variance		3.376	
	Std. Deviation		1.83729198	
	Minimum		-5.97802	
	Maximum		4.48824	
	Range		10.46626	
	Interquartile Range		1.42146	
	Skewness		-.166	.141
	Kurtosis		1.162	.281

Table 26 shows the descriptive statistics for the regression residuals. Almost the mean is zero and a standard deviation of 1.8.

Table 27

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	.131	300	.000	.946	300	.000

a. Lilliefors Significance Correction

The above Table shows the results of the normality tests performed on the regression residuals. Since the sample size of 300 is greater than 50 the Kolmogorov-

Smirnov (K-S) is used. The K-S result is statistically significant (D (300) = .13, p = .001 < .05) indicating that the normality requirement has not been met. However, since the sample size is large (i.e., greater than 30) one may argue using the central limit theorem that the normality requirement for the regression residuals can be waived.

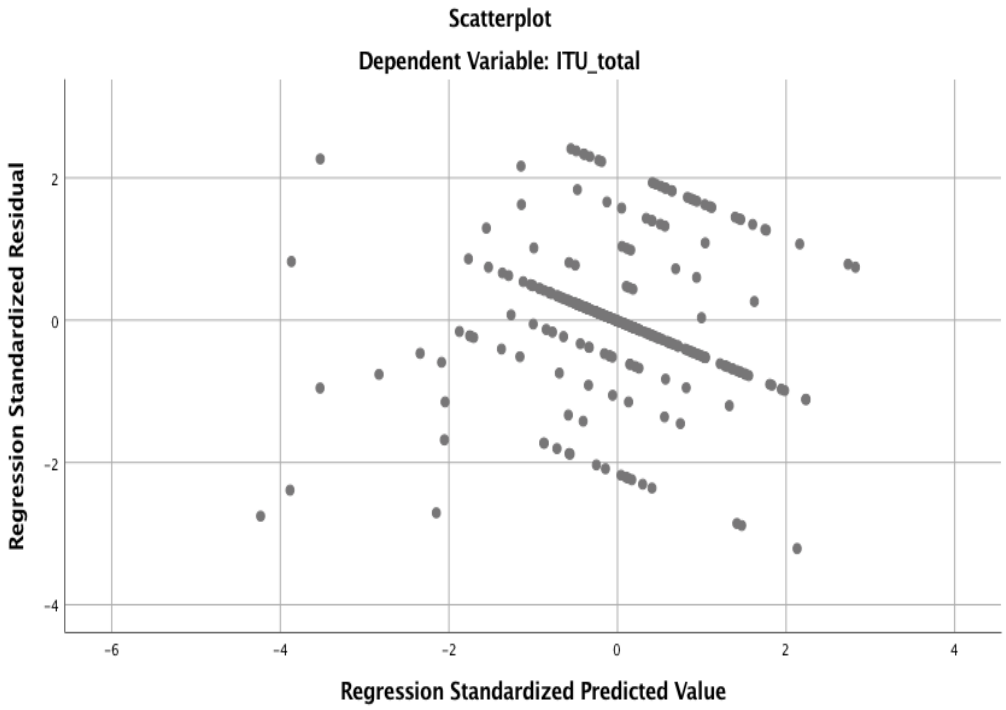


Figure 16. Scatterplot of ZResid vs. ZPred.
The Figure illustrates a random pattern that evenly dispersed through out the plot that indicates the assumption of homoscedasticity has been met.

Research Question 10

RQ.10. Is there relationship between healthcare providers' use PHRs for their own health management and encouraging their patients to use PHRs?

A chi-square test was conducted to determine if the healthcare providers' use PHRs for their own health management was associated with encouraging their patients to use PHRs. Assumptions of chi-square test were checked to ensure that there was no violation in the data: Nominal level variables, Random samples (robust to violations), Expected frequencies in all cells ≥ 5.

Table 28

*Used_for_own * Recommed Crosstabulation*

			Recommed		
			yes	no	Total
used_for_own	yes	Count	48	134	182
		Expected Count	38.2	143.8	182.0
		% within used_for_own_new	26.4%	73.6%	100.0%
	no	Count	15	103	118
		Expected Count	24.8	93.2	118.0
		% within used_for_own_new	12.7%	87.3%	100.0%
Total		Count	63	237	300
		Expected Count	63.0	237.0	300.0
		% within used_for_own_new	21.0%	79.0%	100.0%

Table 28 illustrates the Crosstabulation table that contains the number of cases that fall into each combination of two size categories (used for their own health management, and do not used for their own health management) and two encouraging categories. The subjects participating in this study were selected at random. In addition, the above table shows that all of the cells have expected frequencies of at least 5. Hence, the assumptions for running a chi-square test of the association have been met.

Table 29

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.054[a]	1	.005		
Continuity Correction[b]	7.251	1	.007		
Likelihood Ratio	8.486	1	.004		
Fisher's Exact Test				.006	.003
Linear-by-Linear Association	8.027	1	.005		
N of Valid Cases	300				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 24.78.
b. Computed only for a 2x2 table

The above table 29 shows that the result of the chi-square test was significant χ^2 (1) = 8.05, p = .001 < .05.

In light of this, the null hypothesis is rejected in favor of the alternative hypothesis. Hence, the healthcare providers' use of PHRs for their own health management was associated with encouraging their patients to use PHRs.

Table 30

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.164	.005
	Cramer's V	.164	.005
	Contingency Coefficient	.162	.005
N of Valid Cases		300	

Table 30 illustrates statistical tests to measure the strength of the relationship. Since the size of the contingency table was 2 x 2, the phi coefficient of .164 was used to measure effect size. This phi coefficient represents a small effect size.

Research Question 11

RQ.11. Will a significant difference exist in adoption and use of PHRs by healthcare providers who use and who don't use for themselves?

There were two groups (who use it, and who do not use it for themselves) who were tested for PHRs adoption and use. The dependent variable is measured Likert scale (ordinal data). Since the data are ordinal data, and the independent samples will run the non-parametric Mann Whitney to determine whether or not there is a significant difference between the two groups.

Table 31

Ranks

	used_for_own_new	N	Mean Rank	Sum of Ranks
ITU_total	yes	182	162.23	29525.00
	no	118	132.42	15625.00
	Total	300		

Table 31 shows the group (1) had an average rank of 162.2; the group (2) had an average rank of 132.4.

Table 32

Test Statistics

	ITU_total
Mann-Whitney U	8604.000
Wilcoxon W	15625.000
Z	-3.319
Asymp. Sig. (2-tailed)	.001

a. Grouping Variable: used_for_own_new

Table 32 shows test statistic results. It highlights that the results are significant (there is a statistical effect).

Z= standardized test statistic.

Z= -3.319, P =0.001(P<.05), concluding that there was significant difference between the median scores of the two groups (Accept H0: $(\mu 1 = \mu 2)$)

Calculating the effect size:

The output in figure 7 show that Z is -3.319(standardized test statistic), and we had 182 individuals, and 118 who do not use it so the total number of observation is 300 the effect size is, therefore:

R= $\frac{Z}{\sqrt{n}} = \frac{-3.319}{\sqrt{300}}$ = -.191

This represent a small .19 effect, that tell us there is significant different between the groups.

Reporting the result: A Mann-Whitney U test was used to examine the difference in Adoption and use of PHRs between healthcare providers who use it and do no use it for themselves. A significant difference was found (U=8604., P=0.001<.05).

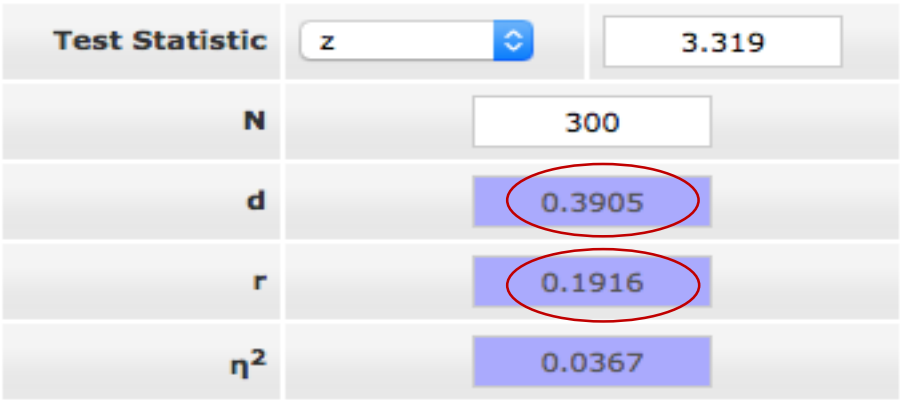


Figure 17. Screenshot of Calculation of Effect Sizes. The Figure illustrates effect size calculation according to (Lenhard, Lenhard, 2016), the (r) is .191 as the calculation above. However, we need the calculation of (d) effect size that is .39 to run a (post-hoc) Power Analysis.

Post-Hoc G*Power Analysis

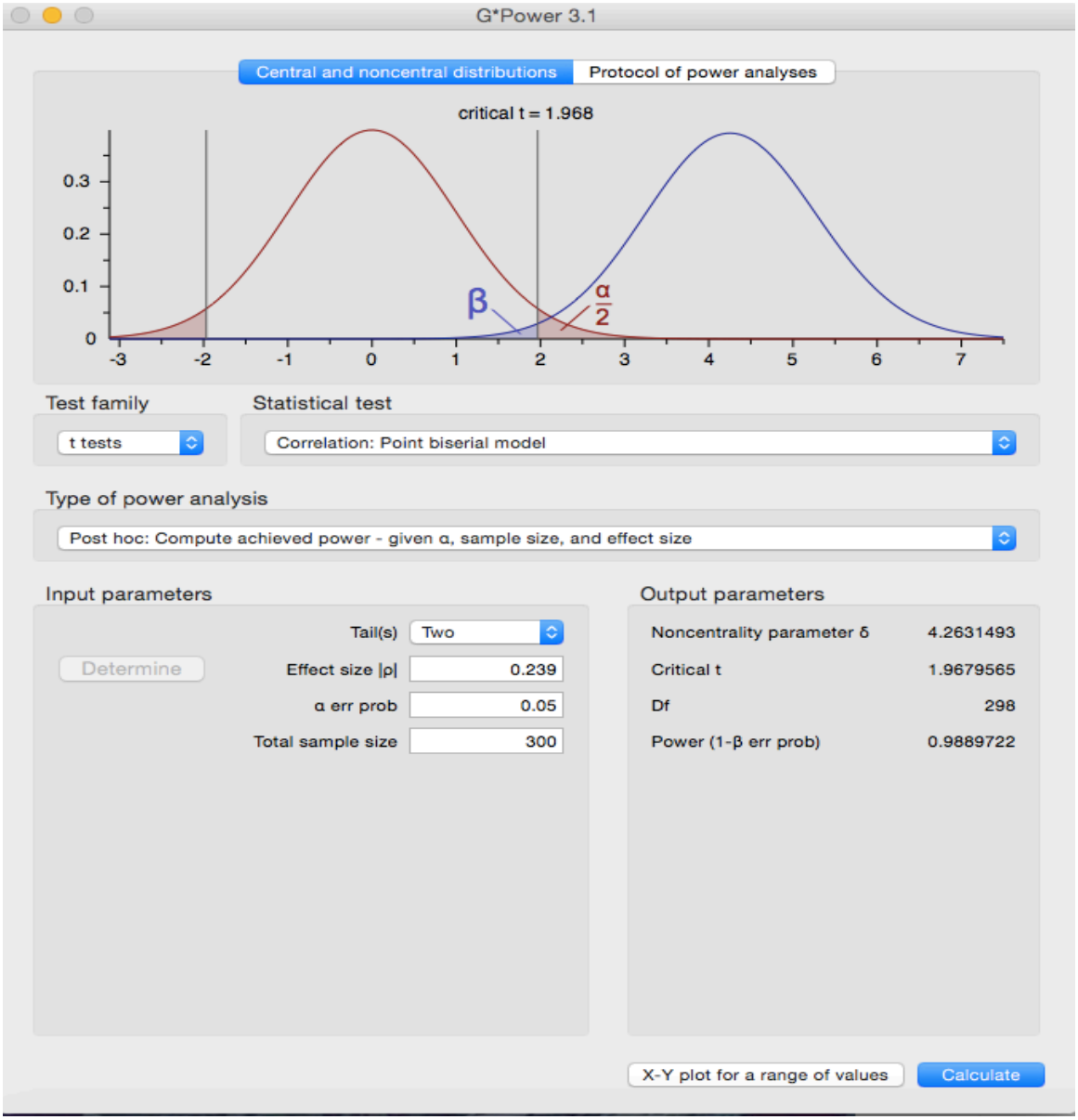


Figure 18. The statistical power analysis of the coefficient of determination ($\boldsymbol{r^2}$=$\boldsymbol{.239^2}$). The figure illustrates the calculated statistical power is 0.99 with an effect size that is above 0.8.

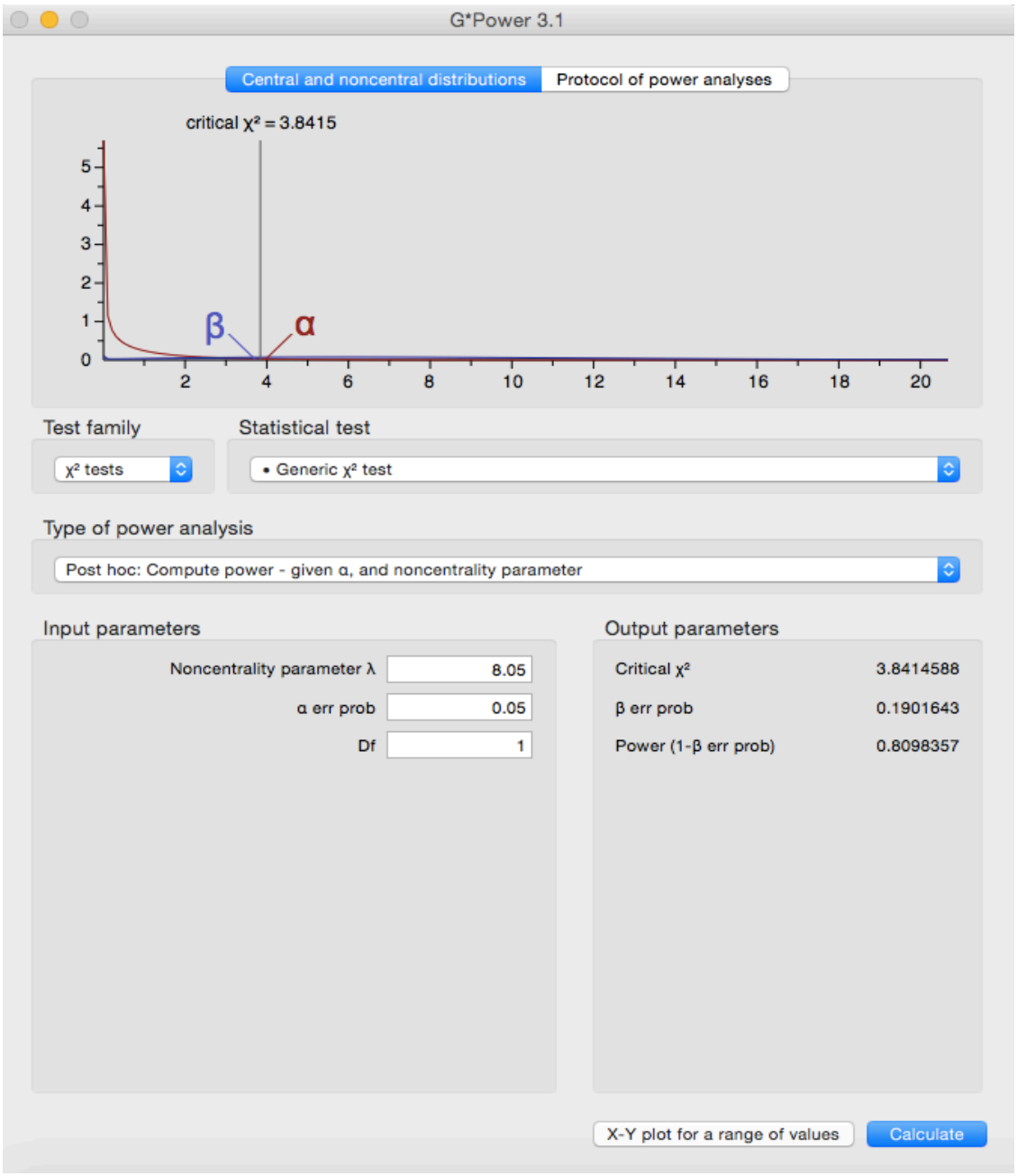


Figure 19. the statistical power for the chi-square test. It was 1 – β = .809 which exceeds the minimum recommended power level of .80.Thus, (1-$\beta = 1.0\ (> 80) at\ \alpha = .05$. We have probability to reject the null hypothesis (if false) 100% of the time. This is a good power to achieve.

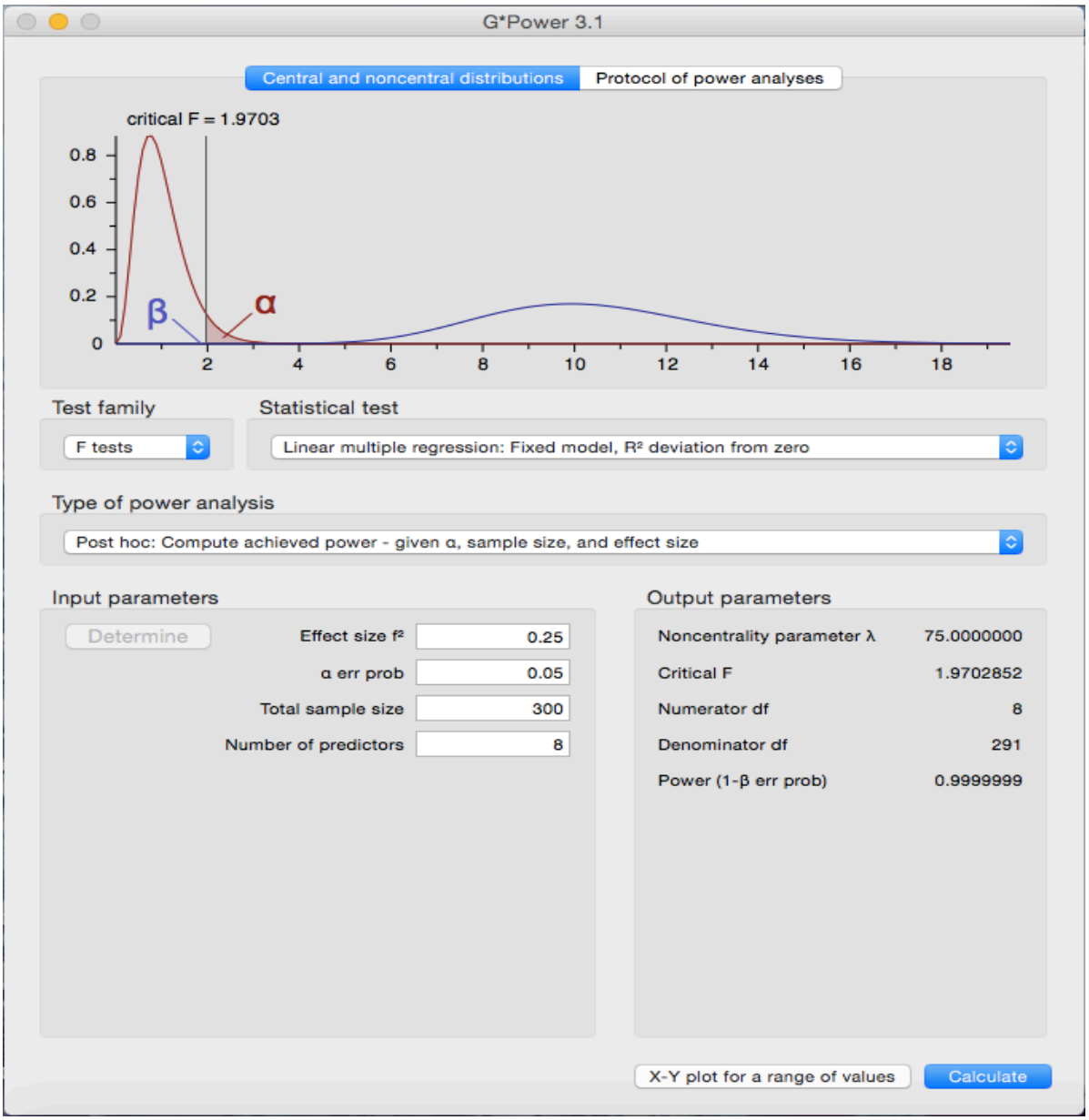


Figure 20. G*Power analysis for regression. The effect size was the coefficient of determination R2 = .2 and the statistical power of the linear regression was 1 – β = .99 which exceeds the minimum recommended power level of .80. Thus, (1-β = .99 $(> 80) at\ \alpha = .05$. We have probability to reject the null hypothesis (if false) 100% of the time. This is a very strong power to achieve.

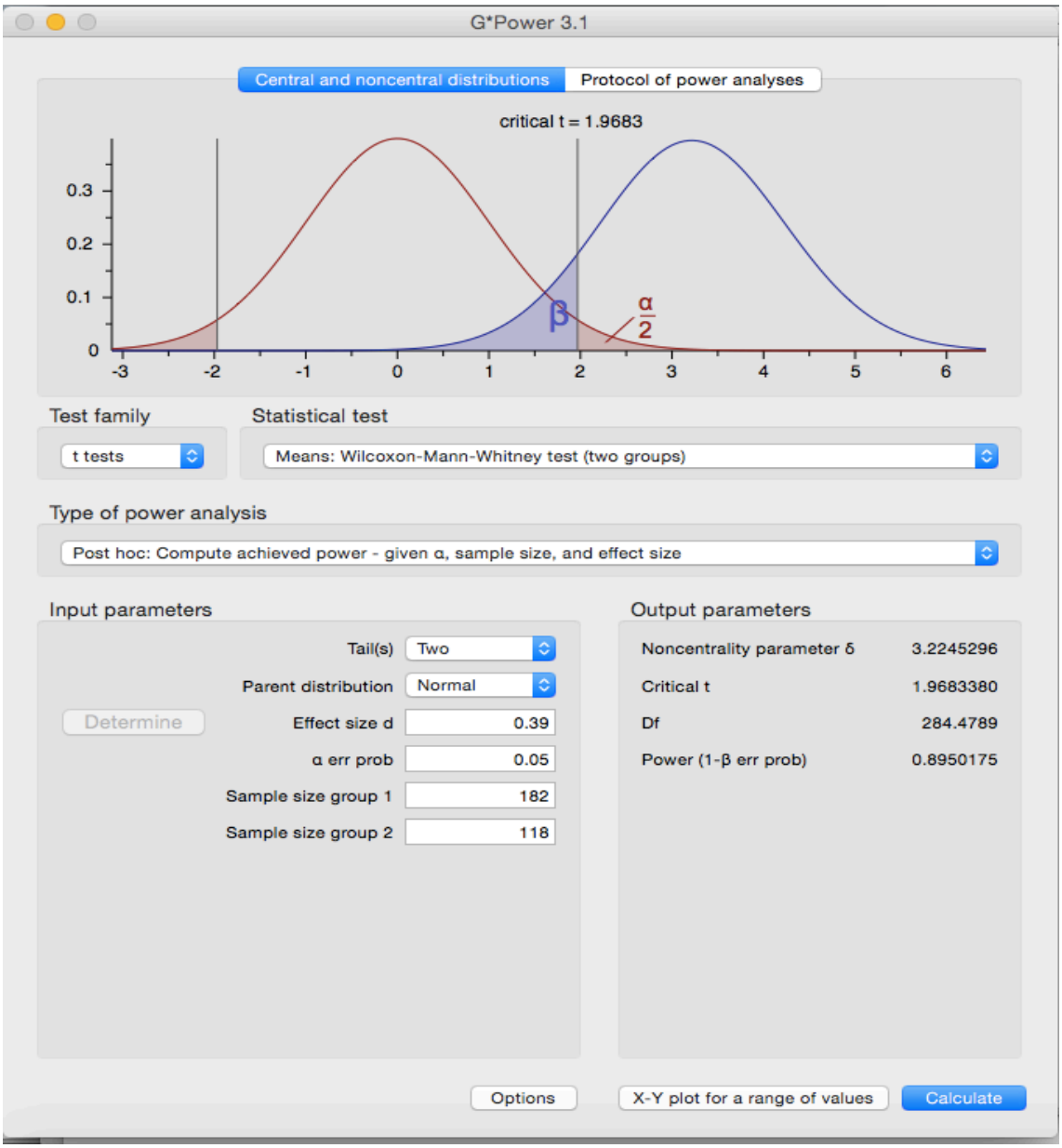


Figure 21. The statistical power analysis for the Wilcoxon Mann-Whitney U test. The figure illustrates the calculated statistical power is 0.89 which exceeds the minimum recommended power level of .80. Thus, (1-β = 1.We have probability to reject the null hypothesis (if false) 100% of the time. This is a good power to achieve.

Summary of Findings

In summary, the total survey (PHARS) tool showed excellent reliability results based upon the recommendations of George and Mallory (2011) at a .914.

- For RQ1 (a), a weak positive correlation was found (*rho* = .239, p=. 001, p < .05). For RQ1 (B), a medium positive correlation was found (*rho* = .648, p=. 001, p < .05). Health care providers with higher Perceived Usefulness tend to adopt PHRs for their medical practice, and for their own health management more.
- For RQ2 (a), No significant relationship between perceived ease of use and the adoption of PHRs for their medical practice (*rho* = .107, p=. 063, p>.05). For RQ2 (B), A weak positive correlation between perceived ease of use and the adoption of PHRs for their own health management was found (*rho* = .226, p=. 001, p < .05).
- For RQ3, a weak positive correlation between attitudes and the adoption of PHRs was found (*rho* = .229, p=. 001, p < .05).
- For RQ4, a weak negative correlation was found (*rho* = .150, p=. 009, p < .05), Health care providers with lower precipitation of knowledge tend to adopt PHRs less.
- For RQ 5, a weak positive correlation was found (*rho* = .296, p=. 001, p < .05), Health care providers with higher subjective norms tend to adopt PHRs more.
- For RQ 6, a weak positive correlation between self-efficacy and the adoption of PHRs was found (*rho* = .235, p=. 001, p < .05)
- For RQ7, a weak positive correlation between perceived credibility and the

adoption of PHRs was found (*rho* = .171, p=. 003, p < .05)

- For RQ8, a weak positive correlation between perceived health promotion related model and the adoption of PHRs was found (*rho* = .169, p=. 003, p < .05)
- For RQ 9, Among the predictor variables examined through multiple regression model, Subjective Norm and Perceived Credibility are significant in a model predicting the likelihood of adoption of PHRs technology.
- For RQ 10, a significant relationship was found (χ^2 (1) = 8.05, p = .001 < .05). That is, the healthcare provider's use of PHRs for their own health management was associated with encouraging their patients to use PHRs.
- For RQ 11, A significant difference was found in the adoption and use of PHRs between health care providers who use it and do no use it for themselves (U=8604., P=0.001<.05).

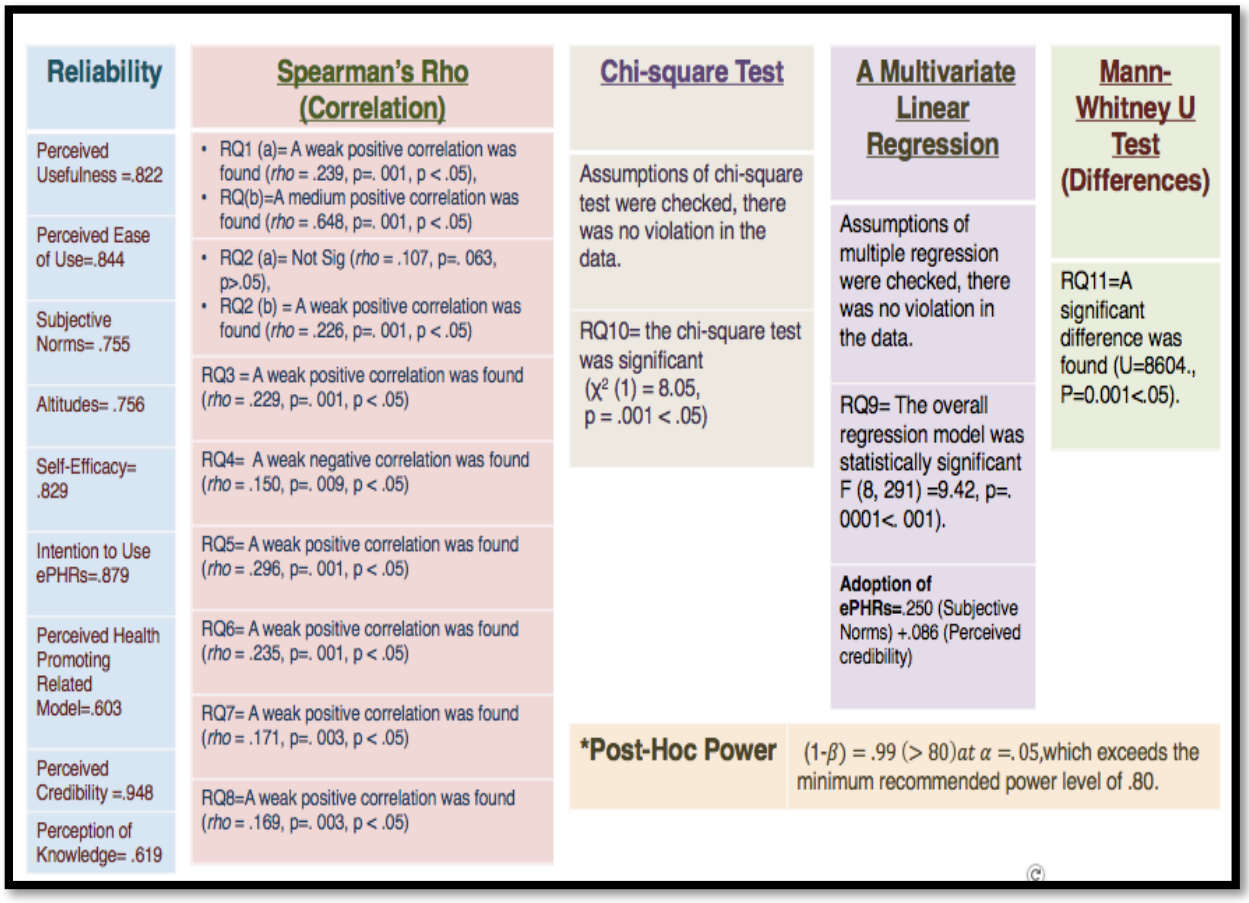


Figure 22. Summary of Findings.

Reject or Fail to Reject?	
✓	H1. a. A positive relationship exist between **perceived usefulness** and the likelihood to adopt PHRs ***for their medical practice.***
✓	H1. b. A positive relationship exist between **perceived usefulness** and the likelihood to adop ***for their own health management.***
✗	H2. a. A positive relationship exist between **perceived ease of use** and the likelihood to adopt PHRs ***for their medical practice.***
✓	H2. b. A positive relationship exist between **perceived ease of use** and the likelihood to adopt PHRs ***for their own health management.***
✓	H.3. There is a positive relationship between healthcare provider's **attitudes** toward PHRs system and the behavior intend to adopt PHRs system.
✓	H.4. There is a positive relationship between **perceptions of knowledge** of the PHRs and the behavioral intentions to adopt it by healthcare professionals.
✓	H.5. There is a positive relationship between **subjective norms** and healthcare provider's behavior intend to adopt PHRs.
✓	H.6. There is a positive relationship between **self efficacy** and a caregiver's behavioral intentions to adopt PHRs.
✓	H.7. There is a positive relationship between **perceived credibility** and healthcare provider's behavioral intentions to adopt PHRs.
✓	H.8. There is a positive relationship between healthcare provider's **perceived health promoting role model** and the behavioral intentions to adopt PHRs.
✓	H.9. A regression model will describe the factors that predict the probability of the behavior intention to adopt PHRs among healthcare providers.
✓	H.10. There is a positive relationship between healthcare provider's use ePHRs for **their own health management** and **encouraging their patients to use ePHRs.**
✓	H.11. There is a significant difference in adoption and use of ePHRs by health care providers **who use** and **who don't use for themselves.**

Figure 23. Review of Hypotheses.

Chapter V

DISCUSSION

General Discussion of Key Study Findings

The purpose of this study is two-fold. First, to determine the reliability (Cronbach alpha) of the newly created "Personal Health Record Assessment Survey (PHRAS)" that was validated using a Delphi panel of experts. The reliability assessments for each factor revealed a good/excellent reliability as mentioned in chapter 3. Second, to use this validated and reliable tool in the population in order to determine association if any among these factors regarding the behavioral intent to adopt PHRs among healthcare providers. The following section presents an explanation of how the results relate to the literature. Followed up with the research limitations, and recommendations for future research.

Discussion of Demographic

The demographic results showed that the average age of the 300 healthcare providers respondents was 31 to 40 years old (60.7%). Age categories were slightly similar to those used in the literature, the national survey CHCF (2010) showed that the users of PHRs age rate were mostly under age 45. However, the average age of the healthcare provider's respondents doesn't mean that healthcare providers who aged (31 to 40) are more likely to adopt PHRs. Also, the study result presents more females than

male respondents (186 females were 62%, and 113 males were 37.7% of the total sample). In the literature, it is stated that male physicians were noticeably more willing to use PHRs than female (Wynia et al., 2011). The larger female population was present within this study doesn't mean that females are more likely to adopt PHRs than male. In order to make inferences on gender, and age further research is needed to look into the gender and age groups.

Overview of Discussion

Previous literature looked at the PHRs from a simple technical side. Although some studies have identified a number of factors that could affect the adoptions of PHRs, only in a limited group of providers. The adoption of PHRs have not been fully studied yet in literature, that is important to understand its low popularity. This study purposely explored a number of these factors and their relationship to the adoption of this technology among healthcare providers. The results showed that the PI developed a theoretical model proposed by this study revealed a good overall model fit and sufficient power, providing a direction for future research on the PHRs. This following section will discuss each of the factors in details.

Perceived usefulness. The findings showed that the relationship between perceived usefulness and the likelihood to adopt PHRs for their medical practice, and for their own health management was significant. This positive correlation results from the study were consistent with some studies in the literature. The study of Chung et al. (2016) found out that perceived usefulness significantly influenced nurse's intentions to use PHRs by using the Technology Acceptance Model. Also, perceived usefulness

found to be a significant factor that affects patients' use of a PHRs (Cocosila et al., 2012; O'Leary et al., 2016). This means that healthcare providers were more likely to use PHRs if they perceived that it might help them with the tasks of tracking their own health, and their patients condition such as communications a between patient and physician, schedule appointment, and access to health information from anywhere anytime. Also, this results indicated health care providers have great perceived usefulness and positive behavioral intentions toward using PHRs that is in contrary with the significant results of Gartrell et al. (2015) that stated nurses who used PHRs were less likely to feel that PHRs was useful for their own health management.

Perceived ease of use. This study did not find perceived ease of use to be a statistically significant factor in determining the likelihood to adopt PHRs for their medical practice. The findings were not consistent with the study of (Iqbal et al., 2013), which highlights perceived usefulness and ease to use of primary care physicians were found as key factors influencing EHRs adoption. Actually, the (HITECH) Act of 2009 mandated and requires that all medical providers use EHR in their medical practice. This may bring about the fact that the PHRs system may be easy to use for health care providers in their practice. This may explain unexpected finding why perceived ease of use was not to be a significant factor in the adoption of PHRs their medical practice in this study. The healthcare provider's answers were based on their medical practice experience with PHRs as they are required to use electronic medical records. However, the finding highlighted perceived ease of use and the likelihood to adopt PHRs for their own health management have a weak positive correlation. This result, like those of

others, found perceived ease of use to have a positive relationship with PHRs use (Gartrell et al., 2015; Chung et al., 2016). It is important to note that this study did not examine the association between perceived usefulness and ease of use. Other studies found perceived ease of use to be a significant antecedent of perceived usefulness among some type of healthcare providers that adopt (Chen et al. 2008; Chung et al, 2016). More research is needed to examine the relationship between perceived usefulness and ease of use among healthcare providers.

Attitude. It was weakly correlated with the adoption total score. That is, attitudes might influence behavioral intentions of healthcare providers to adopt an PHRs. This is agreed with the results of some studies, Hui-Lung et al. (2016), found that attitudes had the highest total effects on the intentions to use patient PHRs by nurses. Also, the study of Khaneghah et al. (2016) that aimed to evaluate the attitude of patients towards using a PHRs to manage their health care. The findings revealed that the attitude of patients towards PHRs is positive. That is, the patient's attitude was generally influenced by the extent to which the system helped them to manage their condition. Though some studies had found disparities exist among different user's groups of PHRs system. The study of Wang et al. (2015) revealed the discrepant attitudes among patients, physician and medical staff with the lowest support from the physicians and the highest support from the patients. Results of this research study with regard to attitudes suggest that the general trend is that healthcare providers who used PHRs for their own health management are more favorable to recommending to their patients. Hence, the healthcare provider's use of PHRs for their own health management was significantly

associated with encouraging their patients to use PHRs. This fits with the study Lobelo, and de Quevedo (2016), finding that stated physicians and health care providers' personal habits are a key, and might predict the manner in which they influence their patients' behaviors on related health habits.

Perceptions of knowledge. This study found a negative correlation between perceptions of knowledge of the PHRs and the behavioral intentions to adopt PHRs. That is, Health care providers with lower precipitation of knowledge tend to adopt PHRs less. In a survey study of Wynia et al. (2011), many physicians who responded had no experience using PHRs, however, a majority of providers were willing to try using them. In addition, the study of Noblin, Wan, and Fottler (2012) found patient's perceived ability to understand e-health information influence their willingness to adopt and familiarity with how to use an PHRs system. This is consistent with Nazi (2013) study of the experiences of physicians, nurses, and pharmacists using a sponsored PHRs system at the (VA), which is the greatest integrated health care system in the US. The finding revealed health care providers who responded believed that lack of knowledge limits their ability to their use of PHRs system elements, and limits their recommendation to patient use. In short, increasing healthcare providers' knowledge about the numerous features could help to utilize the PHRs tools sufficiently, and to support patient use.

Subjective norms. In this study, the subjective norm indicated to a healthcare providers' perception of the people remarkable to him/her and his/her thoughts regarding the use of a PHRs. Subjective norms factors were the strongest predictors in the regression model for the adoption of PHRs. The subjective norms total score was

significantly correlated with the adoption total score. These findings were consistent with the result of Chung et al. (2016), subjective norms had stronger total effects on intentions of nurses to use PHRs than other factors did including perceived usefulness, perceived ease of use, and perceived credibility. Similarly, the study of Zheng (2011) found that subjective norm and attitude have strong influences upon behavioral intentions in the EMR sharing context. Also, the study of Ozok et al. (2016) that focused on patients point out that most PHRs users stated that if their family members or friends recommended, they try new technology, they would try it. The encouragement from a physician, family, and, colleagues is an influential factor to adopt PHRs.

Self-efficacy. It was found to be a significant factor in this study. This finding addresses the concept of the self-efficacy of (Bandura, 1986) that is the more confidence in doing a specific behavior makes it possible for an individual to become more engaged in the health care process. Findings from the literature were similar to this study. The PHRs evaluation of Chung et al. (2016), showed that computer self-efficacy significantly and positively affected the intentions of nurses to use patient PHRs. Deng et al. (2014) studied self-efficacy as it affecting individuals' health technology acceptance behavior, their results showed a significant positive relationship between self-efficacy and intentions to adopt mobile health services by patients in China. Another recent study by Dutta et al. (2018) approved the importance of health technology self-efficacy in encouraging greater intentions toward PHRs use among patients.

Perceived Credibility. It was significant predictor in the regression model for the adoption of PHRs. Perceived credibility is known as an individual consideration level that using information system such as (PHRs) is save against privacy and security threats (Ong et al., 2004). Previous studies that focused in healthcare providers' adoption and patients' adoption suggested that data protection is an influential factor regarding PHRs adoption and use (Gaskin et al. ,2016; Dontje et al., 2014; Witry et al., 2010). The perceived credibility total score was significantly associated with the adoption total score. This may be explained as healthcare providers emphasize the safety and privacy of PHRs that are critical for their intention to adopt and use PHRs. This finding consisted with the study of Li et al. (2014) has found perceived privacy control and trust is one of the major factors affecting intention to adopt the PHRs, more than the effect of potential privacy risks. Some themes that emerged in the open-ended section of this study regarding concerns about PHRs use highlighted that secure and safe, and HIPPA privacy rules. Additionally, this study finding similar to Chung et al. (2016) study, which found that perceived credibility has a direct positive effect on intentions to use PHRs.

Perceived Health-Promoting Role Model. It was found to be a significant factor in this study. This factor represents health care providers believes that he/she has a responsibility to model personal health-promoting practices and behaviors for their patients (Rush et al., 2010). The literature supported this finding, Gartrell et al. (2015) found most nurses perceived health promotion as part of their role and that associated with PHRs use. Also, Dontje et al. (2014) study suggested that nurse practitioners can

influence patient engagement in PHRs by encouraging patient involvement in the development and revisions of electronic resources. Moreover, this study found that the healthcare provider's use of PHRs for their own health management was significantly associated with encouraging their patients to use ePHRs. This fits with the study of Lobelo, & de Quevedo (2016), indicated that physicians and health care providers' personal habits are a key, and might predict the manner in which they influence their patients' behaviors on related health habits. This is important because personal experience with their own PHRs use may encourage nurses to promote use among patients.

Adoption and use of PHR. In this study, significant differences existed between in adoption and use of PHRs by health care providers who use and who don't use for themselves. This finding was consistent with the study of (Emani et al., 2012) that found systematic differences between those who use a PHRs and those who did not adopt a PHRs on technology use and access. This difference might be a results of the influences of any of the eight factors that was examined in this study.

Conceptual Framework Revisited

It is important to re-examine the conceptual framework mentioned in chapter 2, to integrate based on what has been discussed and underlined through statistical results, revisiting that framework and understanding how those variables may have an influence on the outcome. The findings of this study support the conceptual framework. Figure 22 shows the conceptual model of study variables in the context of the Theory of Planned Behavior, Technology Acceptance Model (TAM), and Self Efficacy Theory. The

conceptual framework explained that 1) perceptions of knowledge, 2) attitudes, 3) subjective norms, 4) self-efficacy, 5) perceived credibility, 6) perceived health-promoting role model, 7) perceived usefulness and 8) perceived ease of use are statistically significant influencers of the behavioral intent to adopt PHRs among healthcare providers. Statistical analysis in this research has indicated a relationship; a weak one, however still a relationship between the 8 predictors variables and the behavioral intention to adopt. What does this mean? It might mean that may influence the adoption of the health care providers. Though, a weak correlation means that as one variable increase or decreases, there is a lower probability of there being an association with the other variable. Based on the regression outcome of this study, once the non-significant variables are eliminated, it is revealed that subjective norms and perceived credibility variables were the most significant predictors of outcome. It can be interpreted that health care providers are more likely to use a system if they feel it is secure and safe to use, and there are no privacy issues when using it. Also, if it is promoted by their health care organization, and when their physician recommends it. If their friends or colleagues are using PHRs, they will be more likely to use PHRs also.

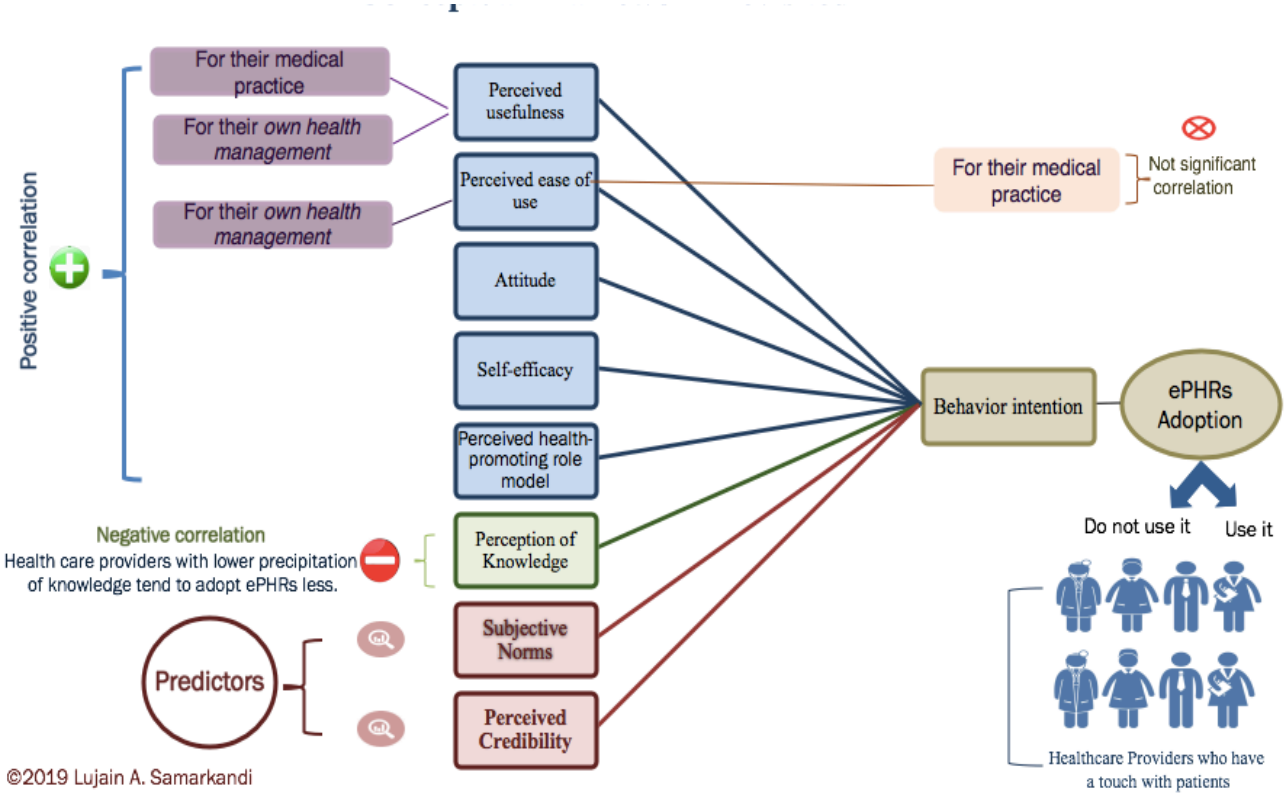


Figure 24. Revised theoretical model.

Qualitative Responses

This next section demonstrates samples of open-ended responses specified by healthcare providers based on some of the survey questions. Although these are not representing any certain statistical question, it is interesting to include some of the comments respondents provided on the questionnaire. These responses helped to better understand the study findings, and might highlight a direction for further research to look into the themes. The open-ended questions:

- Please describe briefly any positive experience(s) that you had when using PHRs.
- Please explain any concerns you have about PHRs use.
- Please describe briefly your overall opinion(s) of the technology available for PHRs use.

For the first question several themes emerged based upon the responses that were related to the literature review portion of this dissertation study, the following figure shows the themes:

Themes in responses	N= 32
Enhance communication	9
Reminders	3
Save time and cost	4
Easy access	13
The benefits not for all patients	3

Figure 25. Qualitative themes of positive experiences.

The comments provided insight into positive experiences of healthcare providers about PHRs which may be viewed as additional advantage related adoption and use of PHRs. Crucial themes identified by the respondents include enhance communication, provide reminders, save time and cost, and accessible health information. Also, some healthcare providers specified that PHRs might be useful but not for all type of patients. The literature review supported our themes that PHRs have potential benefits to the health care and improve health outcomes in many areas such as enhance communication, accessible health information (Tang et al. , 2006; Winkelman et al., 2005; Bartlett et al., 2012; Kaelber et al., 2008). The responses of this question are similar to the literature review that highlighted the perceived usefulness of using PHRs. Accordingly, PHRs have important positive effects on health information access, communication, patient self-report, and patient/provider relationship (Nazi, 2013). The following figure shows a more detailed list of respondents' open-ended answers that fall under these determined them.

Positive experiences

(Enhance Communication)

"I have had quick response from my personal physician in healthcare questions that may take hours when using the prior method of calling the office".
[Medical Doctor]

"As a sonographer, it provides a way for me to gather relevant information about patients from a reliable source and to communicate with members of the healthcare team. As a patient and family member, it provides me with a reliable way of organizing my health information and communicating with my providers".
[Sonographer]

"I messaged my provider to describe symptoms and he encouraged me to schedule an appointment".
[Respiratory Therapist]

"I like being able to communicate with my provider instead of playing phone tag".
[Psychologist]

(Reminders)

"I couldn't remember when I had my last physical or mammogram so I could look into the record and find out".
[Pharmacist]

"Good User Friendly ..... Reminders ....."
[Registered Nurse]

(Easy Access)

"I once worked for a hospital system that had a home-grown EHR that allowed you to click on one section and see the previous entries for that section and allowed you to copy that information forward. This was very helpful in seizing the power of the information in the EHR".
[Medical Doctor]

"Our patient's love to have quick access to information as it is available".
[Medical Doctor]

Figure 26. Example of responses for positive experiences question.

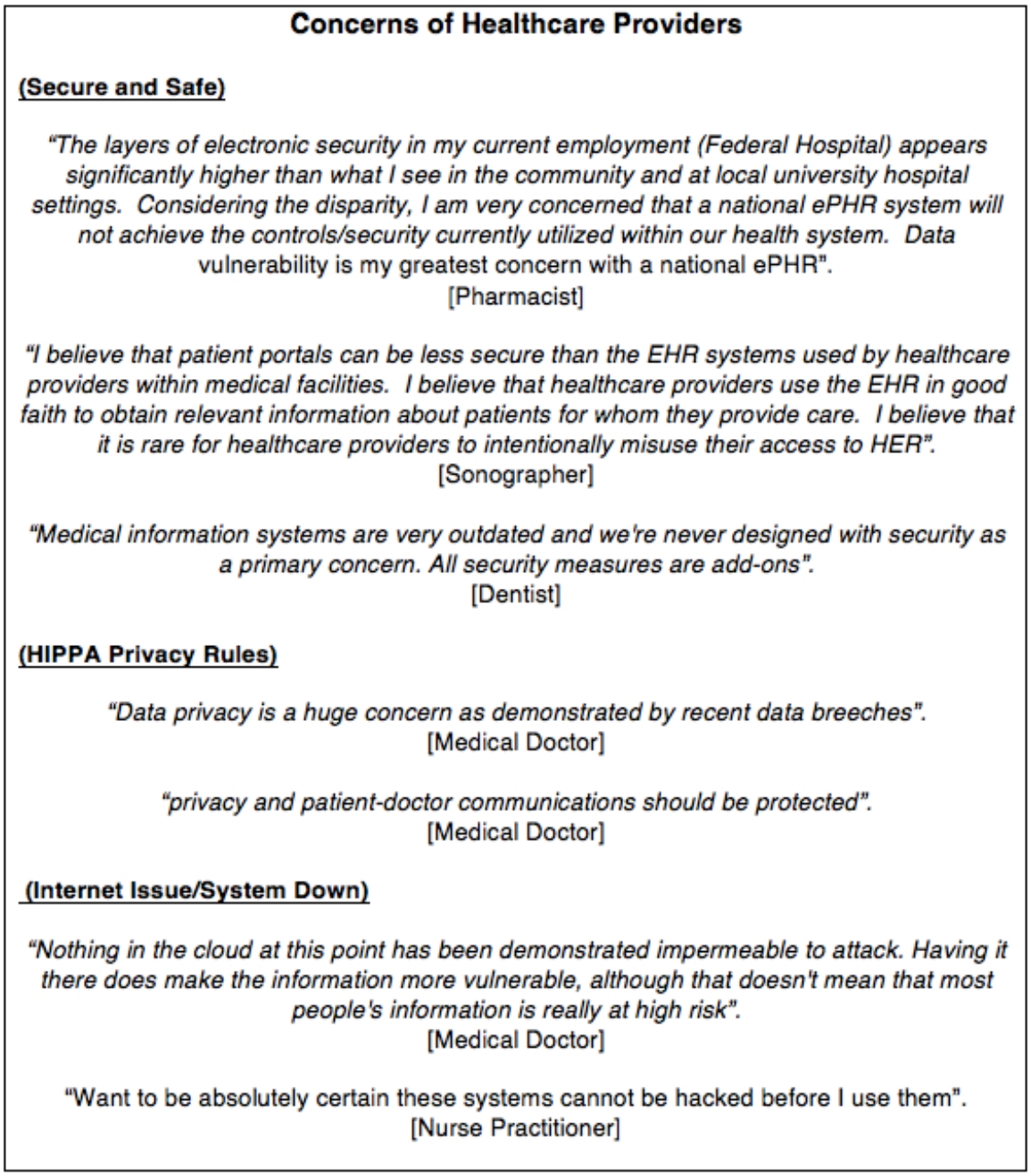
For the second question several themes emerged based upon the responses that were related to the literature review portion of this dissertation study, the following figure shows the themes:

Themes in responses	N= 31
Secure and safe	6
HIPPA Privacy rules	10
Data destroyed	4
Internet Issues/system down	7
Depend on the system	4

Figure 27. Qualitative Themes of Concerns.

The comments provided insight into concerns of healthcare providers regarding PHRs use which may be viewed as challenges to adoption and usage. Basic concerns identified by the respondents include security and safety, HIPPA privacy rules, data destroyed, and Internet Issues. Also, some healthcare providers stated that privacy and credibility might be different as each PHR system has its own credibility and privacy standards. The literature review indicated that PHRs have some major challenges privacy and security concerns, costs, integrity, accountability, health literacy and legal and liability risk (Aleman et al., 2010; Henriksen et al.,2013; Dontje, et al.,2014). The responses of this question are related to the literature review that highlights the perceived credibility of using PHRs. The following figure shows a more detailed list of

respondents' answers that fall under these themes.



Concerns of Healthcare Providers

(Secure and Safe)

"The layers of electronic security in my current employment (Federal Hospital) appears significantly higher than what I see in the community and at local university hospital settings. Considering the disparity, I am very concerned that a national ePHR system will not achieve the controls/security currently utilized within our health system. Data vulnerability is my greatest concern with a national ePHR".
[Pharmacist]

"I believe that patient portals can be less secure than the EHR systems used by healthcare providers within medical facilities. I believe that healthcare providers use the EHR in good faith to obtain relevant information about patients for whom they provide care. I believe that it is rare for healthcare providers to intentionally misuse their access to HER".
[Sonographer]

"Medical information systems are very outdated and we're never designed with security as a primary concern. All security measures are add-ons".
[Dentist]

(HIPPA Privacy Rules)

"Data privacy is a huge concern as demonstrated by recent data breeches".
[Medical Doctor]

"privacy and patient-doctor communications should be protected".
[Medical Doctor]

(Internet Issue/System Down)

"Nothing in the cloud at this point has been demonstrated impermeable to attack. Having it there does make the information more vulnerable, although that doesn't mean that most people's information is really at high risk".
[Medical Doctor]

"Want to be absolutely certain these systems cannot be hacked before I use them".
[Nurse Practitioner]

Figure 28. Example of some responses that fell under concerns question.

For the last question several themes emerged based upon the responses that were related to the literature review portion of this dissertation study.

Themes in responses	N= 73
Advantages of the system (reduce errors, improve quality, enhance communications, time and cost saving, easy access)	21
Patient challenge to use (elderly, education level, health terms, computer difficulty, lack of knowledge)	23
Not all (hospitals/ providers) offer it	14
It is a future trend	5
Empower patients to be take active role	7
Redundant, and Increases work for everyone	3

Figure 29. Qualitative themes of overall opinion.

The comments provide insight into healthcare providers overall opinion regarding PHRs. General themes identified by the respondents include the advantage of PHRs and patients challenge, not offered, future trend, patients empowerment that might be viewed as additional factors influence PHRs adoption. Also, some healthcare described PHRs as it is Redundant, and increases work for everyone. The literature review explained the importance of clinician authorization and engagement to empower patients and increase their participation in their own health care (Nazi, 2013; Woods et al., 2013). Besides, the study of Wang et al. (2015) indicated that physicians concerned about patients misunderstanding of PHRs function, and might need more sufficient

knowledge. The following figure shows a more detailed list of respondents' answers that fall under these themes.

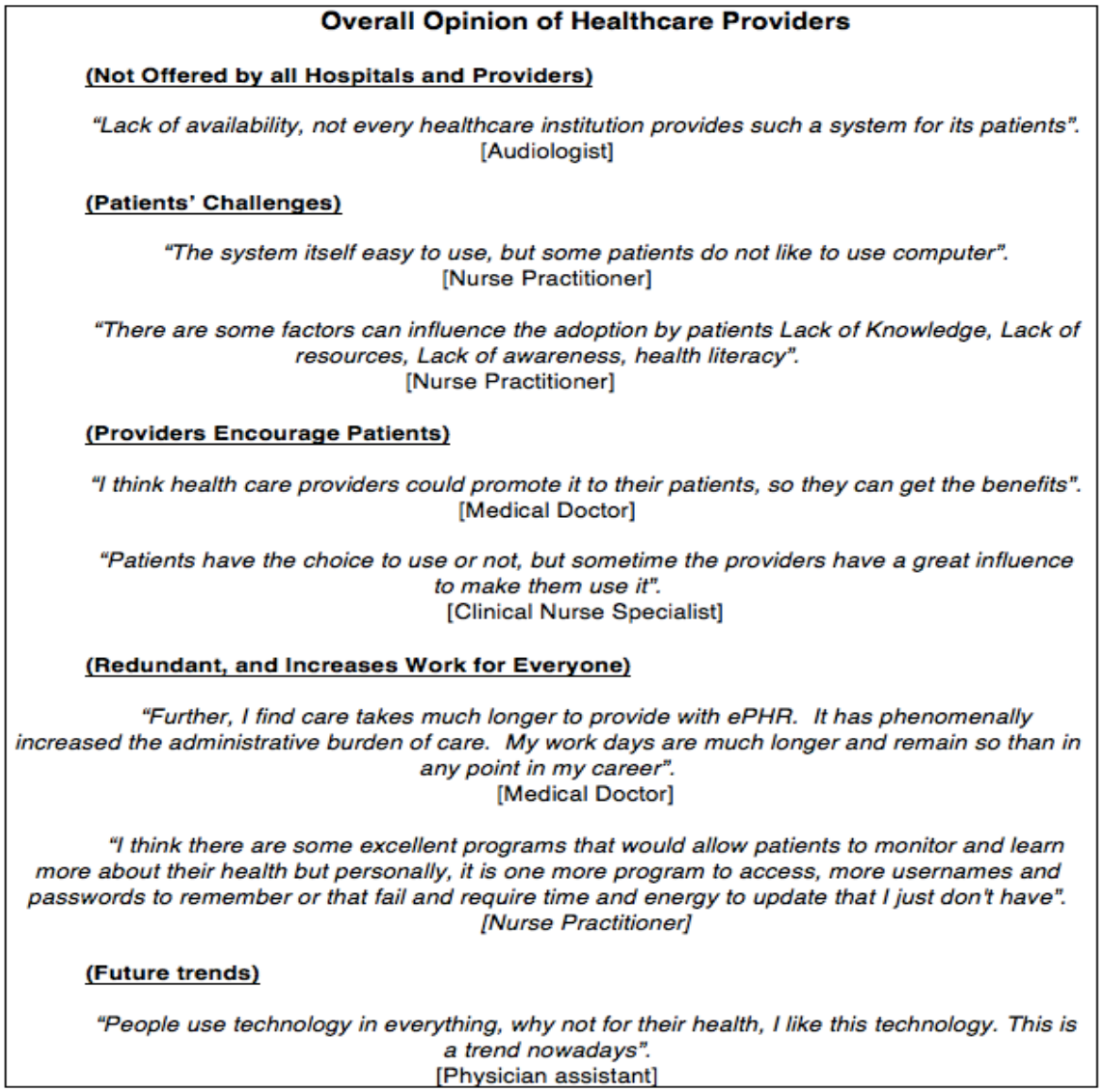


Figure 30. Example of some responses that fell under overall opinion of healthcare providers question.

Study Limitations

As with all research studies, there are always some limitations. The following section discusses the limitations of this dissertation research study.

Self-administered questionnaire. In fact, a self-administered questionnaire was used to protect and secure the data which gave the PI no control over how participants understood the questions. It was undetermined if respondents took the survey seriously and in a reasonably good environment without interruptions, or there were any illegitimate efforts. That might result in not accurate responses regarding PHRs adoption by respondents.

Cross-sectional study design. The data were collected at one point in time (cross-sectional data collection) and evaluated quantitatively together. A longer longitudinal study, where a group of healthcare providers was followed to find if their perceptions of knowledge, attitudes, subjective norms, self-efficacy, perceived credibility, perceived health-promoting role model, perceived usefulness and perceived ease of use had changed, may reveal a different result.

Correlational design. The study used a correlational approach, which could be featured as a limitation because it could not address a casual relationship, so using a different study design may produce different results.

The chain- referral sampling methodology. The snowball sampling method had its benefits; however, the result of this sampling had some disadvantages to this study. As this sampling method provides invitations to forward the survey to other healthcare providers outside the original participants, it becomes difficult to control the

geographic distribution or the size of the sample in any given group. The study respondents were recruited by an anonymized e-mail survey link that gathered from websites or posted in social media (Facebooks, Twitter, and LinkedIn), hence, the study may have excluded those without access to those. In addition, there was no contact information collected for participants, which make impossible to follow-up with or to do the longitudinal following study.

Non-purposive (convenience) sampling. The generalizability of the results is limited to those who participated as the study followed non-purposive sampling. This sampling method may be interpretably providing an outcome, but it had some limitations on what can be inferred. This sample cannot be deduced to make extrapolations about a larger population because of the lack of randomization and selective sampling.

Future Research

To expand our understanding of the factors related to PHRs adoption by healthcare providers, more research is needed. It would be beneficial to reproduce the study in a different geographical area. Future research could include studies with purposive sampling to expand the sample to have a more global representative sample. This would offer much wider interpretations and inferences. Also, more research could focus on the survey tool by develop the instrument in different language to concentrate on the international use of the survey tool. This would allow further understanding of PHRs adoption in other countries than the U.S. Likewise, more resrch could be done to asses the reliability of the instrument at a higher level for wider applicability by preforming exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to

determine the weight of influence by each factor on my conceptual framework. In addition, future research needs to focus on the differences that may exist between different group of health care providers including, gender (male vs. female), age (older vs. younger generation), type of providers (MD vs. nurses). This would allow finding if any of these groups are adopting PHRs more than the other group (in their practice, and for their own health management), plus to understand the reasons with regard to this differences. Moreover, further research needs to focus on the adoption and use of PHRs by patients to see what is the impact of their health care providers to adopt PHRs. To sum up, more research could look into the qualitative themes that were mentioned in this study.

Conclusion

The study aimed to explore PHRs adoption among a wide range of healthcare providers' groups including most medical fields. This exploratory study looked at provider types that no other studies have yet addressed in the literature, these healthcare providers, have a growing role in encouraging patients to use PHRs. This study investigated eight factors from the PI developed a theoretical model, that utilize the *Theory of Planned Behavior, Technology Acceptance Model (TAM), and Self Efficacy Theory* and some themes from the literature review. According to the results, the study evidently identified subjective norms and perceived credibility as significant predictors that influence on healthcare providers' intention to use and adopt PHRs. In addition, it explained that perceptions of knowledge, attitudes, self-efficacy, perceived health-promoting role model, perceived usefulness and perceived ease of use must be

taken into account to increase intention to adopt PHRs by healthcare providers for their medical practice, and for their own health management. The results also specified healthcare provider's use of PHRs for their own health management was linked with encouraging their patients to use PHRs. Understanding healthcare providers' adoption and use of PHRs might increase the adoption of patients by recommending the use of PHRs. Consequently, for the continuing growth of patient adoption and the use of PHRs, understanding the factors that impact the behavior intentions of healthcare providers to adopt PHRs are essential. This study's findings will help to frame the direction of future research to increase the adoption of PHRs.

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APPENDICES

APPENDIX A

Approval to Conduct Delphi Process

SETON HALL UNIVERSITY
1 8 5 6

AGREEMENT FOR DELPHI PROCESS
SIGN-OFF-SHEET – STEP 1

DOCTORAL CANDIDATE NAME: Lujain Samarkandi

PROJECT TITLE: Creating and Validating a New Survey Instrument to Explore Factors Affecting the Adoption of Personal Health Records among Healthcare Providers: The Delphi Panel Development

DELPHI METHODOLOGY REVIEW AND APPROVAL MEETING WITH COMMITTEE: **April 26, 2017**

I HAVE PARTICIPATED IN SEVERAL DISCUSSIONS WITH MY DISSERTATION CHAIR AND MEMBERS OF MY COMMITTEE AND HAVE MY COMMITTEE'S AGREEMENT TO SUBMIT THE DELPHI EXPERT PANEL AND SURVEY CREATION IRB APPLICATION. THE SIGNATURES HEREIN REFLECT MY COMMITTEE MEMBERS' SUPPORT OF MY PROPOSED METHODOLOGY.

DISSERTATION COMMITTEE CHAIR: Deborah DeLuca, MS, JD

COMMITTEE CHAIR SIGNATURE:

DISSERTATION COMMITTEE MEMBER: Terrence F. Cahill, EdD, FACHE

COMMITTEE MEMBER SIGNATURE:

DISSERTATION COMMITTEE MEMBER: Glenn Beamer, PhD

COMMITTEE MEMBER SIGNATURE:

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Appendix B

Letter of Solicitation for Delphi Expert Panel Members

Please note: The attached version is written at an 9th grade level of understanding consistent with the SHU IRB website for Letter of Solicitation and Implied Informed Consent.

Letter of Solicitation for Delphi Panelist

Date: TBD

Dear Dr._____:

Upon our email discussion, you have stated your kind willingness to be a member of my Delphi Panel as an Expert Reviewer of my survey tool titled “Personal Heath record Assessment.” I thank you for taking time to participate in this survey process. I believe it will make a high-quality survey to be used in my Ph.D. Dissertation study after the end of the Delphi process.

The need to cut health care costs and increase quality by engaging patients in their health by using the PHR justifies the need for a more effective active approach among patients and healthcare providers to get the potential benefits of the PHR. Since the use of PHRs for health management and self-care is a reasonably new, little is known as the adoption of the PHR by patients and caregivers in the U.S. is in its primary stages. Thus, the aim of my doctoral study is to understand perceptions of knowledge, attitudes, subjective norms, self efficacy, perceived usefulness, perceived credibility and perceived ease of use of healthcare providers regarding their behavior intend to adopt PHR. To achieve this goal, it will be important for me to validate and determine the reliability of my newly created survey instrument in my population sample and to determine its Cronbach alpha.

You are asked to participate in this Delphi Panel to provide your feedback about the face, content, construct, and concurrent validity of my survey tool. The feedback will be combined with that from the other expert panelists and will be considered to create the final survey tool. The survey has questions to be answered on a Likert five-point scale ranging from strongly disagree to strongly agree. Also, it includes open-ended

questions and multiple choice questions within the survey instrument and the demographic part of the survey as well as that require for your feedback review also.

In the second part of my dissertation study, in order to determine reliability, the survey will be distributed to a non-purposive (snowball) sample of convenience as well as to purposive sample of healthcare providers. The sample will target healthcare providers who have interaction with the personal health records of patients. Your review of the tool for suitability and clarity is important to establish face and content validity. Also, you are asked to review the demographic questions for suitability and clarity. Understanding your time, the first round of review takes a few hours to complete, and you are asked to return it to me eventually within 14 days.

Once I receive your comments and feedback from round 1, I will combine your evaluations with those reviewed from the other expert panelists. I am looking for 80% agreements of feedback on each question in the survey in round one. That means, consensus among 4/5 panelists. After all feedback from the panelists is receives the survey will be revised. According to the panel feedback, a second review round will be needed. In this case, I will kindly ask you to participate in round 2. I will provide more instructions and the updated survey tool based on the combined assessments received from all experts at that time. In addition, a third round may be needed. In this case, I kindly ask you to participate in round 3. By the end of round 3, a new valid tool will be ready to obtain reliability determine Cronbach alpha for this tool among healthcare providers. Each subsequent round should be shorter in duration.

Enclosed you will find 2 documents for review. The first document includes the background information for instrument development, worksheet for the development of

the survey tool, and draft of the tool, along with the scoring scale for the instrument. The second document is worksheet for your use. The worksheet includes constructs, variables and domains relating to the proposed research questions. In round 1, you are asked to identify items that are ambiguous or unclear, identify items that may be double-barreled, identify items that may lead to biased socially desired response, review the order of the questions to decrease order bias, and review the demographic questions for clarity.

Once the above 5 steps are done, you are asked to send back the worksheet with feedback to me by email with in 14 days. Once all expert reviewers' comments received, revision will be made to the survey based on the feedback of each reviewers. Agreement of the panel for each question at 80% will be obtained, with at least 4/5 experts. If 80% agreements are not reached after round 1, the survey will be resent for another review. In round 2, only the questions that is agreement not obtained will be provided for review. Otherwise, the same process as outline will be followed.

Instructions for first round Delphi:

For the enclosed survey: Please review each item and provide feedback in the comment space. Please consider the listed elements in your analysis:

1) Assess each variable for content validity; (i.e. does the item measure the construct as defined in the questionnaire?)
2) Identify items that are ambiguous or unclear.
3) Identify items that may be double-barreled.
4) Identify items that may lead to biased socially desired response.
5) Review order of the questions to decrease order bias.

6) Review the demographic questions for clarity and provide suggestions.

- For ease understanding the Delphi process, a flow-chart diagram is provided for your review.

Please feel free to provide any suggestion, and/or add questions that will improve the survey tool.

Thank you. for your time and effort in participating in this Delphi process.

Best Regards,

Lujain Samarkandi
Doctoral Candidate, Seton Hall University, N.J.

Enclosure:

1- background information with survey
2- Delphi survey Worksheet.

APPENDIX C

Letter from Seton Hall IRB for Delphi

June 28, 2017

Lujain Samarkandi

Dear Ms. Samarkandi,

The IRB is in receipt of the application for your research entitled "Creating and Validating a New Survey Instrument to Explore Factors Affecting the Adoption of Personal Health Records Among Healthcare Providers: The Delphi Process for Survey Development."

Your Application does not fall under the purview of the IRB, not even in exempt status, because use of the Delphi method to create a survey does not meet the criteria for generalizable research. Expert reviewers for the Delphi method are not subjects.

Once you have reliability and validity on your instrument, you should then submit an Application for your study.

Please follow exactly the directives at the IRB website and on the Application form itself. By way of example and to assist you in writing this new Application, the IRB calls to your attention the following points:

- Your Application is too long with materials the IRB does not want. Your response to # 13 of the application is 5 typed pages; this should be no more than 1 typed page. Your response to # 25 of the application is 2 typed pages; this should be no more than 1 page.
- It is clearly stated on these documents "not to attach copies of sections of grant proposal, dissertation or class projects" which it appears you have done.
- NIH certificates of completion of training in the ethics of research with human subjects is only required for the researcher himself [you]; do not put committee members or reviewers in it.

When it is time for you to write your new Application, I am happy to answer any questions you may have. Please do not submit a document of 102 pages or it will be returned to you without review. Please follow directives at the website and on the form. Do not add to them.

Please consult with Dr. T. Cahill, department chair, for advice on how to limit the page numbers of your IRB Application.

You are welcome to call me at any time for clarification.
Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Deborah DeLuca, Dr. Terrence Cahill

APPENDIX D

Instrument Development (Delphi Technique)

Delphi Technique. In order to establish the validity of the tool Delphi process used based on Hassan's (2000) procedure. The design is named a group facilitation technique that is iterative and has several stages in the process to collect the anonymous judgments of experts, by using a series of structured questionnaires and an analysis technique interspersed with feedback (Hasson,2000).

A sample of five individuals is a reasonable number of participants for the Delphi panel (Armstrong, 1985). Since expert opinion is sought, a purposive sample is necessary where people are selected not to represent the general population, but rather present their expert ability to answer the research questions (Fink & Kosecoff,1985). In purposive sampling, subjects are not selected randomly, they were selected for purpose based on the main criteria that are related to the problem of the study (Hasson, 2000). Five Individuals was targeted who fit the inclusion criteria for participation in the Delphi study as expert reviewers. These individuals are selected based upon their experience as health care providers, and their level of knowledge in the field of survey research, healthcare information technology, and a PHRs system.

The Delphi Method is designed as a group communication process that works through a number of cycles of anonymous written feedback for a novel, sequential questionnaire that seeks to gain the agreement of opinion of a group of experts and managed by a facilitator (Hasson, 2000, Turoff & Hiltz, 1996). The PI has reached out to experts in the field of the study-specific issue to sit on the Delphi Panel experts. Two or three rounds in the Delphi technique are preferred or until 80% agreement is obtained by the panel of experts (Hasson, 2000). The tool was considered to have

validity when an agreement was obtained on the construct variables of the survey instrument.

Validity Assessment. Face, and content validity were established through an expert panel review. A modified Delphi process was used to validate the study instrument. Face validity is a type of validity process in which researchers conclude if a test seems to measure what it is proposed to measure (Alreck & Settle, 2004). In the Delphi process, face validity is obtained and established through the Survey Worksheet. The worksheet asks the expert reviewers to determine if every variable measures the concepts and whether it is clear or not. Content validity is obtained through the Survey Worksheet that asks the experts reviewers to provide in the comments section their opinion of the survey statement if the question measured the construct. To confirm validity of the tool, at least 80% agreement on each survey item was obtained through three round of Delphi expert panelists review.

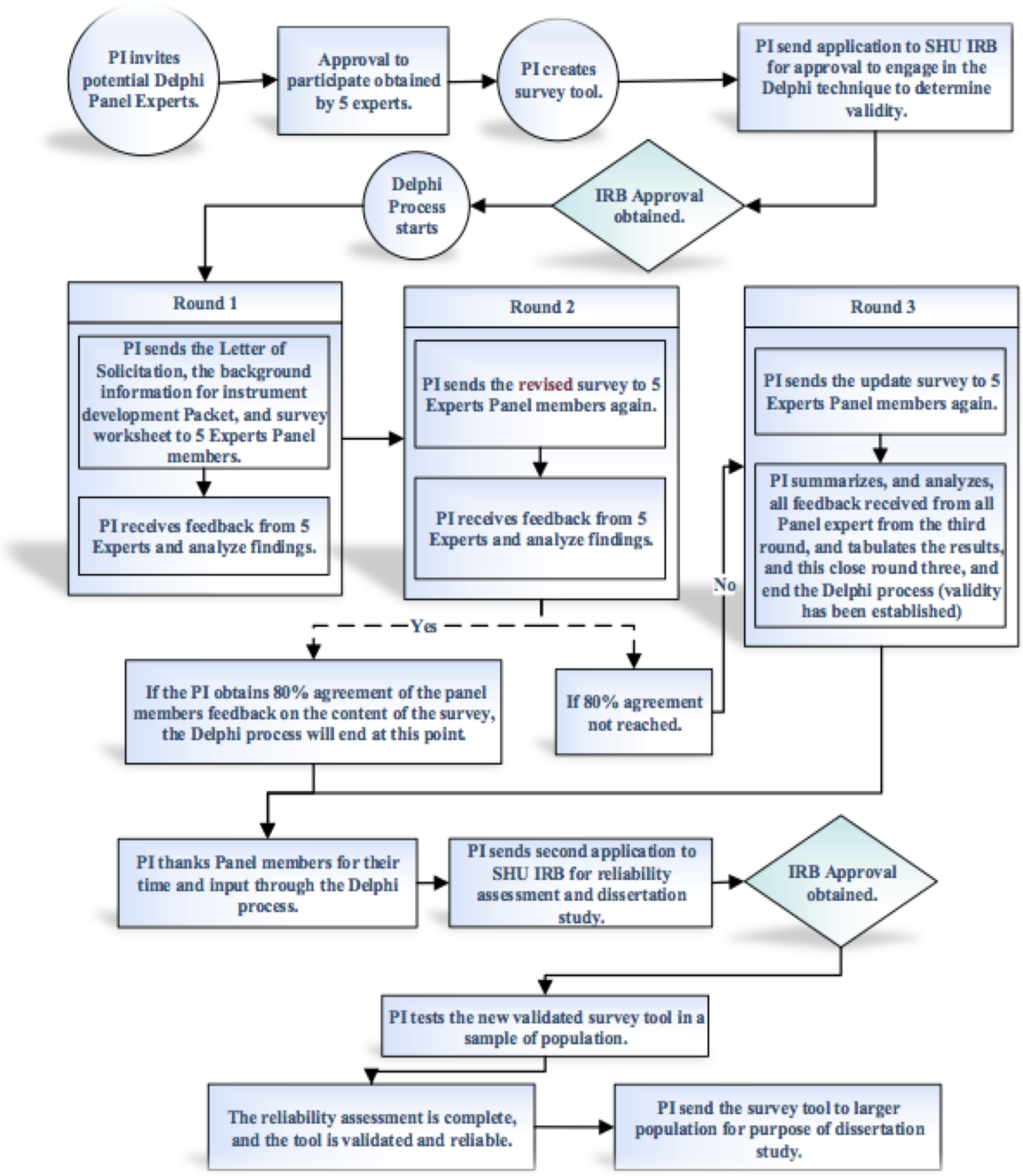


Figure 31. PI- Created flowchart summary of Delphi Process. This figure illustrates the Delphi process that used to create the PI developed survey instrument.

APPENDIX E

Seton Hall IRB Approval Letter

SETON HALL UNIVERSITY
1 8 5 6

May 2, 2018

Lujain Samarkandi
[redacted]

Dear Ms. Samarkandi,

The Seton Hall University Institutional Review Board has reviewed your research proposal entitled "Exploring and Understanding Factors Affecting the Adoption of Personal Health Records Among Healthcare Providers" and has categorized it as exempt.

Enclosed for your records is the signed Request for Approval form.

Please note that, where applicable, subjects must sign and must be given a copy of the Seton Hall University current stamped Letter of Solicitation or Consent Form before the subjects' participation. All data, as well as the investigator's copies of the signed Consent Forms, must be retained by the principal investigator for a period of at least three years following the termination of the project.

Should you wish to make changes to the IRB approved procedures, the following materials must be submitted for IRB review and be approved by the IRB prior to being instituted:

- Description of proposed revisions;
- *If applicable*, any new or revised materials, such as recruitment fliers, letters to subjects, or consent documents; and
- *If applicable*, updated letters of approval from cooperating institutions and IRBs.

At the present time, there is no need for further action on your part with the IRB.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,

Mary F. Ruzicka, Ph.D.

Mary F. Ruzicka, Ph.D.
Professor
Director, Institutional Review Board

cc: Dr. Deborah DeLuca

REQUEST FOR APPROVAL OF RESEARCH, DEMONSTRATION OR RELATED ACTIVITIES INVOLVING HUMAN SUBJECTS

All material must be typed.

PROJECT TITLE: Exploring and Understanding Factors Affecting the Adoption of Personal Health Records Among Healthcare Providers

CERTIFICATION STATEMENT

In making **this application**, I(we) certify that I(we) have read and understand the University's policies and procedures governing research, development, and related activities involving human subjects. I (we) shall comply with the letter and spirit of those policies. I(we) further acknowledge my(our) obligation to (1) obtain written approval of significant deviations from the originally-approved protocol BEFORE making those deviations, and (2) report immediately all adverse effects of the study on the subjects to the Director of the Institutional Review Board, Seton Hall University, South Orange, NJ 07079.

RESEARCHER(S) _____ December/20/2017
Lujain Samarkandi DATE

Please print or type out names of **all researchers below signature.
Use separate sheet of paper, if necessary.**

My signature indicates that I have reviewed the attached materials of my student advisee and consider them to meet IRB standards.

RESEARCHER'S FACULTY ADVISOR [for student researchers only] December/20/2017
Dr. Deborah A. DeLuca, M.S., JD DATE

Please print or type out name below signature

The request for approval submitted by the above researcher(s) was considered by the IRB for Research Involving Human Subjects Research at the 5th May 2018 meeting.

The application was approved ✓ not approved ___ by the Committee. Special conditions were _____ were not ✓ set by the IRB. (Any special conditions are described on the reverse side.)

Mary F. Ruzzolo, Ph.D 5/2/18
DIRECTOR, DATE
SETON HALL UNIVERSITY INSTITUTIONAL
REVIEW BOARD FOR HUMAN SUBJECTS RESEARCH

Seton Hall University
3/2005

APPENDIX F

Email Solicitation Message Text

Date /

Dear Healthcare Provider,

My name is Lujain Samarkandi. I am a student at the School of Health and Medical Sciences at Seton Hall University. I am conducting research on the technology available for Personal Health Records use by health care providers as part of my doctoral dissertation.

Purpose:

You are invited to participate in this survey study because you may be a health care provider that works in the clinical setting. Previous research has suggested that some factors may affect the use of PHRs by healthcare providers. The aim of this study is to examine health care providers' behavioral intent to use PHRs in their clinical practice, and for their own health care.

Procedure:

Please complete the survey if you meet the requirements. The requirements are: being a health care provider who has interaction in the personal health records of patients. You may complete the survey by clicking on the link below. This study will use a recruitment technique known as chain referral or snow-ball sampling. This means that you can forward this email to anyone that you think fits the requirements. This allows the survey to reach more participants. The attached link is not unique to you. It can be forwarded to anyone. No record will be saved of the person you forwarded this to. You will be asked to complete one questionnaire. Answer the survey based on your point of view. Please respond openly to all questions. It is important to answer each section entirely.

Time:

Completing the multiple choice question section of the survey will take about 10 to 20 minutes. There is an open-ended question. You can take as much time as you would like to complete this survey.

Voluntary Participation:

Your participation in this research study is totally voluntary. You may decide not to participate at any time. If you choose not to participate, you will not be penalized nor lose any benefits to which you are otherwise entitled to. By clicking the link below, you agree that you are providing your consent to participate in this study.

Anonymity:

Your personal information will not be collected as part of this study. Your name, address, and other specific personal identifying information will not be collected. The information that will be collected is typical demographic information. There will be no records identifying you, particularly. All of your responses will be kept anonymous. There will be no way to contact you or link your answers to you. If you forward the survey to others, no specific identifying information will be collected from them. The research data may be published. If it is, it will not classify any individual.

Confidentiality:

The study data will be saved confidential to protect its integrity. The data will be kept on a USB drive. The USB drive will be locked in a cabinet in the office of the principal researcher. The principal researcher, Lujain Samarkandi, will have access to all of the data for a period of up to three years after the end of the study. Then, the data will be destroyed.

Risk:

There is no foreseeable risk factor or discomfort expected by participating in this study. However, please be aware that as with any online survey the remote of hacking. Once you complete the survey, please click on the "submit" radio button. By doing so, your browser should be automatically close, but to be safe, close your browser manually after you click the submit radio button.

Benefits of participation:

There are no anticipated or foreseeable direct benefits to you by participating in this research study. However, by participating in this research study you may be helping the education for future health care providers about the adoption of PHRs technology.

Contact information:

If you have an interest in learning more this study, please feel free to contact me at Lujain.samarkandi@student.shu.edu or you can reach Dr. Deborah DeLuca, Dissertation chair for Mrs. Samarkandi at (973) 275-2842 or via her email Deborah.deluca@shu.edu in the Department of Inerprofessional Health Sciences and Health Administration in the Seton Hall University School of Health and Medical Sciences. For questions concerning the rights of research participants you can contact Dr. Mary Ruzicka, Director of the Institutional Review Board, in the office of IRB at Seton Hall University at (973) 313-6314 or via email irb@shu.edu.

Ways to Participate:

Please feel free to ask other healthcare providers that you know to participate in this survey. Also, if you choose not to answer the survey questions, but know someone that might be qualified or interested, please pass this survey link into them. The survey is available on the Survey Monkey® electronic survey.

Thank you. I appreciate your consideration in participating in this study.

Click here to take the survey: The survey link will be placed here.

Best Regards,

Lujain Samarkandi

APPENDIX G

Flesh- Kincaid for letter of Solicitation

(The actual letter of Solicitation Appendix F).

Date /

Dear Healthcare Provider,

My name is Lujain Samarkandi. I am a student at the School of Health an
Sciences at Seton Hall University. I am conducting research on the techno
Personal Health Records use by health care providers as part of my docto

Purpose:

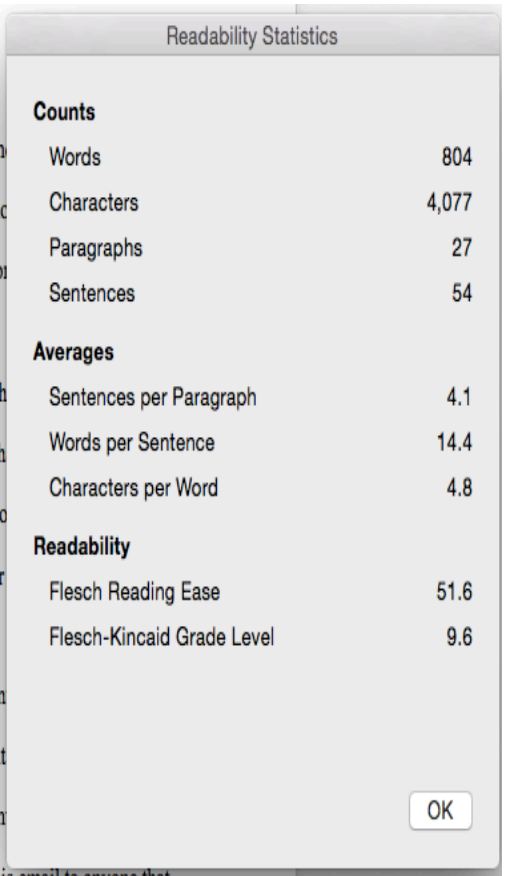
You are invited to participate in this survey study because you may be a h
works in the clinical setting in the US. Previous research has suggested th
affect the use of PHRs by healthcare providers. The aim of this study is to
providers' behavioral intent to use PHRs in their clinical practice, and for

Procedure:

Please complete the survey if you meet the requirements. The requiremen
care provider who has interaction in the personal health records of patient
the survey by clicking on the link below. This study will use a recruitmen
chain referral or snow-ball sampling. This means that you can forward this email to anyone that you think fits the requirements. This allows the survey to reach more participants. The attached link is not unique to you. It can be forwarded to anyone. No record will be saved of the person you forwarded this to. You will be asked to complete one questionnaire. Answer the survey based on your point of view. Please respond openly to all questions. It is important to answer each section entirely.

Time:

Completing the multiple choice question section of the survey will take about 10 to 15 minutes.



APPENDIX H

Principal Investigator Created Tool:(PHARS)

[First page of the survey]

1. How would you best describe your occupation at your facility?

- ◯ Medical Doctor (MD)
- ◯ Physician assistant (PA)
- ◯ Nurse Practitioner (NP)
- ◯ Nurse Midwife (NM)
- ◯ Clinical Nurse Specialist (CNS)
- ◯ Pharmacist (RPh or Pharm D)
- ◯ Physical therapist (PT)
- ◯ Nurse-Anesthetist (NA)
- ◯ Occupational therapist (OT)
- ◯ Respiratory therapist (RT)
- ◯ Speech and language pathologist (SLP)
- ◯ Executive_____, (e.g. PBM, Insurance)
- ◯ Administrator

Other (please specify)

* 2. Are you currently working with / caring for patients?

- ◯ Yes
- ◯ No
- ◯ I am not sure

* 3. If you answer (Yes) for question (2/a), please select the % of time you spent:

- ◯ 0- 25% day
- ◯ 26-50% day
- ◯ 51- 75% day
- ◯ 76- 100% day
- ◯ I do not currently take care of patients.

* 4. Are you knowledgeable about the technology available for ePHR use?

- ◯ Yes
- ◯ No
- ◯ I am not sure

* 5. The first set of statements focuses on Perceived Usefulness of ePHR. Please respond to the following statements using the scale to the right of the statement and indicate your level of agreement or disagreement with each of these statements using the following scale.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
The ePHR can provide accurate information on patients.	◯	◯	◯	◯	◯

APPENDIX I

PI Created Demographic Questionnaire

[First page of the Demographic Questionnaire]

Please provide the following demographic information:

24. What is your gender?

- ◯ Male
- ◯ Female

25. What is your age?

- ◯ 18 to 30 years
- ◯ 31 to 40 years
- ◯ 41 to 50 years
- ◯ 51 to 60 years
- ◯ Age 61 or older

26. What is the highest degree or level of education you have completed?

- ◯ Certificate
- ◯ Associate's degree
- ◯ Bachelor's degree
- ◯ Master degree
- ◯ Ph.D.
- ◯ Graduate or professional degree (e.g.MD, DO, JD)

Other (please specify)

27. For each level of education earned please specify your major or area of concentration (e.g., engineering, biochemistry, nursing, etc.).

28. At what type of facility do you currently work (e.g., acute care, long term care, etc.)? Please specify. If you work at more than one facility, please indicate each type of facility and the percentage of your time each week (Monday through Sunday) that you spend in total (all totals should add to 100%).

29. How many years of experience do you have in practice as a health care provider?

- ◯ Less than one year.
- ◯ 1 to 5 years.
- ◯ 6 to 10 years.
- ◯ 11 to 15 years.
- ◯ 16 to 20 years.
- ◯ More than 20 years.