Exploring Digital Health Promotion and Education in East Texas: Pathways to Improving Access

Authors:

Kent Willis, PhD
Associate Provost of Institutional Effectiveness and Engagement
The University of Texas Health Science Center at Tyler
11937 US-271
Tyler, TX 75708
Telephone: 903-877-7959
Email: Kent.Willis@uthct.edu

Christina Tuell, EdD
Program Manager
The University of Texas Health Science Center at Tyler
Tyler, TX 75708
Telephone: 903-877-8940
Email: christina.tuell@uthct.edu

Colleen Marzilli, PhD, DNP, MBA, RN
Associate Professor
The University of Texas at Tyler
3900 University Blvd.
Tyler, TX 75799
Telephone: 903-566-7033
Email: cmarzilli@uttyler.edu

ABSTRACT

Purpose: *Technology is an important part of healthcare in the United States. There are opportunities for a better understanding of how technology and digital health can improve health and healthcare. The purpose of this study was to answer two research questions. The first research question was, what is the understanding of digital health in the community? The second research question was, what is the knowledge of digital health in the community. These research questions may inform how health professionals address the issue of electronic health records, digital health, and the implications for technology.* ***Methods:*** *Using a convenience sample, participants were recruited to answer an online survey to identify knowledge and understanding of technology, digital health, and a better understanding of health. Participants were able to opt into or out of the survey. The data was analyzed using Microsoft Excel and evaluated with descriptive statistics.* ***Results:*** *The sample size of 14 is small. Results identified that participants were not fully embracing of health technologies. The data indicated that participants were not fully accepting of technology and digital health.* ***Conclusions:*** *Further research should be conducted to obtain a larger sample size. Healthcare professionals have a responsibility to plan interventions to educate the community about health and health technologies. Qualitative and mixed-method studies can add to*

what is known about health and healthcare technology and digital health resources. ***Recommendations:*** *It is recommended that interventions be targeted to educate the East Texas population about electronic health resources, telehealth/telemedicine, and technologies that can support health.*

Key Words*:* digital health, technology, health promotion, health education, health access

INTRODUCTION

Rapid advances in technology have changed many aspects of the human experience, and health promotion is one area where considerable benefits are possible to improve the status of health and promote healthy lifestyle choices. Technology based health education and promotions have the potential to reach a broader audience while still adapting to the needs of the user. The adaptive responsiveness of technology can improve the efficiency of health education and promotion by delivering the material at a level adequate for understanding and potential behavioral change. Health literacy is an important concept, and there is an increased awareness and focus in current health education and policy on the concept of health literacy. Health literacy gained increased focus in the 2000s with an emphasis on improving health outcomes through understanding the unique needs of patients according to their ability to participate in their healthcare. Mackert, Love, and Whitten (2009) foundationally defined health literacy as "the degree to which individuals can obtain, process, understand, and communicate about health related information needed to make informed health definitions" (p 34). Further, Healthy People 2020 defines health literacy 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" (United States Department of Health and Human Services, 2013). Health literacy is one of the key components of health promotion. The problem is lacking utilization of digital health tools to reach rural and underserved population in the effort for improving outcomes.

The interconnected and far-reaching nature of technology improves the ability to reach more people with important information, guidance, and advice. Technology-based health promotions enhance programs because people are able to be proactive in the effort to become aware and better understand the management of illness and disease. Next, people have access to information whenever and wherever they may need it or desire to have it. This is important because it removes some of the stigma that people may have about the clinical and social services settings which have been the primary location for the delivery of health information prior to the uptick in web-based health information resources. Another positive aspect that technology offers is a level of consistency through the standardization of delivery which means information is delivered the same way each time (Bull, 2010).

The interactive nature of computer-based programs helps deliver effective health messages through the internet that captivate the user and helps them remain attentive. Specifically, users who are more familiar with technology, like those from younger age brackets, are more likely to receive a message in this median as opposed to some of the more traditional formats that have been the primary method of delivering health information in the past. Social media applications have been an important tool to specify and reach target populations (Bull, 2010).

Technology based health promotions are a form of Information Communications Technologies (ICT), which is the encompassing category that includes all technologies for the communication of information (Ortega-Navas, 2017). Technologies include, but are not limited to, computers, tablets, smartphones, smart watches, and broadcasting platforms. The World Health Organization (WHO) (2016) defines health promotions as the process of enabling individuals to increase control over their health, including behaviors, social, and environmental interventions. Health promotions have three key components, (1) good governance for health, (2) health literacy, and (3) healthy cities (WHO, 2016). Digital health is another term used to describe the categories where health and technology overlap; such as, mobile health, health information technology, wearable devices, telehealth, telemedicine and telepsych, and personalized medicine.

Health

Technology exists as a method for enhanced simulation in health education. While some studies have not made conclusive statements about the effectiveness of technology-based simulation on patient outcomes, they have had a marked impact on education programs for health sciences, the connection is clear that more applications are at least moving toward technology as a method to expand opportunities by providing more students with the opportunity to participate in simulation exercises (Free et al., 2013).

Effective health messages are essential in the effort to promote behaviors that are conducive to improving outcomes (Lazard & Mackert, 2015). The traditionally hard-to-reach populations, such as those from rural settings and those with limited access to transportation have benefited from e-health interventions in comparison to results from traditional formats. The ability to adjust for health literacy based on user interactions adds intuitive responses that enhances the user experience. Mobile devices and the use of text messaging and other applications allows the user to have even more access (Mackert et al., 2009).

Technology has become integrated with health through electronic medical records, promotion of health messages, intervention techniques, and medical equipment. Health education has been transformed by technology because it allows users to rapidly gain access to a broad spectrum of tools and information to address their health-related question (Ortega-Navas, 2017). An effective health promotion campaign must utilize the appropriate channel to disperse the message. With the emergence of technology, there are a growing number of channels to reach target populations, and they have become essential to health promotions (Ortega-Navas, 2017).

Technology-based health promotions have been utilized as effective tools to communicate heath messages and health intervention primarily due to the potential to reach larger populations (Bull & McFarlane, 2011). Mobile technology based health promotion activities are proven to be an effective tool for smoking cessation interventions and HIV medication adherence; however, they were not as effective of an intervention tool for other chronic conditions like diabetes and hypertension (Free et al., 2013).

Tobacco prevention and awareness is an area that has seen success in utilizing technology based health promotions as a form of primary prevention. For example, the use of text messaging support as part of cessation therapy has been shown to increase the likelihood of staying abstinent from smoking (Free et al., 2013). Interventions that promote tobacco prevention have also seen success in youth populations for decreasing the intention to engage in the use of nicotine-containing products including cigarettes, e-cigarettes, and vaping products (Khalil et al., 2017). This success seen with technology-based interventions like text message campaigns has not been as widely replicated with other chronic conditions like management of diabetes, coronary artery disease, or stroke. The literature supports text message campaigns as tools to promote smoking cessation, mental health awareness, and other healthy behaviors.

Access Gap

The access to digital technologies is not uniform across the population, factors like income, residence, and race impact access to internet capable devices and usage rates. According to a Pew Research Center survey (2016), about 29% of adults in rural areas own multiple online enabled devices, whereas 40% of urban adults own multiple devices. In addition to being less likely to own multiple devices, rural residents are also less likely than their urban counterparts to use the internet daily (58% and 80% respectively). In fact, whites are more likely to have broadband or own a desktop or laptop than Hispanics and blacks (Pew, 2016). This disparity does not apply to ownership of mobile devices for American born whites, blacks, and Hispanics. While mobile devices like smartphones are bridges in the technological divide, blacks and Hispanics are twice as likely to cancel or terminate services due to cost.

According to a Pew Research Center survey (2018), age, income, educational attainment, and community type are indicators of internet adoption. Households with income above $30,000 a year are more likely to have one or more device that enables them to go online than households below that mark (Pew, 2016). The divide also impacts school aged children in what is being referred to as the “homework gap”. The homework gap is the divide between school aged children who have access to broadband internet at home and those who do not. About 17% of

American homes with school-age children do not have broadband access; a disproportionate amount of those households are lower-income households, specifically black or Hispanic households (Pew, 2015).

In addition to access to internet and internet capable devices, there are gaps in readiness to use technology, or comfort in regular use of technology. Lower income households and adults with lower levels of formal education were more likely to report being unprepared to adopt technology (Pew, 2015). The digital readiness and access of the target population should be considered before adopting, developing, and promoting technology based interventions.

PURPOSE

Digital health exists as an innovative pathway for health promotion, improved access to health information, and expanded health education opportunities. A need exists to explore ways to increase the use of digital health as a mechanism for promotion and education in rural and hard-to-reach populations.

Research Questions

The overarching research questions guiding this study are intended to produce meaningful information that may be useful for professionals in public health, education, social services, and leadership interested in the promotion of healthy lifestyle choices. Two research questions were investigated. First, what is the understanding of digital health in the community? Second, what knowledge exists about digital health in the community?

Theoretical Framework

The theoretical heuristic to underpin this study is the Social Cognitive Theory (SCT). The SCT was developed around the assumption that learning can occur through observing and imitating another person's behavior. Most behavior determinants fall within three over-arching factors, cognitive, environmental, and behavioral. In practice the factors all play a role in affecting behavior change; for example, an individual has to have the knowledge of the health risk and benefit of the action to be preconditioned for change (Bandura, 2004). Additionally, the expected outcomes, like social approval, physical outcomes, and the self evaluation reaction to the behavior (Bandura, 2004). Then the SCT discusses the individual will self-regulate the behavior and it is not solely a personal matter, but the cognitive, environmental, and behavioral factors can impact the change and sustainability of the change (Bandura, 2004). An emerging focus area in environmental factors is technology.

A complimentary model to the SCT for this study is the Unified Theory of Acceptance and Use of Technology (UTAUT), which explores the degrees of acceptance of new technologies. UTAUT uses four key factors and four moderators to predict the intention to use technology and the actual use of technology (Venkatesh, Thong, & Xu, 2016). The factors include performance and effort expectancy, social influence, and facilitating conditions; while the moderators include age, gender, experience, and voluntariness (Venkatesh et al., 2016). Venkatesh, Morris, Davis, and Davis (2003) defines performance expectancy as how an individual believes that using the system helps to improve gains in job performance. Effort expect-ancy is the ease of use of the technology (Venkatesh et al., 2003). Social influence is the perceived importance from others of using the new technology (Venkatesh et al., 2003). Facilitating conditions is the belief that there is existing organizational and technical infra-structure that can support the use of the new technologies (Venkatesh et al., 2003).

METHODS

This quantitative study sought to add important perspective about the positive potential of digital health and technology-based health promotion on health status and outcomes in rural East Texas. Specifically, behind the majestic pines of Northeast Texas is a region with urgent health needs. People are dying at higher rates and many of the causes are from healthcare illnesses and diseases and conditions that could have been prevented. The results of this survey should provide key insight into the importance of education of digital health and digital technology.

Institutional Review Board (IRB) approval was obtained from the University of Texas Health Science Center at Tyler. The researchers complied with all facility procedures for research. The research was deemed by the IRB to be expedited.

Sample

The researchers developed a descriptive survey design for the study about digital health.

The population consisted of the Texas Department of State Health Services (DSHS) designated 35-county region in the Northeast corner of the state as Health Service Region 4/5 North. The majority of the counties that makeup the region are rural in comparison to the rest of the state, and they are less educated and in poorer health. Participants in this study are representatives from community-based health centers who all share a similar mission relating to improving access to care, the development of prevention programs and enhancing relationships between organizations to better meet the needs of constituent groups. The sample consisted of a convenience sample of 14 participants that responded to a request to participate in the survey in the East Texas area. Participants were able to opt into or out of the online survey to provide the data for the quantitative survey. The sample size was smaller than anticipated due to COVID-19, but the decision was made to continue the study with the limited sample size and concerns of power.

Data Collection

The instrument for data collection for this study was an online questionnaire that included demographic questions and questions about digital health. The survey was distributed to participants at a graduate health science center campus. Participants were told about the research and given the opportunity to opt into the survey. Participants could opt out at any time by terminating the survey and closing the browser window. The questionnaire included 133 questions in three sections and a fourth section that included demographic data. The data included a Likert-type scale and multiple choice questions. Questions explored the attitudes and knowledge of digital health in the community setting. The survey was distributed electronically and conducted over a four week period.

Data Analysis

The survey consisted of 133 questions about technology, digital health, and the intersection of these elements. Data was categorized as demographic data and included questions such as age, race, and education. Questions were analyzed with descriptive statistics to identify the knowledge and attitude of participants. Percentages, mean, median, and mode were used to describe the results.

RESULTS

While several demographic variables were explored, gender, age, race, household income, and education are shared below. These selected variables provide a good description of the overall demographics of survey participants. This also provide context for interpreting the study findings.

The participants included 57.1% females and 42.9% males. The majority of the participants were between the ages of 18-24 at 85.7% and 14.3% of participants were between the age of 25-34. The majority of participants were Hispanic or Latinx at 42.9%, Caucasian with 28.6% reporting this race, 28.6% Black, and 7.1% Asian. Participants reported 28.6% obtained a high school or GED, and 28.6% reported they had some college. The participants included 7.1% or participants with an associate degree, 28.6% reported a bachelors degree, and 7.1% with a masters degree. All participants were single and not married, and the majority (71.4%) of the participants were students. This information is discussed below in detail.

Gender

The majority of the respondents are females as indicated in the chart below. Gender inequities in health are important to consider, and understanding the composition of the respondents is important to consider. While there are many opportunities for discussion of gender-related disparities in healthcare, this is beyond the scope of this manuscript (See Table 1).

Age

The majority of the participants are between the ages of 18 to 24 as indicated in the chart below. All respondents are between the ages of 18 to 34. This is not representive of the overall demographics of East Texas or the United States. This is important to note when considering the implications for this study (See Table 2).

Race

The majority of the participants are Hispanic, accounting for 42.9% of the respondents, this is followed by blacks and Caucasians. Native Americans are not represented in the collected data (See Table 3). Texas is approaching a minority-majority state, and this trend will continue to grow over time. Texas is on-track to become a minority-majority state so the results in this study reflect this trend (Marzilli & Mastel-Smith, 2016).

Household Income

The income categories were well-represented with 28.6% of the respondents reporting they preferred to keep their household income private, 21.4% has a house income that is less than $20,000 annually, 14.3% earn between $20,000 to $34,999 annually as indicated in the chart below (See Table 4).

Education

The educational status of people is important to explore when considering the implications for technology. Participants in this study represent a wide variety of educational experience. This is not representative of the East Texas area, but it is a good basis to understand health literacy in the area (See Table 5).

The survey consisted of 133 questions, and asked about demographics and knowledge and attitudes towards technology, health, and digital technology. The survey indicated that 50% of participants were comfortable using computers to do basic tasks including sending emails and making documents, while 35.7% of participants were comfortable using a mobile phone to connect to the Internet. The majority of participants have multiple digital access modalities including access to a computer at home, work, and had high speed Internet access at home and work (See Table 6). This is in line with existing literature (Bull, 2010; Pew, 2015; WHO, 2016). All participants had mobile phone access for texting, phone, and Internet access while 50% of the respondents indicated that they are very capable of using a computer for internet-related activities (See Table 7). Over 20% are just capable while 10 to 15% are not very capable (See Table 8). Less than half of participants had access to an e-book reader and more than half of participants had access to video game consoles (Foss & Haraldseid, 2014). Over 60% of the respondents indicated that they are very capable of using a mobile phone for internet-related activities. Over 25% are just capable while 5 to 10% are not very capable.

The analysis reveals that a staggering majority of the respondents have a computer at home (93%), 86% of them also have a computer at work. Computers (home and work) possesses high-speed internet. All respondents have a mobile device with texting, voicemail and internet feature. Fifty-seven percent of the respondents have video game consoles with internet capabilities. Only a few (29%) of the respondents possed an e book reading devices.

Digital health access, utilization, and proficiency is an important subsection of the survey. When asked about the importance of using technology to manage health, 42.9% of respondents identified that this was very important, and participants reported accessing this information via their mobile phone at 35.7% (See Table 9). This speaks to the importance of addressing health issues for improving self-efficacy in managing health (Bandura, 2004). Participants also managed their health information via websites (21.4%), wearable technology (14.3%), electronic health records (14.3%), telehealth/telemedicine services (7.1%), and social media (7.1%). Mobile technologies and digital health resources are important for participants when managing health (See Table 10), and this is consistent with the literature (Edwards et al., 2016; Lazard & Mackert, 2015; Mackert et al., 2009). Interestingly, social support and its influence is not represented in the results of the survey compared to existing research (Free et al., 2013; Khalil et al., 2017; Venkatesh et al., 2003).

All participants noted that technology and digital health helps them to understand, engage with their health, understand the overall quality of care, and communicate with their physician (Bull & McFarlane, 2011; Lobb & McDonnell, 2009; Ortega-Navas, 2017). There are many technologies available to the consumer to manage health. Participants reported 35.7% of the respondents have used mobile phones/tablets to monitor and manage their health, 21.4% have used websites, and 14.3% have used wearables and electronic health records (See Table 11).

The majority of participants reported they would not be very likely to use technology and digital resources to access governmental, employer, online support groups, or their health insurance plan (FDA Center for Devices and Radiological Health, 2018). A little more than half of participants reported they would use technology to communicate with their physician and nurse.

The survey found 50% of participants had accessed their electronic health record (EHR) at least once (See Table 12). Half of participants found the electronic health record to be beneficial to keep them informed of their health, while

14.3% reported they would access their health record out of curiosity, 7.1% wanted to ensure their health record was accurate, and 7.1% wanted to use their EHR to track their disease progress (See Table 13). Participants identified, in order of importance, that they would use their EHR to manage their health by accessing their lab work, immunizations, physician notes, X-rays, billing, prescriptions, and patient profile (See Table 14). Respondents highlighted that the sole purpose of seeking accessibility to EHR is to keep them informed on their health, 14.3% indicated that they are only acting on curiosity, 7.1% access EHR to ensure the correctness of their medical records and to track the progression of a disease or illness. Importantly, particpants reported that they valued accessing blood test results as the most helpful information, followed by immunization records. Participants also reported value in viewing the record of the physician, x-ray imaging results, and billing information.

Importantly, participants noted they would prefer to wait longer to see a doctor instead of using telehealth/telemedicine services (SeeTable 15). Most participants reported a prefer-ence for in-person visits (64.3%), and they associated this with quality care, engagement in care, and timeliness to care. Interestingly, 50% of participants reported not ever receiving any virtual healthcare (See Table 16). Participants noted that telehealth/telemedicine is beneficial for accommodating scheduling needs, timeliness for care, reducing medical costs, and diagnosing problems faster. Participants further identified telehealth/telemedicine as useful for accessing care after hours, having follow-up care after being discharged from the hospital, and receiving follow-up care.

CONCLUSIONS

Participant responses and results highlighted that technology can play a key role in health and healthcare. The research questions of understanding and knowledge of digital health in the community is important to consider. Exploring these elements shows that knowledge of digital health is not fully actualized. The East Texas population, even amongst a younger demographic, do not have a good understanding of digital tools to advance and support health. It is assumed that this particular demographic group would have a higher level of technological understanding. Knowledge of the technological healthcare resources can be improved as technological advances continue to advance. Coupled with Bandura's theory, it is important to consider how to improve self-efficacy with respect to technology. Healthcare professionals have an opportunity to educate the community about the benefits of technology in health, telehealth/ telemedicine, and electronic health resources.

RECOMMENDATIONS

The sample size was small due to COVID-19, and the negative impact on participation. It is recommended that this study be replicated in a larger sample size to fully understand digital health attitudes in East Texas to improve health promotion and educational activities. It is also recommended that interventions be targeted to educate the East Texas population about electronic health resources, telehealth/ telemedicine, and technologies that can support health. It is also recommended that a qualitative or mixed-methods study be conducted to identify the lived experience of East Texas patients using technology to support health initiatives. Understanding the feelings of patients may identify underlying barriers to technological resources and opportunities to improve self-efficacy. Further, with COVID-19 and the heavy reliance on technology and telehealth, the understanding of technology and connectivity's role in health and healthcare is foundational to move forward in uncertain times.

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Table 1: ***Gender***

Table 2: ***Age***

Table 3: ***Race***

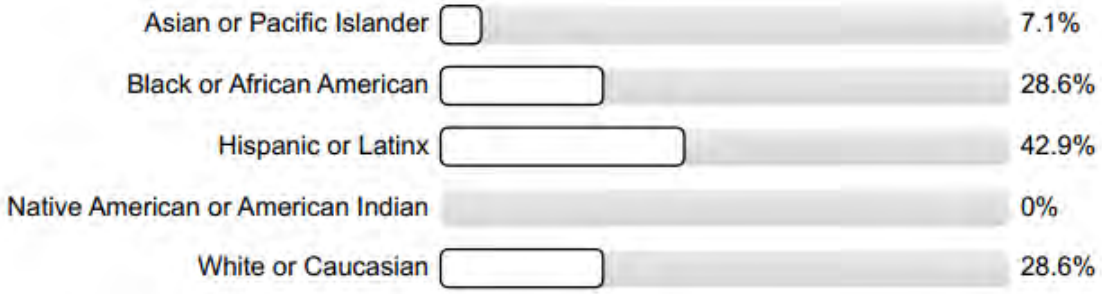

Table 4: ***Household Income***

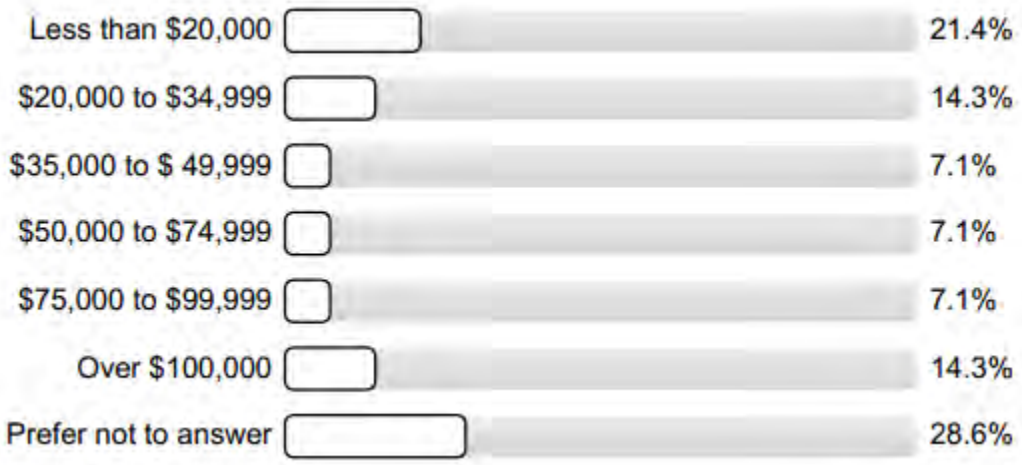

Table 5: *Education*

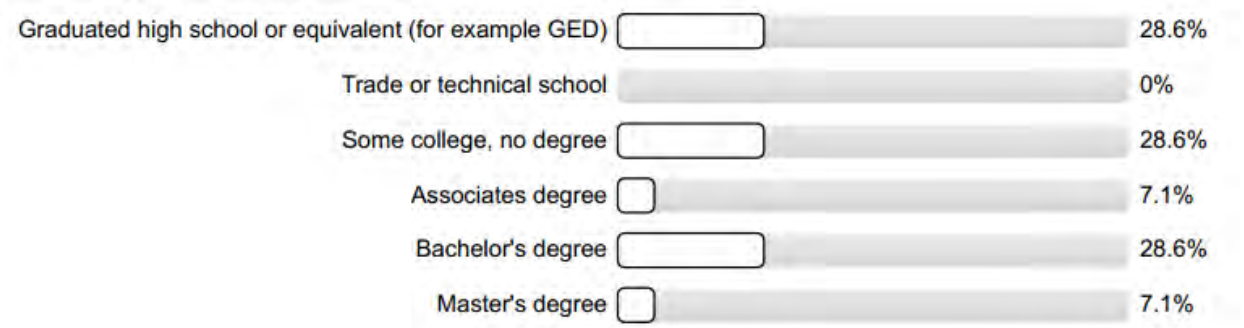

Table 6: *Access*

	Yes	No
A computer at home	93%	7%
A computer at work	86%	14%
High-speed internet at your home	93%	7%
High-speed internet at work	86%	14%
An e-book read (such as kindle, nook, iPod)	29%	71%
A mobile/cell phone for texting and voicemail	100%	0%
A mobile/cell phone for internet access	100%	0%
A video game console that can connect to the internet (such as Xbox or PlayStation)	57%	43%

Table 7: *Digital Access*

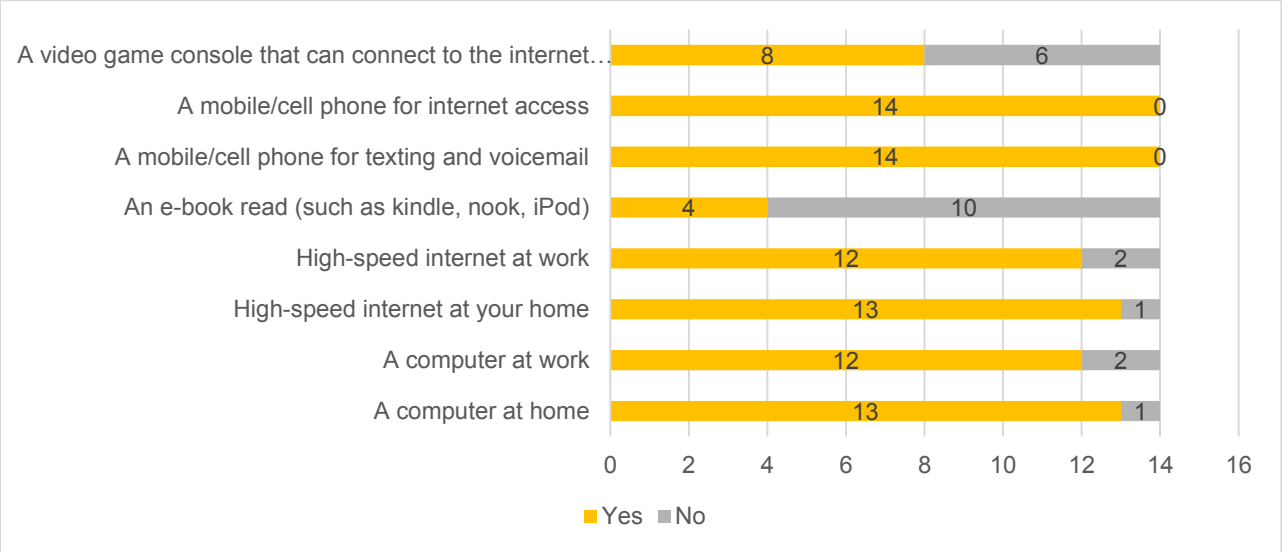

Table 8: ***Capabilities of Accessing Technologies Computer***

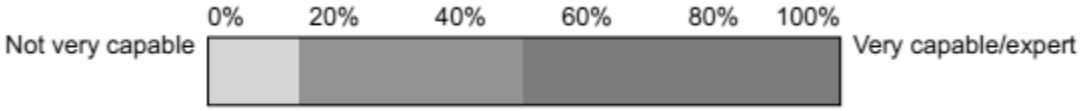

Table 9: ***Mobile Phones***

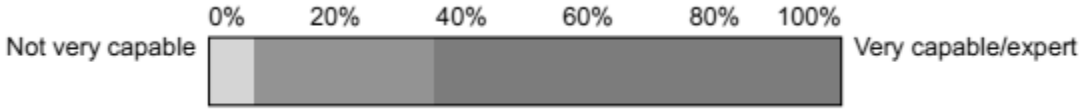

Table 10: ***Importance of Technology when Managing Health***

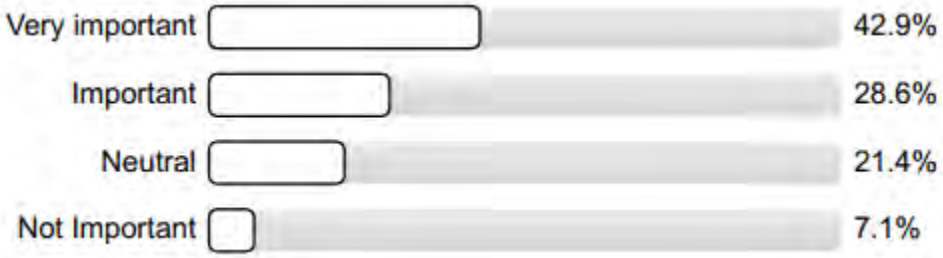

Table 11: ***Technologies Used to Manage Health***

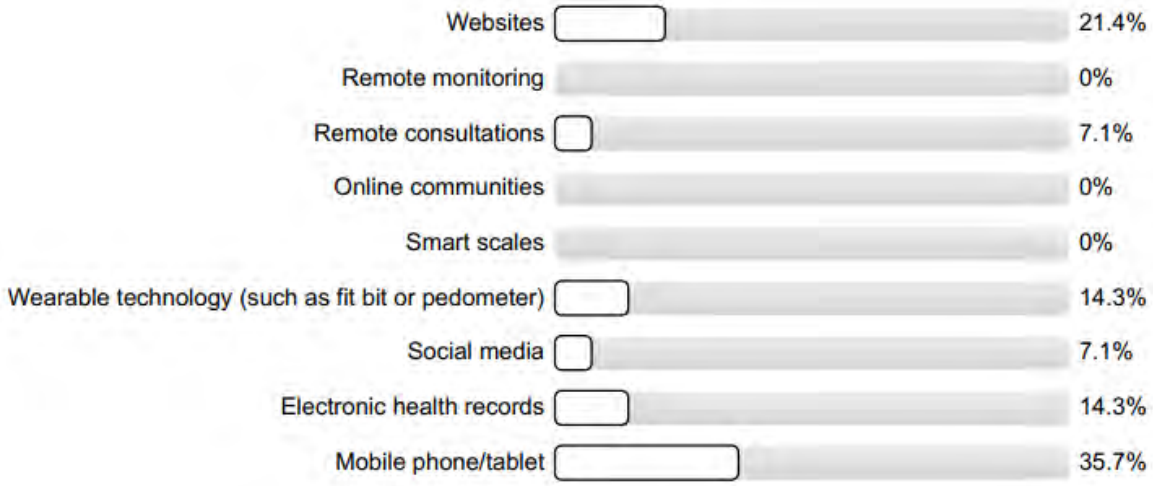

Table 12: ***Accesing Electronic Health Record (EHR)***

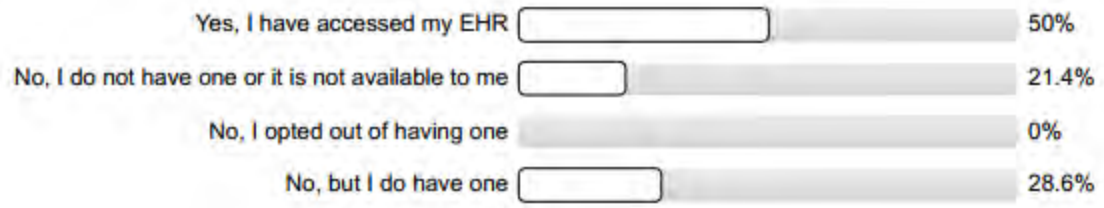

Table 13: ***Primary Reason for Access***

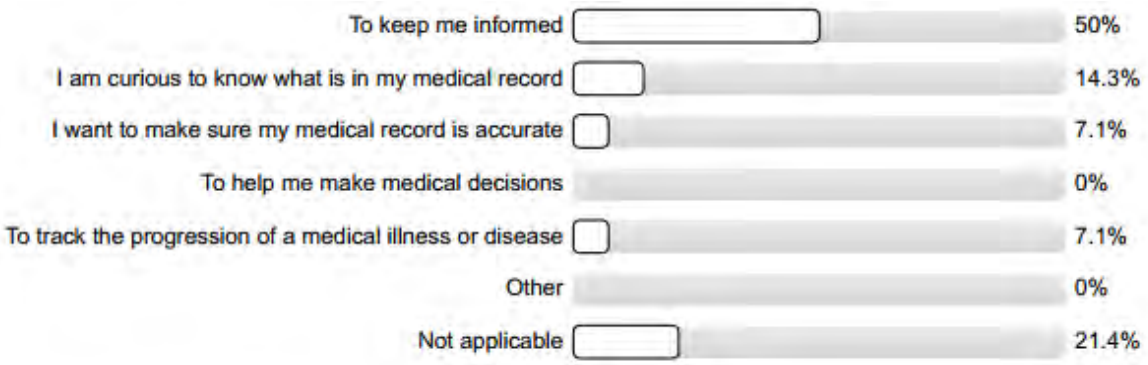

Table 14: ***Types of Information Accessed***

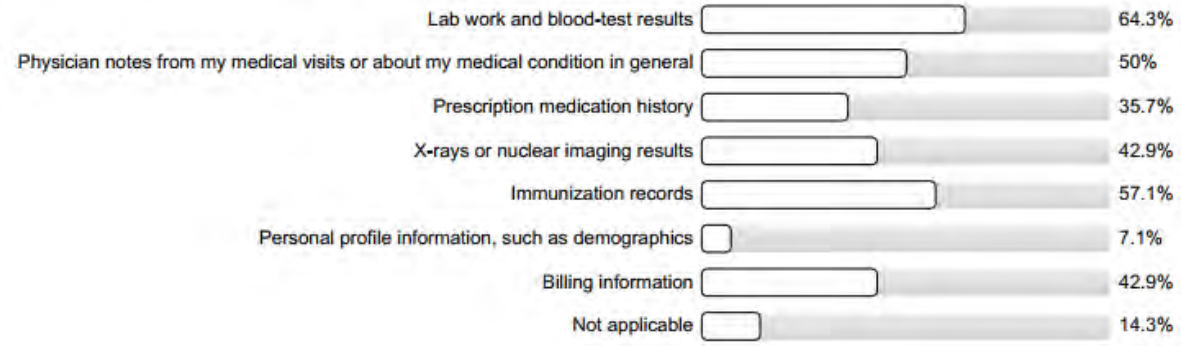

Table 15: ***Preference for Inpatient verses Virtual Healthcare***

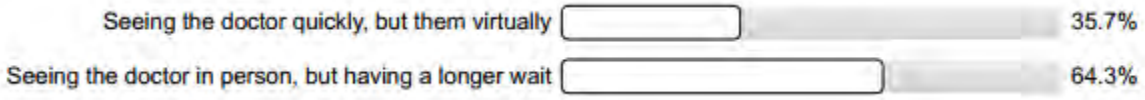

Table 16: ***Virtual Access of Healthcare***