ASSESSING THE COMMUNICATION IMMEDIACY OF AN ONLINE HEALTH PORTAL: ANALYSIS AND RECOMMENDATIONS TO CREATE A COMMUNICATIVELY COMPETENT HEALTH INFORMATION SYSTEM

by

Jordan M. Alpert
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Committee:

_____________________________ Director

_____________________________

_____________________________

_____________________________

_____________________________ Department Chairperson

_____________________________ Program Director

_____________________________ Dean, Colleges of Humanities and Social Sciences

Date: _________________________ Spring Semester 2015
George Mason University
Fairfax, VA
Assessing the Communication Immediacy of an Online Health Portal: Analysis and Recommendations to Create a Communicatively Competent Health Information System

by

Jordan M. Alpert
Master of Arts
New York University, 2012
Bachelor of Science
University of Florida, 2003

Director: Gary L. Kreps, Professor
Department of Communication

Spring Semester 2015
George Mason University
Fairfax, VA
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DEDICATION

This dissertation is dedicated to my family. Without the support, encouragement, paper editing and presentation critiques from my wife Yelena, this would not be possible. Also, my parents were instrumental in helping me achieve this goal along with my sister, Alyson, who always provided guidance and reassurance.
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LIST OF ABBREVIATIONS

MyPreventiveCare.com .......................................................... MPC
Online Health Portal ............................................................. OHP
Relational Health Communication Competence Model ................ RHCCM
Diffusion of Innovations ......................................................... DoI
Patient-Centered Communication ........................................... PCC
Computer-Mediated Communication ....................................... CMC
Perceived Usefulness ............................................................. PU
Perceived Ease of Use ............................................................ PEOU
Technology Acceptance Model ................................................ TAM
Critical Incident Technique ...................................................... CIT
ABSTRACT

ASSESSING THE COMMUNICATION IMMEDIACY OF AN ONLINE HEALTH PORTAL: ANALYSIS AND RECOMMENDATIONS TO CREATE A COMMUNICATIVELY COMPETENT HEALTH INFORMATION SYSTEM

Jordan M. Alpert, Ph.D.

George Mason University, 2015

Dissertation Director: Dr. Gary L. Kreps

Once promised to revolutionize health care, online health portals have yet to achieve their potential of transforming the communication process between patients and providers. Generally, online health portals are mainly used to deliver lab results, which often generate more questions and concerns without allowing patients an outlet to get answers. Their operation is mandated by the Patient Protection and Affordable Care Act, which subsequently causes providers to minimally and begrudgingly use the technology. One particular online health portal, MyPreventiveCare.com, has attempted to reverse this trend by creating a platform that provides tailored health promotion recommendations based on family history, lifestyle habits and medical accounts.

This dissertation examined MyPreventiveCare.com to assess its levels of immediacy, including such factors as personalization, interactivity, engagement, approachability, clarity and the ability to take action. The purpose of the study was to
determine how patients and providers regarded the system so that refinements could be recommended for future improvements. Multimethod design was employed with 31 patient interviews and two focus groups with providers utilizing the Critical Incident Technique. Over 140 incidents were gathered, of which 72% were negative and 28% were positive. Negative incidents among patients included the following categories: (1) content is generic and standardized, (2) it is unclear whether information is coming directly from the provider, (3) website errors and (4) interpreting data is difficult. Negative incidents among providers centered on (1) ineffective one-way communication, (2) the portal increases workload, (3) verbiage disrupts care and (4) website glitches.

In addition, a thematic analysis of the portal was conducted. Positive attributes included pleasant imagery, simple and encouraging language as well as historical medical data. Weaknesses comprised of inconsistent personalization, lack of interactivity and confusing language. Moreover, the Centers for Disease Control and Prevention (CDC) Clear Communication Index, a research based tool that helps health communication professionals assess and develop communication materials was utilized to gauge the clarity of the portal. Once intercoder reliability was established, 37 internal and external webpages were evaluated. The total score among all of the pages was 72%, which falls below the 90% threshold to be considered clear communication. Only four pages received scores of 90% or higher.

Findings from this study connect with several theories and concepts, such as the Diffusion of Innovations Model, Technology Acceptance Model, Relational Health Communication Competence Model and the Self-Efficacy construct. Based upon the data
collected, it was concluded that MyPreventiveCare.com must go beyond simply repeating patients’ self-reported information and instead create a dynamic environment that delivers an interactive and personalized experience. The data collected should inform significant refinements in the online health portal that can serve as an extension of the provider by offering patients a customized, robust, easily accessible, and trusted information source to promote patient adherence with medical recommendations and informed health decision making.
CHAPTER ONE: INTRODUCTION

New technology is constantly developed to enhance communication between patients, providers and health organizations. In spite of the advances, there is still significant progress to be made in making digital communication a solution that contributes to improved health outcomes rather than a problem that complicates the health delivery process (Kreps, 2014). An innovation that has been lauded as a method to initiate better health care is the ability to provide health information digitally, otherwise known as online health portals. So much so that legislation was approved to mandate their use as part of the Patient Protection and Affordable Care Act (Point-of-Care Partners, 2012). Benefits of health portals include the ability for providers to document important aspects of the examination and make lab results immediately available to be reviewed privately by patients. Generally, health portals are helpful, but their impact has not been as profound as anticipated (Clamp & Keen, 2007). In fact, there are many instances in which health portals hindered communication (Kossman & Scheidenhelm, 2008). For example, providers became distracted, placing the onus to initiate the exchange of information upon patients, amongst other issues (Margalit, Roter, Dunevant, Larson & Reis, 2006).

Ideally, providers would have adequate time and ability to identify patients’ preferred communication approaches to ensure that decisions are mutually agreed upon,
understood and adhered to. Unfortunately, many constraints make it difficult for providers to spend sufficient time with patients building rapport and trust, causing patients to limit asking questions and hurriedly accept information. Proper utilization of online health portals may be a solution, but thus far, a new set of communication complications has resulted from their use.

**Statement of the problem**
A Fairfax, Virginia family physician, Dr. Alex Krist, has advocated that online health portals should be more sophisticated and contain personalized and motivational content (Krist & Woolf, 2011). He has been instrumental in improving the platform used in his office, MyPreventiveCare.com (MPC) by customizing content based on family history, age and medical accounts. Currently, about 26% of patients accessed the system within the past year and according to Google Analytics, patients spend about eight minutes on the website.

One of the main objectives of the portal is to inform and encourage patients of preventive screenings, but similar to the national average, about half of all patients are not up to date with recommended screening tests (Preventive Health Care, 2013). Attempts have been made to increase the number of preventive screenings. For instance, electronic reminders were issued, but they have not had much of an impact, with less than 30% of patients making appointments who received a reminder.

Concerns such as low health portal usage and ignored preventive screenings are not unique to this particular practice. In fact, less than 30% of adults ages 50-64 (CDC, 2011) and fewer than half of adults age 65 years or older in the U.S. are up-to-date with
core preventive services (Department of Health and Human Services, 2010). In regards to health portals, a representative from the Mayo Clinic stated that although 240,000 patients signed up for an online account, only 5% of registered patients actually used the portal (Wilkins, 2013). Furthermore, most providers do not believe using digital health platforms is worth the effort (Verdon, 2014). Due to its complex functionality and high cost, 45% of physicians believed they resulted in negative influences on patient care (Verdon, 2014).

Since digital health platforms are mandated, their use will only expand. Therefore, it is essential that online health portals, like MyPreventiveCare.com, are transformed into vital health communication tools that positively influence health behavior to improve quality of care.

**Purpose of the study**

The primary purpose of this study is to advance the use of theories of communication to increase understanding about effective use of information technologies, such as online health portals, in health care environments. Digital platforms are becoming a fundamental element of every medical office throughout the United States. Yet, patients seldom utilize them and providers largely have not embraced their capabilities. Although most systems include useful information like lab results and educational medical content, the majority of online health portals are devoid of relevant communication characteristics like interactivity and personalization (Neuhauser and Kreps, 2003). In addition, most online health portals are not nearly as engaging or straightforward as common commercial health websites.
The overall goal of this study is to evaluate a specific online health portal, MyPreventiveCare.com, to determine how both patients and providers view the portal. Unearthing experiences from patients and providers will help to assess the specific ways in which the portal has or has not contributed to productive health communication and improved health outcomes. Findings from this study will be used to determine if a more interactive, personalized and engaging website is warranted. Furthermore, the data will inform the way in which improvements are prioritized and implemented. Ultimately, this study will provide the foundation for refining MyPreventiveCare.com so that it reinforces preventive screenings, establishes consistent messages to improve patient adherence as well as enhancing office operations and patient-provider interactions by supplying a reliable, trusted and collaborative digital platform.

**Definition of terms**

The following terms will be a focal point of this study. It is necessary to provide clear and concise definitions, as some terms have a variety of meanings depending on the context in which they are used.

**Online Health Portal.** For the purposes of this study, the general term, “online health portal” will be used to describe a digital health information system accessed by patients and providers. To clarify the difference between “online health portal” and other terminology, definitions are provided for other regularly used electronic-based systems.

**Electronic Health Record (EHR).** “A repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users. It contains retrospective, concurrent and prospective information and its primary purpose is to
support continuing, efficient and quality integrated health care” (Häyrinen, Saranto & Nykänen, 2008, p. 293-294).

**Electronic Medical Records (EMR).** “A computerized platform for managing detailed medical information collected during a hospital stay or in a doctor’s office. EMRs usually contain a health history, doctors’ notes and laboratory and radiology results and are generally owned by and limited to the information collected by one doctor or hospital. The EMR rarely contains information provided by the patient” (Markle Foundation, 2003, p. 4).

**Personal Health Record (PHR).** “A single, person-centered system designed to track and support health activities across one’s entire life experience; it is not limited to a single organization or a single health care provider” (Markle Foundation, 2003, p. 4).

**Interactive Preventive Health Record (IPHR).** A high-functioning personal health record, which is an evidence-based, non-commercial online patient portal with the capacity to interface with multiple platforms (Krist et al., 2012).

**Website Interactivity.** Definitions of interaction typically focus on two criteria: (1) a two-way flow of information and (2) a rapid exchange of information. Other definitions include control as the main component of interactivity (Rogers, 1995). Meaning, participants should be able to exercise control over the communication exchange. For the purposes of this study, interactivity will include all three components and is considered, “communication that offers individuals active control and allows them to communicate both reciprocally and synchronously” (Liu, 2003).
Website Personalization. The definition for website personalization is borrowed from a study used to classify personalization on e-commerce websites. Although MyPreventiveCare.com is not an e-commerce website, the following definition was thoroughly explicated and relevant to the current study: “The adjustment and modification of all aspects of a website that are displayed to a user in order to match [the] users’ needs and wants” (Wu, Im, Tremaine, Instone & Turoff, 2003). In addition, personalization is not considered a website that contains an overabundance of information, making it applicable to all users.

Website Engagement. Engagement can have many different definitions depending on the context. This study combines definitions from the fields of marketing (Patterson, Yu, & De Ruyter, 2006), media (Calder & Malthouse, 2008) and psychology (Higgins, 2006) to consider engagement as the level of an individual’s physical, cognitive and emotional involvement or connection with a specific media.

Overview of chapters
This dissertation has the following organization: Chapter two reviews relevant literature and theories that relate to the current study. In particular, themes to be explored include an overview of health communication, patient-provider communication and eHealth. In addition, theories and concepts such as the Diffusion of Innovations Model, the Technology Acceptance Model, the Relational Health Communication Competence Model and the Self-Efficacy construct will be discussed. Finally, the research questions for the study will be stated.
Chapter three will explain the study’s methodological components. The rationale for the study’s design and the way in which it was employed with interviews, focus groups and thematic analysis will be described. The manner in which each method was conducted and how it was used to analyze the data will also be summarized. In addition, justification for the methodology to answer the study’s research questions will be clarified.

The results of the study are described in chapter four. Each research question is addressed, beginning with a description of positive and negative experiences among patients and providers. Next, the meaning of those experiences is expressed, followed by analysis of MyPreventiveCare.com and finally, recommendations provided by participants.

Chapter five examines the significance and implications of the study’s results. Research questions are linked back to previous discussed theories and literature. In addition, the chapter broadly discusses the consequences of the results and how they can be applied in a practical manner. The study’s limitations and directions for future research are also included in this section. Lastly, chapter six concludes the study.
CHAPTER TWO: REVIEW OF THE LITERATURE

This chapter summarizes core concepts and research that relates to the current study. First, an overview of the field of health communication is outlined, followed by patient-provider communication and eHealth. Next, the theoretical framework of the study is described.

Health communication
Communication is a vital and powerful aspect of health care. It has the potential to affect behaviors because it is ubiquitous and influences nearly every aspect of the health care process, such as how patients receive diagnoses (Munoz Sastre, Sorum & Mullet, 2011), prevention of disease (Maccoby, Farquar, Wood & Alexander, 1977; Dearing, et al., 1996), coping and social support (Kaplan, Cassel & Gore, 1977; Wright, 2000; Fisher, 2010) and end-of-life care (Meyer, Ritholz, Burns & Truog, 2006). Communication can be thought of as “the central social process in the provision of health care delivery and the promotion of public health” (Kreps, Bonaguro & Query, 2003). It is central to history-taking during the medical interview, discussion of patients’ problems and treatments (Stewart, 1995) as well as the way in which patients perceive their overall care (DiMatteo & Hays, 1980).

When the communication process goes awry, patient involvement and comprehension of information typically suffers (Stewart, 1995). Difficulty
communicating is not uncommon within health care. For example, physicians interrupt patients after an average of 18 seconds (Frankel & Beckman, 1989) and medical interns spend just eight minutes personally engaged with patients (Block et al., 2013). Moreover, 25% of patients leave the medical visit without having their questions answered (Davis et al., 2006). Ramifications include patients concealing concerns (Stewart, McWhinney & Buck, 1979), low adherence to prescription recommendations (Gadkari & McHorney, 2010) and decreased levels of trust towards the provider (Weng, 2008). In addition, about one-third of the American population has difficulty understanding general explanations or instructions provided by their physician (Polack, Richmond & McCroskey, 2010). Frequent use of complicated medical jargon makes it problematic for patients with low health literacy to comprehend physician instructions (Castro, Wilson, Wang & Schillinger, 2007) and leads to patient confusion and disengagement (Kreps & Neuhauser, 2013).

**Patient-Provider Communication**

An area of health communication, patient-provider communication, “involves creating shared meaning about health care and conditions in the patient and provider encounter” (Sparks & Villagran, 2010, p. 5). One way of achieving positive patient-provider interaction is by utilizing patient-centered communication (PCC), which is a team approach, in which the provider and patient influence one another (Balint, Courtenay, Elder, Hull & Julian, 1993) with the goal of relationship-building (von Friederichs-Fitzwater & Gilgun, 2001). Benefits of patient-centered-communication include greater patient involvement in the decision-making process (Beck, Daughtridge
& Sloane, 2002) and increased levels of activity initiated by the patient during consultations (Street, Gordon, Ward, Krupat & Kravitz, 2005).

**Dimensions of patient-centered care.** To provide a clearer conceptual framework of patient-centeredness, Mead and Bower (2002) developed the following five key dimensions: (1) biopsychosocial perspective, (2) patient-as-person, (3) sharing power and responsibility, (4) therapeutic alliance and (5) doctor-as-person.

**Biopsychosocial perspective.** Many of the previously cited communication deficiencies derive from physicians following the biomedical model of medicine approach. The model relies on scientific procedures for verifying disease and focuses on the patient as a catalog of symptoms rather than a human being (Mead & Bower, 2000). The inclusion of social and psychological factors requires that providers prepare to involve themselves in the assortment of complications that patients bring to their attention—not just biomedical problems (Stewart et al., 1995).

**Patient-as-person.** Since no two people experience illness in the exact same way, medical treatments should not be standardized without considering each patient’s suffering. For instance, a broken leg may inconvenience the life of an office worker, but may end the career of a professional athlete (Mead & Bower, 2000). This dimension of patient-centeredness states that, “in order to understand illness and alleviate suffering, medicine must first understand the personal meaning of illness for the patient” (Mead & Bower, 2000, p. 1089).

**Sharing power and responsibility.** Instead of the traditional paternalistic experience, patient-centeredness should consist of an egalitarian relationship. Power over
decision-making and control should be mutual, with shared participation. When patients are equipped with information, they become empowered to take on greater responsibility of their health (Grol, De Maeseneer, Whitfield, & Mokkink, 1990). Similarly, the U.S. Preventive Services Taskforce judges shared decision-making as a process in which the patient (1) understand the seriousness of the disease (2) understand the risk, benefits and uncertainties (3) has weighed his or her values regarding the benefits and harms of the service and (4) has engaged in decision-making at a level at which he or she feels comfortable (Sheridan, Harris, & Woolf, 2004).

*Therapeutic alliance.* In patient-centered care, it is necessary for there to be a common understanding of the goals and conditions for treatment. Therefore, a positive and open relationship must exist, where both providers and patients are free to express sympathy, empathy and concern. It is typically the responsibility of the provider to establish and foster this bond towards the goal of creating a therapeutic relationship with the patient.

*Doctor-as-person.* The doctor’s attitude, demeanor and overall influence provoke patient responses. However, to accomplish patient-centered medicine, which is “two-person medicine” (Balint et al., 1993), providers must be self-aware that they are capable of producing emotional responses in patients.

*Health literacy.* Realizing an effective patient-centered environment also means addressing patients’ information needs and their ability to understand and comprehend such messages. Health literacy is defined as:
The degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions (Kindig, Panzer, & Nielsen-Bohlman, 2004).

Health literacy not only includes the act of reading text, but also interpreting visuals, like graphs, operating computers and having numerical skills, such as calculations of doses and reading scales (Kindig, Panzer, & Nielsen-Bohlman, 2004). Health literacy is a significant issue in regards to patient-provider communication because only 12% of adults are considered to have proficient health literacy (Kutner, Greenburg, Jin, & Paulsen, 2006). For instance, diabetic patients with limited health literacy were less likely to access and navigate an online patient portal than those with adequate health literacy (Sarkar et al., 2010).

Issues related to health literacy are minimized when there is a productive patient-provider relationship. There are measures that providers can take to assist patients with low levels of health literacy. For instance, active listening, increased patient participation in the decision-making process (Zoppi & Epstein, 2002), providing evidence and checking for understanding (Epstein, Alper, & Quill, 2004) have proven to be valuable tactics. Ultimately, the onus of health literacy falls on the provider to ensure that patients are informed and active participants in their health care.

**Immediacy.** One way of enhancing health literacy and overall patient-provider communication is applying the concept of immediacy, which is “a set of communication features that promote physical and emotional closeness, engaging and caring relationships, as well as authenticity and enthusiasm” (Kreps, 2012). Communication immediacy has been closely examined in learning environments, specifically teacher-
receiver relationships. When immediacy and clear teaching tactics were used, student apprehension was reduced and positive relationships formed between students and teachers (Frymier, 1994). Immediacy behaviors (Andersen, 1979) include non-verbal actions like smiling, enthusiasm and expressiveness as well as verbal communication, such as humor, praise, encouragement of questions and self-disclosure (Gorham, 1988). Communication immediacy contributes to higher motivation, affect for the instructor and increased cognitive learning (Chesebro & McCroskey, 2001).

Immediacy is a concept that has been studied in health contexts as well. Acts of immediacy by physicians is associated with greater patient satisfaction, understanding (Larsen & Smith, 1981; Richmond, Smith Jr, Heisel, & McCroskey, 2001) and compliance (Burgoon et al., 1987). Additionally, providers using patient-centered communication tactics, like immediacy and perceived listening, were positively associated with increased satisfaction and communication among children’s parents (Wanzer, Booth-Butterfield, & Gruber, 2004).

eHealth

One means of generating more immediacy is through eHealth, which is “the use of emerging information and communication technology, especially the Internet, to improve or enable health and health care” (Eng, 2001, p. 1). At the turn of the century, physicians were concerned that computer-mediated communication, like e-mail, would lack appropriate levels of immediacy to provide feedback (Neinstein, 2000), especially during urgent communication (Mandl, Kohane, & Brandt, 1998). eHealth has greatly
evolved and now includes online support groups, collaborative communities and telemedicine (Neuhauser & Kreps, 2003).

**Digital health platforms.** Another aspect of eHealth is digital health platforms, which includes the following: online health portals, electronic health records (EHR), electronic medical records (EMR), interactive preventive health records (IPHR) and personal health records (PHR) among others. Some systems are designed exclusively for providers to keep track of their patient records (EMR), while others are designed for only patients to access (PHR). Although each system is distinct, for the purposes of this paper, the phrase “online health portal” or “OHP” will be used as a generic term because it can encompass systems that allow access to both patients and providers.

The idea to include medical records within online health portals first originated in the late 1960’s by Lawrence Weed (1968). The goal was to improve access to patient information and medical knowledge (Berner, Detmer & Simborg, 2005). Adoption was sluggish in the 1960’s and 1970’s due to physicians’ unwillingness to try the technology, which was viewed as slow, expensive, and unreliable (Berner, Detmer & Simborg, 2005). When physicians finally acknowledged how the technology would improve quality, it was then perceived as an obstruction to workflow (Berner, Detmer & Simborg, 2005). Almost 50 years later, use of digital platforms is not universal because many of the same issues are prevalent. In 2001, about 18% of office-based physicians used digital platforms and the percentage grew to less than half (42%) in 2008 (Hsiao & Hing, 2012). The latest research indicates that 72% of office-based physicians used digital platforms in 2012 (Hsiao & Hing, 2012). Progress has been slow in spite of the Institute of Medicine’s
recommendation that paperless health records be implemented within 10 years of their 1991 report (Dick & Steen, 1991) and financial incentives from the Patient Protection and Affordable Care Act. The legislation mandates health providers to demonstrate adoption, implementation, upgrading, or meaningful use of certified electronic technology to become eligible for compensation (Medicare & Medicaid EHR Incentive Program, 2013).

Thus far, benefits have been apparent for providers using digital platforms, like online health portals. They improve legibility and accessibility of notes as well as quality improvement due to documentation (Miller & Sim, 2004). From the patient perspective, opinions are optimistic about online health portals. Nearly half (43%) of patients believe the technology could improve the relationship with their doctor and 48% would feel more in control of their health (California HealthCare Foundation, 2010). In addition, the use of online health portals compelled 40% of patients to ask their physician a question they may not have previously asked and 90% were interested in looking at test results, receiving test reminders (82%) and reviewing prescriptions online (68%) (California HealthCare Foundation, 2010). The ability to see one’s own record also increased understanding and caused higher prescription adherence (Delbanco et al., 2012).

While online health portals have exhibited advantages, overall results have largely been disappointing. With nearly $30 billion in financial incentives offered as part of the Health Information Technology for Economic and Clinical Health Act (HITECH), the intent of online health portals was to transform the U.S. health care system into a safer, more effective, and more efficient environment (Jha, 2011). Little evidence exists that online health portals improve patient outcomes or improve efficiency of care (Desroches
et al., 2010). Furthermore, a three-year study failed to demonstrate that OHPs empowered patients, personalized care, lowered costs, provided higher quality data, or improved health literacy (Greenhalgh, Hinder, Stramer, Bratan & Russell, 2010). There are also negative consequences related to the patient-provider relationship. Since OHPs require providers to input patient information, their attention is taken away from the patient’s non-verbal communication cues during examinations. Some physicians spend as much as 42% of the time staring at the computer screen, negatively affecting dialog, engagement and emotional responsiveness (Margalit, Roter, Dunevant, Larson & Reis, 2006).

Online health portals can also have negative influences on communication amongst the medical staff. Changes in communication caused by the implementation of new technology may alter the structure of an organization, such as unintended shifts in authority, decision making, or roles (Barley, 1986). For example, orders issued by physicians using OHPs became highly structured and less flexible, leading to “increased ambiguity in communications between physicians, nurses, and staff in some instances, interfering with communications between these clinicians” (Davidson, 2000, p. 206). Overall, implementing OHPs changes the workflow of a medical practice (Boonstra & Broekhuis, 2010). Kaiser Permanente, an industry leader in the use of digital records, initially experienced many difficulties. Resistance to use the system was attributed to reduced productivity, which led to a climate of conflict among the staff (Scott, Rundall, Vogt & Hsu, 2005). Since every medical practice is a complex adaptive system, using OHPs affects everyone involved in the daily functioning of the office in a unique way;
from doctors to nurses to front desk supervisors (Crosson, Stroebel, Scott & Crabtree, 2005).

Online health portals could be more helpful to both patients and providers if they were more patient-centered. Krist and Woolf (2011) propose a model with five levels of functionality. The first level includes the most basic function of storing patient information. The second level addresses the stored data with clinical information. For instance, a patient may not know whether to be concerned about a test result that falls outside of the normal range, but level three would explain technical information in easily understood language and provide clinical advice (fourth level). The last level is of the highest functionality and would help patients take action. Whether it is personalized hyperlinks or motivational messages, the goal would be to extend care beyond the clinical encounter by assisting in self-management, offering logistical support and providing reminders. Without this kind of personalization, OHPs can potentially be harmful because patients may experience confusion, anxiety and be offered generic advice unsuitable for the individual patient (Krist & Woolf (2011).

Presenting patients with more personalized experiences is necessary because Americans only receive one-half of recommended preventive services (McGlynn et al., 2003). When OHPs were employed that explained information in lay language, used tailored recommendations, provided educational resources and reminders, it was found that colorectal, breast, and cervical cancer screenings increased by 19%, 15%, and 13%, respectively, among users of the system (Krist et al., 2012).
**Emerging technologies.** Recent innovations address the shortfalls of OHPs and have the ability to dramatically improve communication between patients and providers. Social networks related to health, such as PatientsLikeMe.com, allow patients and caregivers to share experiences, provide support and track data. Others, like ACOR, provide accurate information in a supportive environment for patients, parents, caregivers and friends dealing with cancer. Quantified mobile health tracking tools like FitBit are gaining in popularity. In fact, 70% of people currently use mobile apps to track calorie consumption and monitor physical activities (Mobiquity, 2014).

Another emerging, health-related technology, virtual human agents (VHA), otherwise known as avatars, are computer models that can be used as real-time representations of people in a live environment (Schuler et al., 2000). Artificial intelligence of this nature “offers exceptional opportunities to increase the effectiveness of health promotion programs by enhancing immediacy and making eHealth communication engaging, relevant, involving, exciting, and actionable” (Kreps & Neuhauser, 2013, p. 205). Often, it is difficult to create immediacy with healthcare providers in modern day environments. Providers work in frenzied conditions and have limited time to treat many different patients, making communication with patients appear superficial (Kreps & Neuhauser, 2013).

In contrast, avatars do not have any time constraints. They can be programmed to be jargon-free so information is more understandable for patients. In addition, the ability for avatars to focus on communication immediacy creates the potential to improve health outcomes, enhance access to information and increase consumer acceptance and
participation in health promotion efforts (Kreps, 2012). Avatars capable of immediacy have been effective in many different types of contexts. Virtual environments have been successfully employed to treat the fear of heights (Emmelkamp, Bruynzeel, Drost & Van Der Mast, 2001), fear of flying (Rothbaum et al., 2006) and fear of public speaking (Anderson, Zimand, Hodges & Rothbaum, 2005).

Avatars have also been used in many health-related contexts, such as student medical training (Raij et al., 2007), companionship for the elderly as a therapeutic activity (Vardoulakis, Ring, Barry, Sidner & Bickmore, 2012), serving as a virtual exercise coach to increase physical activity (Bickmore et al., 2013) and positively influencing adherence to treatment regimens (Bickmore, Gruber & Picard, 2005).

Although the majority of people are skeptical that a computer can present itself as human (Bickmore, Schulman & Yin, 2009), evidence indicates that interactions between humans and machines are primarily social in nature (Nass, Steuer & Tauber, 1994). In fact, 75% of users felt comfortable or more comfortable interacting with an avatar counselor than with a human counselor (Lisetti et al., 2012). The same study also focused on patients with low levels of health literacy and concluded that the avatars were accepted and easy to use. To reduce the initial oddness of communicating with an avatar, it is necessary to build rapport through the display of positive emotions (head nods), mutual attention (eye contact) and coordination, like synchronized movements (Tickle-Dengen & Rosenthal, 1990). Avatars are also referred to as relational agents because of their ability to form relationships with their users by building trust and rapport over time (Bickmore, Caruso, Clough-Gorr & Heeren, 2005).
Theoretical framework
Several components of theories related to health communication, patient-centeredness and innovation adoption are integral to this study. The following section summarizes the theoretical framework utilized and examines the most pertinent principles in greater detail.

Diffusion of Innovations
The online health portal, MyPreventiveCare.com, is a newly introduced technology and therefore, would be considered an innovation. The seminal work on the spread of innovations is provided by Rogers (1962, 1995, 2003) and Rogers and Shoemaker (1971). Diffusion is defined as the process by which an innovation is communicated through particular channels over time among members of a social system (Rogers, 2003). Applying the diffusion of innovations model has had an enormous impact on a multitude of disciplines; particularly health care. Examples of outcomes achieved using diffusion of innovations principles are HIV/AIDS prevention (Singhal & Rogers, 2003), water purification education in Egyptian villages (Belasco, 1990) and tobacco prevention (McCormick, Steckler & McLeroy, 1995).

Attributes of an innovation. Before an innovation can become widespread, its benefits must be apparent. The act of telling an individual why an innovation should be adopted is often unsuccessful; instead, the individual must come to this realization, which can occur through the five perceived attributes of an innovation (Rogers, 2003): relative advantage, compatibility, complexity, trial-ability, and observability. The individual needs to see the innovation’s relative advantage over its predecessor, and the innovation must be perceived as compatible. Rogers (2003) defines compatibility as “the degree to
which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (p. 240). Because individuals deal with innovations “on the basis of the familiar” (Rogers, 2003, p. 243), any innovation perceived as different is immediately considered as incompatible. Complexity is equally important: The rate of adoption is negatively affected when members of a social system perceive an innovation as complex. Finally, the innovation’s trial-ability and observability, the related abilities to experiment with the innovation and monitor it during operation reduce uncertainty, and are the final determinants for its rate of adoption.

In summary, diffusion is predicted by a perception of the innovation as an improvement over its predecessor; consistent with existing values, experiences, needs of adopters; having a low degree of perceived complexity; subject to experimentation, and able to be watched and monitored during operation.

**Innovation-decision process.** Perceived attributes contribute to the movement towards adoption or rejection, otherwise known as the innovation-decision process (Rogers, 2003). The five stages are: knowledge, persuasion, decision, implementation and confirmation. Knowledge is the initial stage of understanding an innovation’s function, which leads to an individual developing either a favorable or unfavorable attitude towards the innovation, known as persuasion. This results in a decision being made to adopt or reject. If adopted, implementation occurs, which is when the innovation is put into use. The final stage of the process, confirmation, seeks to limit cognitive dissonance (Festinger, 1962) among decision-makers and reinforce the decision to either utilize or dismiss the innovation.
Understanding how both patients and providers view the online health portal, what they identify as advantageous attributes and whether decisions have already been formulated about their future use of the OHP is essential to consider when assessing the system.

**Technology Acceptance Model**
A model comparable to diffusion of innovations is the technology acceptance model. It is an extension of Ajzen and Fishbein’s theory of reasoned action (1980), developed specifically for human–computer interactions (Davis, Bagozzi, & Warshaw, 1989). The technology acceptance model (TAM) was originally developed during the advent of computers to provide explanations of the determinants as to why individuals’ chose to use computers and information systems (Davis, Bagozzi, & Warshaw, 1989). The model consists of two main constructs, perceived usefulness (PU) and perceived ease of use (PEOU). PU and PEOU are considered the key determinants of what cause people to accept or reject technology. Perceived usefulness is defined as “the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context” (Davis, Bagozzi, & Warshaw, 1989, p. 985). Perceived ease of use refers to the expected amount of effort required to use the system (Davis, Bagozzi, & Warshaw, 1989). The model was later extended and called TAM2 by including social influence factors, such as subjective norms, with cognitive factors (relevance, quality) to bolster PU and PEOU (Venkatesh & Davis, 2000).

The model is frequently employed in healthcare settings, such as hospice workers using videophones (Day, Demiris, Oliver, Courtney & Hensel, 2007) and patients’
desired eHealth services (Wilson & Lankgon, 2004). The technology acceptance model can be seamlessly integrated with diffusion of innovations. For instance, “the relative advantage construct in [DoI] is similar to the notion of the PU in TAM, and the complexity construct in [DoI] captures the PEU in the technology acceptance model” (Lee, Hsieh, & Hsu, 2011, p.126). In fact, a study investigating factors that influenced the use of a new e-learning system among employees found significant effects of compatibility, complexity, relative advantage, and trial-ability on perceived usefulness. Moreover, compatibility, relative advantage, trial-ability and complexity played a significant role on perceived ease of use (Lee, Hsieh, & Hsu, 2011).

Integrating diffusion of innovations constructs with aspects of the technology acceptance model will strengthen the way in which MPC is evaluated. Ensuring that components of a future version of the OHP have relative advantage over the current system, as well as a perception of usefulness will help to establish upgrades that can benefit both patients and providers.

**Relational Health Communication Competence Model**
A key aspect to patients and providers finding MPC beneficial is its ability to function as a reliable and trustworthy health communication tool. Therefore, the Relational Health Communication Competence Model (RHCCM) (Kreps, 1988) is applicable because it addresses interpersonal relationships in healthcare settings, knowledge of verbal and non-verbal sensitivity, encoding/decoding and information exchange. The model can be illustrated as a bicycle wheel, with the patient (consumer) at the center of the hub. The spokes surrounding the consumer are all of the interdependent
relationships involved in the healthcare process, such as caregivers, providers, pharmacists, family members…etc. Low communication competence causes the wheel to remain still or even roll backwards. High levels of communication competence cause the wheel moving in a positive direction. The ground on which the wheel moves is the context of the situation. A challenging context requires higher levels of communication competence for the wheel to navigate through bumpy terrain.

With an innovation like MPC, every information source involved in the health care process, including the online health portal must be consistent and actively engaged for communication to be effective. Given this, the OHP is perhaps another spoke in the wheel of the RHCCM.

**Self-Efficacy**

An important attribute for inclusion in a portal like MPC is the capability for a patient to believe that they can perform the recommended behaviors to produce improved health outcomes. This concept, better known as self-efficacy, is the centerpiece of Bandura’s social cognitive theory (1986). It is defined as, “The conviction that one can successfully execute the behavior required to produce the outcomes” (1977, p. 193). According to Bandura (1977), there are four factors that contribute to the development of personal efficacy: (1) experience, or enactive attainment, meaning that individuals who experience success with an activity have higher self-efficacy than an individual who has failed during an activity, (2) modeling, or vicarious experience, in which an individual’s sense of efficacy is raised when success is observed, (3) social persuasion, wherein
encouragement is received from others and (4) physiological factors, like how an individual responds to influences of nervousness and stress.

Self-efficacy is frequently used in educational health contexts. For instance, a nutrition website targeted to college students about healthy eating behaviors increased self-efficacy for dietary change (Franko et al., 2008). Likewise, an Internet-based diabetes program found that self-efficacy functions as a moderator for interventions of diabetes self-care (Wangberg, 2008). Just like websites designed to change behavior, self-efficacy should be an important element of consideration within online health portals.

Considering how users of the online health portal, MyPreventiveCare.com, perceive its features, such as usability, personalization, interactivity and overall immediacy, the following research questions are posited:

RQ1: How many positive and negative critical incidents were participants able to recall?

RQ2: What are the main categorical themes of participants’ positive and negative experiences with MPC?

RQ3: What is the immediacy level of the content on MPC?

RQ4: What are the consequences of negative incidents from using MPC?

RQ5: How can MPC advance as a health communication tool?
CHAPTER THREE: METHODOLOGY

The methodology section provides an overview of how the proposed research questions will be answered. The chapter will begin by describing the design of the study, followed by audience analysis and details about the sample population. Next, methods of data collection and data analysis will be explained.

Rationale for Research Method
MyPreventiveCare.com is an online health portal used by a medical administrator at a large Northern Virginia medical practice affiliated with the INOVA Health System. In addition to the Northern Virginia area, the platform is also utilized by 300 other practices across 15 states that care for 65,000 patients.

The overall research program will take a phased approach, beginning with the assessment phase, which is the focal point of the current study. To better understand how patients and providers experience the current system, personal interviews and focus groups were conducted. In addition, a thematic analysis of the content contained on MPC was completed. Data from the assessment phase will be used to inform the second phase of research, which will take place at a later date. The second phase, system refinement and implementation, will include enhancements and modifications to the platform. Finally, after pilot testing, a refined system will be evaluated to determine if the intervention was successful.
**Multimethod design.** To sufficiently assess whether the current system was a beneficial health communication tool for patients and providers, multiple methods were used to collect and analyze data. Multimethod design is often confused with mixed methods research and several definitions have been provided that complicate the distinction. For instance, mixed-method design is the combined use and integration of qualitative and quantitative methods in a single study (Greene, 2007). One of the main purposes of using mixed methodology is to expand upon the information about different aspects of the phenomena being studied (Greene, 2007). Rather than just strengthening conclusions about a phenomenon, the use of different methods helps to broaden its range (Greene, 2007).

Multimethods is defined by Morse (2003) as qualitative and quantitative projects that are relatively self-contained, but are used together under one general problem, topic or research program. In contrast, Teddlie and Tashakkori (2003) describe multimethod as the use of two data collection techniques or research method procedures that are both either qualitative or quantitative.

The distinction between qualitative and quantitative methods has been framed in a variety of ways. For instance, early work differentiated the two methods as either textual or numerical (Maxwell & Loomis, 2003), while Creswell (2013) sees the difference as inductive or deductive approaches, and Tashakkori and Teddlie (1998) believe the methods differ due to type of investigation (exploratory or confirmatory), data collection and analysis. Although analysis of numerical data occurred in this study, the quantitative approach is typically associated with variance theory (Mohr, 1982), which is based on
analysis of the differences in values of particular variables to differences in other variables. In contrast, process theory is associated with qualitative methodology and deals with events and the processes that form connections (Maxwell & Loomis, 2003). To further distinguish the differences between quantitative and qualitative methodologies, Maxwell and Mohr (1999) state:

We define quantitative data as categorical data, with either enumeration or measurement within categories. A conceptual dimension that is itself a category subdivided by measurement, or that is divided into subcategories for enumerative or frequency data, is generally called a “variable,” which is a hallmark of the quantitative approach. Qualitative data, in contrast, are typically textual in nature, consisting of written or spoken words, but may include video recordings and photographs as well as narrative text (p. 2).

Using multiple methodologies in health science research helps researchers view problems from multiple perspectives to enrich the meaning of a singular viewpoint (Creswell, Klassen, Plano Clark, & Smith, 2011). In addition, it helps to develop a more complete understanding of a problem (Clark & Creswell, 2014).

**Concurrent triangulation.** This study employed a qualitative dominant concurrent triangulation strategy (Creswell, 2013). For example, data collection occurred from multiple sources at the same time and therefore, was constantly compared to one another to determine if there was convergence or divergence. Similar to triangulation is the concept of complementarity, in which the goal is to gain a greater depth of understanding rather than simply confirming results (Greene, 2007). Complementarity can be used as a strategy to generate a dialogue among the results of different methods, which forces the researcher to re-examine their understanding of what is occurring (Greene, 2007).
**Population and Sample**

Demographics for current users of MPC are as follows: 18-24 (5.5%), 25-34 (18.5%), 35-44 (22.5%), 45-54 (23%), 55-64 (17%) and 65+ (13.5%). More females use the system (57%) than males (43%) and in fact, the most frequent users are women 45-54 years old. Only about one-quarter (25.6%) of patients accessed the system over the past year and of those who did, the average patient accessed MPC 3.7 times per year. Medical providers’ use of the system is higher than patients because they are required to input data. Physicians, nurses, administrators and any other relevant staff position access their electronic medical record multiple times per day which is integrated with MPC.

Although women 45-54 is the largest demographic group of users, criteria for interviews included patients ranging from 18-79, to generate as many viewpoints as possible since the long-term goal is to design a system relevant for all users. A demographic summary of the Fair Oaks and Herndon areas can be found in table 1 (State & County QuickFacts, 2014). Patients were required to have a valid MPC account, meaning they accessed the system at least once in the past year. Purposeful sampling (Tracy, 2012) was employed by only speaking with active users to avoid acquiring data from individuals with little or no familiarity with the system.

Interviews were conducted in two separate medical offices in the Fairfax, Virginia area: Fair Oaks and Herndon. Multiple locations were used to represent a diverse cross-section of patients who may experience MPC differently. Any patient with an active account and an upcoming appointment in the Fair Oaks or Herndon office was contacted via telephone up to a week before their scheduled visit. Speaking with patients who were about to consult with their physician afforded the opportunity to collect data from
patients with a health-oriented mentality. Therefore, it was presumed that patients would have logged-in to MPC recently and would be able to articulate health issues.

Table 1 Fair Oaks and Herndon Demographics

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Fair Oaks, VA</th>
<th>Herndon, VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>51.5%</td>
<td>47.8%</td>
</tr>
<tr>
<td>Male</td>
<td>48.5%</td>
<td>52.2%</td>
</tr>
<tr>
<td>White</td>
<td>57.8%</td>
<td>50.7%</td>
</tr>
<tr>
<td>African-American</td>
<td>8.8%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Asian</td>
<td>25.9%</td>
<td>17.9%</td>
</tr>
<tr>
<td>Latino</td>
<td>9.3%</td>
<td>33.6%</td>
</tr>
<tr>
<td>Bachelor’s Degree+</td>
<td>64.6%</td>
<td>46.6%</td>
</tr>
<tr>
<td>Age 65+</td>
<td>6.1%</td>
<td>5.2%</td>
</tr>
</tbody>
</table>

In addition, two separate focus groups with providers were conducted in the Fair Oaks, Virginia medical office. One focus group included medical staff, such as nurses and emergency medical technicians. The other comprised of doctors; both residents and full-time physicians. The administrator of MPC in the Fair Oaks office emailed all providers asking if they would be able to participate. Focus groups took place in a private conference room and were expected to last one hour.

Focus groups are defined as “a research method that collects data through group interaction on a topic determined by the researcher” (Morgan, 1996, p. 130). Grounded in the symbolic interactionist tradition (Mead, 1934), focus group participants consider their own role during the session as well as the role that others play (Morgan, 2012). Shared meaning and insights are typically produced through group interaction, known as “group effect” (Carey, 1994). Group effect often leads to disclosures that may not materialize in
individual interviews (Tracy, 2012). One of the unique strengths of focus groups is the
ability to observe participants’ agreement and disagreement (Morgan & Krueger, 1993).
Compared to interviews, focus groups are advantageous because of the capability to ask
participants to compare their experiences and views, rather than collecting individual
accounts and subsequently speculating about their meaning (Morgan, 1996). Similar to
participant observation, focus groups allow access to the process of group interaction
(Morgan & Spanish, 1984). However, focus groups are neither as informative as
participant observation, nor are they as strong as interviewing to directly explore
participant knowledge, but “they do a better job of combining these two goals than either
of the other two techniques” (Morgan & Spanish, 1984, p. 260).

**Participant Anonymity**
This study was submitted to the George Mason University Office of Research
Integrity & Assurance (ORIA) and was given full institutional review board approval.
Before each interview and focus group, an informed consent document was distributed
for each participant to read and sign. Participants were made aware of the expected
duration of interviews/focus groups, that the session would be audio recorded, goals of
the study, possible risks from participation, and the ability to withdraw at any time and
contact information for each investigator involved, as well as the ORIA office. To ensure
participant confidentiality, audio files were only accessed by the researcher and names
were changed to pseudonyms upon transcription.
**Instrumentation**

Interviews and focus groups consisted of nine questions, but were semi-structured to allow for flexibility and additional discussion. The general questionnaire can be found in appendix a. Interviewing is the predominant method of investigation within social science research (Briggs, 1986) and is valuable because it provides opportunities for discovery, understanding and reflection (Tracy, 2012). Interviews took place in a private conference room within the medical facility or in a physician’s private office. One interview was conducted via telephone. Questions for the focus group were similar to patient interviews, but slightly altered to address provider concerns. The moderator guide can be found in appendix b.

**Critical Incident Technique.** Critical incident technique (CIT) (Flanagan, 1954) was the main method of inquiry used during interviews and focus groups. It has become a popular qualitative research method due to its exploratory and investigative abilities (Chell, 1998; Woolsey, 1986). The technique was designed as a flexible set of principles to be adjusted depending on the goal. However, Flanagan outlined five general steps: (1) the researcher establishes objectives, (2) criteria for what qualifies as an incident are specified and if a behavior is deemed relevant, the researcher must then determine, “if an incident makes a ‘significant contribution’, either positively or negatively, to the general aim of the activity” (Flanagan, 1954, p. 338), (3) collecting data which are reported from memory. Generally, if exact details are provided, accuracy can be assumed. However, vague descriptions may indicate that the data is inaccurate, (4) analyzing data by creating a categorization scheme in which “larger categories are subdivided into smaller groups and the incidents that describe very nearly the same type of behavior are placed together”
(Flanagan, 1954, p. 346), and (5) interpretation and reporting the results. Critical incident technique differentiates itself from collecting general opinions or estimates by attaining a testimony of specific behaviors.

Outcomes of critical incident technique have proved to be influential in a variety of sectors. For instance, the application of critical incidents can improve operating procedures by analyzing successes and failures to improve efficiency of operations (Flanagan, 1954). Large numbers of critical incidents has guided the modification of existing equipment or has even helped to develop new equipment (Flanagan, 1954). In addition, the critical incident technique can be used for motivation and leadership by gathering specific actions involving decisions and choices. Lastly, the technique can also be beneficial in counseling and psychotherapy because emphasis is placed on factual incidents (Flanagan, 1954).

The use of CIT is growing within health contexts. It was found to be an advantageous methodology for analyzing quality care among nurses (Kemppainen, 2000) and is a common method in the application of health care services (Beech & Norman, 1995). CIT has also been used to identify communication failures during patient sign-out (Arora, Johnson, Lovinger, Humphrey, & Meltzer, 2005) and it was integral to assess the communication competence of older adults living with cancer (Query & Wright, 2003).

During interviews and focus groups, participants were first asked to recall their best experience using the online health portal. Follow-up inquiries were then made to probe for more details about their experience. Next, participants were asked to recall their worst experience using the online health portal, with follow-up questions as necessary.
These two broad questions framed the rest of the discussion by allowing the interviewer to focus on the incidents mentioned and investigate their significance. On some occasions when patients confused MPC with the practice’s separate communication portal, MPC was shown to patients to familiarize themselves with the application.

**Thematic analysis of eHealth communication programs.** Criterion for analyzing MPC was guided by recommendations presented by Kreps and Neuhauser (2013) in their analysis of artificial intelligence in eHealth communication. Several approaches are endorsed when developing communication systems with the goal of increasing immediacy. Immediacy is important when designing eHealth communication programs because it “is a critical factor in determining whether communication processes capture attention, connect health care participants, and encourage these participants to work together to achieve important health goals” (Kreps & Neuhauser, 2013, p. 207). For instance, personalization can be created by using the consumers’ or providers’ preferred names. Systems can provide better clarification by delivering specific feedback and answering questions to ensure that users understand the information presented. Levels of interactivity can be increased by patients inputting personal data and receiving reminders when necessary. Friendliness, or approachability, can be achieved by demonstrating empathy and concern, but also by generating rapport with users. A system that is actionable allows the user to seek feedback and encourages participation, while high engagement is when a system is visually exciting and dynamic.

**Quantitative content analysis.** To strengthen the claims of the thematic analysis, “quasi-statistics” (Becker, 1970) were incorporated, which can be described as simple
numerical results that enable the amount of evidence in the data to be measured for a particular conclusion (Maxwell, 2012). In fact, content analysis has been described as “a research technique for the objective, systematic and quantitative description of the manifest content of communication” (Berelson, 1952, p. 18).

**CDC Clear Communication Index.** MyPreventiveCare.com was also evaluated using the Centers for Disease Control and Prevention’s research-based tool to assess public communication materials, the Clear Communication Index. The index was developed to enhance the clarity and understanding of public messages and materials (The CDC Clear Communication Index, 2014) and is appropriate for a variety of media, including websites. The index contains four categories, with 20 total items. The four categories are: Core, Behavioral Recommendations, Numbers and Risk.

*Core:* This section includes the central message and is further broken down into four additional assessment areas to include: 1) main message and call to action, which focuses on the use of visual cues to ensure that the main message statement can be seen immediately 2) language, referring to whether familiar words and the active voice are used; 3) information design recommends that bulleted lists and section headings are used; and the last area, 4) state of the science probes whether opinions of subject matter experts are included within content.

*Behavioral recommendations:* This category assesses whether behavioral recommendations are present; whether the material explains the importance of the recommendations to the audience; and whether the recommendations offer specific directions.
**Numbers:** This set of questions asks if numbers are used and if they are presented in a manner that the primary audience would understand. If mathematical calculations are required, a point is deducted.

**Risk:** The last category determines whether the nature of the risk is explained and if both benefits and risks of the behavior are addressed. If probability of the risk is included, a point is given if the probability is further explained or contains a visual. A sample score sheet detailing each section can be found in appendix c.

Each item receives a point if the criteria are met or zero if it is not present. The highest score that can be received is 20/20. Total scores are then converted to a scale of 100. A score of 90 or higher is considered passing. A score of 89 or below indicates that the material may need to be revised in order to make it clearer for the target audience.

The index was created based on a comprehensive literature review that found over 200 factors that affect information clarity (Baur & Prue, 2014). The factors were reduced to the current 20 items and then two online surveys were used to validate the tool. Since the tool is still in its infancy, its use is not yet widespread. It is beginning to gain popularity and was used to assess the message clarity of Consumer Confidence Reports of drinking water and found that the materials failed to properly communicate water quality information (Phetxumphou, 2014).

Intercoder reliability, otherwise known as intercoder agreement (Tinsley & Weiss, 1975, 2000) was utilized to ensure the analysis could be trusted. Intercoder reliability is a term used to measure whether “independent coders evaluate a characteristic of a message or artifact and reach the same conclusion” (Lombard, Snyder-Duch, & Bracken, 2002, p.
589). In addition to providing a standard of research measurement quality, intercoder reliability also allows the researcher to divide coding responsibilities among different coders (Lombard, Snyder-Duch, & Bracken, 2002). In this particular study, a communication researcher was recruited to assist with coding. The researcher received her Ph.D. in Communication in 2013 from George Mason University and had extensive experience with content analysis techniques.

To establish intercoder reliability, approximately 30% of the total content was evaluated by both coders, although 10% is usually sufficient (Wimmer & Dominick, 2006). Each of the four main variables was tested for intercoder reliability using ReCAI2 (Freelon, 2013) set for two coders. Krippendorff’s alpha for variable one (core) was 0.716, variable two (behavioral recommendations) was 0.837, variable three (numbers) 0.926 and variable four (risk) was 0.807. The Krippendorff’s alpha for total scores was 0.873. A full summary of the results is in table 2. Krippendorff’s alpha is “a reliability coefficient developed to measure the agreement among observers, coders, judges, raters, or measuring instruments drawing distinctions among typically unstructured phenomena” (Krippendorff, 2007, p. 1). It takes into account chance agreement and magnitude of misses (Klenke, 2008). According to Keyton (2006), the closer the coefficient is to 1.0, the greater the reliability. Typically, a coefficient above 0.7 is satisfactory for intercoder reliability (Keyton, 2006).

<table>
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<tr>
<th>Variable</th>
<th>Krippendorff’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>0.716</td>
</tr>
</tbody>
</table>
Analytical Process

All data from interviews, focus groups and thematic analysis was recorded, transcribed and uploaded to Nvivo software. The process of iteration, “a reflexive process in which the researcher visits and revisits the data, connects data to emerging insights, and progressively refines his/her focus and understandings” (Srivastava & Hopwood, 2009, p. 77) occurred throughout data collection. The use of critical incident technique has much in common with iteration, because:

Research takes place in a natural setting; the researcher is the key instrument of data collection; data are collected as words through interviewing…data analysis is done inductively; and the focus is on participants’ perspectives (Creswell, 1998, p.16).

In addition, CIT can be thought of as an investigative tool “within an interpretive or phenomenological paradigm (Chell, 1998, p. 51).

Once categories were classified according to the tradition of CIT, the data set was then explored again for a greater level of meaning. Critical incidents were extracted from the transcripts and assigned a code that best captured the significance of the incident. The constant comparative method (Charmaz, 2006) was utilized to compare codes and modify definitions as the data was reviewed. Finally, a codebook was developed to store and organize all of the codes. Similar to the constant comparative method, Flanagan (1954) recommended that researchers analyze data until exhaustiveness or redundancy was achieved. This occurred when new categories no longer materialized. According to
Flanagan (1954), sufficient coverage was achieved when two or three critical behaviors emerged from 100 incidents. Flanagan’s concept of redundancy is similar to thematic salience, which is reflected when recurrence, repetition and forcefulness are present (Owen, 1984). Recurrence is when salient meanings are discovered around a thematic concept; repetition is when key words, phrases or sentences are duplicated and forcefulness refers to vocal inflection, volume or dramatic pauses that help shape participants’ discourse (Owens, 1984).

**Validity.** Originally, 158 critical incidents were gathered. The researcher then reviewed all of the incidents again to ensure that descriptions were detailed and therefore, accurate. This improved the study’s credibility and validity because in qualitative research, validity has to do with the accuracy of the account (Maxwell, 1992). After a second review, 16 incidents were removed from the data set. The 16 incidents lacked antecedent information, such as what led up to the incident, or not enough description of the outcome of the incident stated (Butterfield, Borgen, Amundson, & Maglio, 2005). Typically, quantitative and qualitative researchers handle validity threats differently. Quantitative researchers attempt to design controls to deal with anticipated and unanticipated threats in advance, while qualitative researchers “must try to address most validity threats after the research has begun” (Maxwell, 2012, p. 123). The following sections summarize how validity threats were addressed.

**Transferability.** Ecological validity was a concern in regards to external validity (transferability), but this was protected against by having participants recall their experiences. If participants logged-in to their personal account and used the portal during
the interview, it was believed that their experience would be altered since it would be used in an unnatural setting. Similarly, reactivity, or “the influence of the researcher on the setting or individuals studied” (Maxwell, 2012), was minimized by conducting interviews in a medical facility where patients would feel at ease discussing medical related issues. Still, reactivity, or reflexivity, “is a powerful and inescapable influence; what the informant says is always influenced by the interviewer and the interview” (Maxwell, 2012, p. 125). To avoid additional bias, the interviewer did not lead the interviewee and attempted to have a neutral disposition throughout the discussion. Although the results of this research can possibly lead to additional studies should improvements be necessary, researcher bias was guarded against by being transparent and disclosing the possibility of future research and making sure participants accounted for positive incidents. In addition, the researcher tried to increase the comfort level by developing a rapport with each participant before the interview or focus groups began.

**Member checks.** To address aspects of internal validity, credibility was tested through respondent validation, or member checks (Lincoln & Guba, 1985), in which the researcher summarized participant responses to ensure that the interpretation was accurate. Member checks are considered “the most crucial technique for establishing credibility” (Lincoln & Guba, 1985, p. 314).

**Credibility.** Credibility was achieved through close collaboration with participants throughout the process of research (Creswell & Miller, 2000). Participants were given contact information for the interview and were encouraged to get in touch if they wanted to share any additional thoughts. After one particular interview, one participant sent an
email with further thoughts, observations and suggestions. Another procedure for establishing credibility is to use descriptive detail, also known as thick descriptions. According to Denzin (1989), "thick descriptions are deep, dense, detailed accounts" whereas thin descriptions "lack detail, and simply report facts" (p. 83). Thick description aligns with Flanagan’s criteria for accepting an incident because it is necessary that statements allow readers to feel as if they have experienced, or could experience, the described events (Creswell & Miller, 2000).

Numbers. To validate the conclusions reached, numbers were used to provide quantitative confirmation. Numbers can reinforce verbal terminology like “many”, “often”, “typically” and “sometimes” because it makes the researcher’s claims more precise (Becker, 1970).

Triangulation. Lastly, analyzing MPC’s content combined with interview and focus group data was used to provide triangulation. Triangulation involves using different methods to check one another, to ensure that methods with different strengths and limitations support a single conclusion (Fielding & Fielding, 1986). The use of triangulation can be traced back to Campbell and Fiske (1959) who stated that more than one method should be used to validate data. If data from interviews, focus groups, or thematic analysis was found to be contradictory of another source, the result was questioned and re-analyzed.
CHAPTER FOUR: RESULTS

The following chapter outlines the results of interviews and focus groups conducted with patients and providers from two medical facilities currently using MyPreventiveCare.com. In addition, results of a thematic analysis performed on the content contained within MPC are described.

A total of 31 interviews were conducted with patients who visited the Fairfax Family Practice Center in Fair Oaks, Virginia, and Herndon, Virginia. All interviews were face-to-face except for one interview which was conducted over the telephone. The average length of each interview was 14 minutes, which was then transcribed to produce 103 single-spaced pages in Microsoft Word. Twenty of the interviews were conducted in Fair Oaks and 11 interviews were conducted in the Herndon medical office. Participants included 18 women, of which 14 were from Fair Oaks. Among the 13 male participants, six were from Fair Oaks and seven were located in Herndon. Participant demographics from each office aligned with general demographics of the region they represented.

Two focus groups with providers were conducted in Fair Oaks. The first focus group included eight physicians (two men and six women), half residents and half full-time physicians. The second focus group comprised of five participants (four women and one man), consisting of four nurses and one emergency medical technician (EMT). The average length of both focus groups was 51 minutes. Critical incidents from the
interviews and focus groups were collected and their results were used to answer the first research question.

**RQ1: How many positive and negative critical incidents were participants able to recall?**

Among the 44 total participants of interviews and focus groups, a total of 142 incidents were collected. The majority of incidents, 102, were considered negative; while 40 were positive (summarized in figure 1).

![Figure 1 Percentage of Critical Incidents](image)

<table>
<thead>
<tr>
<th>Total Critical Incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>72% Negative Incidents</td>
</tr>
<tr>
<td>28% Positive Incidents</td>
</tr>
</tbody>
</table>

The number of negative incidents more than doubled the number of positive incidents in every participant category (figure 2).
RQ2: What are the main categorical themes of participants’ positive and negative experiences with MPC?

Patient and provider incidents were analyzed separately because the two groups had different goals and objectives. The number of positive and negative incidents by patients mirrored the overall percentage of the entire sample, which was unsurprising since patient interviews encompassed the majority of the data, with 31 patient interviews compared with 13 provider participants (figure 3). The results of patient incidents are detailed first.
Patients: Positive Incidents

Three main categories emerged in which MPC was helpful for patients: (1) the ability to instantly access medical information, (2) simple and straightforward data and (3) MPC helped to facilitate decision-making. A summary of the sub-categories for positive incidents among patients can be found in table 3.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instant Access</td>
<td>45.7%</td>
</tr>
<tr>
<td>Simple and Straightforward</td>
<td>30.4%</td>
</tr>
<tr>
<td>Facilitates Decision-Making</td>
<td>23.9%</td>
</tr>
</tbody>
</table>

Instant Access. Nearly half of all positive incidents among patients were associated with conveniently and instantaneously retrieving medical information, no matter the place or time. Tatiana, a busy mother from Fair Oaks cited an example about how she was anxiously awaiting test results, but unable to call the doctor’s office during
business hours. She appreciated how she could log-on to MPC in the evening and look up the information. Whether it was after-hours or during the day, most patients primarily utilized MPC to look up lab results. For instance, patients complained that obtaining lab results used to be a chore involving endless telephone calls, but MPC has streamlined the once laborious process. Stephen from Fair Oaks described how he used to get results before MPC was available. He said, “The office doesn’t have time to call you, or they call, and they don’t get you and leave a message, and you call back and leave a message.”

On the other hand, Yegor accessed MPC for a recent blood test:

I was looking to see what the results were of the blood test. I was pretty impressed with the fact that it was there and the information was provided so easily. In the past, getting information from doctors used to be pretty hard. Having this information available, that was very easy.

Similarly, Leonard from Fair Oaks was able to get his results even though he was out of the state. He remembered:

I was on vacation in Pennsylvania when these results came in. [The doctor] wrote what the results meant and what the next steps were…He followed up with a call, but if my cell phone wasn’t available, I was able to go online and read what the doctor said.

Although patients have been conditioned that not receiving a call from the doctor indicates normal lab results, most patients valued the option to see results themselves. For example, Adrienne in Fair Oaks liked how MPC “gives me quicker access to my labs. Sometimes when the doctor’s office calls, they’ll say your labs are fine, but I like to know what they were and I can get that from the website.” Another example of MPC’s convenient instant access was when John from Herndon needed an old lab report and was able to access it directly from MPC instead of calling.
Simple and Straightforward. Not only did patients appreciate the ability to get lab results, but results were displayed in a straightforward manner. Sheri, a patient from Fair Oaks said, “All the information you need to figure out if you’re in the normal range of things is there, so I think it’s easy to read.” Patients also found the design of the website easy to use. Referring to MPC’s interface, Leonard commented, “It is very icon driven and it’s all very intuitive, so I don’t find it complicated to use.” Along with the uncomplicated design, patients were pleased with the lack of jargon on MPC. Betsy in Fair Oaks mentioned, “It’s nice that it’s informative on a patient type level with patient type English.”

In addition to understandable terminology, MPC was praised for providing historical data, making it extremely helpful for patients to fully comprehend results. Stephen said, “I was able to look at previous labs so the numbers I didn’t understand, I can compare to trend data. I thought that was useful.” Jasmine, in Fair Oaks, also utilized MPC’s historical data by checking her previous A1C levels to confirm it was in the normal range. Rachel found looking at previous results helpful because, “I can look and see if my cholesterol or blood pressure is moving in a bad direction.”

Facilitates Decision-Making. Combined with viewing historical data, patients were able to utilize MPC to assist in making decisions about their health. Reminders of upcoming examinations were helpful, but most importantly, patients used information found on MPC to gauge the status of their health. Betsy from Fair Oaks checked her lab results and monitored them to determine if “medications were working like they should or if there was a problem somewhere.” Correspondingly, Adrienne always checked lab
results as soon as they were available and said, “If my labs are getting worse, or even if they’re normal, I can make adjustments and monitor it closer.” In addition to easily monitoring one’s health via MPC, it is a convenient way to quickly transfer lab results directly to another hospital, according to Isabella from Fair Oaks.

**Providers: Positive Incidents**

The percentage of negative and positive incidents among providers corresponded with the total percentage of incidents (see figure 4). Positive incidents fell into two main areas: (1) MPC helps patients feel more empowered and (2) MPC has the capability to generate efficiency in the office. A summary of the sub-categories for positive incidents among providers can be found in table 4.

![Figure 4 Provider Incidents](image)

### Table 4 Positive Incidents among Providers

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Incidents</td>
<td>69%</td>
</tr>
<tr>
<td>Positive Incidents</td>
<td>31%</td>
</tr>
</tbody>
</table>
Develops patient empowerment. Over half of all positive incidents cited by providers involved patients having access and using medical information to their advantage. A nurse recalled, “I work with patients who have jobs that take them out of the country and the fact that they have this information is awesome.” Another nurse said, “[patients] love that they can go on there and track things and it makes a graph for them.”

Before the introduction of the MPC portal, nurses would review lab results over the phone, but patients did not have access to the data as reference. One nurse mentioned that now patients are able to log-on and see the results and ask questions, which ensured that lab values were properly communicated. A doctor noted how MPC provided helpful tools, enabling patients to monitor their health. The doctor recalled:

The current cholesterol calculator is all the information you really need on preventive care for that because it has your recent blood pressures, recent cholesterol and the patient can do it themselves.

MPC helps patients communicate more directly about their health. For example, an EMT remembered how a patient perused information on MPC about skin cancer, which initiated a conversation. The patient was inclined to see a dermatologist, but unable to make an appointment for at least two months. Instead, the EMT knew that one of the doctors on staff could address the concern and made an appointment for the following week. Correspondingly, providers have observed higher levels of patient motivation after interacting with MPC. For instance, a nurse said:

<table>
<thead>
<tr>
<th>Develops Patient Empowerment</th>
<th>56.3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generates Workplace Efficiencies</td>
<td>43.7%</td>
</tr>
</tbody>
</table>
[Patients] will use MPC to track things, like ‘my cholesterol wasn’t that good, so I need to increase my exercise’, and next time, they’ll come in and say, ‘I added another day to my exercise routine and I’m really anxious to see how my cholesterol is now.’

Due to this increased level of motivation, office visits have also become more productive. A doctor has noticed that MPC “helps start a conversation when there’s so much to cover in an office visit. So it’s nice when both you and the patient have wellness agendas.” Another doctor confirmed that notion and said MPC creates “Patient led agendas rather than the physician leading the agenda.” He continued, “I’ve had patients who have already looked at their labs before they come in. Instead of me going over them, they’ll come in and say, ‘now I looked at my cholesterol and it’s really bad.’”

Many patients altered behavior and even researched possible treatment options before coming in for an appointment. The doctor was not convinced that this interaction was necessarily an improvement in care, but did admit that “it gets you to a different point in the conversation a little earlier in the process and lets patients think through alternatives and come with a better idea of what they want to discuss.”

Generates workplace efficiencies. The other main category of positive incidents among providers was how MPC had the capability to create a more efficient working environment. Patients were able to correct errors or add previous treatments that were not on record. One incident included a patient whose file stated that her last colonoscopy was 12 years ago, but the patient had the procedure five years ago. “The patient can let us know and get the record straight,” said the doctor.

MyPreventiveCare.com also eases the workload of members of the medical staff. Typically, unit clerks are responsible for calling patients and providing reminders about
upcoming examinations and procedures. Nurses were in agreement that MPC “takes the pressure off the unit clerks because they’re already hammered.” A doctor agreed that reminders were particularly useful because they prevent unit clerks from trying to interpret information that is clearly described in the portal.

**Patients: Negative Incidents**

Although patients recollected positive incidents of MPC, the majority of incidents were negative and accounted for 72% of total incidents. Four main categories developed: (1) content is generic and standardized, (2) it is unclear whether information is coming directly from the provider, (3) website errors and (4) interpreting data is difficult (summarized in table 5).

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized Content</td>
<td>36.0%</td>
</tr>
<tr>
<td>Absence of Provider’s Voice</td>
<td>33.0%</td>
</tr>
<tr>
<td>Website Glitches</td>
<td>20.0%</td>
</tr>
<tr>
<td>Data Interpretation is Difficult</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

**Standardized content.** Many patients were unaware that the content was indeed tailored based on their demographics and a questionnaire they had previously filled out. The primary frustration that patients experienced was not recognizing that the content was personalized. For instance, Zachary said, “it felt generic. I don’t know if it was specific to my medical history or if it’s just some code that says you’re this old, but it didn’t feel personal.” Aaron from Fair Oaks concurred:
You don’t want a standard one-stop shopping thing. Individuals are individuals. I’d want something more targeted, based on height and weight, based on past medical history. I’d want something more focused on me as opposed to something generic like this.

Morton from Herndon was originally excited by MPC because the initial list of topics was highly personalized, but he became disappointed because, “Once I got in there, it was general.” Patients desired more personalization that focused on their most important health issues. For example, Harriet from Fair Oaks regularly takes vitamins, but is not sure what she should eat with them or if she’s taking the correct amount. She commented, “No personal touch is there. I think they should know the customer a little bit better.” Meanwhile, Nancy from Herndon said, “MPC tells me my specific blood pressure and what it means,” but falls short because it doesn’t incorporate her family history of hypertension and therefore does not provide recommendations based on that fact, which would “make it more personal.” Perhaps the most significant example of MPC’s insufficient personalization came from Betsy. She stated, “My blood pressure is extremely low. If it’s 120 over 80, I’m told, ‘your blood pressure’s great.’ For me that’s high.” Although Betsy’s blood pressure is classified in the normal range, the system is ineffective because for her, it is an abnormal blood-pressure reading. Ahmad of Herndon revealed, “I’d like to get the vaccine for shingles, but I’m on a lot of antibiotics right now and I have Lyme disease. I’m not allowed to have steroids.” The system did not factor Ahmad’s current issues, which made him feel as if “the suggestions offered on MPC are very generic.”

Other patients were disappointed that they were unable to include more of their own individual information to create ultra-personalized recommendations. Yegor said,
“I’d like to put in that I walked four miles yesterday and this is what I’m eating.”

Lorenzo gets health information from a wide variety of sources, but wants MPC to “tell me something I don’t already know. Tell me, ‘hey, this is a new diet you might want to look at.’”

**Absence of Provider’s Voice.** Related to content that did not seem personalized, patients expressed concern over the authority of the content. Aisha commented, “The patient wants to communicate with the doctor. That’s number one.” After using the system, Milton thought the information provided was standardized and wondered, “Can the doctor and the medical provider put what they would propose as next steps? If they could, that would be much more valuable.” Zachary was not confident that the content on MPC was coming directly from his physician. He asked, “Does my doctor agree 100%?” The desire to directly connect with a provider was expressed most loudly by Pearl, a Fair Oaks patient. She was upset that advice nurses were no longer available via telephone. She said, “I used to rely on them…it was a real way to access the practice when I needed to reach somebody that could understand the problem.” For Pearl, MPC has not served as an adequate substitute.

In addition to wanting to interact directly with providers, many patients desired a resource that would be beneficial between scheduled office visits. For example, Aaron stated, “you’re always going to have follow-up questions. If you just read the results on the webpage, you’re going to have a question or two, so what do you do at that point?” While MPC did provide useful information, patients felt that it often left them with more questions and nowhere to turn for answers. Betsy stated, “once in a while something
goofy will happen and I wonder if this means anything, so it would be nice to come in here (MPC) and read the things that I need.” Similarly, Nikki from Herndon’s blood pressure often wildly fluctuates and during those times, she thought, “it would be nice if I could say, is this something I should worry about?”

MPC’s inability to address concerns led to patients feeling as if “you’re out there using the web to self-doctor and you’re searching for answers on your own,” said Yegor. The most popular destination for patients was WebMD and Google searches. Lucy from Herndon “always goes to Google and opens up another screen” to help her interpret results. Morton often relies on Google to provide more information about tests that are recommended, while John in Herndon frequents the Mayo Clinic and WebMD to help with his back pain. Others, like Jerry in Herndon, subscribes to feeds from Microsoft, Harvard Medical School and the Mayo Clinic, which are sent directly to his email and Kindle, making MPC unnecessary in his opinion.

**Website glitches.** For several patients, simply accessing the website was troublesome. Twenty percent of all negative incidents among patients involved technical errors or glitches on MyPreventiveCare.com. Aaron remembered, “the second time I logged in, I couldn’t remember what my password was. I hadn’t written it down. Even after I got the password when I went to log in again, it wouldn’t let me.” Rachel voiced a similar difficulty, saying, “It (MPC) isn’t always easy to get in. If I don’t go in because I haven’t been to the doctor in a year, I can’t get in and I have to reset my password every time. That gets really frustrating.” Marina from Fair Oaks was not able to log-in either, even after she attempted to recover her user ID. She went through several hurdles to re-
gain access, but eventually gave up because “it was too much work.” Others, like Pearl, attempted to access MPC late at night, but found that the website was down. She recalled, “If I go on there at 1 a.m., it’s often shut down or I can’t get through and I keep trying and trying and I go back and I register again. I’ve tried everything and it really aggravates me.”

When patients were able to log-in, mistakes were often found. For instance, Sheri said, “It’s been hit or miss as far as having the information being correct…lab results weren’t accurate.” For other patients, their information was not updated to appropriately reflect their health status. Rachel cited the following example:

I kept getting these flash things that said I was overdue on a pap exam. Well, I do a well woman every year…And I had just been in in April, but when I went to this, it kept flashing at me like I was a bad girl.

Laura from Fair Oaks received messages about getting a colonoscopy even though she recently had the exam. Oversights like these sometimes occurred because patients received medical procedures from a different provider. For example, Harriet mentioned that she got the flu vaccine at CVS. She said:

Because I don’t come here to get this service doesn’t mean that I don’t have it. So when I come in, if they’re going to look at this and say, ‘you haven’t had a flu shot yet’ and treat me differently, then we have a problem.

Several patients had difficulties actually using the website. Alyson said, “When I’ve logged in, I’ve found out that I have other messages waiting for me I didn’t know were there.” Lorenzo was unsure which website to use; MPC or the portal located on the medical office’s homepage. He said, “It’s one of those things where if you can get what you want in 60 seconds, it’s good, but otherwise, it just becomes one more thing.” Upon
discussing MPC, Milton asked, “Isn’t there some other website? I remember there are two websites and they have overlapping functions.” Zachary wondered, “Which website do I go to?” Similarly, Lucy’s employer offered a comparable health website to MPC, leaving her confused and unsure which to use.

Data interpretation is difficult. The last category, difficulty interpreting data, accounted for 11% of all negative patient incidents. Patients were not confident in their ability to accurately understand the data that was provided. Milton recently opened the “watch your weight” page and said, “One question I have is this BMI (body mass index). Is it just sort of a number pulled out of the air or is it in fact appropriately calculated?” Milton wanted to better understand what the number actually meant in order to “take the number seriously.”

The blood-sugar section of the website (figure 5) is another example of patients’ inability to decipher results. The exchange with Nancy, described below, occurred with several patients:

Interviewer: How do you interpret the blood-sugar result?

Nancy: It was measured on September 3rd. I have a value of 100 and my goal is to be less than 126, so I should be good? I should be ok? I don’t know what that symbol means. [Nancy notices the orange icon which indicates a marginal score]. Why would I be marginal?
The same confusion was applied when patients reviewed their cholesterol. Kathy looked at her results and wondered:

I have high cholesterol, but my good cholesterol kind of outweighs my bad cholesterol. So am I really high cholesterol? I understand what it should be, but why does that outweigh and I still have high cholesterol?

Whenever Laura checked her lab results, she found that “something came up and it’s out of the range and it’s a bunch of letters or whatever, so I’m running to the Internet to find out what in the world it means.” Likewise, most of the content on MPC was difficult for Harriet to interpret. She suggested, “Maybe a little more everyday language that we all use instead of medical terminology. That is very needed for this site. Not everybody can understand the language of medical.”

**Providers: Negative Incidents**

Providers’ incidents overlapped with patients, and in many cases, reinforced what patients experienced. Incidents fell into four main categories: (1) one-way communication is ineffective, (2) MPC increases workload, (3) verbiage disrupts care and (4) website glitches (table 6).
Table 6 Negative Incidents among Providers

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Way Communication is Ineffective</td>
<td>41.2%</td>
</tr>
<tr>
<td>Increases Workload</td>
<td>29.4%</td>
</tr>
<tr>
<td>Verbiage Disrupts Care</td>
<td>17.6%</td>
</tr>
<tr>
<td>Website Glitches</td>
<td>11.8%</td>
</tr>
</tbody>
</table>

**One-way communication is ineffective.** Overall, providers considered MPC a valuable tool that contains many flaws. Perhaps the biggest flaw, which accounted for over 41% of negative incidents, was how MPC truncates communication between patients and providers. There was universal agreement during both focus groups that MPC is not practical because providers cannot confirm that patients viewed and understood the information that they input into MPC. A nurse summarized this problem by saying, “we’re writing in those messages, but we’re assuming they’re looking but we have no real way of knowing.” A doctor shared the same concern and therefore, regulated the amount of information she entered because if the subject matter was concerning, she had no way of knowing whether the patient would actually see the message.

In other scenarios, providers received inquiries from patients, but MPC was not deemed as an appropriate forum to discuss the matter. For example, a resident recalled his predicament:

You get this message and you want to answer it. You have a desire to please and maybe it’s part of my learning, but I find that if that question pushes the boundaries of what I should do outside of an office visit, maybe I should bring them in? But they’re asking for it, so I send the anti-biotic I otherwise wouldn’t. When do you draw the line and say, ‘you just gotta come in?’
Similarly, another doctor described a time when he said to a patient, “we need to talk about the risk and benefits and how they apply to you and decide together what’s best for you.” The patient responded, “I don’t want to come in. Can we just do this on messaging?”

Another issue that limited communication between patients and providers was the belief that MPC was not equipped to handle complex communication. A doctor thought that tailoring information to patients was beneficial, but doubted the portal could “do it all” because as he said, “it takes a lot of subtlety and complexity.” Another doctor shared the same opinion and brought up the issue of mammographies. She said, “There’s real controversy on when to start screening and what the intervals should be.” Yet another physician agreed by saying, “the problem is there are different ways to do it. We all know we should screen for colon cancer. When I see a patient in person, I ask them do you want to do a colonoscopy or annual stool test?” According to the physicians, ultimately, information found on MPC is not adaptable, one-sided and therefore, ends conversations instead of initiating new ones.

**Increases workload.** Providers were very concerned that MPC may create unnecessary, additional work. Although nearly 44% of providers’ positive incidents focused on how MPC generates workplace efficiencies, the emphasis of negative workplace-related incidents concentrated on how new burdens were placed on providers. Using MPC can be particularly challenging for physicians new to the practice. A nurse said, “The residents using it…Everything is Greek to them when they come in. They don’t know how to send it or they think they’re sending it to the nurse and they’re
sending it to the patient.” Nurses were confronted with increased workloads because, “MPC is supposed to help lessen the calls, but sometimes it actually creates more calls.” This typically happens when patients “look at lab results and one thing is a little off, they freak out and if the doctor doesn’t mention it, they’re calling us and asking.” Additionally, patients are “WebMD-ing it and they’re freaking out when they see what it’s related to because WebMD tells everyone they’re going to die from cancer.” Doctors were also affected by patients concerns over viewing lab results online because “when ratios are elevated, patients freak out, so now instead of in the past being able to say, ‘your labs are all ok,’ you have to comment on every single little abnormality, which takes more of my time.” Devoting more time to addressing patient’s concerns and questions was taxing for doctors because as one said, “It is frankly time we don’t get reimbursed for.” Since doctors do not receive confirmation that the patient viewed the message, it is necessary to take the time to call the patient and ensure the information was communicated. The task of calling patients typically falls under the responsibility of nurses. A nurse said:

We’re assuming patients are looking at the information on MPC, but we have no real way of knowing. I get calls saying ‘I was looking for my labs’ and we have to say they are available on MPC. Then we end up going over them again.

Nurses also had the added responsibility of educating patients about MPC. Instruction was usually unsuccessful because there was limited time to convey a lot of information.

A nurse described the typical scenario:

The bad part is we don’t have enough time to tell the patient. Here’s your number. You should sign up for MPC. You get like one sentence in there. You’re rooming the patient, doing their history, vitals at the same time. You got your two minutes to get all that stuff in there.
Since nurses had very little time to communicate all of the benefits of MPC, they usually just instructed patients that they will be able to access their lab results. Thus, patients must discover other features of MPC on their own.

**Verbiage disrupts care.** Many patients complained that the terminology on MPC made it difficult to interpret data on the website. Surprisingly, providers admitted that they were responsible for adding language that patients may find difficult to understand. For instance, nurses noticed that doctors “give all the big terms and the patient will get confused. I think a lot of the newbies do that.” A fellow nurse agreed that younger doctors included jargon while physicians with more experience will “give you plain Jane this is what’s going on.” Nurses acknowledged that younger doctors enter sophisticated terms because they are aware that their supervisors may see the information and want to impress them. Physicians with more seniority were also at fault. Nurses complained that many doctors would write messages meant for nurses and were unaware that patients were also capable of viewing them.

Sometimes, doctors recognized that information was written in a very insensitive manner. A doctor said, “I’ve had a few patients who get the health maintenance or lifestyle change reminders and they say, ‘my portal says I’m fat.’” Other doctors felt that the content on MPC may be suitable for the average patient, but might be beyond comprehension for patients from different cultures, lower economic levels and diverse backgrounds.
**Website glitches.** As with patients, several negative incidents from providers highlighted errors with the website. In particular, there was confusion over MPC and the medical office’s website. A doctor said:

The other difficulty is MPC and the portal that we use to message with patients are not the same thing. It’s two different ID’s and two different log-ins. My patient sees results on MPC and they want to communicate with me, but they have to go to a different log-in to a different portal which frankly works maybe half the time.

Other malfunctions cited by the medical staff included patients not being able to see notes from the doctor and when notes did appear, the same message was written three consecutive times. Nurses also frequently heard from frustrated patients about password difficulties. One nurse recalled, “it’s like waiting for the cable guy because you’re sitting there with the phone in your hand waiting for them (IT) to call you back and you have to log-in with them on the phone to get it straightened out. I know that’s still a big issue with people.”

Although the critical incidents provided specific examples of how MPC positively and negatively affected patients and providers, incidents were overwhelmingly negative. The next section builds on participant’s incidents to analyze the immediacy level of MPC.

**RQ3: What is the immediacy level of the content on MPC?**

MyPreventiveCare.com was evaluated using the following six attributes, which are believed to enhance eHealth programs to attract user attention, involvement, improve health education and influence health behaviors (Kreps & Neuhauser, 2013): actionable,
engaging, approachability, interactivity, personalization and clarity. Each concept is evaluated and described below.

**Actionable**
Characteristics on MPC were considered as actionable if they encouraged participation from the user to perform an activity, like seek feedback, which aided in managing one’s health.

**Strengths.** MPC contains a variety of ways that patients can utilize the website to move their health forward. For instance, it is possible to convert webpages to a pdf file and easily print. In addition, on the “other preventive care” page, examinations for different types of screenings are listed and they are hyperlinked so that a user can click to get more information immediately.

MPC includes a detailed help section that clearly explains how to navigate the website. There is also a link to a dictionary, in which 37 medical terms are listed and explained. Links to access the help section and the dictionary are fixed at the top of the page so that a user can access them at any time.

When recommendations are provided, they are written in a way that encourages the user to follow through with the suggestion. For instance, on the Quit Smoking page, the text compels patients to “pick a quit date,” while the Watch Your Weight page proposes that patients keep a food and activity diary, or “drink water instead of soda.” Other language on the website is motivational, imploring individuals to change, such as “the sooner you quit, the sooner your body can begin to heal” on the quit smoking page.
The Flu Shot page includes, “when you get a flu shot, you don’t just protect yourself – you also protect everyone around you.”

**Weaknesses.** Although the “preventive care you need now” pages incorporate next steps, not all sections of the website provide directions for the user. For instance, there is a graph of blood-pressure readings, but there is no information or links to help the patient clarify what they can do to maintain or improve their current blood-pressure. Similarly, the “your labs” page presents a laundry list of scores, but once again, there is no way for the patient to take action based on the information presented.

**Engaging**
To engage patients, there had to be appealing content that made the user want to further explore the website by creating physical, cognitive or emotional involvement.

**Strengths.** There were sections of MPC that used text to appeal to the patient by providing a very direct message. For instance, at the very top of the blood pressure page, there is bold text pronouncing, “Your last blood pressure was too high.” Even when the text was not bolded, honest advice is given, such as, “Don’t eat mindlessly in front of the TV.” In the “self-management tools” section, there is a list of several engaging links. For instance, under smoking cessation, there is an external link to testimonials from former smokers. The “self-management tools” section contains several videos, such as “safe in the city” about protection from STD’s and a detailed video about PSA tests.

**Weaknesses.** Although many links on the “self-management tools” page include engaging content, a patient must scroll through 164 separate links. There are 19 categories the links are housed under, 41% (68) of the links begin with the words “learn
more” or “learn about.” All 164 links appear for every patient, no matter if they are susceptible to abdominal aortic aneurysms or cervical cancer. Even though some videos from external links are engaging, they take the patient away from MPC.

Another area of the website that fell short of engaging content was the health trends section, in which line graphs were displayed. The charts were very simplistic and patients were unable to manipulate any of the data or project what their numbers may be if adjustments were made to their health.

**Approachability**

Approachability, or the level of friendliness found on MPC, was considered the representation of information and images in a welcoming manner that demonstrated empathy or helped patients feel comfortable.

**Strengths.** The homepage of MPC displays several positive images, such as a healthy vegetable meal and bicycle riders passing through a tranquil mountain landscape. Moreover, within MPC, there are photos of a joyful couple as well as a smiling physician interacting with a patient during an examination. The rest of the website features neutral medical images, such as a woman receiving a shot and a blood-glucose monitor for diabetes. More uplifting images can be used, but because they were associated with the content on the page, these images were not considered to be negative.

MPC also uses easily discernible icons. For instance, in the “other preventive care” section, several exams are denoted by a red, green or orange icon. The icon indicates whether a patient is “doing well”, “needs improvement” or if the system is “missing information.” A summary of images is in figure 6.
**Weaknesses.** Different icons were used in the “medical records” section than what was used in the “other preventive care” section. The inconsistent use of icons makes it difficult for the patient to determine its exact meaning. In regards to language, there are strengths, but they are outweighed by the website’s weaknesses. For instance, simple and direct language is used and the average word length on the entire website was only six letters. A dictionary is easily accessible to assist patients with unfamiliar with medical jargon. In addition, the following friendly and comforting language appears in the flu shot section: “there is no reason to worry.” However, for as many supportive words that appeared, there were equally as many challenging medical terminology. For example, on the blood pressure page, “systolic” is used, but there was no definition, nor is the word available in the dictionary. Although systolic is common terminology associated with blood-pressure, its meaning may be difficult to decipher for patients periodically monitoring their health.

The medical records page resembled information strictly for providers. Under “active diagnosis”, it has phrases such as “malignant neoplasm of colon”, hypercholesterolemia” and listed the technical names for vaccines, like “Zostavax 19400 UNT/0.65ML Solution Reconstituted”. Once again, none of these terms appeared in the dictionary. Even when explanations were attempted, they were verbose and appropriate for patients with at least moderate medical knowledge. For example, on the “your health trends” page, the following paragraph explains the difference between HDL and LDL:

HDL cholesterol - a form of cholesterol in your bloodstream that decreases the risk of heart disease. HDL is also called high-density lipoprotein or "good" cholesterol.
LDL cholesterol - a form of cholesterol in your bloodstream that in high levels increases the risk of heart disease. LDL is also called low-density lipoprotein or "bad" cholesterol.

Examining language used on the entire website revealed that some of the most frequent words were relatively unfriendly. The most popular word, “cancer” appeared 215 times, accounting for over 5% of all the words on MPC. “Blood” was the fourth most frequent word, surfacing 160 times. Encouraging words that could possibly motivate patients, like “learn” were found 145 times (3.45%), and a proactive verb like “get” appeared 128 times (3%). With MPC being a medical website focused on preventive care, it is unsurprising that words like “cancer”, “blood” and “diabetes” were present. However, their pervasiveness also served as an indicator of MPC’s approachability.

Overall, out of the top 25 words, four were considered negative (cancer, blood, disease, diabetes), five were positive (learn, get, help, recommends, use) and the rest were neutral. The inclusion of more supportive, caring and thoughtful language holds the possibility to positively transform the mood of the website. A summary of the top 25 words can be found in table 7.

<table>
<thead>
<tr>
<th>Word</th>
<th>Length</th>
<th>Count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>6</td>
<td>215</td>
<td>5.11%</td>
</tr>
<tr>
<td>Tests</td>
<td>5</td>
<td>183</td>
<td>4.35%</td>
</tr>
<tr>
<td>Information</td>
<td>11</td>
<td>164</td>
<td>3.90%</td>
</tr>
<tr>
<td>Blood</td>
<td>5</td>
<td>160</td>
<td>3.80%</td>
</tr>
<tr>
<td>Doctor</td>
<td>6</td>
<td>158</td>
<td>3.76%</td>
</tr>
<tr>
<td>Learn</td>
<td>5</td>
<td>145</td>
<td>3.45%</td>
</tr>
<tr>
<td>Get</td>
<td>3</td>
<td>128</td>
<td>3.04%</td>
</tr>
<tr>
<td>Help</td>
<td>4</td>
<td>127</td>
<td>3.02%</td>
</tr>
<tr>
<td>--------------</td>
<td>----</td>
<td>-----</td>
<td>-------</td>
</tr>
<tr>
<td>MyPreventiveCare</td>
<td>16</td>
<td>118</td>
<td>2.81%</td>
</tr>
<tr>
<td>Disease</td>
<td>7</td>
<td>106</td>
<td>2.52%</td>
</tr>
<tr>
<td>Screening</td>
<td>9</td>
<td>106</td>
<td>2.52%</td>
</tr>
<tr>
<td>Risk</td>
<td>4</td>
<td>102</td>
<td>2.43%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8</td>
<td>100</td>
<td>2.38%</td>
</tr>
<tr>
<td>Preventive</td>
<td>10</td>
<td>99</td>
<td>2.35%</td>
</tr>
<tr>
<td>Heart</td>
<td>5</td>
<td>98</td>
<td>2.33%</td>
</tr>
<tr>
<td>Pressure</td>
<td>8</td>
<td>95</td>
<td>2.26%</td>
</tr>
<tr>
<td>Prostate</td>
<td>8</td>
<td>89</td>
<td>2.12%</td>
</tr>
<tr>
<td>Recommends</td>
<td>10</td>
<td>89</td>
<td>2.12%</td>
</tr>
<tr>
<td>See</td>
<td>3</td>
<td>88</td>
<td>2.09%</td>
</tr>
<tr>
<td>Shot</td>
<td>4</td>
<td>86</td>
<td>2.05%</td>
</tr>
<tr>
<td>Use</td>
<td>3</td>
<td>85</td>
<td>2.02%</td>
</tr>
<tr>
<td>Year</td>
<td>4</td>
<td>76</td>
<td>1.81%</td>
</tr>
<tr>
<td>2014</td>
<td>4</td>
<td>71</td>
<td>1.69%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>11</td>
<td>71</td>
<td>1.69%</td>
</tr>
<tr>
<td>Dashboard</td>
<td>9</td>
<td>71</td>
<td>1.69%</td>
</tr>
</tbody>
</table>

![Image Summary](Image6)
Interactivity
Going beyond static text, interactivity includes any function that enables the user active control to become involved more deeply within the content.

Strengths. MPC uses a fairly standard template, with almost every page seemingly designed in the same manner. There are not many opportunities to interact with MPC aside from reading content. The presence of interactive quizzes, cholesterol calculators, a nicotine addiction test and other risk assessment tools are only found as external links, which take the user away from the portal. A relatively strong aspect of MPC’s interactivity is the ability for the user to dictate what information they want to access. The main navigational menu located on the dashboard offers a variety of options to allow users to freely explore, instead of mandating that content be viewed in a particular order. Additionally, prevention topics located in the library provide broad topic areas in which users can choose categories to learn more about.

Weaknesses. For the most part, MPC is predominantly lacking in interactive functionality. In fact, the absence of interactivity can best be summarized when the “contact us” button is clicked. The text on the page reads, “Please DO NOT SEND MEDICAL QUESTIONS and DO NOT SEND QUESTIONS TO YOUR DOCTOR using this page.” The “contact us” page is primarily for patients to send comments and problems about the website, but no direction is offered on how to get in touch with a provider. This is a recurring problem, because on the Diabetes page, a recommendation is given to “Talk with your doctor about getting your A1C checked now”, but once again, there is no immediate method for getting in touch.
Furthermore, if a patient does have a question and seeks assistance in the “help” section, there is a list of pre-populated questions. Another area that appears to be interactive, but is not is the “update and report your information” page. Once again, a pre-populated list appears in which patients can alter aspects of their medical history with “yes/no” questions. Patients are unable to enter their own data, which they may have received from other providers, or enter tests, like blood-pressure, which are possible to take at home.

**Personalization**

Personalization on MPC was determined by an enhanced sense of inclusion and cooperation to match the users’ needs and wants. This can be achieved through language, like “we” or “us”, as well as providing unique information that is applicable to an individual’s life.

**Strengths.** The “preventive care you need now” section provides a customized list of health issues that a specific patient should address. Once each heading is clicked, the information presented is written in a personalized manner, using possessive pronouns, like “you have hypertension” and “you have never had a PSA test.” In addition, the information presented incorporates data the patient entered on the “health risk assessment page.” This enables MPC to reference specific dates of past treatments so that they are seamlessly combined with the recommendations. For instance, regarding colon cancer, MPC states, “It is good that you had a colonoscopy on 5/9/2014. You should continue to have colonoscopies.”
**Weaknesses.** While terms like “you” and “your” express personalization, their use is inconsistent. In the “lab results” section, information is written in a very clinical manner, eschewing past attempts at personalization. For example, the text reads as, “patient would like a PSA test” and “patient wants to share decision with provider.” Instead of using “you” or even the patient’s name, the content distances itself from the patient. This is especially true on the dashboard, which is the first page that appears when a patient logs-in. At the top, it reads, “you are here”, instead of immediately making it clear that the website is personalized by using the patient’s name.

Similarly, recommendations come across as impersonal, although some aspects of personalization are utilized. As an example, the flu shots section states, “Get the flu shot as soon as it is available in your community each year.” Using “your” makes it seem as if the recommendation is for the individual patient, but not entering the actual name of the community changes the sentence from personal to generic. This trend is apparent in other areas of MPC as well. The first line of the quit smoking page reads, “You said you smoke,” which portrays passive personalization instead of authoritatively stating that the patient is a smoker. Direct language would allow the patient to focus on recommendations instead of instantly knowing that the information was pre-populated based on their survey response. Also, advice is provided, like “get active,” or “balance the calories you eat with the calories you burn.” Although this is useful advice, it is not personalized. A personalized experience would include specific details about a patient’s life and incorporate actual methods to increase activity or mention foods that are commonly eaten by the individual.
Personalization only occurs in certain sections of MPC. Most of the website is not personalized at all. The library, which contains prevention topics from A-Z and self-management tools, is comprehensive, but also comprises information that is likely to be irrelevant to most patients. Therefore, it would be difficult for patients to find the tool that they need. It is also confusing as to which sections are personalized and which are not. Under “setting priorities” in the library section, a list is provided that seems as if it is customized. However, there is information in the list such as, “Pneumonia shot for adults’ age 65 and greater” and “Breast cancer screening (mammogram) for women age 40 to 85.” The inconsistent mixing of personalized content with general content lessens the impact when personalization does occur. This is also the case with images that appear throughout the website. Several generic photos of physicians are displayed, instead of images of the patient’s actual physician. Also, pictures of patients are throughout the website, which contributed to MPC’s approachability, but harm its personalization. Patients may not relate to the people shown or may assume that since they are different than the ideal candidate exhibited, a specific treatment many not be applicable.

Clarity

The CDC’s Clear Communication Index was used to gauge the level of well-defined explanations and overall communication of MPC. A total of 37 internal and external pages were analyzed within 10 sections of MPC (preventive care you need now, other preventive care, take aspirin, get tested for Diabetes, you have high blood pressure, get a tetanus shot, get a pneumonia shot, quit smoking, watch your weight and you have diabetes). Seventeen pages was internal content contained within MPC and the other 20
were links to external webpages, like the Mayo Clinic, CDC and National Library of Medicine. MPC’s “Preventive Care You Need Now” section had a total of 70 external links, of which 53 went to governmental websites and 17 sent users to commercial websites (figure 7). The CDC was the most popular governmental link within MPC, followed by NIH and NCI. The most frequently linked commercial website was the American Heart Association, followed by the U.S. Preventive Services Taskforce and Mayo Clinic. A summary of all external links is in table 8. Analysis of links found on MPC is significant to the clarity property because it is either content included on MPC or a recommended referral website which takes the user away from MPC and to another destination.

![Figure 7 External Link Summary](image)

<table>
<thead>
<tr>
<th>Governmental Link</th>
<th>Frequency</th>
<th>Commercial Link</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDC</td>
<td>18</td>
<td>American Heart Association</td>
<td>4</td>
</tr>
<tr>
<td>NIH</td>
<td>11</td>
<td>US Preventive Services Taskforce</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 8 External Link Frequencies
Two coders reviewed 37 internal and external links on MPC. Once intercoder reliability was established, the rest of the webpages were divided among the two coders and evaluated individually. The average score of all 37 internal and external webpages evaluated was 72%, which falls below the 90% threshold for acceptability. Internal MPC pages scored 75% and external pages scored 69%. A summary of all scored pages is in table 9.

<table>
<thead>
<tr>
<th>Internal Link</th>
<th>Score</th>
<th>External Link</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>94%</td>
<td>FDA Nutrition Label</td>
<td>95%</td>
</tr>
<tr>
<td>Get a Pneumonia Shot</td>
<td>93%</td>
<td>NIH Diabetes</td>
<td>94%</td>
</tr>
<tr>
<td>Colon Cancer Testing</td>
<td>84%</td>
<td>beTobaccoFree.hhs.gov</td>
<td>88%</td>
</tr>
<tr>
<td>Quit Smoking</td>
<td>84%</td>
<td>CDC Tetanus</td>
<td>88%</td>
</tr>
<tr>
<td>Get a Tetanus Shot</td>
<td>82%</td>
<td>Mayo Clinic Weight Loss</td>
<td>86%</td>
</tr>
<tr>
<td>Take Aspirin</td>
<td>80%</td>
<td>National Library Blood Pressure</td>
<td>85%</td>
</tr>
<tr>
<td>Bone Density</td>
<td>80%</td>
<td>AHA Medications</td>
<td>84%</td>
</tr>
<tr>
<td>You Have High Blood Pressure</td>
<td>79%</td>
<td>Weight Control Info Network</td>
<td>82%</td>
</tr>
<tr>
<td>Cervical Cancer</td>
<td>75%</td>
<td>Mayo Clinic Blood Pressure</td>
<td>75%</td>
</tr>
<tr>
<td>Get Tested for Diabetes</td>
<td>74%</td>
<td>CDC Vaccines</td>
<td>75%</td>
</tr>
<tr>
<td>Watch your Weight</td>
<td>74%</td>
<td>CDC Diabetes</td>
<td>73%</td>
</tr>
</tbody>
</table>

Table 9 Link Scores
Internal webpages. Only two MyPreventiveCare.com pages scored above 90%: the “exercise” page and “get a pneumonia shot” page. These two pages scored 94% and 93% respectively. The “exercise” page only lost one point for not including the opinions of subject matter experts. It excelled in having the most important information on the top of the page, so its importance was immediately realized. It also had a very clear, universal message that exercise was important. The page discussed benefits, like “Physical activity increases your chances of living longer and keeps you healthier.” An image of a man playing basketball reinforced the overall message. Similarly, the “Get a Pneumonia Shot” page only lost one point for not including authoritative sources or the opinions of subject matter experts. Like the “exercise” page, information found on the “get a pneumonia shot” page presented recommendations in plain language and used bulleted lists as to not overwhelm the patient.

The other 15 MPC pages failed to garner scores of 90% or higher, although four pages scored in the 80’s. Several other pages scored in the 60’s and one was as low as
50%. Overall, low scoring MPC pages suffered from not thoroughly explaining numbers when they were used and not providing clear information about recommended behaviors. Oftentimes, generalities were included as recommendations, making it difficult for users to decipher what they actually meant. For example, the “Diabetes” page offered behavior recommendations like, “eat healthy,” but that can be interpreted in many different ways according to different patients. Just like the “Exercise” and “Get a Pneumonia Shot” pages, MPC never stated where the content provided was coming from, nor did it ever state what was still unknown about a particular condition or recommendation.

The layout on MPC is fairly consistent and the portal frequently employed the use of bulleted lists. In addition, almost every page had a graphic or image associated with the content. Most images were not particularly striking nor were they always culturally appropriate, but credit was given for their presence. However, MPC suffered the most from failing to provide specific behavioral recommendations. For example, the “blood pressure” page recommends that patients limit salt and alcohol intake. This recommendation is not specific and leaves it to the patient to determine how much salt and alcohol is too much. Furthermore, on the “PSA Test” page, the recommendations state that the patient may not need further testing, but does not explain the rationale. On the “You Have Diabetes” page, blood pressure is discussed and the text refers to "both numbers" needing to be less than 130/80. No further information is provided as to what is meant by "both numbers". Overall, the result of almost all of MPC’s pages scoring below 90% is due to providing vague information that can cause confusion for the patient.
While the portal has noble intentions of providing general advice, it is presented in a manner that can possibly cause patient disengagement.

**External webpages.** A total of 20 external links were analyzed using the Clear Communication Index, but only two external webpages received scores of 90% or greater: the “FDA Nutrition Label” page and NIH’s “Diabetes” page. All seven of the CDC’s pages analyzed were below 90%. The lowest scoring page, which received 19%, was the CDC’s “pneumonia vaccines” page. Commercial websites did not fare better than governmental websites. Websites like the Mayo Clinic and U.S. Preventive Services Task Force were outperformed by several government websites.

The FDA Nutrition Label page was the top performing external website. The page featured plenty of images and explained all the numerical calculations of nutrition labels. Furthermore, it used plain language and provided specific benefits and risks. Another top performer, beTobaccoFree, had a very clear message and used numbers that most people were accustomed to seeing.

One of the main reasons why external websites, like government webpages, scored so low was because they rarely contained imagery. For the most part, paragraphs of text appeared that were not bulleted or separated with headings. A major flaw of commercial websites was requiring the user to click for more information instead of having the main message appear at once. For instance, the Mayo Clinic’s high blood pressure page first featured a general definition and forces navigation so that users have to receive information in the order that the website dictates. The U.S. Preventive Services
Task Force received a very low score because it used advanced language and complicated numbers without explanations.

In summary, only four pages out of 37 related to MPC passed the CDC’s threshold for clear communication. The CDC Index can be used as a guide to refine MPC pages and to determine which external pages to remove so that the most straightforward and concise information is presented to patients. Combining data from critical incident interviews and focus groups along with analysis of the OHP, the next section provides a deeper analysis of the underlying issues and ramifications of the current version of MPC.

**RQ4: What are the consequences of negative incidents and lack of immediacy from using MPC?**

Once all of the data was synthesized, the following three themes were uncovered about the use of MPC: (1) susceptible to communication lapses, (2) standardization contributes to patient disengagement and perfunctory communicative exchanges, and (3) arduousness constrains involvement.

**Susceptible to Communication Lapses**

Several providers touted MPC’s ability to serve as an intermediary that made office appointments more productive. For example, a doctor said that MPC “primed” patients effectively for discussions that took place during follow-up visits. Another found that the calculators located on MPC “facilitated a conversation in the room.”

**Outside sources muddle communication.** Unfortunately, positive examples that contributed to improved communication were rare. Most patients and providers found that MPC hampered ongoing discussions for a variety of reasons. First, MPC provided general awareness information, but inevitably, questions would arise about how a
particular treatment or illness would personally affect an individual. When Adrienne was confronted with such questions, she said, “I would think a lot of people would just go on another site to find those questions, which is what I would do.” When patients did go to alternate sources like Google and WebMD, they were largely unhelpful because the information they found was written for the masses. For instance, Alyson was taking a prescription blood thinner due to a blood clot. She attempted to use MPC as a resource, but was not able to find the information she was looking for. She explained, “I have gone to other websites to look up certain foods to see what has high vitamin K. If that were on this website and were tailored to me, then I would go here to use it instead of something else, like WebMD.” Having to leave MPC and seek out another website caused division between a patient and their provider. According to Yegor:

You’re kind using the web to self-doctor yourself. You’re searching for answers on your own and that’s kind of not good…They’ll say take this medication and it doesn’t necessarily work, so I quit taking it and I’ll do something else. That’s the thing with the web, you get so confused. You see other people’s responses. They did this. Well I took it and I felt like crap.

By using alternate websites for medical information, patients are receiving direction that they may not normally have received from their provider. Like Yegor, patients may veer off and find another resource, which breaks the flow of communication directly from the provider to the patient. Providers found patients’ reliance on outside websites to be a major concern. A nurse said, “Sometimes I think [information they get on MPC] makes them go to WebMD and MayoClinic.com and I hate that.” If patients were using content on MPC, communication and medical direction would improve because as one nurse said, “at least we know the resource so we could be better educated
so we know what information they have. When they go to the outside sources, we have no idea what they read.” This same concern was true for patients who used health portals provided by their employer or insurance company. Lucy was not certain if she frequently used MPC or the portal from her employer. She recalled, “They’re very similar, so it’s kind of confusing now.”

**Information needed in-between office visits.** In addition to using outside sources to clarify information found on MPC, some patients used them as a substitute for their provider. John said, “Sometimes I have back pain or something and I cannot come to the primary care doctor, but I need some information.” John is like many patients, whose first instinct was to seek outside sources rather than to rely on MPC. Most patients agreed that the effort to contact their provider or make an appointment was cumbersome. When minor health issues emerged throughout the year or between scheduled appointments, patients were not inclined to seek out their provider. Howard said, “I don’t want to schlep in here between my annual visits,” while Nikki, who regularly monitors her blood pressure wondered how she can maintain healthy readings. She questioned, “So do I have to do a mile swim to keep my blood pressure in the good?” Nikki would like supplemental information from MPC to help manage her condition better. Other patients required a trusted resource when they could not reach the provider. For example, Ryan experienced a funny feeling in his chest and did not want to wait to see his doctor, so instead he spent $350 by going to a mobile health bus. When he did finally see his doctor several weeks later, he was notified that “it was a waste of money.” Jasmine is a Type 2 diabetic and was concerned about managing her blood-sugar. Even with access to MPC,
she stated, “I know all the dangers of being diabetic. But at the same time, I’m not sure that I’m always doing the right things to prevent it.”

Although content on MPC was customized to patient demographics and information they filled out in the questionnaire, failing to deliver truly personalized information impeded patients from taking action. Recommendations like “eat healthier” or “be active” did not adequately inform patients of steps to take in between scheduled office visits.

**Asynchronous communication.** Providers also confessed that the system does not do a good job providing continuous communication because confirmations were not received. A provider called this process “one-way communication,” which ultimately led to “broken communication” because patients were unable to contact doctors directly. Typically, patients have to contact a nurse, and then a task is assigned to the provider, which is then reviewed hours or even a day later. This type of asynchronous communication is aggravating for both patients and providers, leaving them both dissatisfied with the quality of communication transmitted and received. This issue becomes more complicated because many patients see different providers each time they visit the office. A physician summarized how this can be problematic:

A Dr. X patient sees Dr. Y for an acute issue. Dr. Y looks at vitamins D’s, where other doctors aren’t quite too concerned about vitamin D’s. You might have one physician, [that classifies] bad cholesterol of over 100. Some physicians will be like ‘eh’; others will be like ‘oh my gosh’. Everyone is a little different based on their training or recent article they read. In a practice like this, there is a lot of diversity with the physicians, with what they want to say.

Receiving contradicting directions from physicians, the inability to quickly receive follow-up answers to questions and a portal that necessitates locating outside
information for common concerns does not encourage patients to regularly use MPC. In addition, inconsistent and infrequent communication does not motivate patients to want to maintain continuous conversations with providers.

**Standardization Contributes to Patient Disengagement**

Although MPC is tailored to each patient based on demographics and their patient questionnaire, the lack of meaningful personalization resulted in patients opting out of regularly using the system. MPC was largely viewed as just another platform offering standardized information, which made patients not value it as a resource capable of delivering personal health recommendations.

**Underwhelming personal relevance.** Lorenzo became indifferent and dismissed MPC as a helpful tool after reading the section about weight loss. He responded, “Yeah, but what do I do with it? I’m overweight. I need to lose weight. Got it.” Similarly, Zachary said, “It didn’t feel personal, no. Like eat healthier, obviously.” Stephen was unimpressed with the recommendations and said, “A lot of the information, the basics, this is stuff I could read on CNN health’s website. [It] doesn’t tell me much.”

**Advanced information needed.** For many patients, disinterest came because they already knew so much about their chronic disease or upcoming examination. Laura said, “I pretty much know all this stuff.” Ahmad, who has his blood tested often, said, “If I wanted to look at blood tests, I would want to look at a lot more because I’m much more educated on blood. It would be nice to look at the RBC (red blood cells) and a whole bunch of other things. More is better for me.” Jerry considered MPC “dumbed down” and
mentioned that since he was due for a prostate exam, he already conducted basic research and considered himself an “informed consumer.”

**Not motivational.** Because MPC did not provide what patients deemed as actionable information, there was little motivation to use the system. Isabella remembered, “When I was searching for information, it wasn’t there.” Nancy said, “This is not motivating. Maybe if it gave me examples, like go for a walk or have an apple with lunch.” Marina mentioned, “I want to feel motivated to use it. Not just to see my results, but what other information can I use to benefit me or my family?” Last year she complained about headaches and wanted that information included on MPC. A few patients mentioned the section on flu shots. Alyson said, “I’m someone who’s never gotten the flu shot and I don’t know if this would persuade me. I’m not sure if it’s motivational. It’s a suggestion.” Similarly, Betsy admitted that the last time she received a flu shot was in the seventh grade. She thought the content on MPC was “generic” and not particularly motivating, but mentioned, “I am here today because I’ve been told by my daughter’s baby’s pediatrician that I need to get a flu shot.” Utilizing MPC to gain Betsy’s attention about the importance of a flu shot as a grandmother would make the website instrumental in providing information that patients can use.

**Provider presence needed.** Information on MPC may seem more motivation and credible if it contained a stronger sense of the provider’s identity. The very presence of a provider is comforting to patients. As a nurse described, “We’ve got patients that as soon as they see you, they calm down. They just feel better when they see you (the provider).” This sentiment was confirmed by patients who wanted MPC to serve as a vehicle that
delivered information directly from their provider. After interacting with MPC, Muriel exclaimed, “I want to reach out and talk to someone.” Further, the use generic images of doctors from stock photography add to the depersonalization of the website. After patients read content that did not feel as if it was from their own physician, viewing an image of an unfamiliar doctor did not provide any reassurance.

For some patients, MPC did not seem like a viable option because they saw numerous physicians each time they visited the office and did not have a solid relationship with one doctor. Harriet was concerned about the quality of information she received on MPC because as she said, “I see all different doctors every time I come in. I don’t have that relationship. So they don’t know me well and I don’t know them well.” Although most patients wanted to get information directly from their provider, several patients were also sensitive to burdening the provider. Kathy suspected, “I could only imagine the thousands of patients they have. Making it personalized for everybody, it’s going to be a hard thing to do.” Yegor stated, “You don’t want to call the doctor and bother them.”

**Lack of access.** Providers also wanted to be able to engage with patients through MPC more deeply. A nurse said, “We’re limited. I can’t go in and look at my patient’s information.” A doctor thought it would be beneficial to have greater access and stated, “I think it would be nice if there was a way for us to tell how often they’re on MPC and what they looked at. From a physician standpoint, you can say, ‘hey, I noticed you were looking at these things.’” Additionally, not everything from a patient’s record was accessible on MPC. Nurses often received calls to retrieve patient’s immunization and
were unsure why that type of useful information was not available to patients through MPC.

In sum, patients were not receiving what they regarded as personalized and actionable information. They wanted to receive vetted content from their provider. Content currently on MPC is comparable to what could easily be accessed on commercial websites. Therefore, patients have little motivation to use MPC and after an initial trial, they withdrew from active engagement with the system.

**Arduousness Constrains Involvement**

Aside from the content provided on MPC, patients and providers disengaged from actively using MPC because it was considered difficult to use and riddled with errors. Harriet recalled, “It was a little bit unfriendly. Especially for me since I’m not a techie person.” After Ahmad logged-in, he was unsure of where to go and what to do, so he, “Just stopped using it.”

**Website confusion.** The use of two separate portals was a constant source of frustration, resulting in patients not wanting to use either system. In addition to not knowing which website to use, some patients rarely logged-in to the system and were unaware that communication was attempted by their provider. Alyson remembered, “When I’ve logged in to do that, I’ve found out that I had other messages waiting for me I didn’t know were there.” Many patients could have used the information on MPC, but never bothered to navigate deeper into the website. For instance, Lucy wasn’t sure if she needed a tetanus shot and Kathy wanted to know if a colonoscopy was appropriate.
Errors lead to distrust. Discovering errors caused patients to question whether the website was trustworthy. Pearl used MPC often, but encountered too many problems. She said, “The thing that makes me most angry is when you send me a message saying your lab results are here. Press this. And I press it and nothing. I can’t get them.” Although Pearl does see the benefits of MPC, her recent experiences have altered her perceptions. She continued, “It has been uniformly awful! If this was supposed to be an interactive process, it fails miserably.” Interestingly, providers who were also patients at the practice came across errors which made them question the authenticity of the message. A nurse remembered, “I went on my own MPC this morning just to look at it because I just had labs done, and the nurse’s message was in triplicate.”

Interpretation is a roadblock. The use of medical terminology and listing numbers without explanation caused many patients to abandon MPC. Aaron wanted MPC to use “layman’s terms” and to “communicate on a more personal level since some of us are not as educated.” Even when information seemed straightforward, patients were unable to clearly convey its meaning. This was especially true with the blood-sugar example, which left many patients dumbfounded. Although the reading used an easy identifiable icon, it generated even more confusion. Milton agonized over the meaning of “marginal.” He said:

My goal is to be less than 126 and I’m 100, so therefore, one would think I would get a little smiley face or something. I’d be left perplexed as to why does it say marginal when in fact I’m below my goal. Unless my goal was inappropriately set? Why’s it grading me marginal when I know from general knowledge that 100 is ok? That is strange.
Howard scrutinized the blood-sugar reading and although he was not confident that he fully understood it, he asked, “And then, so what? I can’t fix my blood sugar from this screen.” The lack of consistent icons did not help patients interpret data. In one set of results, green, red and orange icons were used to indicate whether a patient’s readings were acceptable, missing or if there were additional questions. Another set of data uses different icons, which were less intuitive.

Overall, the inability to identify the function of each portal, finding inaccuracies and not being able to confidently interpret the information presented led to disillusionment among patients. The next section addresses the fourth research question by analyzing the content on MPC.

**RQ5: How can MPC advance as a health communication tool?**

Both patients and providers were eager to offer suggestions as to how MPC could become a frequently used health tool. The majority of responses involved increased personalization and interactivity.

**Personalization Suggestions**

Most patients were not impressed with the current level of personalization on MPC. Although the website incorporates recent exams and demographics, it does not take into account other important aspects of a patient’s lifestyle. Presently, there are numerous innovations which allow patients to track and monitor their health at home. Several patients, including Stephen, would like MPC to synchronize with these new products to offer in-depth recommendations. He commented:

The new iPhone for example. If I agreed to tie in my data to this so you have that and it monitors your blood pressure every morning for the next 20 days or tracks
your weight… I don’t expect my doctor to pay attention to my numbers every day but if there was something that would catch medical professionals’ attention to be flagged and brought to his or the nurse’s attention…then I feel like it’s about me. It’s not about my age or something broader. It’s about me.

Stephen also uses Nike Plus and suggested that its information be incorporated. He imagined a scenario in which his physician utilized Nike Plus with MPC to analyze his health:

We noticed your average run length has dropped off… We also looked at your calendar and noticed you’ve taken 19 airplane rides is 45 days which tells us you’re on the go… How are you feeling? Are you stressed?

Similarly, Milton recently purchased Fitbit, a fitness tracker bracelet, and syncs it with his computer every day to understand how long he slept, how much food he has eaten and the number of calories burned. He said, “What would be neat is if this software (MPC) would sync with this software (Fitbit). Fitbit obviously doesn’t have your medical history.”

While the popularity of fitness trackers continues to rise, owning a smartphone is nearly universal. Many patients inquired about the development of a MPC smartphone application. Lorenzo would use MPC more if he could easily access it on his smartphone. He has difficulty using MPC on his phone with the way that it is currently designed. He said, “A website like this, with a lot of stuff on the screen becomes a challenge.”

In addition to new technology, patients thought the level of personalization could be increased by knowing more about a patient’s everyday life. Nikki thought the quit smoking section would be more motivational if it included how second-hand smoke affected pets. She said, “There are some studies that show that your pets can be affected. People are crazy about their pets. The worst thing you could do is say, you shouldn’t
smoke.” Other patients would like MPC to consider their favorite foods, exercise habits and location when offering medical advice or recommendations.

Suggestions for increased personalization also included the ability for caregivers to access MPC for their family member. Rachel thought it would be beneficial to access family members’ medications. Lucy normally escorts her mother to the doctor, but was unable to attend the last examination. If she was able to access her mother’s MPC, she thinks, “It would’ve made life much easier.” Kathy plans to bring her children to the Herndon office eventually and would like to be able to manage their accounts. She asked, “Can you have like a head patient? The schools have a Blackboard that I can click on all of my kids to see what’s going on. I’m wondering if something similar could happen here, so I don’t have to log in, log out.” Conversely, providers recommended that children under 18 be able to get their own account so that they can begin managing their health at an early age. Currently, the system requires that a parent sign-up on behalf of their child.

Related to personalization, providers saw the need to include additional languages other than English. A nurse commented, “Yes [our patients] can speak English, but it’s not their first language. It would be great to have that information in Spanish, Chinese, Vietnamese, Mandarin, Cantonese and probably Arabic too.” Another nurse referenced the demographics of other medical offices using MPC and cautioned, “Our patients are not representative of [other centers]. It’s a completely different culture. It would have to be visualized since [MPC] is not super generalizable.
**Interactivity Suggestions**

The majority of patients had ceased using MPC, but Marina said, “I’ll check it if it’s interactive.” She also suggested having a feature in which “you can click on a word and a pop-up comes up that tells you easily what that word meant.” A number of patients were unsure whether information from MPC could be sent directly to email. Alyson offered, “If there were some way to have it forward to your email to say, go check your website, you have a message. That would be helpful.” Kathy wondered, “Will I get reminders? It would be a good idea to say, she’s due for a colonoscopy. Don’t forget, so it’s pestering me every month until I do it.”

Other patients wanted the ability to update MPC’s information and use the system as a health tracker. Milton does not visit the doctor more than once a year, but he takes his blood-pressure at home. He said, “I could track from one year to the next and input my own blood-pressure.” Like Milton, Nikki seldom visits the physician, but does take her blood-pressure regularly. She mentioned, “I do my [blood-pressure] on the same monitor all the time to try and minimize variation and error.” If she was able to update her recordings in MPC, the provider can view monthly or annual trends looking for areas of concern.

Since patients were sensitive to the time demands of providers, a number of suggestions incorporated ways of avoiding over-burdening providers while increasing interactivity. A possible solution for many patients was the creation of a message board. Leonard suggested, “A good idea might be a forum where people can pose questions. I’m sure people aren’t expecting an instant answer from the doctor, but if it’s an easy question, they could put the answer up on the forum.” Other patients were open to the
idea of hyper-interactivity. Marina offered, “It would be wonderful to have someone there, like how someone pops up on airlines where you can chat with somebody.” A virtual representation of a provider was welcomed by the majority of patients. Rachel thought the technology would deliver “a kick in the butt” due to its personalization. She thought communication would be more direct and clear because “there’s no way to misunderstand.”

Interestingly, the strongest advocates for increased levels of interactivity were from providers. A doctor mentioned how every physician has “the same spiel”, making it easy to populate MPC with specific directions directly from the provider regarding conditions or treatments. Providers were also open to patients being allowed to interact with MPC because they believed it would make office visits more productive. A nurse thought that reminders of upcoming appointments sent by MPC could help set expectations for the visit. For example, she said, “If a patient knows they’re coming in for wellness and there’s another issue, they should schedule a different appointment for that other issue.” Similarly, detailed communication would notify patients “that a physical doesn’t mean you’re going to get all chronic medications take care of.” Some nurses believed that greater provider access to MPC would benefit patients. For instance, “If we could get a list of the questions [patients] are asking, their visits might not be as long. They might not save it all up for that six month checkup.”

Providers also preferred to prepare for discussions of stigmatized issues with patients. This can be accomplished if providers were made aware of issues before meeting with the patient. Currently, providers are typically unaware of what a patient is
grappling with because “When patients call, the front desk asks what they’re coming in for and it might be a sensitive topic, like STD or depression, and they don’t want to say it.” The doctor suggested:

They can type in, ‘I’m depressed or I think I’m anorexic or I think I might have an STD’, and that would help us prepare for the visit and that way, they might not be so anxious coming to us for sensitive topics.

As previously mentioned, providers were adamant about including a verification system. A doctor offered the solution of “A box that [patients] check. I reviewed this. If there was a way to prove that they looked at [the information] and acknowledged it, I wouldn’t have to follow up.” This feature would be significant because currently, “Medical legally, you don’t know if the patient saw it. You can’t say, ‘well I sent it to you on the portal.’” A resident would use the portal much more often with this feature. He said, “I think the uptake would be much higher if I felt confident saying this is my default and you have to click this button.” Although there were concerns from other physicians that patients may not still fully understand the information on MPC, a doctor said, “I don’t think it would be worse that what we’re currently doing.”

Lastly, providers had many ideas to better promote MPC, so that patients used the system more often. A nurse said, “I don’t understand why they don’t set up something in the waiting room with a computer that has a video playing on what MPC is.” Another proposed, “Have a commercial on the television. The TV’s are always on CNN and ESPN, but every 15 minutes, it could play a five minute video asking if they have signed up for MPC.” Other nurses remembered that iPads were frequently used for patient
surveys and suggested distributing them to patients in the waiting room to help facilitate signing up and describing the benefits of MPC.
CHAPTER FIVE: DISCUSSION

Now more than ever, is the ideal time for online health portals to emerge as trusted, reliable and comprehensive sources of medical information and recommendations. Online health portals must go beyond simply leveraging patients’ medical history and demographics and instead create a dynamic environment that delivers an interactive and personalized experience. Compared to most online health portals, MPC is much more effective in tailoring content specific to patients’ needs. However, judged against other emerging health technology, MPC does not offer an immersive, personalized experience. By strengthening MPC to be equivalent or even to surpass commercial offerings, there is opportunity to build a system that contributes to relationship building by continuing communication outside of office visits. A system that patients rely upon before, after and in-between appointments would make providers the central hub for all things medically related to patients’ lives. Providers would not just be relied upon for annual visits, but they would in essence, be communicating with patients on a frequent basis. No commercial entity has the capability to include patients’ lab results, family history and other details directly observed by the provider.

Overall, findings from the current study revealed that the health portal, MyPreventiveCare.com, provides helpful information to both patients and providers, but has the capability to generate much greater impact and to become a more dependable
source for health support, guidance and education with refinements. Leveraging the positive aspects of the system, as described by patients and providers, and minimizing the negative aspects of the system illustrated by the negative critical incidents identified should contribute to system modifications.

**Hyper-personalization.** Narratives collected mainly suggested that health information content presented on the portal does not come across as truly personalized. Moreover, patients desire information directly from their provider and want aspects of their lifestyle considered. For MPC to be a tool that patients can rely upon, it must function in the same manner as if a patient is communicating with their provider. Meaning, if advice about blood-pressure is given, the provider, or the OHP, must also know significant characteristics of the patient’s life to provide worthwhile advice. Furthermore, information does not always have to be communicated via text. There is available technology to allow for video demonstrations, animations and illustrations that may help minimize health literacy issues. This was exemplified by a study that presented information directly from the provider in a non-traditional way through educational videos about diet and exercise. Physicians disclosed information about their personal lives about healthy behaviors, which helped motivate patients to adopt the same healthy behaviors (Frank, Breyan, & Elon, 2000). Another example used interactive videos to inform patients about elective back surgery. Participation in the program helped to facilitate decision-making and informed consent (Deyo et al., 2000). Imbedding short video clips in websites is not difficult and can be tailored based on a patient’s situation.
Furthermore, they may be effective in discussing such issues as treatment options, patient testimonials or benefits of preventive care.

**Artificial intelligence.** Beyond video, making MPC a more robust, personalized, and relationally-competent portal can be designed with the use of artificial intelligence. The technology has already proven effective in minimizing fear, improving training and promoting healthy habits. An example of this technology, avatars, can physically represent the provider and supply very high levels of immediacy, by including interaction, personalization and engagement. This type of technology can transform MPC into patients’ personalized health assistants. They could incorporate motivational interviewing, so that patients are partners in decision-making.

**Improve user experience.** Before any ambitious improvements are made, users need to be able to easily access MPC. Password issues and incorrect data have to be corrected for users to trust the website and value its recommendations. Currently, reports with mistakes and an arduous log-in process acts as a barrier to entry. Once patients do enter the website, there are simple ways of increasing personalization and overall immediacy. First, the patient’s name should appear upon log-in. The patient’s name can also appear before recommendations, to reinforce that the website is indeed customized. Also, instead of stock photography, images of patients’ providers should be used.

Enhancements should also be considered for providers. They are required to use the system, but it is more of a chore than an advantageous activity. Allowing providers more access could improve patient-provider communication and make office visits more efficient. While some fear information overload or constant communication, patients are
already sympathetic to providers’ busy schedules. Lastly, if improvements are made, patients need to be educated about the system and its capabilities in a thorough manner. Designing a diffusion program to demonstrate the advantages of the new system, as well as how it functions could lead to greater adoption and increase prolonged use.

In summary, by upgrading its technology to become a more patient-centered, interactive health communication tool, MyPreventiveCare.com could set itself apart from competitive portals, commercial and governmental websites. More importantly, a website in which patients and providers can easily interact and receive information customized to their lifestyle could become much more than just a website; it could become a resource that fully engages users and contributes to healthier lives.

Outcomes of the current study reinforce and extend various aspects of the theoretical framework. In addition, results also have implications for MyPreventiveCare.com and the medical offices that employ the technology.

**Theoretical Implications**

*DoI & TAM.* Generally, MPC users appreciated its capabilities and liked how easily they could access information. Nonetheless, operating the website proved challenging and has become a barrier of prolonged use. Therefore, Rogers (2003) five perceived attributes of an innovation (relative advantage, compatibility, complexity, trialability, and observability) must be considered. The simple act of identifying the proper website or even logging-in was deemed complex to a large percentage of users. At times, while discussing MPC, providers confused it with the office website and began offering suggestions for improvements to features only found on the office website.
Since sorting out which website to use was strenuous; instead, patients turned to alternatives, like other health portals or Internet searches. Comparably, MPC does not establish itself as having high relative advantage over alternative means of information, such as WebMD. Due to difficulties accessing the website, MPC was perceived as incompatible, because users wanted a quick and easy tool for medical guidance. In particular, patients were accustomed to using their smartphones to access information and since so many patients have active lives, utilizing MPC by traditional means was not prioritized.

Like patients, providers were aware of the redeeming qualities of MPC, but because it generated more work and hampered the communication process, MPC was largely regarded as ineffective. Providers used MPC because it was required of their organizational environment. It was not a surprise that their perfunctory use of the system caused frustration, because providers were not confident patients were utilizing the information uploaded, resulting in repeated instructions and persistent follow-up calls. Providers seemed to appreciate MPC’s relative advantage over government, commercial websites and other portals, compared to patients. In addition, since they used MPC frequently, they experienced less complexity from the system. Still, making MPC beneficial for patients would in turn make it more valuable for providers.

As demonstrated by patients and providers, there is affinity between DoI’s attributes of innovation and the two main constructs of the technology acceptance model, perceived usefulness and perceived ease of use. As previously stated by Lee, Hsieh and Hsu (2011), PU aligns with relative advantage while PEOU resembles complexity and
compatibility. The development of TAM2, which includes social and cognitive factors, improves the scope of PU and PEOU. However, perhaps additional factors such as experience levels, digital literacy and health literacy are also relevant. For many patients, the system was either considered very easy to use and interpret or extremely difficult depending on whether they understood the content presented. Also, patients familiar with using secure websites found MPC much easier to use than patients who do not frequently interact with password protected websites.

The absence of clear, favorable attributes affected users when they experienced MPC for the first time. For instance, many patients were unable to log-in or had to go through a lengthy process to enter the portal. Because perceived ease of use was more difficult than expected, most patients were unable to move beyond the very first stage of the innovation-decision process. Among patients who were able to advance, perceived usefulness was low because it was not clear MPC was beneficial, since most patients did not feel like the website was personalized to their needs. Including greater personalization would make MPC relevant, therefore persuading patients to use the portal more often, moving it towards becoming an integral part of their lives.

Several patients used emerging technologies, like mobile apps, and found their operation simple and useful. This was largely because new technologies make the user experience easy and intuitive, through voice commands and the ability to touch the screen. Although most of the participants in the study were not extremely tech-savvy, incorporating technological features that uncomplicated the process of using the system would be welcomed.
Lastly, many of the issues presented in this paper are organizational. Diffusion of Innovations theory primarily deals with individual-focused adoption. Greater emphasis can be placed on addressing organizational issues to reduce adoption barriers and create a more welcoming environment for implementation and dissemination.

**RHCCM.** It is now commonplace for patients to seek information from a variety of sources, like providers, family members and the Internet. The difference between commercial and government health websites and an online health portal like MPC is that the OHP is built specifically for patients of a particular practice. Medical information found on MPC is customized for the specific patient who logged-in. Information comes from the provider, albeit indirectly, but often has the same influence as receiving direction directly from the provider and should be considered a new component that affects other medical relationships. For instance, patients are increasingly sharing information with physicians found on the Internet. Patients expect their physician to discuss, explain and offer professional opinions (Bowes, Stevenson, Ahluwalia, & Murray, 2012). If there is disagreement among the information presented to providers, there is opportunity for discussion and to hear the provider’s view. However, information from an online health portal can serve as a proxy for the discussion with the provider. If information or recommendations are unclear or contradictory, it equates to overall low communication competency.

The previously described scenario was fairly common for both patients and providers. Providers claimed that MPC reinforced one-way communication, in which there was not a constant dialog between patient and provider. The uncertainty
manufactured opportunities for communication gaps to occur. Additionally, verbiage used by physicians and the presence of complicated medical terminology also contributed to patients discounting the information from MPC and thereby, halted communication with their provider. There were also instances of patients having difficulties interpreting data and directions from MPC. Some patients could not remember directions from the provider and used MPC to retrieve the instructions. If patients were unable to find the instructions or were not capable of grasping information about a diagnosis or exam, the communication process became compromised and ineffective. This was particularly true for many of the links to outside websites found on MPC. Many times, the link took users to a new website with different subject matter from the content on MPC. For example, if a patient reviewing information about high blood pressure clicked on the link, “learn more about blood pressure testing and measurement”, the expectation is that the new webpage would contain information specific to testing and measurement. However, the current link on MPC takes the user to the American Heart Association homepage, creating a disconnect that disrupts the patient’s information search. In addition, only four internal and external webpages had acceptable CDC Clear Communication Index scores.

**Self-efficacy.** Providers stated that MPC helped to empower patients to make decisions. Unfortunately, that finding was not as common among patients. Most patients found MPC full of information, but did not find it relevant to their situation and were unsure what to do next. A common theme throughout interviews was the patient response, “now what?” MPC provided just enough information to make patients aware of a condition, but the lack of meaningful personalization stifled patients’ abilities to take
action. Also, many patients were already experts of their condition and found the information on MPC rudimentary.

Practically all of Bandura’s (1977) four factors that contribute to self-efficacy were missing. On the positive side, MPC used encouraging language and symbols, praising patients when they exhibited healthy behavior. For instance, a green checkmark appeared when patients maintained a healthy weight. The next step stated, “Continue to maintain a healthy weight”, which reinforces the successful behavior. However, there is ample opportunity to increase self-efficacy by providing more specific feedback and celebrating successes with more than a checkmark. Similarly, MPC’s use of language can be more motivational to help patients respond to physiological factors. The blood pressure page states, “Uncontrolled high blood pressure can cause serious health problems.” Text on the mammogram page reads, “Something does not make sense. Your records show that you do not know if you have had an abnormal mammogram and that you have never had a mammogram. This cannot be correct.” This type of language helps to produce urgency and alert the patient that they need to take action. Conversely, many providers input medical jargon and complicated medical terminology, which can heighten patient nervousness and stress. Despite using possessive pronouns and the active voice, with words like “you” and “your”, the majority of language on MPC is emotionless. The inclusion of sensitively written recommendations that considers patients’ sources of stress can improve the way in which patients respond.

Another of Bandura’s factors, modeling, hardly occurred on MPC. While there is photography associated with each condition or preventive exam, they do not serve as
motivational vehicles for health behaviors. For instance, the “get tested for diabetes” page features a blood-sugar monitor and the “get a tetanus shot” page has an image of a needle. In addition, patients may not identify with certain images displayed. A patient may view the couple on the “colon cancer testing” page and think that the picture displays people who appear much older, therefore causing the patient to equate getting tested for colon cancer as something not yet relevant. Utilizing testimonials, identifiable or pertinent images demonstrating specific behaviors would help to raise self-efficacy. MPC does not have any way of interacting with providers or fellow patients experiencing the same concerns, thereby making social persuasion nonexistent.

Since self-efficacy is a central construct of social cognitive theory, which focuses on how people learn behaviors, information found on MPC should serve as a means of not only helping patients understand, but assist in facilitating the performance of the behavior. The previously discussed nutrition and diabetes websites in the literature review were designed to promote behavioral change. The diabetes website tailored information to address individuals’ self-efficacy to improve self-care behaviors. It is not enough for MPC to simply provide information to raise awareness. Instead, using personal information from the patient questionnaire, content on MPC can be specifically designed to motivate patients and help them practice healthy behaviors.

**Practical Implications**

**Immediacy.** Factors such as the Patient Protection and Affordable Care Act will increase the utilization of online health portals, like MPC. Moreover, the trend of providers spending less time with patients does not appear to be slowing. Patients are
already leveraging information found online, with 72% of Internet users reporting that they have looked for health information (Fox & Duggan, 2013). Most Internet users (77%) begin using a search engine, like Google, while 13% seek out a specialized health website, like WebMD (Fox & Duggan, 2013). This process typically results in patients receiving health information designed for the masses; not based on their specific lifestyle, family history or recent medical events. Even with the incorporation of patients’ medical history and demographics, MyPreventiveCare.com is not much different than the typical government or commercial health website. The website is comprised of static text, stock photography and standardized information that lacks true personalization. In sum, MPC lacks features of immediacy. To promote physical and emotional closeness, MPC needs to bolster its levels of personalization, clarity, engagement, interactivity, approachability and the capacity for users to perform actions.

Since immediacy is a concept derived from instructional learning, MPC would benefit by positioning itself as a learning tool to actively move patients through the preventive care process. It currently does an adequate job of providing general awareness information, but is ineffective at motivating patients to act in the best interested of their health. An environment that enables patients to ask questions and receive instant feedback opens the communication process between patients and providers. In addition, an interactive environment helps patients understand how their lifestyle affects health, fostering the capability to become a vital health tool that increases self-efficacy. In regards to health literacy, a key aspect for improvement is active listening. If patients are able to feel as if MPC listens to their needs and addresses their concerns, they are likely
to become more engaged. In addition, an improved OHP would lessen the focus on text and provide more visuals and demonstrations.

A more immediate online environment would also take pressure off of the medical staff by having a reliable system that they can be confident is providing valuable information. Currently, a few providers commented that MPC helped facilitate more productive office visits by prepping patients in advance. Visits can become even more efficient and constructive if patients have a resource that provides useful information before and after appointments.

**Patient-provider communication.** The second most cited negative incident among patients was MPC’s inability for the provider’s voice to be distinguished. Patients wanted to feel as if the information on MPC was coming directly from their provider. Currently leveraging demographic information and medical history is not having enough of an impact for patients to feel like the content is personalized. In fact, basing content on patient characteristics only serves to reinforce the biomedical model of medicine where patients are not much more than what their symptoms determine.

To have a more patient-centered system, MPC must include Mead and Bower’s (2002) four key dimensions. First, adding a biopsychosocial perspective would address the complications that patients must endure along with treatment recommendations. For instance, language can be included to address John’s back pain, which affected his exercise and nutrition habits. MPC should be able to empathize with busy moms like Tatiana, who made a point to log-in once her kids were asleep. More generally, MPC can factor in the stress and worry that most patients experience with certain examinations.
Increased levels of personalization would make patients feel as if the content presented was exclusively designed for them. This aligns with the second dimension of patient-centeredness, patient-as-person. MPC must overcome the sentiment that the system is “some code that says you’re this old,” as Zachary stated. This can be accomplished by demonstrating that MPC understands how a specific condition affects the patient. For example, Nikki, a frequent swimmer, was concerned about her blood-pressure and did not know how swimming affected it. Addressing a key component of Nikki’s lifestyle, swimming, has the ability to make her feel as if MPC is truly customized. Similarly, mentioning Stephen’s running routine or including statistics from Fitbit and analyzing how behavior may contribute to improved health would fulfill patients’ expectations of a personalized system.

As providers mentioned, MPC currently provides asynchronous, one-way communication. Lack of interactivity has diminished the third dimension of patient-centeredness, sharing power and responsibility. MPC simply provides information, but most of the time, providers are unsure whether that information actually reaches the patient. If it does, patients are unable to take immediate actions. Rationales were provided as to how recommendations pertain to risks and rewards of certain medical treatments, but MPC has a very patriarchal disposition. Instead of the patient and provider coming together to make a mutual decision, MPC is dictating what behaviors should occur. Including more interaction so that patients feel as if they are part of the decision-making process could motivate them to follow through with preventive examinations and other treatments.
Joint decision-making through interaction contributes to a therapeutic alliance, the fourth dimension, in which providers and patients can freely express themselves. Sometimes, patients have the desire to simply be heard. Allowing patients an outlet can position MPC, as well as providers, as a social support resource. Increasing levels of social support may motivate a patient like Ahmad who suffers from Lyme disease, to better understand how the shingles vaccine would interact with his current medications. The ability to express that concern and have a provider respond creates a bond between patient and provider that can facilitate joint decision-making.

The last dimension, doctor-as-person, can be addressed if the providers’ presence is better represented within MPC. Although providers can write notes to patients, the majority of content on MPC has a general tone and is clearly not directly from the patient’s specific provider. Just like during face-to-face interactions, the provider’s non-verbal behavior can influence patient responses. In MPC, the way content is presented, the way in which it is written, language used and images displayed all contribute to how patients respond. Greater emphasis needs to be placed on including appropriate levels of bedside-manner with authoritative recommendations.

**Limitations**

There were several limitations to this study. First, the sample size lacked diversity. The towns of Fair Oaks and Herndon are relatively affluent and highly educated sections of Fairfax, Virginia. Although the sample included participants of various ethnicities and socioeconomic classes, it would have been beneficial to have greater representation of people from a broader variety of backgrounds. In addition, the
majority of participants were middle-age and older, which accurately represents the Fair Oaks and Herndon regions, but younger participants with a wider knowledge of technology may have offered different perspectives and produced additional recommendations.

Another limitation included the lack of comparisons across other health care information systems, or health care delivery systems. Some participants mentioned how they use other online health portals provided through their employer or insurance company. Contrasting the differences between systems may have illuminated the various ways that systems are used depending on the context.

A final limitation involved the scoring system outlined by the CDC Clear Communication Index. Several categories were left to interpretation since the Index did not explicitly state the nuances found when reviewing the website. For instance, several webpages stated a main point or overall recommendation, but it was necessary to click to another page to see more detailed information. This type of scenario was not addressed in the guidelines. In addition, the Index does not address the quality of information provided. If recommendations were present, even if they were not overly detailed, a positive score was given.

**Direction for Future Studies**

Future research should focus on analyzing the content, design and usability of MPC. In addition, research should be conducted to analyze how patients use MPC’s content to determine whether it is a factor influencing health behavior. The current assessment can serve as the first phase of the refinement process. Next, data should be
collected to establish a baseline of portal activity, perceptions of the communication process, patient-centeredness levels and health outcomes, such as preventive care examinations undergone. Once system refinements are implemented and a diffusion program is conducted, users should be surveyed about their use of the new system, measuring the same variables as the original survey. Therefore, the two data sets can be compared to determine whether refinements impacted the online health portal with enhanced immediacy through personalization, interactivity, engagement, approachability, clarity and the ability to take action.
CHAPTER SIX: CONCLUSION

This study evaluated an online health portal, MyPreventiveCare.com, to determine whether it is considered a valuable health communication tool. Through interviews and focus groups, over 140 incidents were cited, of which the majority were negative. Both patients and providers found that MPC fell short of enabling users to effectively use the system to communicate important health messages and motivate patients to take preventive care measures. Results of a thematic analysis of MPC corroborated many of the issues that patients and providers encountered. In addition to errors, MPC lacked features of personalization and interactivity. Moreover, information on the portal was not very engaging or approachable, nor did it allow users to take immediate actions.

Although MPC contains flaws, increasing its levels of immediacy can have a substantial impact. The inclusion of an easy log-in process, simplified language and relevant photos would improve the website’s ease of use and personalization. More sophisticated measures can be taken, like the use of artificial intelligence in the form of videos or avatars, to enhance interactivity and engagement.

Communicatively competent health information systems can transform the way patients receive care and communicate with providers. In a world of smartphones, 3D
gaming and gadgets with voice recognition; it is time to elevate an online health portal, like MyPreventiveCare.com, into the 21st century.
APPENDIX A: INTERVIEW QUESTIONNAIRE

1. Have you ever used the mypreventativecare.com portal? Yes, No (if yes go to question 2; if no, ask: Why haven’t you used the mypreventativecare.com portal and what could be done to encourage you to use the site?)
2. Describe your best experience using the mypreventativecare.com portal. (probe for details)
3. Describe your worst experience using the mypreventativecare.com portal. (probe for details)
4. What factors would make you come back to the portal and use it more than once?
   a. How easy or difficult it was to understand the information on the portal? (probe for details)
   b. Did the information you got from the portal lead you to make an appointment for further tests or to talk to your doctor? (probe for details)

[Participants will be shown an examplary version of the patient portal on a computer screen for the next set of questions].

5. Do you find this information helpful? Why or why not? How can it be changed so that it is easier to understand and more helpful for you?
6. Describe what you would do next if you received information such as this reminding you that you need preventive services (e.g. annual physical, flu vaccine, pneumonia vaccine, mammogram, PAP smear, etc.).
   a. What is your response to reading the following sections?
      i. The Basics
      ii. Benefits
      iii. What do the numbers mean?
      iv. What should you do next?
      v. More information
7. What could be changed to make you more likely to schedule a preventive service appointment?
8. How would you expect your health care provider to be involved, if at all, with the information presented about preventive services?
9. What type of information would you want to share with your doctor through the patient portal?

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APPENDIX B: FOCUS GROUP MODERATOR GUIDE

1. Describe a positive experience you have had with mypreventitivecare.com.

2. Describe a negative experience you have had with mypreventitivecare.com.

3. Describe an instance when the patient portal may have improved health care.

4. Describe an instance when the patient portal may have worsened health care.

5. Describe an instance when the patient portal may have improved communication with patients.

6. Describe an instance when the patient portal may have worsened communication with patients.

7. How could you use information provided on the portal in caring for patients?

8. What other information could be provided on the portal that would be helpful for patients? Why?

9. Do you think the current content on the portal is effective? Why or why not?
APPENDIX C: CDC CLEAR COMMUNICATION INDEX SCORE SHEET

CDC Clear Communication Index scoring material:

Using the Score Sheet
The Index has a total of 20 items in 4 parts. These 20 items are presented as questions.

- Questions 1-11 in Part A apply to all materials.
- Questions 12-20 in Parts B, C, and D may not apply to all materials.
- Choose one answer for each item you score.
- Only score a point when all instances of an item in the material meet the criteria.

More detailed descriptions and examples of each item can be found in the User Guide.

Part A: Core
The items in this section (1-11) apply to all materials.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Score (Check one per question)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the material contain one main message statement?</td>
<td></td>
</tr>
<tr>
<td>□ Yes = 1</td>
<td>□ No = 0</td>
</tr>
<tr>
<td>2. Is the main message at the top, beginning, or front of the material?</td>
<td></td>
</tr>
<tr>
<td>□ Yes = 1</td>
<td>□ No = 0</td>
</tr>
<tr>
<td>3. Is the main message emphasized with visual cues?</td>
<td></td>
</tr>
<tr>
<td>□ Yes = 1</td>
<td>□ No = 0</td>
</tr>
<tr>
<td>4. Does the material contain at least one visual that conveys or supports the main message?</td>
<td></td>
</tr>
<tr>
<td>□ Yes = 1</td>
<td>□ No = 0</td>
</tr>
<tr>
<td>5. Does the material include one or more calls to action for the primary audience?</td>
<td></td>
</tr>
<tr>
<td>□ Yes = 1</td>
<td>□ No = 0</td>
</tr>
</tbody>
</table>
**Language**

6. Do both the main message and the call to action use the active voice?
   If only the main message or only the call to action uses the active voice, answer no.
   If you answered no to #1 or #5, answer no. (User Guide page 13)

7. Does the material always use words the primary audience uses?
   If all specialized or unfamiliar terms are explained or described (not just defined)
   the first time they are used, answer yes. Acronyms and abbreviations must be
   spelled out and explained if unfamiliar to the audience. (User Guide page 12)

**Information Design**

8. Does the material use bulleted or numbered lists?
   If the material contains a list with more than 7 items, and the list is not broken up
   into sub-lists, answer no. If the list is for additional information or references
   only or at the end of the material, answer no. (User Guide page 14)

9. Is the material organized in chunks with headings?
   This term applies to prose text lists. If the chunks contain more than one idea
   each, answer yes. If the headings don't match the information chunks, answer no.
   (User Guide page 15)

10. Is the most important information the primary audience needs summarized
    in the first paragraph or section?
    The most important information must include the main message. A section is a
    block of text between headings. For a Web material, the first section must be fully
    visible without scrolling. (User Guide page 17)

**State of the Science**

11. Does the material explain what authoritative sources, such as subject
    matter experts and agency spokespersons, know and don't know about
    the topic?
    If the material addresses both, answer yes. If the material addresses only one (who
    is known or not known) answer no. (User Guide page 18)

| Part A score | Total _0_ / 11 |

**Part B: Behavioral Recommendations**

Answer this question to determine if items 12-14 apply to the material.

Does the material include one or more behavioral recommendations for the primary audience?

- If yes - score items 12-14.
- If no - skip to Part C.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Score (Check one per question)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Does the material include one or more behavioral recommendations for the primary audience?</td>
<td></td>
</tr>
<tr>
<td>13. Does the material explain why the behavioral recommendation(s) is important to the primary audience?</td>
<td></td>
</tr>
<tr>
<td>14. Does the behavioral recommendation(s) include specific directions about how to perform the behavior?</td>
<td></td>
</tr>
</tbody>
</table>

This may include step-by-step directions or a simple description (for example:
Link for email with 100% daily value of folic acid). If the material includes
information about when and how to contact a medical provider or local official,
answer yes. If the material mentions when and how often to perform a behavior,
answer yes. (User Guide page 21)

| Part B score | Total _0_ / 3 |
### Part C: Numbers

Answer this question to determine if items 15-17 apply to the material.

Does the material include one or more numbers related to the topic?

- If yes – score items 15-17.
- If no – skip to Part D.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Score (Check one per question)</th>
</tr>
</thead>
</table>
| 15. Does the material *always* present numbers the primary audience uses?  
*Many audiences find numbers distracting or confusing. Make sure the numbers in the material are both familiar and necessary to support or explain the main message statement. If not, delete them. Whole numbers are used by most audiences. The types of numbers used will vary for each audience.* (User Guide page 22) | □ Yes = 1  
□ No = 0 |
| 16. Does the material *always* explain what the numbers mean?  
*For example, “The amount of meat recommended as part of a healthy meal is 3 to 6 ounces – it will look about the same size as a deck of cards.”* (User Guide page 23) | □ Yes = 1  
□ No = 0 |
| 17. Does the audience have to conduct mathematical calculations?  
*Adding, subtracting, multiplying, and dividing involve calculations. Calculating a common denominator for the purposes of comparison is a mathematical calculation. Use the same denominator, even for absolute risk (example: 1 was of 3), throughout the material so that audiences don’t have to calculate.* (User Guide page 24) | □ Yes = 0  
□ No = 1 |

**NOTE:** for this item, Yes is scored 0 and No is scored 1.

**Part C score**: **Total 0 / 3**
Part D: Risk
Answer this question to determine if items 18-20 apply to the material.

1. Does the material present information, including numbers, about risk?
   - Yes
   - No
   - NA

Questions

18. Does the material explain the nature of the risk?
   - Yes
   - No
   - NA

19. Does the material address both the risks and benefits of the recommended behavior?
   - Yes
   - No
   - NA

20. If the material uses numeric probability to describe risk, is the probability also explained with words or a visual?
   - Yes
   - No
   - NA

Part D score Total 0 / 3

Calculate the Score for the Material

- Step 1: The total points that the material earned (this is the numerator).
  \[ A \cdot B \cdot C \cdot D \cdot E = 0 \]

- Step 2: The total possible points that the material could have earned (this is the denominator).
  \[ A \cdot 11 \cdot B \cdot C \cdot D \cdot E = 11 \]

- Step 3: The numerator divided by the denominator multiplied by 100 to get the total score.
  \[ \frac{0}{11} \times 100 = 0.0 \]

How to Interpret the Score

The purpose of the Index is to improve the clarity of communication products.

If the total score is 90 or above:
Excellent! You have addressed most items that make materials easier to understand and use.

If the total score is 89 or below:
Note which items scored 0 points. Use the descriptions and examples in the User Guide to revise and improve the material. Then apply the Index again to check your work. You can use the Index as many times as you need to revise the material to get a score of 90 or above.
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BIOGRAPHY

Jordan Alpert received his Bachelor of Science degree from the University of Florida in 2003. He went on to receive his Master of Arts in Media, Culture & Communication from New York University in 2012. He then received his Doctorate in Communication from George Mason University in 2015.