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# PATIENT ENGAGEMENT:THE FACTORS CONTRIBUTING TO INDIVIDUALS USING THE PATIENT PORTAL

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# PATIENT ENGAGEMENT: THE FACTORS CONTRIBUTING TO INDIVIDUALS USING THE PATIENT PORTAL

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by

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# ABSTRACT

## PATIENT ENGAGEMENT: THE FACTORS CONTRIBUTING TO INDIVIDUALS USING THE PATIENT PORTAL

Diane P. Fabian

The patient portal is an electronic repository of health information, including doctor's notes, laboratory test results, and diagnostic imaging reports. There are limited studies that explore how individuals make sense of their health information, and use that understanding to increase health literacy. Education leaders should consider the ways that students in allied health care fields might better understand the role of the portal, the federal investment in developing electronic records, and the perceived value of the portal by patients.

The purpose of this study was to explore portal usage among employees at Suffolk County Community College, individuals' experience with the health care environment, the individuals' understanding of health information, and how these influence the individuals to become a more active participant in their own health care.

To do so, this quantitative study examined the relationship between individual attributes, including health status, and education level that may determine a patient's perceived value of the portal as measured by portal usage. Factors measured include individual beliefs that a patient can master the portal, the environment that supports the individuals, and their health literacy. The participants of the survey study were individuals employed by Suffolk County Community College.

A twenty item self-reported questionnaire measured key variables in the study. Section one of the instrument including independent variables, demographic characteristics, health literacy, education level, and health status. The dependent variable is patient portal usage.

A multiple linear regression analysis was conducted to test the null hypothesis to determine if health literacy, education level, and health status can predict portal usage. A Pearson's correlation was used to examine the relationship between health literacy and portal usage, education level and portal usage, and health status and portal usage. An independent-samples *t*-test was conducted to compare portal usage with health status, specifically for major and minor health issues. Descriptive statistics also provided information for consideration. The findings support previous literature that indicates health status and health literacy are significant predictors of portal usage, and provide considerations for educational leaders in allied health.

## DEDICATION

Many years ago, my sister introduced me to the health care field. She always encouraged me and supported me. While I was on this path, the good Lord took her home. She would have been very proud of my accomplishment and for this reason I dedicate this work to my sister, Lorraine.

# ACKNOWLEDGEMENTS

Since I began this program, I have been encouraged and supported by my family, friends, and my colleagues. I bonded with my classmates; and I learned a great deal from the excellent faculty.

I have been most fortunate to have had Dr. Ceceilia Parnther as my mentor. She walked along side me at every step. She has been my guide throughout this process. I will always be grateful for her direction, her guidance, and her help with completing my dissertation.

I would like to thank my committee, Dr. Anthony Annunziato and Dr. Catherine DiMartino for taking time out of their busy schedules to provide support to me as I worked my way from proposal to defense.

Lastly, I would like to thank my family for their patience and understanding during the many nights that I attended class and days spent reading, writing, and analyzing data. I am so blessed and grateful to be surrounded by so many wonderful people. I couldn’t have done this without all of your support. Many blessings to all of you!  Forever grateful….

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# CHAPTER 1

## Introduction

The health care system is a complex system and patients must navigate through many parts including, doctor office visits, trips to an imaging center, visits to the laboratory for tests, and hospital stays. Until recently recordkeeping processes were primarily paper-based, the pieces disconnected, and the patient did not have access to their own health information. The doctor was in charge of health care, and patients followed their orders. The patient was not at the center of any decision making. As a result, patients often accepted the premise that they have no participation in their health care decisions. Recently, the health care system began to examine ways to become more effective and efficient. The discussion among policymakers, industry professionals, and allied health educators has ultimately focused on individuals' health outcomes improving population health (Graffigna & Barello, 2018). Technology has been the key to providing individuals with greater access to their health care records. For several years, electronic health records and notification systems replaced the earlier paper-based systems.

Policymakers, industry professionals, and allied health educators shifted focus towards empowering patients as (a) more active participants in their care and (b) partners with their health care providers (Graffigna & Barello, 2018). The patient's role in health care decision making is changing. As patients become more engaged in their care, health outcomes may improve, thereby positively impacting the delivery of health care (Dendere et al., 2019). Patients are now encouraged to be participants in their own health care decisions and may need transformative methods to be able to process the health information. Their knowledge and skills must increase to process their changing role, that is--changing their behavior as it relates to their health care. Transforming to a new perspective of being engaged in their care will require patients to develop a new view of their relationship with their doctor (Tavares & Oliveira, 2016). This shift also requires a change in how clinicians introduce the health care portal, providing health care educators an important opportunity for early intervention. Allied health care programs have the opportunity to integrate such interventions in their training and practicum programs. Health care portal and education are a national imperative.

The federal government identified several initiatives that would improve quality of care and reduce costs if providers used technology in a meaningful way (U.S. Department of Health and Human Services, 2013). One of the initiatives used to encourage health care providers to use Electronic Health Records, (EHRs), instead of paper systems was to offer incentives to doctors and hospitals (Krasowski et al., 2017). To receive financial incentives, doctors and hospitals had to demonstrate that they were using technology in a meaningful way, thus the term *meaningful use* (MU) was adopted. According to Tavares and Oliveira (2016), "meaningful use guidance requires that doctors and hospitals that participate in the Medicare & Medicaid EHR Incentive Programs must give patients secure online access to health information, including EHRs. Stage 2 meaningful use boosted the development of new integrated EHR portals…" (Tavares & Oliveira, 2016, p. 3). One aspect of meaningful use is the provision of access for patients through a portal so that the patient's health information is available to the patient at any time and at any place. The technology provides better communication with the patients and engages patients to be participants in health care decision making. According to the Centers for Medicare and Medicaid Services (CMS) a patient portal is defined as “a secure online website that gives patients convenient 24-hour access to personal health information from anywhere with an internet connection. Using a secure username and password, patients can view basic health information” (U.S. Department of Health and Human Services, 2017).

According to a brief prepared by the Office of the National Coordinator for Health Information Technology (ONC), a division of the Department of Health and Human Services (DHHS), “52% of patients have patient portal access” despite this, “24% of patients did not view their online medical records, even after being granted access to them. Reasons for not viewing patient health records included: wanting to speak with providers in person (76%); little perceived need to view medical records (59%)…” (Heath, 2018, p. 2). The reasons for not viewing patient health records online are consistent with habits and viewpoints that will require transformation from passive to active participants. Knowledge, skills, and self-efficacy will drive this transformation to patient engagement and technology; that is, the electronic health record will pave the way for better communication between patient and provider (Ancker et al., 2015).

The portal contains important parts of the patient’s electronic health record (EHR), such as a history of their encounter/visit, a list of medications along with a list of allergies, if any, and lab and imaging test results (Ancker et al., 2015). There is a presumption that access to the patient portal will make the patients more engaged in their health care, that is, patient portals may motivate and involve patients to change their behavior as it relates to their own health care. The health care industry developed the patient portal with the expectation that patients would use the portal. However, most individuals have no experience reviewing the medical record and little knowledge of the medical record's content (Dhanireddy et al., 2014). To be involved in their own health care, they will need to have a better understanding of the health information available to them through the patient portal. They will need to have health literacy in order to interpret the information so that they can become more involved in their own health care. The underlying premise of providing this information to the patients is intended to transform the health care system by encouraging patient engagement. Using the portal to engage patients to become more active participants can only succeed if the patients are encouraged to be active. Patients' individual perceptions of their ability to use the portal effectively should motivate their behavior as it relates to the patient-doctor relationship so that they are capable of participating in health care decisions.

## Purpose of the Study

The health care delivery system will transform as health care literacy is optimized among patients. Patients may be empowered to perform self-management treatments that will change their role in the health care system (Tavares & Oliveira, 2016). The relationship between patients' behavior and their use of the patient portal is influenced by their personal beliefs, experience with their environment related to the patient-doctor relationship, and the patients' understanding of the health information.

This survey study examined the relationship between individuals' attributes including health status that determined perceived value of the portal influenced by portal usage, individuals' beliefs that they can master the portal, the environment that supports individuals and the individuals' understanding of medical information. Managing complex health issues and chronic disease may affect how individuals value the patient portal (deBont et al., 2015).

## Theoretical/Conceptual Framework

The theoretical approach of this study is based on Bandura’s theory of self-efficacy. Self-efficacy pertains to how individuals perceive their own skills and abilities and is influenced by environment and behavior. Since policymakers and health care professionals have focused on patients as active participants in their own care, self-efficacy plays an important role for this transition to more active patient participation. As a construct of Bandura’s social cognitive theory, self-efficacy influences individuals' confidence to take control over their actions and become motivated to change (Bandura, 1977). Individuals must have self-efficacy to participate in activities that will lead to behavior changes.

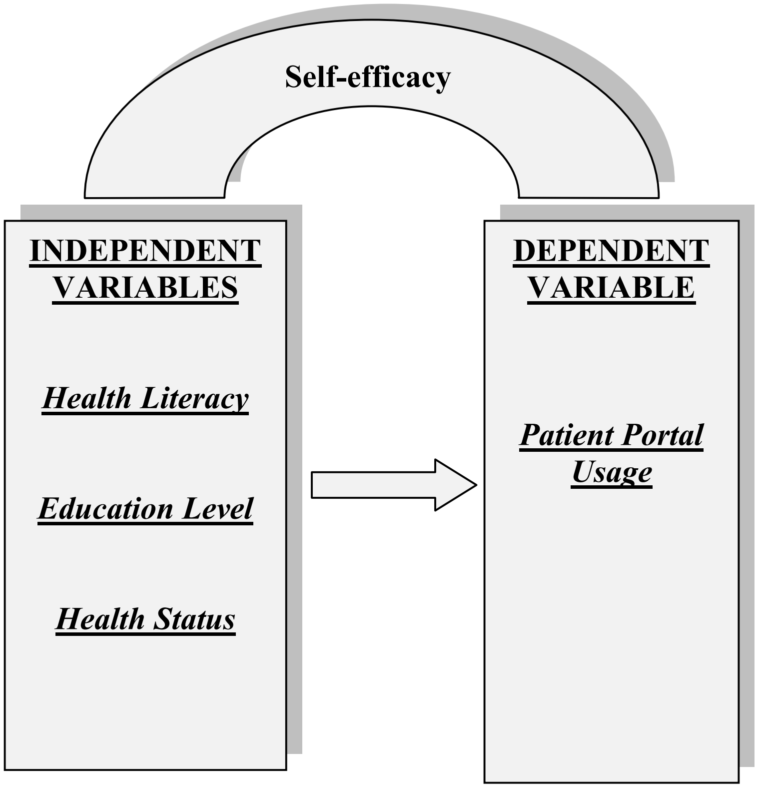
Self-efficacy and self-regulation are constructs that may drive the change from disease management by doctors to health promotion by patients (Bandura, 2005). The demand and supply side of the health care system was discussed by Albert Bandura (2005) in the article, “The primacy of self-regulation in health promotion”. Bandura discussed that the aging population is challenging the demand for health care. Demand is overwhelming the supply, creating pressure on the health care system to reduce health services as a cost-saving measure. A focus on health promotion to exercise control, decision making, and improve health represents a cost savings (Bandura, 2005). To do this, educational leaders who understand modern patients' needs can design supportive intervention measures that help patients feel like informed consumers.

According to Bandura (2005), self-management needs motivation and self-regulatory skills. Bandura discussed the social utility of self-managed systems and the benefit of having a plan to implement linking interactive technologies that would give individuals a guide and then tie this to the individuals' self-efficacy beliefs, their ability to self-manage, and whether they are motivated to make behavior changes. Bandura further postulated the importance of self-management systems whereby continuous guidance helps people control their behavioral changes. In 2005, Bandura proposed that further development of interactive Internet-based models with promoting self-management programs will improve patients' health. This was prescient foreshadowing because patient portals are interactive Internet-based tools. They provide health information that guides patients in self-management and presumably will engage patients in their own health care decisions, thus improving their health. There is little to no guidance given to the patients on how to access and use the portal in a meaningful way (Powell & Myers, 2018). Individuals' effective use of the patient portal will require guidance, education, and training interventions from their health care providers to support self-efficacy. Even patients who use the portal report that an informational barrier still exists. In one study, patients indicated that they were not sure of what is available in the portal and that, in some cases it was difficult to use (Lee et al., 2020). A significant barrier is the lack of detailed guidance for patients using the portal (Lee et al., 2020).

The conceptual framework of this study identifies the factors that influence the portal's use. Individuals must have health literacy, that is, the ability to access the health information in the portal and understand and interpret the medical information that will allow them to change their behavior. The education level and health status of individuals may influence the portal's use. The relationship between health literacy, education level, and health status was analyzed to predict the portal's use. The concept map (Figure 1) identifies self-efficacy as the driving force to motivate individuals to use the portal. As individuals become more comfortable with their skills and abilities, they will be better prepared to change their behavior related to the encounter with their health care provider. This study provides stakeholders with the factors that most likely predict using a patient portal and was guided by the conceptual framework.

**Figure 1**

*Conceptual Framework for Factors Predicting Portal Usage*



## Significance/Importance of the Study

This study's significance is to explore portal usage among individuals employed by Suffolk County Community College, individuals' experience with the health care environment, individuals' understanding of health information, and how this influences the individuals' changing behavior to become more active participants in their health care. Health literacy, education level, and health status may affect portal usage, which was explored. Additional research is needed to assess factors objectively, such as self-efficacy and health literacy, that may contribute to portal usage. This study will add to the literature as it focuses on self-efficacy and the relationship of the individual's beliefs. Education and support for training will create an environment that will help individuals better understand how to use the portal and become more active participants in their own health care. Individuals' use of the patient portal will be related to their changing behavior as they become more active participants in their own health care decisions.

The specific objectives of this study (a) asked the participants to describe their patient portal usage; (b) asked participants to describe what support in the way of training and education that they receive from their doctor's office; (c) asked participants to describe their health status and education level; and (d) asked participants to describe their understanding of medical information. The literature shows that studies have asked patients in health care settings about the use of the patient portal but never in the context of how individuals not in a health care setting use the portal.

The federal government has invested heavily in offering incentives to hospitals and doctors to create an EHR that would be used in a meaningful way including providing patients access to their own health information. In "Waiting on the ROI: 3 lessons from health IT investments", published by Becker's Health IT and CEO Report, it was reported "…the federal government itself has invested upwards of $26 billion in EHR meaningful use incentives…" (Becker's Health IT and CIO report, 2015, p. 5). There is an expectation that patients will use the patient portal but to what extent is it being used effectively and where is the return on investment? By understanding gaps in portal usage, the policy makers can focus on what educational and technological tools that patients would need to use the portal as it was intended, that is, engagement in their own care.

Patient portals are available to patients, and, although there are many benefits, few patients are using them (Nystrom et al., 2018). Although the patients have access to the portal, they need additional components that will support the patients in managing their test results, and interpreting their medical conditions (Nystrom et al., 2018). The patient portal has great potential to engage patients in their own health care but what motivates them to use the portal, what information do the patients want to view, who assists patients with setting up the portal and how will they understand and interpret the information that they now can view in the portal? Patients' level of self-efficacy along with their health literacy will be a factor in using the portal. Patients will learn how to use the patient portal when they perceive the value that it has to offer. According to Bandura (1986) "value refers to the perceived importance or usefulness of learning" (Bandura, 1986, as cited in Schunk, 2016, p. 140). The patient portal has the potential to encourage patient engagement but work needs to be continued by health care leaders, policy makers and software developers with creating sustainability (Irizarry et al., 2015). Training and education on portal usage may contribute to sustain use. If the health care system is truly going to be transformed, then patients will have to become more health literate and more active in their own health care. If the patient portal is going to be the conduit for this transformation, then patients must perceive the value of the portal.

### Connection With Social Justice and/or Vincentian Mission in Education

According to Foster and Krasowski (2019), more data on patient portal usage are needed to guide education and training that will promote patient engagement and minimize sociodemographic disparities. The portal has been designed by EHR software developers and is now adopted by the health care industry, but little has been done to address the sociodemographic disparities. Policymakers must consider social justice aspects of the use of the patient portals and patient engagement. There are marginalized groups--those who have literacy barriers, racial and ethnic barriers, and the poor and homeless who do not have access to the portal. This population has been neglected in the patient portal's current design and may be the most in need of health care services (Lyles et al., 2017). Portal usage and social justice may require more in-depth review in a later study.

### Research Questions

This research is guided by the following questions: 1. What factors predict portal usage? 2. Does a relationship exist between health literacy and portal usage? 3. Does a relationship exist between education level and portal usage? and 4. Does a relationship exist between health status and portal usage? The patient portal is defined as electronic/web access to a patient’s electronic health record (EHR) which may include lab test results, visit summaries, radiology images, and a list of medications.

## Design and Methods

### Research Design and Data Analysis

This is a survey study. For this study, the collected data is information that could be collected from the “average” individual who may have access to a patient portal as a part of their experience receiving health care. The research design includes descriptive and inferential statistics to describe individual responses. To do this a multiple linear regression analysis was conducted to test the null hypothesis that determined the predictive relationship between the independent variables, health literacy, education level, and health status, and the dependent variable, portal use. A Pearson's correlation was conducted to determine the relationship between the independent and dependent variables. An independent-samples *t*-test was conducted to compare portal usage with health status, specifically for major and minor health issues.

## Hypotheses

$H_0$: There will be no significant prediction of patient portal usage by reported understanding of health information, by education level, and by health status.

$H_1$: There will be a significant prediction of patient portal usage by reported understanding of health information, by education level, and by health status.

$H_0$: There will be no relationship between individuals' portal's use and individuals' reported understanding of health information.

$H_1$: There will be a relationship between individuals' portal's use and individuals' reported understanding of health information.

$H_0$: There will be no relationship between individuals' use of patient portal and education level.

$H_1$: There will be a relationship between individuals' use of patient portal and education level.

$H_0$: There will be no relationship in individuals' use of the patient portal and health status.

$H_1$: There will be a relationship in individuals' use of the patient portal and health status.

$H_0$: There will be no difference in portal usage between reported major health issues and reported minor health issues**.**

$H_1$: There will be a difference in portal usage between reported major health issues and reported minor health issues.

## Participants

The participants of the study include 95 employees of Suffolk County Community College. The rationale for selecting employees at Suffolk County Community College is that all individuals have the potential of having access to a patient portal. This is a convenience sampling.

## Instruments

A twenty item self-reported questionnaire measured the key variables in the study. The instrument was validated for its use in a previous study, "Patient portal preferences: perspectives on imaging information", (McNamara et al., 2015). Cronbach's Alpha test for reliability was conducted. Section one of the instrument includes characteristics of individuals, such as age, gender, ethnicity and socioeconomic status. The rest of the instrument assessed the independent variables, health literacy, education level, and health status. The dependent variable is patient portal usage. The use of the patient portal is measured using a four-point Likert scale on ten out of twenty survey questions. The following values were assigned to the response options for data analysis: *most of the time*= 1; *some of the time* = 2; *seldom* = 3; and *never* = 4.

## Procedures

The participants were employees of Suffolk County Community College and were recruited from the three campuses over three weeks. An email was sent to 166 employees requesting their participation in the study and 125 responses were received. A second email with a direct link to the survey in Qualtrics was sent to each individual. Two follow up emails were sent reminding the participants to complete the survey after weeks one and two. The questionnaire had a detailed explanation of how to complete the survey noting that it would take between five and ten minutes to complete.

## Definition of Terms

*Electronic Health Records (EHR)* is an electronic repository of a patient's medical record in digital form (Tavares & Oliveira, 2016).

*Meaningful Use (MU)* As a result of the federal government financial incentive program to promote the adoption of electronic medical records, doctors and hospitals who had received funding had to demonstrate through a series of measures that they were ensuring the meaningful use of the electronic health record thus the term, Meaningful Use (MU) (Tavares & Oliveira, 2016).

*Patient Engagement* is the involvement in their own health care by individuals with the goal that they make competent, well-informed decisions about their health and health care and take action to support those decisions (Maurer et al., 2012).

*Patient Portal* is defined as "a secure online website that gives patients convenient 24-hour access to personal health information from anywhere with an internet connection. Using a secure username and password, patients can view basic health information" (U.S. Department of Health and Human Services, 2017).

*Tethered portal* is when a portal is linked to a vendor-specific electronic health record and managed by a health care organization (Ancker et al., 2015).

*Health literacy* is the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (Irizarry et al., 2015).

*Heuristics* has a specific predictive heuristic for health literacy with the purpose to identify clinical information in the portal that would most likely be misunderstood by a lay person (Irizarry et al., 2015).

# CHAPTER 2

## Introduction

The role of the patient in health care decision making is changing. Knowledge, skills, and self-efficacy will drive this transformation as patients begin to embrace the technological advancements in health care. Chapter one outlined the development of the patient portal, the purpose of the study, and the conceptual framework. Chapter two presents a review of related literature. The sections explain the status of the literature on the patient portals. Using Bandura's self-efficacy theory here as a framework, the literature describes how the portal was developed as a result of technological advancements, how the portal has been adopted by different patient populations, and the effect of the portal on patient engagement and self-efficacy that may drive patients to adopt the portal. The chapter concludes with a description of the self-efficacy constructs with relationship to prior research. Chapter three will describe the participants of the study and the general description of the research design.

The health care delivery system is "shifting from a disease model to a health model" (Bandura, 2005, p. 245). The health model will reap benefits resulting in a healthier population. For this transformation to occur, patients must become more active participants in their own health care decisions. One of the tools that evolved because of technological advancement is the patient portal. The portal has many benefits; however, patients must know how to use the portal. They have to understand medical jargon and how to interpret test results. Bandura's self-efficacy theory is one way to understand how patients feel empowered to become active in their own health care decisions.

## Theoretical Framework

The theoretical framework for this study is based on self-efficacy as described by Albert Bandura as a construct of social cognitive theory. Bandura's theory refers to the way individuals behave influenced by how individuals perceive their own ability and skill that will motivate their actions in the environment by which they are surrounded (Bandura, 1977). Bandura's self-efficacy theory postulates a triadic relationship among person, environment, and behavior (Schunk, 2016). Personal efficacy involves self-management, the environment, and support for promoting self-efficacy and will likely lead to behavior changes. Adults will use the portal, and since this is a new technology in health care that allows patients to access their health information, they will have to gain knowledge and skills that will create a transformation on how to use the tool--the portal. They will have to receive encouragement from the health care environment-- their providers--and then make it meaningful that may lead to new behaviors-- their participation in making health care decisions.

According to the self-efficacy theory, the cognitive process will lead to behavioral change, but these processes are affected by and altered by the experience of mastering a skill from repeated effective performance (Bandura, 1977). Interventions that are cognitively based can provide individuals with the skills and knowledge that motivate behavior change (Strausser, 1995). The environment where events occur affect the assessment of self-efficacy. Self-efficacy will increase as individuals ascribe their success to their own skill and not attribute it to task difficulty (Strausser, 1995). Bandura (1977) discusses the assumption that the psychological procedures strengthen expectations of personal efficacy. There is the efficacy expectation and the outcome expectation.

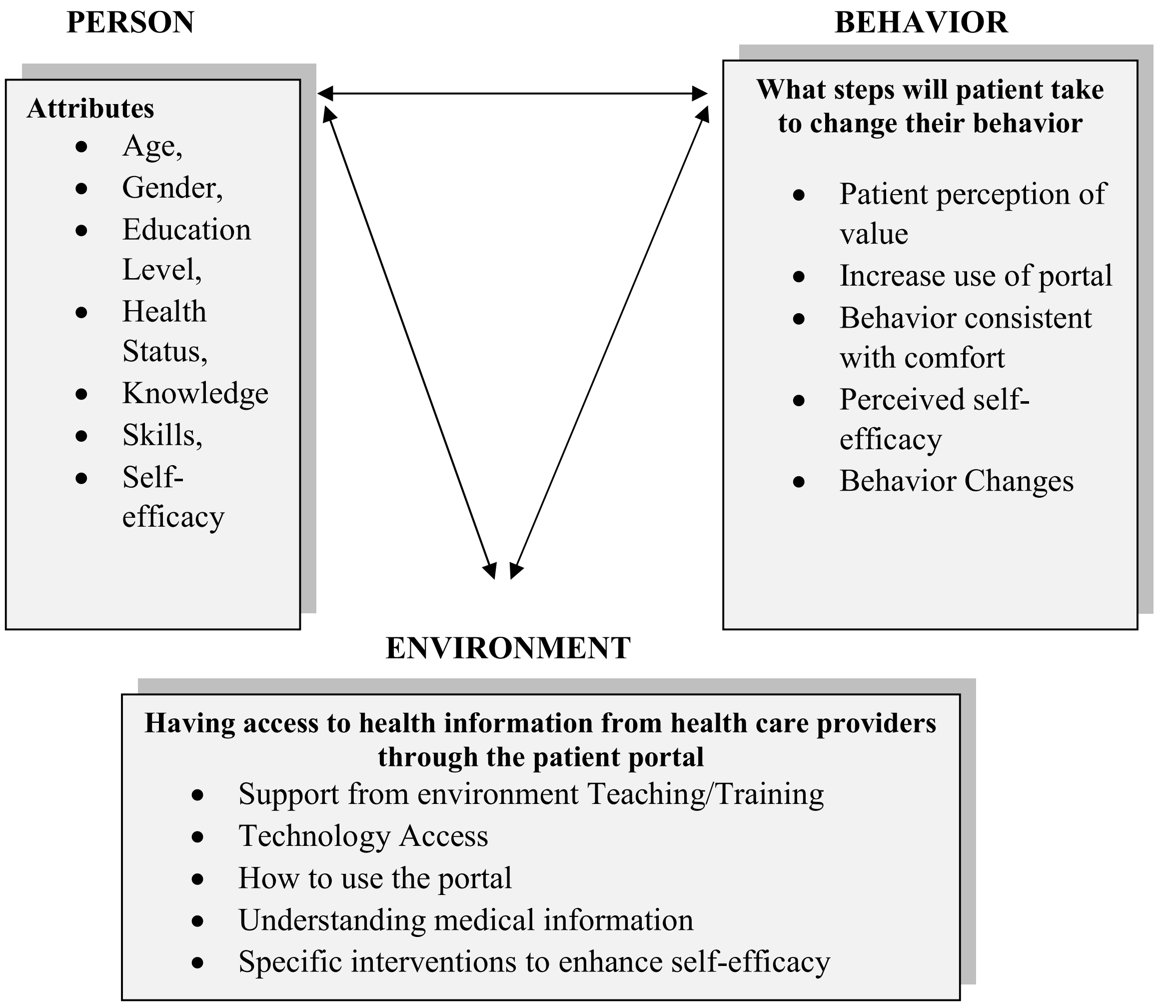
According to Bandura (1977), “the efficacy expectation is the conviction that one can successfully execute the behavior required to produce the outcome” (p.193). Simultaneously, the outcome expectation is an individual’s belief that particular courses of action will lead to a specific outcome (Bandura, 1977). Bandura (1977) has stated that efficacy expectations determine the amount of effort people will use and how long they will continue dealing with obstacles and adverse experiences. Obstacles and negative experiences can be correlated to an individuals’ health status and the individuals’ persistence to access health information in the portal to motivate them to change the outcome, that is, their behavior.

Self-efficacy influences motivation. Individuals may place significant value on the portal as they increase their knowledge and skills that will help them to interpret medical information. This will lead to self-confidence and self-regulation. By accessing their health information through the portal, individuals will be better prepared to communicate with their medical team. The environmental factors can affect the progression of self-efficacy with encouragement from providers in the health care setting. The self-confidence, encouragement from the providers, and self-efficacy may be important predictors of portal usage that will lead to behavioral changes whereby individuals will become more active participants in their care.

Understanding how individuals use the portal and perceive the patient portal's value is best demonstrated through Bandura’s theory of self-efficacy. This is a new construct for health care but falls into the triadic relationship of beliefs, environment, and behavior in Bandura’s social cognitive theory. In the theoretical framework (Figure 2) the individual’s beliefs begin with the concepts of skills, knowledge, and self-efficacy that is influenced by the environment with the support of the provider, guidance and training to support self-efficacy and health literacy, and how the value of the portal is perceived by the individuals that will drive increased portal's use and how self-efficacy and the environment will promote behavioral change.

**Figure 2**

*Theoretical Framework for Self-Efficacy (Bandura, 1977)*



Self-efficacy refers to individuals' perception of their own skills and how they behave in situations. The transition for patients to become more active in their own care will require a high level of self-efficacy. This construct influences and motivates individuals to change their behavior. When individuals are faced with changes in their health status, self-efficacy will play an important role in how they react emotionally and adjust their participation in their own care.

Graffigna and Barello (2018) explored the consumer health psychology relative to changing behavior using an evidence-based model, the Patient Health Engagement (PHE) model. The model has theoretical roots in two theories, behavioral change theory and adaptation to change theory. The PHE model has the potential to identify how people emotionally adjust to their health status and shift from the paternalistic approach relying on their doctor to becoming an active participant in their own care. The PHE model combines emotional component and changing environment affecting patient's behavioral and understanding relative to managing their health (Graffigna & Barello, 2018). Graffigna and Barello (2018) compare the PHE model with other theoretical frameworks. The emotional adjustment associated with a newly described disease or illness requires a psychological process. The emotional adaptation theory developed by Kubler-Ross (1969) identified five stages (denial, anger, bargaining, depression and acceptance) that have been applied to patients' reaction to a chronic disease or illness. The process entails emotional upheaval to meaning-making process for patients coping with their illness. The PHE model was rooted in the Kubler-Ross theory. Although the patients may adapt to living with their illness, they may need to make behavioral changes to manage their health. In addition to the Kubler-Ross model, Graffigna and Barello (2018) describe the Transtheoretical Model of Change where the individual goes through stages, from not being concerned to becoming fully engaged. The model offers strategies to guide patients through each stage of changing behavior and the main construct is self-efficacy (Graffigna & Barello, 2018).

## Review of Related Literature

Several studies address the evolution, proliferation, and adoption of the patient portal (Tavares & Oliveira, 2016; Dendere et al., 2019; Pillemer et al., 2016; & Price-Haywood et al., 2017). Specific aspects of selected studies can be found in sections on technological advancements in health care, use of the electronic patient portal, patient engagement, self-management, education and training, and social justice.

### Technological Advancements in Health Care and Patient Portal Usage

The literature on technological advancements in health care describes constructs necessary for patients to interact with the patient portal technology found in the electronic health record (EHR).

The purpose of the quantitative study by Tavares and Oliveira (2016) was to identify and examine what drives the adoption of the use of portals by health care consumers. The researchers developed a research model that expands the theory of acceptance and use of technology, and they integrated constructs that were specific to health care that included self-perception and chronic disability. The data were collected with an online questionnaire from 360 valid responses. In order to test the research model, a partial least squares (PLS) causal modeling approach was used. They studied the predictors of behavioral intention as performance expectancy, effort expectancy, habit, and self-perception and these constructs had the most significant effects on behavioral intention. They also studied the predictors of technology use and found habit and behavioral intention had a significant effect on technology use. The model explained

49.7% of the variance in behavioral intention and 26.8% of the variance in technology use behavior. Their results show that the fact that people know about a technology does not make them frequent users. Also important in the conclusion was that the adoption of the patient portal is still low and the current users access the portal infrequently. They used their results to provide insights for managerial implications promoting the usage of the portals and to increase the adoption.

The development of the patient portal was a result of technological advancement and government incentives. The literature has been tracking portal usage since its inception and the results indicate an upward trajectory (Emani et al., 2016; Graffigna & Barello, 2018). In 2011, Ancker et al. conducted a study to identify adoption and portal's use examining socioeconomic and clinical characteristics. A retrospective analysis of clinical and demographic factors was compared to portal access and portal usage. Data were obtained from the EHR system on the active patients in a network of federally qualified health centers in New York City and the Hudson Valley. The main measure was the percentage of patients receiving an access code, activating the portal and using it more than once. The researchers performed a multivariate logistic regression to determine the characteristics associated with portal access, portal activation, and portal usage more than once. The overall results of the study revealed that although racial disparities were evident (although relatively small) in all stages of access, activation, and use, the disparities persisted in the models. The patients with chronic conditions were more likely to access, activate and use the portal and further studies are needed to address provider support, teaching literacy skills for disadvantaged groups and to conduct qualitative studies to assess patient's reason for portal usage.

Access to the portal allows patients to be more engaged in their own self-management and increases their self-efficacy and can help patients change their behavior as it relates to their own care. Ronda et al. (2014) studied the opinions and barriers of patients with diabetes about requesting a login and using the patient portal. Through a set of questionnaires and data obtained from the EHRs from a health care organization comprised of primary care practitioners and one hospital system, patient characteristics and attributes were collected. Out of all of the participants 45.47% (n = 632) had a login and 54.53% (n = 758) did not have a login. Multivariable logistic regression analysis was run using the enter method to determine the adjusted association between patient characteristics and patients not requesting a login. The overall results revealed that one of the barriers for the portal's use was unawareness of the patient portal. Patients became aware of the portal based on the guidance from their health care provider. In order to increase the portal's use, the researchers recommended that the health care providers must encourage participation and make patients aware of the portal and how useful it can be to manage their disease.

An initial requirement of the meaningful use program was to provide a clinical summary of the patient encounter to the patient. This was called an after-visit summary. There was relatively little research on the characteristics of patients who review the after-visit summary and their beliefs about the after-visit summary that is found in the patient portal. Emani et al. (2016) studied the characteristics of who were aware of the after-visit summary and those who accessed the after-visit summary through the patient portal. They also examined the predictive behavioral intention of patients toward accessing the after-visit summary in the patient portal. They applied the Theory of Planned Behavior.

The study was conducted in a northeast academic medical center and participants were selected if they had at least one office visit and access to a patient portal. Using multiple regression analysis, the overall results of the study revealed that behavioral beliefs about having access to the information in the portal and the ability to track test results and visits were more important than beliefs about accessing their information for patient engagement in their own health care. In addition, the results did not find differences between groups with respect to sociodemographic characteristics. Also of importance to note is the study found that doctors have an important role in encouraging patients to access specific aspects of the portal.

As patients are increasingly offered access to their medical records through a patient portal, there has been little documenting on the feedback from patients especially from the vulnerable patient populations. Belyeu et al. (2018) conducted a mixed methods study with focus groups and a brief survey to identify patients' feedback after reading their own clinical summary from their doctors' notes and to discover rates of portal's use by this population served in safety-net clinics. The participants included 27 patients from primary care clinics associated with a medical center located in Seattle, Washington. The safety net clinics treat the medically underserved patients including, homeless patients, patients with mental health and substance use disorders, and patients with HIV/AIDS. Three themes emerged from their focus groups. The patients found it difficult to understand parts of the doctors' notes and relied on doctors to interpret; patients had trouble understanding the content and preferred direct communication; and the patients wanted to continue receiving detailed notes that could be interpreted by their provider. The commonality among the participants was that the majority had not accessed the electronic patient portal. Also of importance, the patients identified inaccuracies and confusing medical terms. Both the survey and the focus groups revealed that patients accessing their after-visit summaries through the patient portal were willing to assist others and promote the benefits of the portal. They identified opportunities for improving the accuracy of the notes and promoted the portal's use that would better engage this vulnerable population in their continuing health care.

As the portals began to be considered valuable tools for self-management especially for chronic disease management, there were concerns about how patients may interpret the laboratory test results and how they would behave, that is, what action the patient may take. The purpose of the study conducted by Balatsoukas et al. (2018) was to understand how patients interact with and process laboratory test results based on visual cues according to the web-based screen design of the results presented and the patients' ability to interpret risk factors. A controlled study with twenty kidney transplant patients was conducted. The participants were monitored in a lab setting to study their experience and how they interpreted the risk by employing eye-tracking to assess visual search behavior. The results of the study found that misinterpretation of risk was common and participants underestimated the need for action even when normal results were highlighted. The findings of this study raised concerns over the limitations of the patient portals in supporting self-care and patient safety risks. Their results highlighted the importance of patient education that would include which tests have more relevance before the patient uses the portal. Their study also emphasized that the portal's design should highlight important pieces of information and filter out less important results that may help with patient's interpretation of laboratory test results.

## Use of the Electronic Patient Portal

Since the development of the portal the literature has been focused on patients' interactions with the electronic patient portal. Activating the portal, interpreting the test results, and using the newly acquired information that patients will use to change their health care behaviors is being studied.

Ancker et al. (2015) conducted a study to assess the relationship between patient activation (described as a combination of knowledge, self-efficacy, and engagement) and the use of the patient portal. The study was conducted at the Weill Cornell Physician Organization using a tethered portal, which means that the portal was linked and managed by the health care organization. The result of the univariate logistic models showed that the probability of portal use was slightly higher among patients with the highest level of patient activation, although not a statistically significant difference. In order to find the association between patient activation and probability of portal use when controlling for other correlates of use, a multivariate model was built. The result of the multivariate model was not significantly associated with portal use and patient activation. Their findings were not statistically significant and did not correlate that patients who established a patient portal were more highly activated than those who did not establish an account. However, their findings did confirm that patients with higher education were more likely to use the portal. The findings of their study added to the discussion of the adoption of patient portals.

The role of health care organizations influences how the patient portal is implemented. Operational policies, procedures, and portal's design must be embraced by executives in order to encourage patients to become engaged in their own health care.

The purpose of the research that was conducted by deBont et al. (2015) was to understand how the patient portal used at Kaiser Permanente (KP) has affected the organization's operational performance and affected patient health. A qualitative case study was the method of analysis. The case study intended to assess how practitioners and executives who work closely with the portal believe that it impacts care delivery and improvements in organizational performance. Two questions were used to frame their study: 1. How does the patient portal impact care delivery to produce the documented effects at KP? 2. What are the important organizational factors that influence the patient portal's development? The study was conducted using semi-structured interviews with 18 leaders who worked with the portal. The summary of their findings identified ways the participants believed that the portal had a positive effect on care delivery and identified several organizational factors that influence the patient portal's development. This study was conducted from the perspective of the leaders of the organization and not the patients. One of the recommendations of the study was to further study the patients' perspective and to explore how and why different patient populations benefit from the portal and improved care delivery.

Now that patients have online access to their electronic health record through the patient portal, there are the medically underserved patients and patients with HIV/AIDS who have not been included in the research that has been focused on patients who have access to computers and the Internet. Dhanireddy et al. (2014) conducted a qualitative study to gain insight into the vulnerable patients' attitudes towards having access to their medical records online that includes their doctors' visit notes. They recruited patients from two different clinics, an HIV/AIDS clinic and a primary care clinic for adults (where patients medical conditions are compromised by homelessness, substance abuse and psychiatric conditions), and facilitated four focus group discussions. There were thirty participants. There were no significant differences in age, gender, ethnicity, education level or chronic illness among participants. The results of their study found that the vulnerable populations were excited about gaining access to their medical records through the portal but there continues to be a knowledge gap within this population and the patients had a high level of concern for privacy. The researchers concluded that there will need to have targeted support to help the underserved patients.

There are many benefits of the patient portals, but the literature continues to point out that few patients use them. The studies point to patients' difficulty with interpreting lab tests and lack of medical knowledge. The portal's design may contribute to the lack of use. In continuing to improve the design of the patient portal, Nystrom et al. (2018) designed a way for patients to view laboratory test results in a more usable patient-centered prototype. They used a multiple evaluation method including user testing and focus group review sessions to assess the usefulness of their design. Fourteen participants were recruited for user testing. After user testing of each iterative prototype of the design, users completed a questionnaire to estimate the product's usability. A System Usability Scale (SUS) was used. The results showed that after the third iteration of the design the SUS score was 82 or higher which indicates an acceptable rating of usability. The overall results of testing the interface design suggested that patients perceive the usability of this design and that it met the patient's information needs when viewing their lab tests. This study illustrates that the design of the patient portal would be better served if software designers would use methods and processes that would include results of studies on the use of patient information needs.

The electronic health record provides access to the patient portal. Patients can activate their portal and review their diagnostic test results after every encounter with a provider. There is little known about portal usage by patients after their treatment in the emergency room. Foster and Krasowski (2019) reviewed the utilization of the patient portal by emergency department patients and examined the rate of portal activation and the rates of viewing diagnostic test results and they analyzed the impact of age, gender, and self-reported patient race. They conducted a retrospective analysis of electronic health record patient portals from the University of Iowa Health System. The study measured patient portal activation rates and analyzed patterns of patients viewing diagnostic tests in patients treated in the emergency department. A chi-square was used to compare test view rates, whether viewed or not viewed, by age, gender, and race. The activation rates were highest for Asian (58.1%) and white (39.52%). Rates of activation for patients aged 18-70 years were 41.61%. The viewing rates of lab tests that were ordered in the emergency department by those patients with activated accounts was 8.9% of lab tests (18,573 viewed/208,655 treated). Females had higher rates of viewing test results (10.73%) than males (7.20%). The overall results of the study revealed that patient portal usage to view diagnostic test results for patients treated in the emergency department were highest in females, Caucasian, and Asian. The researchers pointed out that even though groups had higher access rates they only viewed test results less than 20% of the time. This result creates opportunities for improvement. The researchers suggest further studies are needed to develop strategies to increase patient portal usage following treatment in the emergency department.

## Patient Engagement

Knowledge, health literacy, skills, and self-efficacy will drive the transformation for patients to become more engaged in their health care (Lee et al., 2020). The expected result is better communication between patient and provider that will improve health outcomes. Through the EHR, the patient portal has become the repository for the health information shared with patients. How this information is delivered to patients, what level of health literacy is evident in patient populations, and how it is used has been studied. This transformation is currently taking place and the studies in the literature are advancing how to encourage, assist and develop policies that support patient engagement through the portal's use.

The population most affected by chronic disease is the elderly. It is also the population that is most disconnected to making their own health care decisions. The advancement of technology and innovation in managing chronic illnesses has placed this population in a new frontier. These patients must navigate through new technology, health tracking tools, and access to their medical information in the patient portal. They must embrace their role in health care decision-making, but they may not have the self-efficacy with technology or the health literacy to manage their own illness. Because older adults are less likely to adopt new methods of participating in their own health care decision making, Price-Haywood et al. (2017) conducted a study that would examine older adults ($\geq$50) with hypertension or diabetes (chronic conditions) and the relationship between portal usage, interest in health-tracking tools, and eHealth literacy. The researchers conducted a cross-sectional survey of 247 older adults (50 years and older) at Ochsner Health System in Louisiana. A survey questionnaire was developed that would compare Internet use among the portal users and non-users, self-efficacy in using the Internet, interest in tracking health using websites and smartphone applications. The results of a multivariate analysis showed a correlation with higher levels of education among the users of the patient portal. There continues to be a challenge for the health care system as it relates to self-efficacy and health literacy among the older adult patients and the portal's use that will engage patients in self managing their conditions.

The rollout of the patient portal was driven by the health care industry. Patients were not fully prepared for receiving test results to be used to help them engage in their own health decisions. Because of the timeframe of the rollout there were few studies on the impact of allowing patients access to their test results. A study conducted by Pillemer et al. (2016) set out to see if patient's direct access to their test results would increase their engagement in health care decisions. The participants in this study were all patients from an integrated health care delivery system. A mixed method approach was used, where the researchers collected quantitative data on the patient portal usage, they collected data on the patient's view of tests and their doctor-patient encounters through the EHR and they used survey data regarding the patient's experiences with the direct access to test results. In addition, they conducted interviews with patients and providers. The researchers used a difference-in-difference regression framework to compare the patients who viewed any type of test results either directly released or released after reviewed by the physician (n = 8,486) to those who did not view test results before or after tests were released directly or by a physician (n = 5,955). The results of their study showed that one of the benefits of the direct access method is improving patient engagement. The patients reported in interviews that they have a sense of ownership with viewing the test results; they have more time to research the results and are better prepared with questions for their next office visit. Additionally, the findings of their study indicated that the direct release of the test results in the patient portal was highly valued by patients and it appeared to increase patient engagement.

Patient engagement has been defined by the Agency for Healthcare Research and Quality (AHRQ) as the involvement in their own care by individuals (and others they designate to engage on their behalf) with the goal that they make competent, well-informed decisions about their health and health care and take action to support those decisions (Maurer et al., 2012). Since patient portals serve as a means to support greater patient engagement, patients must be encouraged to adopt the patient portals. A state of science review was conducted by Irizarry et al. (2015) where they reviewed literature from 2006 through 2014 to present how current literature is in addressing the support of patient engagement using the patient portal. The results of their study were grouped into five major areas, patient adoption, provider endorsement, health literacy, usability and utility. Studies on health literacy proposed adding advanced technology to the portal for health literacy. Using algorithms, clinical information would be identified whereby an explanation for the lay person would be provided. Suggestions were made in studies to add tools that would help patient’s ability to understand their health information and to add links to definitions for medical terms. Patient adoption of the portal showed potential barriers to access the portal, particularly the disparities among those who lack access to the Internet and those who are not computer literate. Furthermore, barriers exist for adoption among those with language barriers and race, age, ethnicity, and socioeconomic status. Patients with chronic illnesses and frequent users of health care services tend to be the more active users of the patient portal. An important outcome of their review of the studies identified that the patient portal adoption rate is influenced by personal factors, including health literacy, health status, and education level, and improves with a trained healthcare provider's guidance and encouragement. Their study concluded that the patient's interest and ability to adopt the patient portal are influenced by personal factors and provider endorsement.

Engaging patients to participate in their health care can improve patient health outcomes and patient satisfaction. In the inpatient hospital setting, developing the patient portals has been challenging due to the acute episode of the patient's condition, the number of diagnostic tests and procedures, and extensive medical information generated during the patient's stay in the hospital. The concept of patient engagement in the inpatient hospital setting was studied by Dendere et al. (2019). Their study was a systematic review of the literature to identify the portal's role in the inpatient setting, the impact on the delivery of care, and the best practices for implementing this new technology. After an extensive systematic search of several databases, they selected and assessed 53 articles for quality using a measurement tool to assess systematic review (AMSTAR2) and quality assessment tool for studies with diversity design (QATSDD). The information in the articles was categorized into themes related to the implementation of the portals. These researchers conclude that the available evidence for inpatient patient portals is too premature to assess the patient portals' implementation in the hospital setting and the relationship to health outcomes.

## Self-Management

The concept of patient engagement focuses on patients and their willingness to embrace a new role in their care. Self-efficacy and self-regulation are constructs that may drive the change from disease management to health promotion (Bandura, 2005). Motivation and self-regulatory skills will drive self-management. Bandura authored a review article where he discussed two large scale research programs that developed health promotion models using social cognitive theory's theoretical framework. In a self-management model, a computer-assisted model combined motivation and self-regulatory skills. Patients were provided detailed guides on how to improve their health. In this model, self-efficacy points to the self-regulatory skills that need to be developed. In the second study, Bandura reports that a randomized control trial was conducted promoting lifestyle changes among patients diagnosed with coronary artery disease. The group that was given guidance and intervention on self-management showed 47% less coronary arterial disease. The personalized guidance allows patients to take charge of their health. In 2005, Bandura proposed that further development of interactive Internet-based models to promote self-management programs will improve patients' health.

Constructs that include internal (personal) factors and external (environmental) factors influence individual’s engagement in self-care and improvement of their health and well-being. Sousa and Zauszniewski (2006) proposed a conceptual framework for the diabetes self-care management research model. They used two research models to test their conceptual framework. Orem’s self-care theory and Bandura’s self-efficacy theory were used to form the conceptual framework. The relationships of the constructs and variables were used to develop the conceptual framework for diabetes self-care management. The influencing factors, that is, personal factors and environmental factors impact self-care and self-efficacy that will drive behavior and the outcomes for health and wellbeing. The proposed conceptual framework was tested using a research model for diabetes self-care management. A cross-sectional correlation model testing design was used to analyze two research studies to find the relationship among knowledge of diabetes, social support, self-care agency, self-efficacy, self-care management, and glycemic control. There were141 subjects from an outpatient diabetic center in a major university located in the southeastern United States. A simple linear regression, standard multiple regression, and hierarchical multiple regression were used to test the relationship among the variables proposed in the research model for diabetes self-care management. This study's conclusion suggests that people with diabetes, a chronic condition, must learn how to better assess their condition and take action when needed. Self-efficacy had a significant effect on diabetes self-care management.

### Education and Training

As the EHR technology matured more features were offered through the patient portal. Secure messaging is the tool that allows patients to communicate with their providers through electronic messaging similar to email (Ancker et al., 2011). Hefner et al. (2019) conducted an exploratory qualitative study to explore how experienced portal users engage with secure messaging to manage their chronic illness. A total of seventeen patients with reported cardiopulmonary conditions from a Midwestern academic medical center were selected using convenience sampling. The themes that emerged included: patient’s motivation for using the messaging tool; patients had quicker access to their doctors; and patients were motivated by the fact that it is quicker than calling the office.

The overall results show that the messaging can serve as a tool for coordinating care, especially with patients with chronic conditions, leading to managing aspects of their condition. The authors suggested that patient training on topics for communicating through secure messaging could serve as a guide for patients. It was also suggested that further research may be needed to develop training for patients and study the implementation and efficacy of the training programs.

Although the patient portal has the potential to engage patients with chronic conditions to practice self-management and participate in their own care, few patients are taking advantage of this tool. Powell and Myers (2018) explored how patients are introduced to and learn about portals and how patients and providers perceive the usefulness of the portal in managing their own care. A convenience sampling method was used to choose patients and providers from urban and rural health clinics. The researchers selected patients (n = 9) and providers (n = 7) to participate in a semi-structured interview. The interview findings revealed four themes: (a) introduction to the patient portal; (b) perception of the benefit of the portal; (c) perceived barriers; and (d) perceived usefulness and how this will promote self-management of chronic illnesses. The data from the study showed low rates of portal use. They reported that three out of nine patients (33%) never logged into the portal. The overall results identified the main reason for patients not accessing the portal were that they did not perceive it to be useful and did not understand the functionality. In addition, patients reported that they would use the portal after their provider encouraged them to use it. The providers reported that their time was limited to be able to teach patients how to use the portal. The researchers concluded that there is a need for further research that examines the effects of provider encouraged portal's use especially to promote self-managing of chronic illnesses.

### Social Justice

There are certain marginalized groups, race, ethnic, and low socioeconomic groups, that are less likely to use the portal although these groups are representative of populations with more health care needs. There are barriers for these patients to access the portal. Research indicates that "26% of the U.S. population has inadequate health literacy, 12% have limited English proficiency, and 22% have a disability" (Lyles et al., 2017). Public and private coordination failed the marginalized groups in the development of the patient portals. This social justice inequity must be analyzed in future studies.

The proposed study will analyze the relationship between individuals' attributes and their portal's use that has been influenced by their personal beliefs, their experience with their environment and their understanding of their health information. In order to engage all patients in using the technology, a transformation in knowledge and practice must take place. "Self-efficacy beliefs emerged as the predictor of adoption of healthful practices" (Bandura, 2005, p. 247).

## Conclusion

Understanding how the individuals' perceptions of their ability to effectively use the patient portal are best demonstrated by the interaction between personal and environmental factors. In Bandura's social cognitive theory, the self-efficacy construct begins with person (beliefs), environment (doctor-patient relationship) and behavior (value of the portal) (Schunk, 2016). The relationship between the variables is reciprocal:

the environment influences patient's beliefs, patient beliefs influences behavior, and behavior influences environment.

The review of literature presents studies of populations within health care settings. There is a designated portal for the participants and a relationship with a health care provider or institution. There has been no evidence that populations (not in a health care setting) are represented in research. The current study aligns with other studies in that the purpose of the study is to understand the portal's use, what personal attributes influence the portal's use, and how to achieve patient engagement. Unique to the proposed study is an exploration of how the individuals report their experiences with the patient portal not influenced by a health care setting.

# CHAPTER 3

## Introduction

Chapter one outlined the development of the patient portal, the purpose of the study and the conceptual framework. Chapter two presented a review of the literature describing how the portal was developed as a result of technological advancements, how the portal has been adopted by different patient populations, and the effect of the portal on patient engagement and self-efficacy that may drive patients to adopt the portal. Chapter three describes the procedures for gathering and analyzing the data. Following this is a description of the participants in the study and a general description of the research design. This chapter also includes details on how the data were collected and analyzed. The research questions that guide this study were designed to explore the relationship between individuals' characteristics including health status that will determine the perceived value of the portal as defined by portal usage, a self-belief that they can master the portal, environmental factors that support the individuals, and understanding of medical information. Chapter four describes the results of the survey study using multiple regression analysis, Pearson's correlation, descriptive statistics and independent-samples *t*-test.

## Methods and Procedures

Derived from the research questions, the predominant hypothesis is that there will be a statistically significant difference in patient portal usage by one or more of the following characteristics: health literacy, health status, education level, self-perception, environmental factors, and an understanding of medical information. In addition to descriptive statistics, a multiple linear regression analysis was conducted to test the predictive model, a Pearson Correlation was used to determine the relationships between variables and an independent-samples *t*-test was conducted to compare portal usage with health status, specifically for major and minor health issues. A significance level was tested at the 0.05 level.

The primary purpose of this current study was to determine what factors predict patient portal usage and to examine the relationship between health literacy and portal usage, education level and portal usage, and health status and patient portal usage.

## Research Questions

The research is guided by the following questions: 1. What factors predict portal usage? 2. Does a relationship exist between portal usage and health literacy? 3. Does a relationship exist between education level and portal usage? 4. Does a relationship exist between health status and portal usage?

The patient portal is defined as electronic/web access to a patient's electronic health record (EHR) which may include lab test results, visit summaries, radiology images, and a list of medications. The research of this study focused on the factors that predict patient portal usage.

## Hypotheses

$H_0$: There will be no significant prediction of patient portal usage by reported understanding of health information, by education level and by health status.

$H_1$: There will be a significant prediction of patient portal usage by reported understanding of health information, by education level and by health status.

$H_0$: There will be no relationship between individuals' use of the patient portal and individuals' reported understanding of health information.

$H_1$: There will be a relationship between individuals' use of the patient portal and individuals' reported understanding of health information.

$H_0$: There will be no relationship between individuals' use of the patient portal and education level.

$H_1$: There will be a relationship between individuals' use of the patient portal and education level.

$H_0$: There will be no relationship between individuals' use of patient portal and health status.

$H_1$: There will be a relationship between individuals' use of patient portal and health status.

$H_0$: There will be no difference in patient portal usage between reported major health issues and reported minor health issues

$H_1$**:** There will be a difference in patient portal usage between reported major health issues and reported minor health issues.

The hypotheses were tested at a .05 level of significance.

## Research Design and Data Analysis

This is a survey study. Non-experimental group design is research that measures variables as they naturally occur. For this study, the collected data is information that was collected from the "average" individual who may have access to a patient portal as a part of their experience receiving health care. The research design includes descriptive and inferential statistics to describe individual responses. Mills and Gay (2016) indicate that descriptive research is necessary to describe the characteristics of a group toward an issue at a specific time. To do this, a multiple linear regression analysis was conducted to test the null hypothesis to determine if the independent variables: health literacy, education level, and health status, would predict portal usage--the dependent variable. The data were screened and a scatterplot was used to test the linear relationship between the independent variables and the dependent variable. The assumptions of normality, homoscedasticity, and multicollinearity were analyzed. An independent-samples *t*-test was conducted to compare portal usage with health status, specifically for major and minor health issues. The rationale for using a correlational design was to explore the predictive relationship between the independent variables: health literacy, education level, and health status on the dependent variable--portal usage. A correlational design is ideal for exploring the relationship between the independent and dependent variables (Fraenkel et al., 2019). In order to determine if a relationship existed among the variables, a Pearson's correlation was used to examine the relationship between health literacy and portal usage, education level and portal usage, and health status and portal usage.

### ***Reliability and Validity of the Research Design***

This design was vulnerable to internal and external threats because it did not have explicit treatment manipulation nor were the participants randomly assigned. A possible threat to this design includes an internal threat to validity (Cresswell, 2014). The selection process of participants included individuals who have discussed their experience with the portal with this researcher during the initial phases of research design. Those individuals who have discussed the portal may be vulnerable to influence the responses on the survey. An external threat of this current study is an interaction of setting and treatment. There were technical constraints on individuals completing the electronic survey tool, Qualtrics, because participants completed it from their own homes, and they may not have had the technical capacity to navigate the system. Another threat to the reliability of the study included environmental and participant changes occurring due to the COVID19 pandemic. Since individuals were working from home, there may have been many distractions, including the fear of their own health status.

## The Sample and Population

### *Sample*

The participants of the study included employees of Suffolk County Community College (SCCC). The college is the largest community college in New York State with 24,000 students. It is located in a suburban area of Long Island, New York. There are approximately 2,000 individuals employed at Suffolk County Community College. The rationale for selecting employees at Suffolk County Community College is that all individuals have the potential of having access to a patient portal. The health care available is generally equivalent among participants. The number of participants in the study were 95 (n = 95). There were 102 responses to the survey but three were practice surveys in Qualtrics and were removed. Four responses were removed due to collection errors. This sample was predominantly female and highly educated and highly compensated. The participants were primarily Caucasian/White (90.5%) with 6.3% Hispanic/Latino, 2.1% Black/African American, and 1.1% Asian/Pacific Islander. Half of the participants were in the 50-64 years age range. Table 1 illustrates the demographics of the participants.

**Table 1**

*Demographics of Participants*

| Demographics | n | % |
|---|---|---|
| Gender | | |
| Male | 26 | 27.4 |
| Female | 69 | 72.6 |
| Age | | |
| 20-34 yrs | 3 | 3.2 |
| 35-49 yrs | 33 | 34.7 |
| 50-64 yrs | 47 | 49.5 |
| 65-79 yrs | 12 | 12.6 |
| Ethnicity | | |
| Caucasian/White | 86 | 90.5 |
| Hispanic/Latino | 6 | 6.3 |
| Black/African American | 2 | 2.1 |
| Asian/Pacific Islander | 1 | 1.1 |
| Household Income* | | |
| $26,000-$50,000 | 5 | 5.3 |
| $51,000-$74,000 | 4 | 4.2 |
| $75,000-$99,000 | 9 | 9.5 |
| $100,000 + | 75 | 78.9 |
| *Missing | 2 | |
| Education Level | | |
| High School Diploma | 4 | 4.2 |
| Associate Degree | 8 | 8.4 |
| Baccalaureate Degree | 10 | 10.5 |
| Master's Degree | 50 | 52.6 |
| Doctoral Degree | 16 | 16.8 |
| Professional Degree | 7 | 7.4 |

### *Population*

The basis for selecting a convenience sampling method was validated by the literature. "Convenience sampling is a type of nonprobability or nonrandom sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study" (Etikan et al., 2016, p. 2). A convenience sampling was used to select individuals employed full time at SCCC. The participants were easy to reach through email, available at the workplace and willing to participate. Since the participants include only individuals employed at Suffolk County Community College, the results of this study may not be generalizable to all community colleges due to differences in populations, thus a limitation of this study. A bias in the sample does exist as it relates to the education level. Since many of the employees may be faculty, the participants' level of education may be skewed to represent a more educated population.

## Instruments

A twenty item self-reported questionnaire was used to measure the key variables in the study. The instrument was validated for its use in a previous study, "Patient portal preferences: perspectives on imaging information", (McNamara et al., 2015). Their study included fifteen questions that were based on a literature review of 25 peer-reviewed articles and one Pew Institute report on the topics of patient information needs, patients' perceptions of portals and observed outcomes of patients using the portal (McNamara et al., 2015). Their questions were prepared by two graduate students and reviewed by an oncologist where relevant questions were filtered and eliminated. Their survey was modified to align with conceptual and theoretical framework of this study. To do this, nine questions were added, two were deleted, and one question was reworded (see Appendix C for Permission to use survey). The survey was sent to three individuals as a pilot. Their feedback resulted in changes to the design, formatting and scaling of the survey instrument.

Section one of the instrument includes characteristics of individuals, such as age, gender, ethnicity and socioeconomic status. The rest of the instrument assessed the independent variables: health literacy, education level, and health status. Health Literacy informed the study with the participants reporting their capacity to understand medical terms and test results. Participants were asked to describe their health status including no health issues, well and quarterly visits, some health issues, minor health issues and major health issues. Education level was measured by high school through graduate school completion. One assumption of this study is that the individuals' use of the patient portal is likely to change their behavior to participate more fully in their health care decisions (See Appendix B for Patient Portal Survey).

The use of the patient portal was measured using a four-point Likert scale of ten out of twenty survey questions. The following values were assigned to the response options for data analysis: *most of the time* = 1; *some of the time* = 2; *seldom* = 3; and *never* = 4. A Cronbach's Alpha test for reliability was conducted. Two questions were removed from the study. Asking participants their level of anxiety was not relevant for answering the research questions and Question 14 was removed. Additionally, the participants received the survey through email demonstrating that they had computer skills, therefore asking participants if they could learn computer skills in Question 20 was not relevant for the study. The number of questions used to answer the research questions for the multiple linear regression analysis was reduced from twenty to twelve. Six of the questions identified characteristics and two questions (question 14 and question 20) were removed from the analysis. The questions on the survey are mapped to each research question in Figure 3.

**Figure 3**

*Mapping Survey Questions*

| **CHARACTERISTICS** | **SURVEY QUESTIONS**<br>1. Please select your age category<br>2. Please select gender<br>3. Please specify your ethnicity<br>4. Please select your appropriate average household income<br>9. What information would you like to review in a portal from your personal medical record<br>10. After reviewing the information in the portal where do you get your health information that will help you understand test results, medical terms, and/or diagnoses |
|---|---|
| **RESEARCH QUESTIONS** | **SURVEY QUESTIONS** |
| **1) What factors predict portal usage?** | 7. How often do you access the patient portal<br>8. Who introduced you to the patient portal at your provider's office<br>19. I have the computer skills necessary to use a patient portal |
| **2) Does a relationship exist between health literacy and portal usage?** | 11. Understanding my medical images and test results will make me more confident and help me to better manage my health problems<br>12. I understand the medical terms, test results, and/or diagnosis and how to interpret what I am reading in my medical record<br>13. I would like to see more definitions of medical terms and explanations of tests in the portal<br>15. Accessing my medical record with a patient portal will make me more confident and help me talk to my doctor about health problems<br>16. A patient portal will help me to follow my doctor's instructions<br>17. A patient portal will cause me to ask my doctor/nurses more questions<br>18. Having access to the medical record in the patient portal empowers me to take charge of my own health |
| **3) Does a relationship exist between education level and portal usage?** | 5.Please select your highest educational level |
| **4) Does a relationship exist between health status and portal usage?** | 6.Please select your description of your health status |

## Procedures for Collecting Data

The data were collected over a period of three weeks. The participants were employees of Suffolk County Community College and were recruited from the three campuses. Upon recommendation from Suffolk County Community College Institutional Review Board, an email was sent to each employee recruits asking if they were willing to participate in the study before an email with a direct anonymous link to Qualtrics could be sent. An email was sent to 166 employees requesting their participation in the study. There were 125 responses to the original email and a second email with a direct link to the survey was sent to each individual. After waiting until the end of the three weeks, the Qualtrics data were reviewed and there were 102 surveys completed. Three of the surveys turned out to be practice surveys and four of the surveys did not have complete information. The questionnaire had a detailed explanation of how to complete the survey noting that it would take between five and ten minutes to complete.

## Research Ethics

This study was submitted to the Institutional Review Board at St. John's University and the Institutional Review Board at Suffolk County Community College for their review. An email was sent to 166 individuals employed by Suffolk County Community College with the majority of participants from the Eastern campus asking the participants to participate in the study. As responses were received, a second email was sent with a direct link to the electronic survey through Qualtrics. Informed consent forms were included as the first page of the survey instrument, indicating that responder participation was strictly voluntary, and their responses would be kept confidential. The research survey did not ask the participants to identify their names to protect participant's anonymity. The researcher analyzed the anonymous responses received from the study participants with IBM's version of Statistical Package for Social Sciences (SPSS) (see Appendix A for IRB Approval). Participants who agreed to the conditions of the informed consent were permitted to complete the survey. The surveys were reviewed by the researcher, who is responsible for the data collection and analysis. An electronic copy of the data is stored in a secure One Drive folder following St. John's University policy.

## Conclusion

The study examined individuals' use of the patient portal that may be influenced by health literacy, education level, and health status. To do so, the study is framed by Bandura's theory of self-efficacy. A review of the literature shows that the studies presented are focused on patients in health care settings. To explore how a more generalized population uses the patient portal, the study analyzed data from individuals who are not currently in a specified health care setting. Using descriptive statistics, a multiple linear regression, Pearson's correlation and an independent-samples *t*- test, Chapter 4 illustrates the results of the survey study.

# CHAPTER 4

## Introduction

The purpose of this study was to examine the relationship between individuals' attributes, health status, education level and health literacy that will determine perceived value of the portal influenced by portal usage, individuals' beliefs that they can master the portal, the environment that supports the individuals and the individuals' understanding of medical information. Chapter one described the conceptual framework, chapter two presented the review of the literature and chapter three outlined the methods and procedures used to conduct the study. Chapter four presents the data to address the following research questions and provides analysis and discussion of the results.

1. What factors predict portal usage?
2. Does a relationship exist between health literacy and portal usage?
3. Does a relationship exist between education level and portal usage?
4. Does a relationship exist between health status and portal usage?

A multiple regression analysis was used to analyze what factors predict portal usage among the independent variables: health literacy, education level, and health status and the dependent variable: patient portal usage. A bivariate correlation analysis was used to analyze the relationship among health literacy and portal usage, education level and portal usage and health status and portal usage. An independent samples *t*-test and descriptive statistics were also used to present the data.

## Results/Findings

This survey study participants (N=95) were individuals employed by Suffolk County Community College with representation from all campuses. The sample was primarily females (72.6%), with males making up 27%. Fifty percent of the sample range in age from 50-64 years old. The ethnicity descriptors showed 91% were white, and the majority of the sample (79%) were in the upper income category ($100,000+).

The current study will address the results that answer the following research questions;

## Research Question/Hypothesis

### Research Question 1

What factors predict portal usage?

### Hypothesis 1

$H_0$: There will be no significant prediction of patient portal usage by reported understanding of health information, by education level, and by health status.

A multiple regression analysis was conducted using SPSS to see if the patient portal usage can be predicted by the individual's health literacy, education level, or health status. The three independent variables in this study were health literacy, education level, and health status, and the dependent variable was patient portal usage. The alpha level (.05) was selected for testing significance. Prior to running the analysis, the data were screened. There were no missing values or coding errors found in the data. All assumptions were tested for a multiple regression analysis. The assumption of linearity was conducted for each of the independent variables to determine a relationship with the dependent variable. Scatterplots for each independent variable were analyzed and it was determined that the relationships between health literacy, education level, health status, and patient portal usage were linear. Assumption #1 was met. Analysis of collinearity statistics showed that this assumption had been met as the independent variables are not too highly correlated. The Variance Inflation Factor (VIF) scores were well below 10, and tolerance scores above 0.2 (health literacy = 1.000; education level = 1.000; and health status = 1.000). There is no multicollinearity in the data, as seen in Table 3. Assumption #2 was met. Results of the Durbin-Watson indicate that 1.920 is close to 2, and therefore, the value of the residuals is independent. Assumption #3 was met. The scatterplot of standardized residuals vs. standardized predicted values shows no apparent signs of funneling, suggesting that the assumption of homoscedasticity has been met. Assumption #4 was met. The values of the residuals are normally distributed, evidenced by the P-P Plot. Not all of the data points touch the line but are close to the line and are connected. Assumption #5 was met. After running Cook's Distance there were no values over 1; therefore, no outliers have occurred. There are no influential cases biasing the model therefore, Assumption #6 was satisfied.

A multiple regression analysis was conducted to investigate whether health literacy, education level, and/or health status could significantly predict patient portal usage. The results of the regression indicated that the model summary explained 24.7% of the variance and the model was a significant predictor of patient portal usage, $F(3, 91) = 9.949$, $p = .001$ as shown in Table 2.

**Table 2**

*Summary of the Variance and Significance of the Model Predicting Portal Usage*

| Model | $R^2$ | SE | F | df1 | df2 | *p* |
|---|---|---|---|---|---|---|
| | .247 | 1.381 | 9.949 | 3 | 91 | .000 |

Higher levels of health status contributed significantly to the model (B = .511, $p = .000$), and to a lesser extent levels of health literacy (B = .123, $p = .002$), primarily predicted patient portal usage, while education level did not significantly predict portal usage ($B = .021$, $p = .868$). Health status received the strongest positive weight in the model and uniquely predicted 16% of the variance of portal usage ($sr^2 = .16$), which was followed by health literacy which uniquely predicted 8.6% ($sr^2 = .086$). As seen in Table 3 health status and health literacy proved to be statistically significant predictors of patient portal usage however, the education level was not a statistically significant predictor of the model.

The final predictive model is:

Patient Portal Usage = 3.915 + (.123 * health literacy + .021 * education level + .511* health status)

Health status and health literacy proved to be statistically significant predictors of patient portal usage; therefore, the null hypothesis was rejected.

**Table 3**

*Summary of Multiple Regression Analysis for Variables Predicting Patient Portal Usage (N=95)*

| | Portal Usage | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | B | SEB | B | *p* | $sr^2$ | Tolerance | VIF |
| Health Literacy | .123 | .038 | .294 | .002 | .086 | 1.000 | 1.000 |
| Education Level | .021 | .125 | .015 | .868 | | 1.000 | 1.000 |
| Health Status | .511 | .116 | .400 | .000 | .16 | 1.000 | 1.000 |

Descriptive statistics were examined to further explain how often individuals access the portal and what motivates individuals to use the patient portal. Almost 80% of the participants reported that they have accessed the portal. Forty five percent access the portal once a year, 33% access the portal once a month and 1% reported that they access the portal once a week as seen in Table 4.

**Table 4**

*Experience with Accessing Portal*

| Question | Never<br>% | Once a year<br>% | Once a month<br>% | Once a week<br>% |
|---|---|---|---|---|
| How often do you access the patient portal | 21.2 | 45.3 | 32.6 | 1.1 |

Additionally, in order to understand the range of support that individuals receive from their environment, that is, their providers and staff, participants were asked the following question, *Who introduced you to the portal?* Almost half (46%) reported that they were introduced to the portal through an email or brochure, 22% reported that clerical staff introduced the portal, and 14.7% reported that the doctors and nurses encouraged their participation in using the portal. This is the same percentage as 14.7% reported that no one helped them with the portal as seen in Table 5.

**Table 5**

*Support from Environment*

| Question | No one<br>% | Email/brochure<br>% | Clerical staff<br>% | Doctors/Nurse<br>% |
|---|---|---|---|---|
| Who introduced you to the portal | 14.7 | 46.3 | 22.1 | 14.7 |

**Research Question 2**

Does a relationship exist between patient portal usage and health literacy?

**Hypothesis 2**

$H_0$: There will be no relationship between individuals' use of the patient portal and individuals' reported understanding of health information.

A Pearson's correlation was computed to assess the relationship between patient portal usage and health literacy. There was a positive correlation between the two variables, $r = .295$, $p = .004$ which is classified as small. A scatterplot summarizes the results, as shown in Figure D1 in Appendix D. Overall, there was a positive correlation between health literacy and portal usage. The null hypothesis was rejected.

Descriptive Statistics were used to describe the frequency of participant decision making related to health literacy and portal usage. The results showed that 76% of the participants reported that understanding the test results would make them more confident and better able to manage their health problems, but only 50% reported that *some of the time* they understand medical terms, test results and how to interpret the information. In addition, 56% reported that *most of the time* they would like to see more definitions of medical terms and explanation of tests in the portal. See Table 6.

**Table 6**

*Health Literacy*

| Question | Most of time % | Some of time % | Seldom % | Never % |
|---|---|---|---|---|
| Understanding my medical images & test results will make me more confident and help me to better manage my health problems | 75.8 | 20.0 | 2.1 | 2.1 |
| I understand the medical terms, test results, and/or diagnosis and how to interpret what I am reading in my medical record | 41.1 | 50.5 | 6.3 | 2.1 |
| I would like to see more definitions of medical terms & explanations of tests in portal | 55.8 | 30.5 | 10.5 | 3.2 |

### Research Question 3

Does a relationship exist between education level and portal usage?

### Hypothesis 3

$H_0$: There will be no relationship between an individual's use of the patient portal and education level.

A Pearson's correlation was computed to assess the relationship between patient portal usage and education level. The correlation between the two variables, *r* = .024, *p* = .817, is not statistically significant, therefore, there is not a significant linear relationship with education level and patient portal usage. A scatterplot summarizes the results, as shown in Figure D2 in Appendix D. Overall, there was no correlation between education level and portal usage. Therefore, the null hypothesis was retained.

### Research Question 4

Does a relationship exist between health status and patient portal usage?

### Hypothesis 4

$H_0$: There will be no relationship between individuals' use of patient portal and health status.

A Pearson's correlation was computed to assess the relationship between patient portal usage and health status. There was a positive correlation between the two variables, *r* = .400, *p* = .000. A scatterplot summarizes the results, as shown in Figure D3 in Appendix D. Overall, there was a positive correlation between health status and patient portal usage. The null hypothesis was rejected.

### Hypothesis 5

$H_0$: There will be no difference in patient portal usage between reported major health issues and reported minor health issues.

An independent-samples *t*-test was conducted to compare patient portal usage with reported major health issues and reported minor health issue conditions. There was a significant difference in the portal usage for those who reported major health issues (M = 10.50, SD =.707) and those who reported minor health issues (M = 8.37, SD = 1.433), conditions;  t(41) = -2.059, *p* = .046. The significant result had an effect size of Cohen's *d* = 1.88, which is classified as large. The null hypothesis was rejected.

### Self-Efficacy

There were several questions reviewed for responses related to self-efficacy. The participants reported that *most of the time* (64%), accessing the patient portal will make them more confident to talk to their doctor about their health problems, 55% reported that *most of the time*, the portal would help them follow the doctor's instructions and 40% reported that *most of the time* by accessing the portal they would likely ask doctors and nurses questions. However, when asked *how often they access the portal* 45% reported once a year as previously seen in Table 4. Also, the participants reported that *most of the time* (68%) having access to the patient portal will empower them to take charge of their own health as shown in Table 7.

**Table 7**

*Self-Efficacy*

| Question | Most of time % | Some of time % | Seldom % | Never % |
|---|---|---|---|---|
| Accessing patient portal will make me more confident to talk to my doctor about my health problems | 64.2 | 29.5 | 2.1 | 4.2 |
| A patient portal will help me follow my doctor's instructions | 54.7 | 31.6 | 8.4 | 5.3 |
| A patient portal will cause me to ask my doctor/nurse more questions | 40.0 | 43.2 | 9.5 | 6.3 |
| Having access to the patient portal empowers me to take charge of my own health | 68.4 | 17.9 | 8.4 | 5.3 |

### Health Information

This study included questions to examine the reasons why individuals view the portal and where individuals look for information that will help them to understand what they reviewed. Descriptive statistics were used to provide further context to questions pertaining to self-efficacy, what type of information that they are seeking, and where to obtain health information that will help to interpret the clinical information that is reviewed. There were two questions where participants were able to give multiple responses. The first question was "What information would you like to review in a portal"? The results indicate that 29% of the participants seek laboratory results and 26% would like to view the radiology results. Almost half of the respondents (45%) are interested in receiving the laboratory and radiology test results however, 50% reported that only *some of the time* that they understand the medical terms, test results, and/or diagnosis and how to interpret the information. Individuals were not as interested in reviewing medications (19%) or doctor's notes (22%). There were 4% of the participants who were not interested in viewing any information in the portal. See Table 8

**Table 8**

*Information in Portal*

| Responses | n | % |
|---|---|---|
| I don't want to see my personal medical record | 12 | 4.0 |
| My doctor's notes | 67 | 22.3 |
| My medications | 57 | 19.0 |
| My laboratory results | 86 | 27.7 |
| My radiology results | 78 | 26.0 |

After reviewing the information in the portal, individuals may need help to understand medical terms and jargon; therefore they will seek information from other sources. The participants were then asked the following: "After reviewing the information in the portal, where do you get your health information that will help you understand test results, medical terms, and/or diagnosis"? The participants responded with 37.1% receiving their information from their doctors; however, 24.4% reported that they use online consumer health sources and 21.7% of the participants use Google indicating approximately 45% of the individuals seek health information from the

Internet as shown in Table 9. These results show that individuals are seeking information from consumer health sites.

**Table 9**

*Finding Health Information*

| Responses | n | % |
|---|---|---|
| I do not search the internet for health information | 11 | 5.0 |
| From family and/or friends | 26 | 11.8 |
| From online consumer health sources | 54 | 24.4 |
| From Google | 48 | 21.7 |
| From my doctor | 82 | 37.1 |

## Conclusion

The multiple regression analysis's main findings indicate that in this study, patient portal usage is predicted by an individual's health status and health literacy. A positive correlation shows a positive relationship between portal usage and health status. A Pearson's correlation indicates that the results also suggest that there is no relationship between education level and portal usage. An independent-samples *t*-test was conducted to compare portal usage with health status, specifically for major and minor health issues. The descriptive statistics identify the demographics of the participants, as well as, answers to survey questions that support health literacy, self-efficacy, environmental influences, and health information. The study was conducted to predict portal usage based on several factors. The results of the multiple regression analysis, Pearson's correlation, independent-samples *t*-test, and descriptive statistics are presented. The implication of the findings, recommendations for future research, and future practice suggestions are presented in Chapter 5.

# CHAPTER 5

## Introduction

Chapter five includes the conclusions based on findings, implications, suggestions for future practice, and recommendations for future research. Chapter one presented the conceptual and theoretical framework that was supported by the literature review in chapter two. Chapter three provided the plan for data analysis and chapter four described the results and analysis. The purpose of this survey study was to examine the relationship between individuals' attributes, including, health literacy, education level, and health status and patient portal usage, and how these attributes predict the use of the patient portal. By understanding gaps in portal usage, improvements may be made with policy and technological changes. This study was important to determine what motivates individuals to use the portal, how they were introduced to the portal, what they find is important in the portal, and how the portal's use may empower them to change their behavior and become actively engaged in their own care. This study was unique in that the population studied were individuals not tethered to the same patient portal and not patients affiliated with a health care system.

### Implications of Findings

The relationship between the variables, health literacy, education level and health status that influence portal usage, are described through statistical analysis and descriptive statistics. This study observed useful insight into the personal attributes that predict the patient portal's use and what motivates individuals to use the portal. The survey study set out to answer the first research question of what factors predict patient portal usage. The predictors used to examine patient portal usage were health literacy, education level, and health status. The health literacy and health status contributed significantly to the multiple regression analysis models. Health status predicted 16% of the variance of portal usage in the model which is consistent with previous findings--that patients with chronic conditions were more likely to use the portal (Ancker et al., 2011; Irizarry et al., 2015). Health literacy contributed 8.6% as a predictor for portal usage. Education level did not predict portal usage. This was a surprising find because the participants were employees at Suffolk County Community College with approximately three quarters of the participants reporting a level of a Master's degree or above. One likely explanation is that although the education level is high among the participants, there may still be a knowledge gap in understanding health information, medical terms and interpreting test results. Descriptive statistics were further examined to explain how often individuals access the portal and what motivates individuals to use the portal. The sample was predominately female and white, primarily between the ages of 34-64, and highly compensated. The majority of the participants reported that they have accessed the portal. This leaves 20% of the participants who have not accessed the portal at all. This may indicate that there is a greater awareness of the portal because in an earlier study by Powell and Myers (2018) their results showed overall lower rates of portal usage to be 33% of participants who did not access the portal. This sample has an economic and social status advantage to access health care and use the patient portal. There are underrepresented groups, marginal groups, that face social, technological, and educational barriers to access the patient portal indicating a need to further study the patient portal's use that includes a sample representing a more diverse racial group, include ethnic representation and low socioeconomic groups.

A Pearson's correlation was used to examine the relationship between health literacy and patient portal usage, education level and patient portal usage and health status and patient portal usage. There was a positive correlation between patient portal usage and health literacy, indicating a relationship between health literacy and the portal's use. Descriptive statistics expanded the results of health literacy and patient portal usage. Half of the participants reported that *some of the time* they understand medical terms, test results, and/or diagnosis and interpret their results and more than half reported that *most of the time* they would like to see more definitions of medical terms and explanations of tests in the portal. When asked if understanding their medical test results will make them more confident, the majority response was *most of the time.* The findings may indicate that if medical terms and test results are better understood, the portal's use would promote self-efficacy and patient engagement. This points to the need for additional education and support. Previous studies on health literacy showed a positive response when medical terms are presented in the portal in a more friendly manner (Irizarry et al., 2015). Price-Haywood et al. (2017) highlighted in their study the importance of incorporating health literacy interventions into the portal's design. Although this is a highly educated population, it points to the medical knowledge gap among the non-medical layperson and the need to provide more resources and tools within the portal. There was no correlation between education level and portal usage, which was a curious find because previous studies point to an association of portal usage and higher education (Ancker et al., 2015; Tavares & Oliveira, 2016). This may be an indication that even highly educated individuals need more experience using the portal. This may be an opportunity to provide more education and training on health information for all portal users. The final research question tested was the correlation between portal usage and health status. The results showed that there was a positive correlation. Previous studies report that individuals with chronic diseases tend to be more active users of the portal (Ancker et al., 2015; Irizarry et al., 2015). The relationship between health status and portal usage may indicate that as individuals have more health issues, they may use the portal more frequently. An independent-samples *t*-test was conducted to compare portal usage with health status, specifically for major and minor health issues. The results indicate that portal usage aligns with reported minor health issues. This finding is a surprising consideration, especially given that health status is significant, a finding at odds with that of the *t*-test. One explanation for this can be an incomplete definition of major and minor health issues. There are little to no definitions of these concepts in the literature. One interpretation by Ancker et al. (2015) suggests that the severity of health issues can be categorized by the number of prescription medications a patient may take. The authors also suggest that individuals with major health problems may be too ill to use a patient portal. As these were not questions asked as a part of this study, the findings do not align.

Despite this, the finding that patients with minor health issues may use patient portals is an essential consideration for research. The health care industry should pay special attention to how individuals can be supported when they have a newly diagnosed condition. The portal may require specialized information for particular major health issues that may include links to specialized sites or links to information on interpreting test results.

Descriptive statistics were used to explore the constructs of self-efficacy, knowledge, environment, and behavior of individuals as it relates to portal usage. The results for examining the environment showed that almost half of the participants reported that they were introduced to the portal through an email or brochure and a small percentage reported that they were introduced through doctors and nurses. This indicates that health care providers are not actively involved with encouraging the portal's use. Many of the previous studies (Ronda et al., 2014; Hafner et al., 2019; Emani et al., 2016) recommend that the health care providers introduce the portal and encourage its use for patients to better manage their care. These previous studies point out that doctors have an important role in encouraging patients to access the portal (Powell & Myers, 2018). Self-efficacy and patient engagement may be influenced if the provider takes the time to explain the portal's benefits.

Descriptive statistics were also used to recount the reasons that individuals view the portal. Participants were asked what information that they would like to review in the portal. In this study, doctor's notes were reported as the most important, followed by more than half reporting laboratory and radiology results. More than half reported that *most of the time*, they would like to see definitions and explanation of test results in the portal. Explanations would make it easier for individuals who view their laboratory and radiology results better understand and interpret test results. Providing education at various levels may be the way to help individuals interpret test results. Only 4% of the participants reported that they do not want to see their medical records. This perception may be a result of limited or low health literacy. These results show that many of the participants are reviewing their medical records in the portal. A follow-up question asked the participants where they get their health information after reviewing the portal's information. The results indicated that approximately half of the participants use either Google or other health consumer websites for their health information. If the portal does not explain terms, individuals are forced to seek health information from the Internet and may be misguided by misinformation. A previous study discussed patients having difficulty interpreting lab tests and lack of medical knowledge (Nystrom et al., 2018). Their study focused on redesigning the portal that would present information that would help individuals interpret test results. If the portal’s design includes tools that provide explanations for health information or helpful links to reputable sources for health information, individuals may not need to seek information from the Internet. An improved design of the patient portal may be able to better guide patients with useful information.

The theoretical framework of self-efficacy is the driving force for individuals to be confident in their own knowledge and skills, to be influenced by their environment and will likely be motivated to change their behavior. Using a theoretical framework of self-efficacy the individual’s beliefs begin with the concept of skills and knowledge. Self-efficacy is influenced by the environment with the support of the provider with guidance and training that will support health literacy, and how the value of the portal is perceived by the individual that will drive the increased portal’s use. Self-efficacy and the role of the environment will promote behavioral change. The study is guided by a conceptual framework that infuses Bandura’s self-efficacy theory. In terms of self-efficacy descriptive statistics were analyzed to determine if there may be a planned behavior change among the participants after accessing the patient portal. The results show a strong indication that the participants are more confident to discuss matters with their doctor after reviewing the information in the portal. Additionally, many of the participants reported that *most of the time*, by having access to the patient portal they are empowered to take charge of their health. The perception of their ability to use the portal shows that they are motivated to change the patient-doctor relationship so that they are participating in their own health care decisions. This is an indicator that the portal's use may engage individuals to become more active participants in their own health care. The underlying premise of providing health information in the portal is intended to transform the health care system by encouraging patient engagement.

## Relationship to Prior Research

The result of this research related to health status is supported by previous literature. Health status proved to be a predictor of portal usage and this was supported by two studies. One study examined the use of the patient portal among disadvantaged populations. Ancker et al. (2011) reported that their results prove that patients with chronic conditions were more likely to access and use the portal. In another study conducted by Irizarry et al. (2015) reported results that the more active users of the patient portal are patients with chronic illnesses and are frequent users of health care services. In addition to health status, education level was tested as a predictor of portal usage. The results of this research did not prove that education was at a significant level, which is not consistent with prior research. In a study that examined older adults with chronic conditions, Price-Haywood et al. (2017) reported the results of their multivariate analysis that showed a correlation with higher levels of education among older adults who used the patient portal. Although health literacy proved to be a significant predictor for portal usage, patient engagement will require a high degree of health literacy. In order to achieve this higher level, patient education may have to be supported within the portal. There was an overwhelming interest for individuals to view lab tests and radiology reports. Almost half of the participants reported that *most of the time* they would like to see more definitions of medical terms and explanations of tests in the portal. How can we make it easier for understanding and interpreting the results? This will require that the portal be redesigned. A study conducted by Balatsoukas et al. (2018) emphasized that the portal's design should highlight important pieces of the laboratory test results and leave out the less important information. Balatsoukas et al. (2018) reported that their study resulted in the importance of patient education for interpreting laboratory test results. Nystrom et al. (2018) conducted a study to test an interface design for viewing laboratory test results. Nystrom et al. (2018) reported that their results suggest that the portal should have more attention to patient information needs.

The majority of the participants of this study reported that *most of the time* they will be more confident and better able to manage their health problems by understanding the medical images and test results. It is important to provide an interpretation in layman's terms. Only half of the participants reported that they understand the terms and a little more than half would like to see more definitions and terms especially in the portal. Studies reported by Irizarry et al. (2015) on health literacy, proposed that predictive heuristics be added to the portal for health literacy to identify when health information may need to be interpreted for the layperson. Additionally, suggestions are made to add tools to the portal to help patients understand the health information, and add links in the portal for definitions of medical terms (Irizarry et al., 2015). The results of this research support the constructs of self-efficacy, knowledge, environment, and behavior and the findings of several related studies.

## Limitations of the Study

The study had limitations. It was a sample of employees at a single community college, which limited the ability to generalize to other community college populations. Since most of the participants were highly educated, there may have been a bias toward a better understanding of the portal's value. Results might have been different if there was a more diverse population, adding another limitation to the study's generalizability. The author cautions placing extraordinary value on this study's significant findings, primarily due to its homogenous population and its low sample size. When conducting assumption tests for Pearson’s correlation, the test for normality was achieved through a Q-Q plot for health literacy. It was the only measure that showed normality. This limitation could influence the result.

## Recommendations for Future Practice

The future of health care is moving to a more patient-centered model encouraging patient engagement. This study's findings offer suggestions concerning financial support, portal design, patient education, and provider involvement. Through the Meaningful Use program, the federal government provided financial incentives to adopt electronic health records. In response, patient portals were created. The unintended consequence of the implementation of the patient portal was that it became available to individuals with little or no experience viewing medical terms and test results. Half of the participants reported that only some of the time that they have an understanding of medical terms, test results and how to interpret the information. Individuals who have health issues will use the portal. While health literacy did contribute to the significance of the model, half of the participants reported that only some of the time they have an understanding of the medical terms, test results, and how to interpret the information. This clearly points to a medical knowledge gap. The education level did not contribute significantly to the multiple regression analysis. This has a larger implication in that this was a highly educated population and if education does not predict portal usage, then how do we promote health literacy to all education levels.

The population studied included only a small number of participants with diverse backgrounds. All ethnic and underserved groups should be studied. This supports previous research where one study recommended that there be future studies for teaching literacy skills to the disadvantaged groups and another study that concludes that targeted support is needed to help the underserved populations. There is a need for additional research on a diverse population.

It is time for a discussion among allied health educators in higher education to consider adding a health literacy component pertaining to the use of the portal in health related programs. There is also an opportunity to begin teaching a lesson on how to read a medical record. This should begin at the elementary level through secondary and postsecondary health courses. Future generations will become health consumers so why not have them prepared with the knowledge and skills and be better informed to become more engaged in their own care. The public will be better informed, health literacy will be improved, and self-efficacy will influence individual’s confidence to take control of their actions. Education leaders overseeing health career programs should consider operationalizing the education efforts of including lessons on patient portals. This can be the starting point for developing curriculum to be used in the elementary and secondary schools on how to read a medical record.

There has been evidence in prior studies that the provider plays an important role with introducing patients to the portal and encouraging them to use the portal. Participants reported that only 14.7% were introduced to the portal from the doctor/nurses. This is a strong indication that provider education is needed. Since patient engagement is the ultimate goal of the patient portal, the doctors and nurses will have to understand their role. Education programs for providers on patient portal usage should probably be offered. Providers have an important role in providing support to the patients for using the portal. Provider education needs to be operationalized to make providers aware of their important role in encouraging patients to become more engaged in their health care. Provider education can be offered in provider continuing education programs.

The participants reported that most of the time they would like to see more definitions of medical terms and explanations of tests in the portal. Prior literature addresses the redesign of the portal to include health literacy interventions in the portal and another study reported that by releasing the test results in the portal, it gives patients more time to research results to better communicate on their next office visit. It empowers patients to have a sense of ownership. Education may take place in the patient portals. To sustain the portal's use, for patient engagement to be successful, to improve health outcomes, and reduce health care spending, the federal government should set aside funding to build the infrastructure for the next generation of the patient portal. One way to make credible health consumer websites accessible is to provide links in the portal and features that will help the layperson better understand the portal's health information. Features may include test results with explanations and graphic displays, medical term definitions, and links to reputable websites for additional information, particularly for patients with chronic conditions and newly diagnosed conditions. Policymakers must consider redesigning the portal in ways to motivate individuals to use the portal, be better informed and improve health outcomes. More research is needed to study the use of the patient portal and health outcomes.

The study set out to study factors contributing to individuals’ use of the patient portal. The results have significant implications for changing the patient portal landscape and improving the health literacy of all individuals. In Figure 4 you can see the implications for stakeholder communities that have a role in patient and provider education and the patient portal redesign.

**Figure 4**

*Implications by Stakeholder Communities*

| Stakeholder Community | Implications |
|---|---|
| Higher Education | Education leaders should operationalize education efforts involving allied health educators |
| Elementary and Secondary schools | Education leaders should develop a lesson on How to read a medical record |
| Providers (doctors/physician assistants/nurses/nurse practitioners) | Provider education should include an explanation of their role, the role of the portal, and connection to patient engagement |
| Policymakers | Provide financial support to redesign the portal whereby tools and features in the portal will help to improve health literacy, improve health outcomes and reduce health care spending |

## Recommendations for Future Research

There are underrepresented groups that face social, technological, and educational barriers to access the patient portal. It would be important to study the factors impacting the use of the patient portal that includes a sample representing a more diverse racial group, including racial/ethnic representation and diverse socioeconomic groups.

A qualitative study may expand the results of this study to ascertain the patient portal's perceived benefit. During an interview, the information used to manage health, improve knowledge, and improve self-efficacy can be categorized into themes that will inform the health care community on how patients perceive the portal's value. Doctors and nurses are instrumental in providing support for the use of the patient portal. As such, a mixed-methods study may identify the portal use and the attitudes, perceptions, and behaviors of providers would help to understand how providers are trained to assist patients with portal activation and use. Additionally, research may be needed to study health outcomes and patient portal usage. A mixed methods study may identify the important role of the portal on health outcomes.

## Conclusion

The participants of the study were individuals who had the potential of having access to a patient portal. Unlike previous studies where the participants were affiliated with health care organizations and tethered to the same portals, this population was unique because they were not from a health care organization and their experience with the portal was individual and varied. The results of this research study were not that different from previous studies. Health status and health literacy continue to be predictors of portal usage. While health status cannot be manipulated, this research offers implications for policy changes, suggesting that policymakers consider updating policies related to the portal's design and create opportunities to educate the public. The study identifies an opportunity for health care educators to provide education on the essential role of patient portal use in patient engagement and health care management. Health literacy of portal users will require educational tools to help the users better understand the health information. The constructs of self-efficacy, knowledge, support from the environment, and behavioral changes will drive health care changes. These factors will contribute to individuals using the patient portal for patient engagement.

# APPENDIX A

## IRB Approval Memo

Firefox https://outlook.office.com/mail/inbox/id/AAQkADFmZWM3ZWY1...

**IRB-FY2021-16 - Initial: Initial Submission - Expedited - St. John's**

irbstjohns@stjohns.edu <irbstjohns@stjohns.edu>
Mon 8/17/2020 8:55 AM
**To:** Diane P. Fabian <diane.fabian17@my.stjohns.edu>; parnthec@stjohns.edu <parnthec@stjohns.edu>

ST. JOHN'S
UNIVERSITY

Federal Wide Assurance: FWA00009066

Aug 17, 2020 8:55 AM EDT

PI: Diane Fabian
CO-PI: Ceceilia Parnther
Ed Admin & Instruc Leadership

Re: Expedited Review - Initial - **IRB-FY2021-16** *Patient Engagement: The factors contributing to individuals using the patient portal*

Dear Diane Fabian:

The St John's University Institutional Review Board has rendered the decision below for *Patient Engagement: The factors contributing to individuals using the patient portal*. The approval is effective from August 15, 2020 through August 14, 2021

Decision: Approved

PLEASE NOTE: If you have collected any data prior to this approval date, the data must be discarded.

Selected Category: 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Sincerely,

Raymond DiGiuseppe, PhD, ABPP
Chair, Institutional Review Board

1 of 2 9/9/2020, 9:37 PM

Institutional Review Board
IORG 0006694

July 10, 2020

To: Diane Fabian

From: Institutional Review Board

RE: Patient Engagement: The factors contributing the individuals using the patient portal

Dear Diane,

After a review of your protocol, it was the decision of the Board that the study meets the federally designated criteria for an expedited review under category 45 CR 46. 101 (b)(3). Your proposal has been granted authorization. Please note the following information:

- **IRB# 20-012**
- **Expiration Date: July 10, 2021**

Please note that changes to the protocol must be reported to the IRB immediately and that such changes may warrant a new review. An adverse event in any instance which places participants at risk or at a level or degree of potential harm outside of those indicated within the initial protocol. Should such an event occur, the College IRB must be notified within 48 hours of the event. This information will be forwarded to the Vice President for Planning and Institutional Effectiveness as well as the Office for Human Research Protection.

Upon receipt of the adverse event report, the co-chairs of the IRB, in consultation with other members and administrators as appropriate, will require immediate suspension of the activity prior to review by the full membership.

Should you have any questions, feel free to contact me.

Sincerely,

# APPENDIX B

## Patient Portal Survey

This survey is for my dissertation that I am completing as a doctoral candidate at St. John's University. My research is to explore what factors predict an individual to use a patient portal. If you have been a patient in any health care setting, then you probably have access to a patient portal. I hope that you will participate. Thank you in advance. The questionnaire has twenty items and you should be able to select the responses within ten to fifteen minutes. Please select the most appropriate answer. Anonymity will be maintained.

**Part 1. Demographic data**

1. Please select your age category by circling your response:
    ___1) 20-34 years
    ___2) 35-49 years
    ___3) 50-64 years
    ___4) 65-79 years
    ___5) 80+

2. Please select gender
    ___1)Male
    ___2)Female

3. Please specify your ethnicity
    ___1)Caucasian/White
    ___2)Hispanic/Latino
    ___3)Black/African American
    ___4)Native American/American Indian
    ___5)Asian/Pacific Islander

4. Please select your appropriate average household income
    ___1)$0.00-$25,000
    ___2)$26,000-$50,000
    ___3)$51,000-$74,000
    ___4)$75,000-$99,000
    ___5)$100,000+

5. Please select your highest educational level by circling your response:
    ___1)High School Diploma
    ___2)Associate's degree
    ___3) Baccalaureate degree
    ___4)Master's degree
    ___5)Doctorate degree
    ___6)Professional degree (MD, JD, other)

## Part II. Health Status

6. Please select your description of your health status:
   ___0)No health issues
   ___1)Well visits only
   ___2)Minor health issues (Visits as needed)
   ___3)Some health issues
   ___4)Quarterly visits to doctor's office
   ___5)Major health issues (Monthly visits or more frequently)

## Part III. Experience with accessing and using information in the patient portal.

7. How often do you access the patient portal?
   ___0) Never
   ___1) Once a year
   ___2)Once a month
   ___3)Once a week

8. Who introduced you to the patient portal at your provider's office?
   ___0)No one. Found it on my own
   ___1)Through an email or brochure from doctor's office
   ___2)Clerical staff in doctor's office helped me sign on to portal
   ___3)Doctor/nurse encouraged me to sign on to portal

9. What information would you like to review in a portal from your personal medical record? Select all that apply.
   ___ 9a)I don't want to see my personal medical information
   ___9b)My doctor's notes (What the doctor writes during a visit with you)
   ___9c)My medications
   ___9d)My laboratory results
   ___9e)My radiology results (x-rays, MRI, CT scans, ultrasounds/sonograms)

10. After reviewing the information in the portal where do you get your health information that will help you understand test results, medical terms, and/or diagnoses? Select all that apply.
   ___10a)I do not search the internet for health information
   ___10b)From family and/or friends
   ___10c)From online consumer health sources (Mayo clinic, Medline Plus, Chat forums)
   ___10d)From Google or other search engines
   ___10e)From my doctor

**Part IV. Health Literacy**

11. Understanding my medical images and test results will make me more confident and help me to better manage my health problems.
___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

12. I understand the medical terms, test results and/or diagnosis and how to interpret what I am reading in my medical record.
___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

13. I would like to see more definitions of medical terms and explanations of tests in the portal.
___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

14. Accessing my medical record with a patient portal will increase my anxiety if I do not understand the results.
___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

15. Accessing my medical record with a patient portal will make me more confident and help me talk to my doctor about my health problems.
___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

16. A patient portal will help me to follow my doctor's instructions.
___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

17. A patient portal will cause me to ask my doctor/nurses more questions.
___1)Never

___2) Seldom
___3)Some of the time
___4)Most of the time

18. Having access to the medical record in the patient portal empowers me to take charge of my own health.

___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

**Part V. Technology and Portal access**

19. I have the computer skills necessary to use a patient portal.

___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

20. I could learn the computer skills necessary to use a patient portal with the assistance of a nurse or medical assistant in the doctor's office.

___1)Never
___2)Seldom
___3)Some of the time
___4)Most of the time

# APPENDIX C

## Permission to Use Survey

htfps :/ioutlook.office.corn /maiUdeeplink?version:2020050302...
[EXTERNAL EMAIL]Re: Request to use your survey tool
Mary [redacted]@g.ucla.edu > Tue LL/L9/20L9 9:01 PM
To: Diane Fabian <fabiand@sunysuffolkedu>
[CAUflON] - External email. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Diane,
You are welcome to use the survey. Unfortunately I am traveling this week for work and do not have access to a copy while traveling. I will look for a copy and send it to you this coming week.
- Mary

On Nov L8, 2019, at 1L:20 PM, Diane Fabian <fabiand@sunysuffolk.edu> wrote:

Hello Ms. [redacted], My name is Diane Fabian. I am currently a student at 5t. John's University in their doctoral program. My dissertation is to find out the patient's perspective on the value of the patient portal. ln my literature search I came upon your study in an article called, Patient portal preferences: perspectives on imaging information. My research is related to your study in that I am trying to determine how the patient portal is valued by patients. I found that your survey instrument appears to be a good tool for my study and I wanted to know if I can use your survey in whole or in part for my data collection. I will be forever grateful if you approve my request. Thank you. Diane P. Fabian

# APPENDIX D

## Scatterplots

**Figure D1**

Scatter Plot for Health Literacy

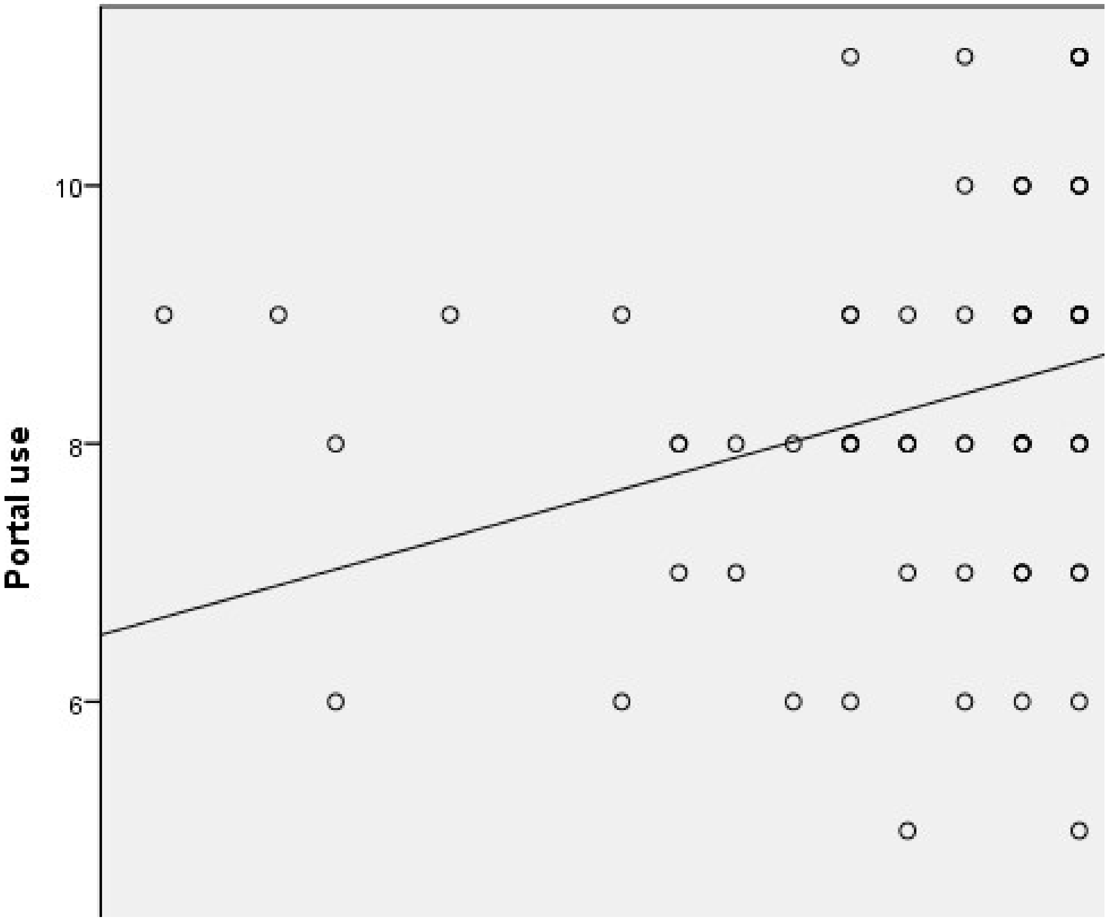


**Figure D2**

Scatter Plot

Education Level

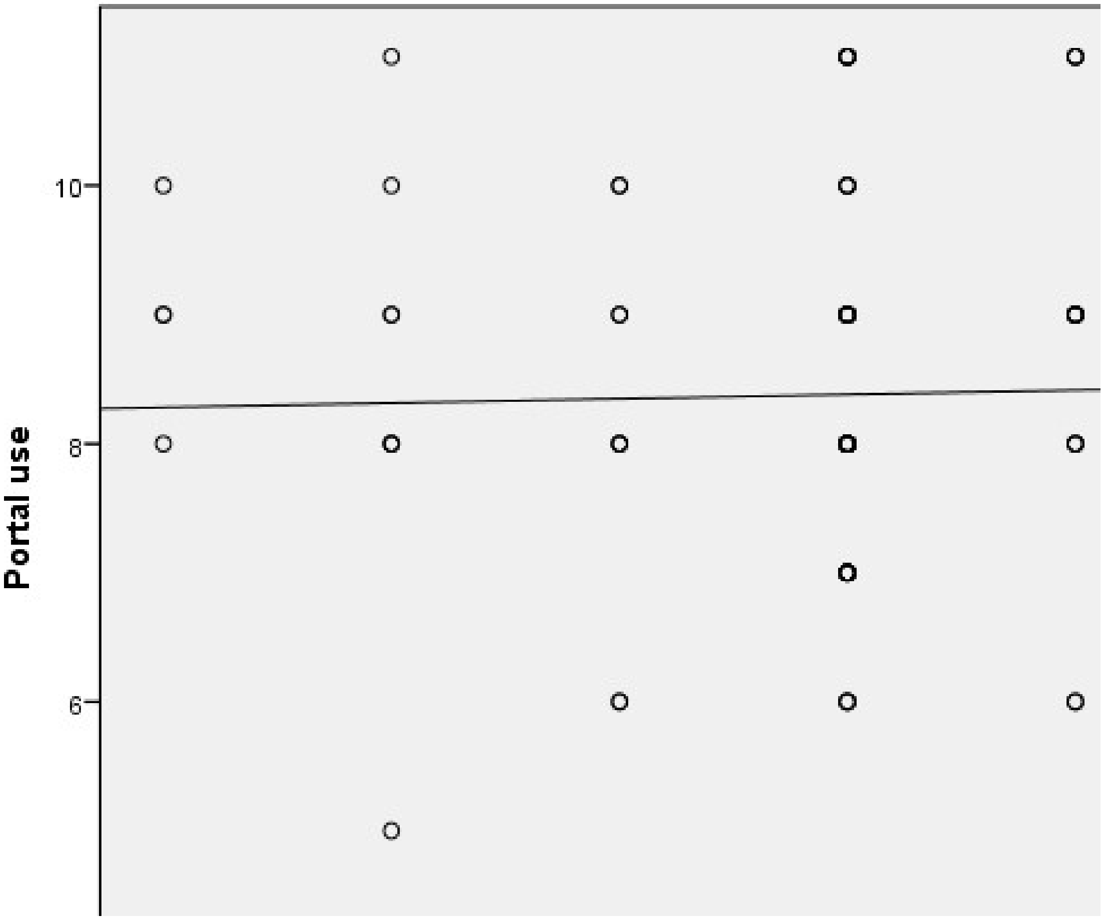
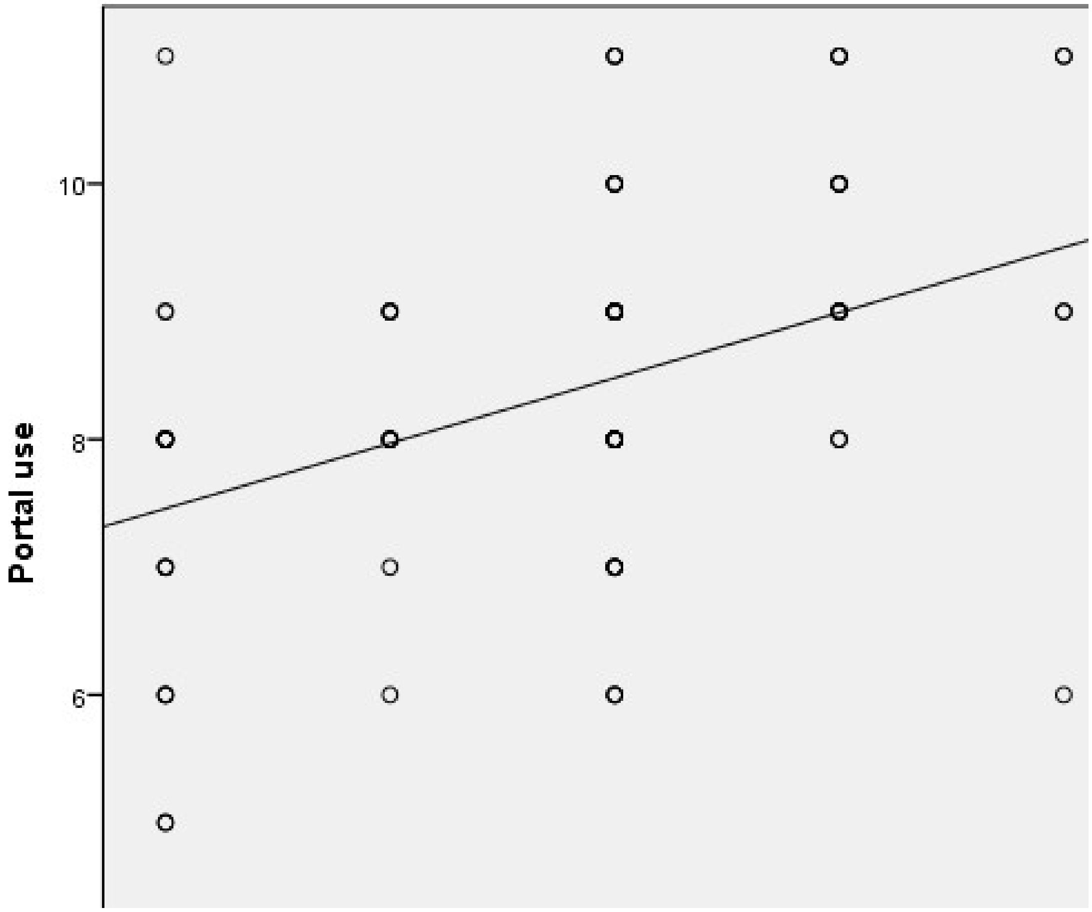


**Figure D3**

Scatter Plot

Health Status



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U.S. Department of Health and Human Services, Office of the National Coordinator for Health Information Technology (2017). *What is a patient portal?* http://www.healthit.gov/providers-professionals/faqs/what-patient-portal

# Vita

| | |
|---|---|
| Name | *Diane P. Fabian* |
| Baccalaureate Degree | *Bachelor of Arts, Stony Brook University, Stony Brook, Major: English* |
| Date Graduated | *August, 1977* |
| Other Degrees and Certificates | *Master of Business Administration*, Adelphi University, Garden City *Major: Business Administration* |
| Date Graduated | *May, 1994* |
| | *Master of Science, Stony Brook University, Stony Brook, Major: Health Care Policy and Management* |
| Date Graduated | *May, 2009* |