A Study of eHealth: Challenges and Opportunities

Anuja Keerthi Konda

Abstract— eHealth is one of the means or processes to provide and/or seek healthcare information. This concept has been receiving wide acceptance in both the healthcare field and among healthcare consumers and stakeholders. Many businesses have been leveraging e-based (electronic based) tools/applications across many fields, and eHealth, in particular, has recently been gaining popularity. With its distinct advantage of easy access, synchronous and asynchronous nature, eHealth has been easy to use, cost-effective, and efficient solution for providing several health care related services independent of location and time. Along with the many benefits of eHealth, there are several challenges that need to be solved to make eHealth a better means to seek and/or provide healthcare. This paper presents the background, literature review, current usage, challenges, and opportunities of eHealth. The research findings from paper will be useful for both healthcare providers and healthcare consumers to improve and optimize their usage of eHealth. To understand the current usage of eHealth, National Health Interview Survey (NHIS) data from years 2015, 2016, and 2017 are studied in this research.

Index Terms— Internet, eHealth, Obstacles, Medical field, Healthcare, Apps, NHIS, Platform, e-Based.

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1 INTRODUCTION

Telecommunications, technology, and Internet based products have been very successful in many businesses in improving efficiency, productivity, quality, and customer satisfaction. Over the last two decades, healthcare field has been embracing the emerging technologies for the benefit of its stakeholders and consumers. Klein [1] reported in his findings that "E-health has been touted as the single-most important revolution in healthcare since the advent of modern medicine, vaccines or even public health measures like sanitation and clean water. Common areas of e-health include telemedicine, electronic patient records, computer-assisted surgery, and monitoring systems that are portable and/or wearable such as activity trackers."

In terms of normal usage, eHealth can be accessed via many kinds of electronic devices or health monitoring systems that are used by physicians in the healthcare practice or by individuals to monitor or improve their health. Furthermore, it was noted that such eHealth tools can encourage positive health behavior changes, assist people in leading a healthier lifestyle, or support diagnosis and treatment of diseases [2]. Health consumers are interested in knowing their own health information. It can be expected that the 'more that one knows about his/her health, the more they may be inclined to take required actions to be healthy'. Mills and Sullivan [3] discussed many positive effects of obtaining health information from a consumer's viewpoint. One of most the efficient and effective way of obtaining health information and experiencing the benefits of it can be through eHealth. As eHealth is still an emerging concept, there does not seem to be any simple, scholarly defined definition due to its nature of touching many disciplines.

In one of the early pieces of literature on this topic, the Editor of Journal of Medical Internet Research, Eysenbach [4], provided the following definition: "e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology". Further, Eysenbach stated that e-health should be easy-to-use and exciting. Also, Eysenbach invited comments on the above definition of eHealth. Several researchers also tried to come up a succinct definition of eHealth.

Over the last two decades, eHealth represented the promise of sophisticated processing and communication technologies to improve health and healthcare systems [5]. However, the rate of growth thus far has been slow compared to technological development in other fields. It is important to understand the underlying reasons of this and the potential actions one can take to promote eHealth and to leverage its advantages in communities and society in general.

A brief background of eHealth is discussed in section 2. In the following section 3, Data and Analysis is discussed. National Health Interview Survey (NHIS) data from years 2014, 2015, and 2016 [6] was used for the study and analysis purposes in this paper. Section 4 presents the challenges and opportunities of eHealth. The paper ends with conclusions in Section 5.

2 E-HEALTH BACKGROUND

Eysenbach [4] states that the term 'eHealth' was barely in use before 1999, however, now the term eHealth seems to have become "buzzword," used to characterize not only "Internet medicine", but also anything related to combination of computers and healthcare.

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Evers [7] describes that eHealth is increasingly playing a large role in association with Internet. It can make some of the healthcare services affordable and effective source of health promotion interventions. With the help of computer technology, eHealth can can create custom process to interact between an individual and the healthcare provider. With the advent of human-computer interaction, individual likes to be independent and self-driven as much as possible. eHealth's ability to provide interactive nature can be very attractive to healthcare consumers to receive individualized and custom information independent of time and location. Additionally, it was mentioned that with the eHealth, the consumers tend to access the required health needs as needed basis which gives them flexibility.

Pagliari et al. [8] discussed that since the term eHealth emerged in the year 2000, a lack of common understanding of the definition of eHealth has led to uncertainty among researchers, healthcare providers, consumers and policymakers. Regardless, due to its perceived and observed benefits, eHealth has gained acceptance. Pagliari et al states that definitions of eHealth may vary with respect to functions, stakeholders, contexts, etc. by encompassing a broad range of medical informatics. Researchers and practitioners in the healthcare field tried to define eHealth in different ways, and some of them may be more specific to a certain context or use case. The precise meaning of eHealth varied with the context in which the term was used [9].

As stated in the previous section of this paper, Eysenbach's definition [4], [8] seems to cover a much broader perspective and it stands out among many. Oh et al [9] have performed an extensive review of published definitions, and reported that the term eHealth encompasses disparate concepts, including health, technology, and commerce. Further, it was stated that they have found 51 unique definitions with varying degrees of emphasis on health, technology, stakeholders, commerce, the attitudes encompassed, the role of place and distance, and the expected benefits of eHealth. Another way of looking at eHealth can be as a process and enabler rather than outcome, and it cannot replace human activity [10].

With the Internet and telecommunications facilitation, widespread access to up-to-date medical information, including the online support, eHealth has risen in prevalence. Overall, eHealth services are believed to be beneficial, and it provides a means to obtain some of the healthcare within a reachable and reasonable time either remotely or in-person [11], [12], [13], [14]. From the healthcare personnel resources point of view, usage of eHealth can be seen as addressing an increasing need of care resulting from increasing population and also increasing aging population [15]. Among the supportive notions of eHealth, Pagliari et al [16], [17] discussed many of the   key positive benefits of eHealth.
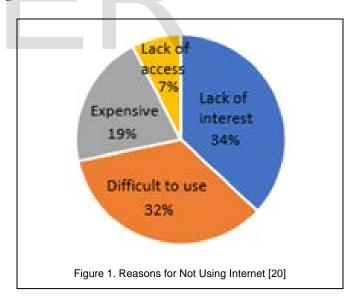
Minichiello et al [18] makes a central point that eHealth can make positive difference in healthcare across the globe. It was reported that a South African social rights activist and Archbishop Emeritus, Desmond Tutu, alluded that "e-health is a ray of light on the horizon for the health and equity challenges that plague humanity". This statement is so powerful and provides greater encouragement for the researchers working in promoting eHealth. It was further discussed [18] that eHealth can improve health services locally, regionally and worldwide with the help internet and other relevant technologies. Minichiello presents that eHealth services can encompass "six C's": content, connectivity, commerce, community, clinical care and computer applications to make it a viable and best supplement to the traditional in-person healthcare.

Researchers in this fields continued to track and understand the number of people using eHealth. A Pew Research Center's survey analysis of phone interviews of 3,014 adults in the United States found that 59% searched online for health information in the past year. When the analysis is limited to the 81% who use the Internet, 72% have searched online for health information [19], [17].

Other Pew Research Center surveyed reasons for not using the Internet for any purpose. It was reported that "15% of American adults do not use the internet at all, and another 9% of adults use the internet but not at home". Of the people interviewed, the below are the reasons listed for not using the Internet [20], [17]:

- 34% have no interest or think Internet is irrelevant
- 32% say it is too difficult to use
- 19% say expensive to have computer or internet
- 7% say physical lack of access to the internet.

The last two reasons listed above can contribute to support a common perception of the digital divide, characterized by age, education, and income levels, that are responsible for people not using the Internet. However, it is only a smaller percentage i.e., 26% out of 15% of total non-users of Internet.

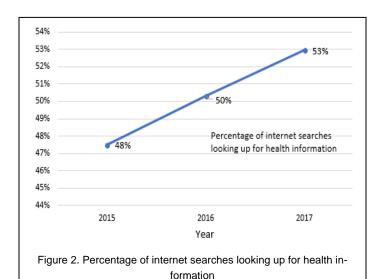Figure 1. Reasons for Not Using Internet [20]

In spite of challenges and slowness in adopting eHealth, Oh et al [9] observed that none of the published literature that they have reviewed suggests any adverse, negative, harmful, or disadvantageous effects from the use of eHealth. The ongoing study in this area is to examine level of public engagement, different ways of promoting eHealth, new forms of eHealth, health informatics and predictive data analytics.

3 DATA AND ANALYSIS

The data collected by National Health Interview Survey (NHIS) is used in this research. NIHS is one of the most premier and US government sponsored activity. For over 50 years, interviewers from the U.S. Census Bureau have conducted in-person interviews about a broad range of questions that include health related questions. The interviewers were trained by the United States governmental agency of the Census Bureau staff, which assures consistency in the research data collection. The NHIS randomly samples approximately 35,000 households annually [6]. In this study, the data from last three years (2015, 2016, and 2017) are considered. The answers for the two questions, DURING THE PAST 12 MONTHS, have you ever used computers for any of the following: "Look up health information on the Internet Or Use online chat groups to learn about health topics" were considered as eHealth related question, and the answers received as 'Yes' or 'No' have been analyzed as described in the below sections. If one of the answers was 'Yes', then the respective data point was considered as 'Yes' to eHealth. This data is very relevant and latest for this research. Chi-Square tests are conducted as noted below to statistically validate significances.

The below Figure 2 shows the trend in percentage of people looking up internet for health information. From Figure 2, an increasing trend in the percentage of internet searchers looking up for health care is evident. However, it is still at around 50% levels for past the several years. This needs to be investigated to further improve. As stated earlier in this paper, there are about 85% population of US are accessing Internet. One of positive results from Figure 2 can be that there is an increasing trend in looking up for health information. This data was tested using Chi-square and found to be significant at .05 level.

Figure 2. Percentage of internet searches looking up for health information

The below Figure 3 shows the difference between gender who is searching Internet for health information. Female are more active and interested in looking up internet for health information. Considering this, programs and technology should be
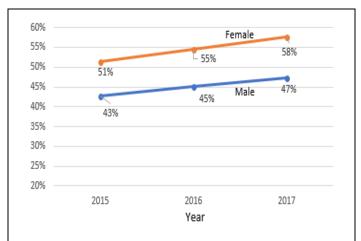
developed to motivate male to leverage eHealth.

Figure 3. Percentage of internet searches looking up for health information among Male and Female

From Figure 3, it can be stated that around 55% female are looking up internet for health information while 45% of male are looking up internet for health information. There is clear 10% difference between male and female who are searching Internet for health information; this is validated as significant using Chi-square at 0.05 level.

The below Figure 4 represents the Internet searchers region-wise looking up for health information. The people who live in 'south' seems to leverage eHealth the most averaging around 29%. The next one is 'west' averaging about 24%, and Midwest is at 20% and the least one is Northeast averaging at 15%. One of the observations is that the 'west' region percent went down by 4% from year 2016 to 2017. This should be investigated to find the special cause and/or root cause.
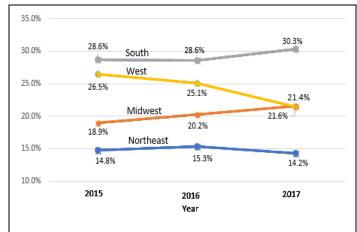
Figure 4. Percentage of internet searches region-wise looking up for health information

The below Figure 5 shows breakdown based on the marital status. It shows that married couple are looking up more for health information and next ones are people who 'not married' (single or living with a partner), and followed by 'married but now single' (divorced, widowed, separated). The level of internet searchers for health information from year-after-after within each group did not look significantly changing.
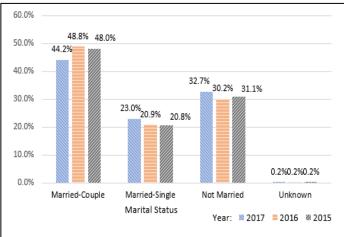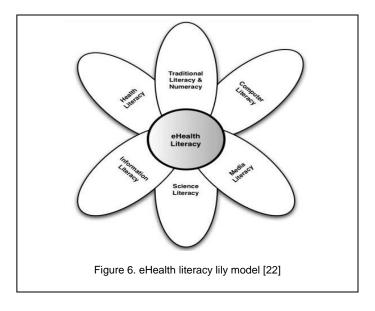

Figure 5. Percentage of internet searches by marital status who are looking up for health information

4   CHALLENGES AND OPPORTUNITIES

One of the main challenges for patients in adopting eHealth is the fear of losing personal contact and live interaction with healthcare provider. Another key challenge is not having enough trust in the technology driven guidance for one's own health. Additional factors such as unauthoritative health information, and incorrect or incomplete information could have detrimental effects on health. Also, the uncertainty in one's own ability to fully understand the health information is a great challenge for many to overcome. This can be characterized by lack of health literacy.

Norman and Skinner [22] have done extensive research in health literacy and report that eHealth adds little value if the health consumers lack the skills to effectively use it. They described that the concept of eHealth literacy is the "ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem."

Norman and Skinner proposed an eHealth literacy model as shown in the below Figure 6 which shows that an individual requires knowledge in multi-disciplinary areas in order to effectively leverage eHealth. Norman and Skinner advocates that these six skills in their eHealth literacy lily model can be considered the challenges for eHealth, and must be addressed. It was discussed that mastery of all these six areas need not be required to benefit from eHealth, but without fair skills across these areas, one may not be able to effectively utilize eHealth.

Figure 6. eHealth literacy lily model [22]

In a recent editorial in March 2018, Stoffers [22] states that though eHealth is beneficial, much is still unclear, and we will have to learn from each other's experiences and the experiences of our patients. Also, Stoffers brings up questions such as what part of the healthcare ecosystem can eHealth replace and "what can it add to our current healthcare services? And what are the financial consequences of integrating eHealth in everyday healthcare?" Additionally, Stoffers brings up fundamental questions such as "how does eHealth influence the doctor–patient relationship? How does the personal expertise of healthcare professionals relate to algorithm-guided decision making?"

Arnoldussen [17] has compiled a good list of the challenges of eHealth that include one's mindset of denial of mode of healthcare, conflict with comfortable beliefs, increased stress when wanting to maintain optimism, low health literacy, trust, cultural preferences, time constraint, personal preference to talk to healthcare provider, past negative experience, language fear, disinterest, privacy and security, informational avoidance, information overload, fatigue, non-technology savvy, attitude, desire to maintain good relationship with healthcare provider, legality, contains mostly general information, hard to integrate eHealth into regular healthcare, learning curve to use, etc.

Even though access to Internet and information posted on it is easily acquirable, the digital divide still plays an impact on certain populations in accessing eHealth. Care must be taken to ensure that differential access to eHealth does not worsen existing inequalities in health [23].

In terms of the opportunities for the people to use eHealth, there has been good amount of literature regarding this [17], [21]. Some of the benefits of eHealth are: easy retrieval of useful knowledge, remote/asynchronous contact or support, reduced uncertainty, self-actualization, self-care, decision-making assistance, having control, easy-to-use, second opin-

ion, curiosity, transparency, evidence-based, cost efficiency, etc. Stoffers [22] inspires that "eHealth is here to stay; the promise of eHealth is comprehensive: better quality of care, more effective care, more efficient care, better service to the patient, more control for the patient (shared decision making, self-management support) and growing availability of high-quality data for quality assurance, education and research." One of the greatest opportunities of eHealth [23] is that it may possibly reduce barriers to access health information by offering low-cost and easy to access and transparent/unbiased professional information/health services independent of location and time.

5 CONCLUSIONS

The research presented in this paper shows that e-Health has been gaining popularity for over last two decades, however the level of usage did not seem to be at a rapid pace. In this paper, along with the background on eHealth, the current level of eHealth usage was discussed. Additionally, a list of key challenges and opportunities were discussed. The information presented in this paper gives an idea to health industry stakeholders, technology developers, healthcare providers, health educators and policy makers on how to leverage and address these factors to promote eHealth further.

ACKNOWLEDGMENT

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