

Health Kiosks as an Equal Opportunity Resource for Better Health: A Systematic Review

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Abstract— Computerized health kiosk systems could be the key to improving public health among diverse populations around the world. The objective of our study is to examine the current utilization of health kiosks in various diverse settings. Further, the study aims to describe the various characteristics of the individuals using these health kiosks. A search was performed using a scientific database, Pubmed, to identify articles published during the period of January 2005 to January 2012 using the following keywords: “public health kiosk”, “public health kiosk rural”, and “public health kiosk urban”. A secondary search was also performed to include the articles that met the inclusion criteria. Results of our review show variations in the geographic patterns of users’ accessibility of kiosk locations. Health kiosk acceptance was high among Black Hispanics, people born outside of the United States, and users with no formal education past high school. High satisfaction was observed among low literacy users, individuals with no formal education, and low-income families. Older populations accessed kiosks at churches and health fairs. Users with no insurance most commonly accessed the kiosk at public libraries, followed by neighborhood health centers and Laundromats. The health kiosks have shown to be a useful medium of reducing health disparities by bridging the gap among users with varied characteristics. However, there is a need for further research to determine long-term impacts of health kiosks on the health outcomes of the populations in various settings.

Keywords- Health kiosks; users; technology; acceptance.

I. INTRODUCTION

Computerized kiosk systems could be the key to improving public health around the world among diverse populations. Public health kiosks have proved to be successful in disseminating health education and interventions. Kiosks are free standing units containing a computer that delivers services, as well as informational and instrumental support. Many of the kiosk computers have touch-screen interfaces and vary in the level of interactivity. Public kiosks have been used in the distribution of a variety of services, such as gift registries, bank Automatic Teller Machines (ATMs), movie theater tickets, movie rentals, and grocery store checkout lanes. The current utilization of kiosk systems has made the use of health kiosks accepted and familiar in public settings. Conventional ways of delivering health interventions to participants would be time

and labor extensive to provide tailor health information for each participant of the health intervention. The health kiosk improves the quality of information appropriate to the user across a larger, more diverse audience. Therefore, health kiosks are time efficient, accessible, and have the capability of adapting to diversity [1]-[3].

Culture, socioeconomic status, and language are three components that affect the gap of health disparities. Health care delivery should be culturally competent for at least six reasons: (1) respond to demographic changes, (2) improve quality of services and health outcomes, (3) meet legislative, regulatory and accreditation mandates, (4) gain a competitive edge in the market place, (5) decrease liability and malpractice claims, and (6) eliminate health disparities of diverse cultural, ethnic, and racial backgrounds [3]. Programs have been designed through conducting surveys within communities enabling them to present consistent culturally relevant information that has been approved by individuals in the community [5]. Furthermore, providing relevant information itself can help reduce disparities within populations, and help close the gap of low health literacy. Cultural tailoring and theoretical framework needs to be incorporated in the delivery of health information, and can be easily managed into the design of kiosk programs. Kiosks have the ability to provide multiple language options in the delivery health information, and maintain consistent culturally relevant information.

Public health promotion efforts would be more successful if they were targeted at specific geographic areas. The national public health objective calls for an increased use of Geographic Information Systems (GIS) to make interventions more cost effective [6]. The use of GIS can improve health promotion and disease prevention efforts in at least seven ways: (1) helping visualize patterns of disease and disparity, (2) help identify risk factors, (3) fostering local collaboration and data-sharing, (4) interpreting geographically specific intervention outcomes, (5) identifying the medically underserved populations, (6) planning of interventions for maximum reach and effectiveness, and (7) selecting the most appropriate setting for prevention efforts [7]-[11].

Public health kiosks can potentially be utilized to enhance self-management of chronic diseases, reduce health disparities, better outreach of healthcare services, and can be

a cost effective way to improve delivery of healthcare services. However, several variables such as digital divide, health literacy, lack of culturally adaptive health information, and limited availability of tailored health material are some of the existing barriers to greater adoption of health technologies and their impact in the improvement of health outcomes. To our best knowledge, there has not been a systematic review to analyze relationships among location, user characteristics, study outcomes, and user perceptions to the technology. Health kiosks disseminate education and help build skills for better health that reach the medically underserved communities, and approach challenges faced in the field of public health.

The objective of our study is to examine the current utilization of health kiosks in various diverse settings. Further, the study aims to describe the various characteristics of the individuals using these health kiosks. This paper contains five sections. You have just read the Introduction in Section I. Section II describes the methods, and comprised of keyword search, inclusion criteria, exclusion criteria, variable extraction, and statistical analysis. The results of the study are described in section III with the kiosk locations and user characteristics, technology outcomes, components/functions/features of the kiosks, and correlations of user characteristics with technology outcomes. Section IV concludes our paper, and followed by section V explaining future research.

II. METHODS

A. Keyword Search

A search was conducted on Medline via Pubmed electronic database [12] to identify the up to date literature about the use of the kiosk in public health settings. The search period was during January 14-January 20 2012 with keywords searched included “public health kiosk”, “public health kiosk rural”, and “public health kiosk urban” and included articles published during the period of January 2005 to January 2012. A manual review of the literature provided by the electronic database search was conducted to identify relevant articles to include in our analysis. A secondary search was also performed to include the articles that met the inclusion criteria.

B. Inclusion criteria

Those studies that had studied health kiosks in both clinical and non-clinical settings, were in English, and were conducted both within and outside United States were included in our final analysis.

C. Exclusion Criteria

Electronic search entries were excluded if they were not full text peer-reviewed papers, such as abstract submissions or news report articles. Other studies that were excluded included those that focused on the use of kiosks educating individuals on topics not related to health, home based health kiosks, and kiosks that vend/distribute products. Computerized kiosks that were used solely to answer a

survey or to collect data for patient check in at a private practice were also excluded.

D. Variable Extraction

The following variable information was extracted from the final analyzable articles:

- Targeted audience: It was aimed to gather information about the different age groups race/ethnicity and gender for which previous studies have been conducted. This will help us in developing better understanding about the usage and acceptance of health kiosks for various socio-demographics.
- Study location: The aim here was to develop a better understanding about the research that currently exists about the implementation and adoption of health kiosks in various developing and developed countries.
- Study setting: This information will help us identify the disparities in the implementation of health kiosks in rural and urban settings. Additionally, “setting location” defines location specificity of kiosks within communities, businesses, and events.

E. Statistical Analysis

Descriptive analysis was performed to report means and standard deviations for the continuous variables and frequency analysis for the categorical variables. All analysis was performed using SPSS version 20 [13].

III. RESULTS

A. Kiosk Location and User Characteristics

The majority of the studies were performed only on adults (56%; n=18), followed by children and adults (38%; n=12), adolescents (3%; n=1), and only children (3%; n=1). The majority of the studies were focused both on males and females (84%; n=27) while only limited number of studies included only females (16%; n=5). Additional variables that might be important to determine use of the health kiosk among various users may include educational status, income, and prior familiarity with use of computers. However, there were few studies that reported this information in the studies included in our final analysis.

Among health care settings, half of the studies placed kiosks in medical clinics (50%; n=16), followed by 28% (n=9) at emergency departments, and 19% (n=6) at community health centers. The other locations utilized by studies were social service agencies (16%; n=5), public libraries (13%; n=4), churches (13%; n=4), health fairs (9%; n=3), beauty salons (9%; n=3), Laundromats (9%; n=3), pharmacies (6%; n=2), and restaurants (6%; n=2). Only one out of 32 studies placed kiosks at a senior apartment (3%; n=1), community center (3%; n=1), grocery store (3%; n=1), Department Motor Vehicles office (3%; n=1), and school (3%; n=1). Of all the 32 studies analyzed, only 5

TABLE I. NUMBER OF STUDIES DETERMINING THE LOCATION HAVING THE HIGHEST REACH TO PEOPLE ON MEDICARE, MEDIAID, AND NOT INSURED

Order of Kiosk Location Preference	Type of Medical Coverage		
	Medicaid	Medicare	Those with No Insurance
1	Neighborhood Health Center	Church	Public Library
2	Social Service Agency	Public Library	Neighborhood Health Center
3	Medical Center	Laundromat and Beauty Salon	Laundromats
4	Laundromats	Neighborhood Health Center	Social Service Agencies
5	Public Library and Emergency Department	Social Service Agency	Beauty Salon
6	Beauty Salon	Health Fair	Church
7	Church		Health Fair
8	Health Fair		

studies reported the most preferred locations where the health kiosks can be placed. Majority of the studies (60%; n=3/5) reported neighborhood health centers as the most preferred location for the health kiosk. This was followed by public library and social service agencies.

An additional analysis was conducted to determine the preferred kiosk location to reach patients receiving Medicaid, Medicare, and people with no insurance. Of all the 32 studies analyzed, only 4 studies reported the reach of Medicaid users at each location where the health kiosks can be placed. The majority of the studies reported neighborhood health centers (75%; n=3/4) as the most accessed by users on Medicaid. Other highly accessed locations were social service agencies, medical centers, and Laundromats. Only three studies (9%) reported the reach of Medicare users that accessed the kiosk at each location. All three of the studies reported churches (100%; n=3/3) as the most preferred by users on Medicare, followed by public libraries, Laundromats, and beauty salons. One limitation to the preferred Medicare locations is that beauty salons were third, sixth, and seventh order in the three different studies. More analysis is needed to determine the preference of beauty salons among Medicare patients. Only three studies (9%) reported the reach of users with no insurance that accessed the kiosk at each location. The location with the most access among users with no insurance was public libraries (66%; n=2/3). Other highly access locations were neighborhood health centers and Laundromats (Table 1).

Three studies (9%; n=3/32) reported the mean age across different kiosk locations, and consistently show that older populations access health kiosks at churches and health fairs with a mean range of 47.8 to 42.9 years of age. Younger populations access kiosks at beauty salon, social service agencies, library, Laundromats, and neighborhood health centers with a mean range of 33.1 to 36 years of age. Although, the mean age can be shifted from the kiosk health

topic presented, the results were consistent across the three studies using the same kiosk at each location.

B. Technology Outcomes

The ease of use of the technology (34%; n=11) evaluated the ability of users to operate the kiosk without issues. The kiosk usage (28%; n=9) was evaluated in respect to the users’ utilization of the kiosk and its features accessed during use. The usability (19%; n=6) was studied to define the users’ ability to navigate and operate the technology, and the presentation of materials by the technology with clear, concise actions provided to the user. Two studies assessed logistical issues (6%; n=2), such as kiosk generated data, and concerns of kiosk. The acceptance (9%; n=3) was evaluated with consumers’ approval of the new technology. One study (3%) evaluated the use of the kiosk placed across different locations to differentiate the reach of the kiosk per location (Table 2).

C. Components/Functions/Features of the Kiosk

The majority of studies used a touch screen computerized kiosk (78%; n=25), and about half of the kiosks provided printed information (53%; n=17). Four (13%) kiosk systems were able to store personalized health records. Tailored information personalized to the user characteristics was delivered by 75% (n=24) of the studies. Only two studies provided information about the local resources available. Only 5 (16%) studies had kiosks that were Internet enabled, one had (3%) fax capabilities, and six (19%) had a designated personal attendant to guide users. There were limited studies that had reported the use of telephone handsets (9%; n=3), video camera (3%; n=1), microphone (3%; n=1), headphones (3%; n=1) with the health kiosks.

TABLE II. NUMBER OF STUDIES THAT DETERMINE EASE OF USE, TECHNOLOGY ACCEPTANCE, AND SATISFACTION OF HEALTH KIOSKS

Variable Assessed	N	Outcome results	
		Positive Impact	Negative Impact
Usability	6	5	1
Ease of use	11	10	1
Technology satisfaction	6	6	
Technology acceptance	3	2	1
Kiosk usage	9	6	

D. Correlations of User Characteristics with Technology Outcomes

Outcomes were analyzed to determine groups with specific characteristics that are significantly correlated with the outcome. The acceptance of the kiosk was analyzed in three studies (9%) and satisfaction in six studies (19%), among studies both were found to be significantly higher among black Hispanics, people born outside of the United States, and individuals with no formal education past high school. Among studies that analyzed usage (28%; n=9), two studies (6%) identified significant results of low literacy users, no formal education past high school, and low-income families of 5000 US dollars or less having the highest usage of the kiosk. The ease of use of the technology (34%; n=11/32), and usability (19%; n=6/32) were readily reported among studies. High literacy, no formal education past high school, and users of the age 36 years or less was positively correlated with ease of use regarding the technology. Usability of the kiosk was correlated with high literacy users, and spending more time at kiosk (Table 3). Additionally, two studies (6%) identified health kiosks were easy to use and accepted among children; with more time spend at the kiosk among younger children.

IV. CONCLUSION

Computerized kiosk systems could be the key to improving public health around the world among diverse populations. Through our review, we identified high usage among low literacy users, no formal education past high school, and low-income families of 5000 US dollars or less. There was high acceptance and satisfaction among black Hispanics, people born outside of the United States, and users with no formal education past high school. Although theoretical framework was not often provided to determine the correlations of specific framework, we can in fact conclude that the technology has the capability of reaching health disparity groups and potentially narrow disparity gaps through the analysis of the perception of the users.

Furthermore, our findings suggest that there are geographic patterns of user accessibility of kiosk locations. Older populations access kiosks at churches and health fairs. The location with the most access among users with no

TABLE III. NUMBER OF STUDIES CORRELATING USER CHARACTERISTIC AND TECHNOLOGY OUTCOME

User Characteristics	Variables Assessed				
	Acceptance	Ease of Use	Usage	Satisfaction	Usability
Low literacy			2		
High literacy		1			1
Black Hispanics	1			1	
Born outside of the US	1			1	
No formal education past high school	1	1	1	1	
Age of 36 years or less		1			
Low income			1		

insurance was public libraries, followed by neighborhood health centers and Laundromats. Unanimously, churches were identified the most accessed by users on Medicare. The majority of the studies reported neighborhood health centers and social service agencies as the most accessed by users on Medicaid. Better understanding the patterns would help target appropriate interventions, and in return be more cost effective.

This review indicates a sustainable and accessible health kiosk would have a positive impact on the prevention and management of a variety of health topics, as well as chronic diseases in communities. The evidence of positive study outcomes across a wide spread of processes suggests a positive impact on communities' health, although there is a need for further research to determine long-term impacts on populations. There can be a sense of community empowerment by providing a resource enabling communities to take their health into their own hands. Studies have shown high rates of kiosk usage among people who are uninsured or underinsured interested in preventative health. Men who are over weight and self-reported being depressed were most interested in kiosk information on weight control. Women who smoke and self-reported being depressed was most interested in kiosk information about smoking cessation [1]. This suggests that individuals are seeking out help, and access education modules provided by the kiosk that are most relevant to improving their own health. Engaging a community in their public's health and providing them with the resources to make a difference, could empower the community to have healthier habits as a social group. An economic analysis, indeed suggests that the role of health kiosks will impact persons who may not otherwise be reached, along with low-income populations and a resource that will becomes extremely cost effective over time [14].

There are several limitations of our study. First, the search included only those studies that were indexed in Pub med. Therefore, we may have excluded studies that might not have been part of it. Second, the search was limited to

certain combination of key words that might have resulted in missing of the other reference articles that might have been applicable to our study. However, every effort was made to include additional articles after reviewing and including the references of the primary articles in the final analysis after they met the inclusion criteria.

V. FUTURE WORK

There is a need to compare and contrast the use of the health kiosks among different countries, as several factors might impact the overall health kiosk usage in these countries. These factors might include social, political, cultural, organizational and logistical variations, and challenges among populations and other stakeholders. Further research is needed to examine health kiosk usage patterns stratified by age, gender, occupation, income, educational status, and prior computer skills of the individuals.

An understanding of usage patterns can help us better assess the impact of health kiosks in improving overall health outcomes among diverse user groups. Additionally, there is the need for more comparative studies among kiosk locations within communities to identify optimal settings for kiosk placement, and among a wider variety of settings.

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