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ORIGINAL PAPER

Disseminating Health Information and Diabetes Care for Latinos Via Electronic Information Kiosks

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Abstract This study investigated the use of electronic, web-enabled touch-screen information kiosks as a tool to provide culturally and linguistically appropriate diabetes information to Latino audiences. Two kiosk models (high privacy sit-down, group enabled stand-up) in two locations (pharmacy, community center) in Northeast Georgia provided bilingual, read-aloud diabetes education and local resource information on health care. Data from public use and interviews with focus group participants showed that users found the kiosks and their functions helpful and usable, though usage was moderated by presence or absence of a peer health educator (*promotora*); participants also preferred the sit-down, multi-function kiosk model.

Keywords Health communication · Electronic kiosks · Latino/Hispanic · Diabetes education

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Background

Racial and ethnic minorities in the US, especially those living in poverty, tend to suffer from higher health risk and lower health care quality than non-minorities [1]. Though the nature of those disparities varies within and across groups [2], causes can include differential access to health care, genetic predispositions, and prejudice on the part of health care providers [3]. Contributing significantly to those sources of disparate health outcomes are communication gaps, wherein minorities, especially language minorities, do not participate in effective communications regarding prevention and treatment [4]. "Information poverty"—when a segment of the population remains persistently ignorant—can thus result from a group's isolation and unfamiliarity with information sources, leading to further unwillingness to access information [5]. Immigrant Latinos in particular are unlikely to have a reliable point-of-information for health care, and even when they have contact with health care providers, interactions are often unsatisfactory [6, 7], with over twice as many Latinos as whites reporting communication problems with their doctors [8]. (While Latino and Hispanic are "pan-ethnic" terms that are commonly used as group identifiers in health, education, and demographics for the group of people who also share commonalities of culture, language, and health [9], we acknowledge that these terms, though useful, can also potentially obscure important differences related to country of origin, race, language, immigration status, socioeconomic status, and other variables).

Diabetes mellitus is a disease condition for which effective health communication is particularly critical [10, 11]; additionally, Latino populations are at particular risk. Diabetes is the sixth leading cause of death among Latinos; compared with other populations, they have earlier onset

and are twice as likely to have serious complications, including heart and kidney disease, high blood pressure, and amputation. Over 10% of Mexican-origin adults have diabetes; for those aged 45–74, the rate is almost 24%, vs. 12% for non-Hispanic whites [12]. Furthermore, diabetes-associated health risks are exacerbated for Latinos because of the poor quality of diabetes-related care this population receives [13].

Conceptual Framework

To be effective, communication programs promoting diabetes prevention, identification, and treatment for Latino populations must not only improve Latino access to necessary health information resources [14], but also must present this information in a culturally competent manner [15, 16]. National standards state that patients should receive "effective, understandable, and respectful care that is provided in a manner compatible with their cultural health beliefs and practices and preferred language" [17]. One well-developed framework for assessing such appropriateness [18] recommends that programs should (a) employ the target culture's dominant language, (b) involve constituents such as community health workers from the target community, (c) take account of deeply held socio-cultural beliefs and traditions, (d) utilize more "peripheral" design features in published materials such as colors, music, and physical appearance of people represented to appeal to target culture members, and (e) present data and health statistics that are most relevant to target culture members. Additionally, because some immigrants are not sufficiently literate to access written information in any language, extensive graphic support, and even aural delivery, may be required. One way of meeting criterion (b) involves making use of lay peer health educators from the target population, often known as "*promotoras*" [19]. *Promotoras* have been used with good results in previous diabetes health promotions targeting Latinos [14].

Several researchers (e.g., 20) have examined the promise and challenge of "new media" such as the internet for improving health information access for under-served minorities. Latinos report accessing information through the internet less frequently than do other ethnic groups [21], preferring informal information intermediaries and social networks from their neighborhood or workplace for health information [22], which may result in inconsistent and inaccurate information transmission. However, past studies have also indicated that once immigrant Latinos find "information grounds" with accessible resources, they do utilize these resources consistently [22].

One promising venue for providing accurate health information to patients and families who lack internet access is through electronic health information kiosks [23, 24], ATM-style terminals with touch screens that require no technological expertise to navigate. Kiosks are also flexible; they can not only disseminate information (via internet-available content, specially designed modules, or both), but also can gather, record and transmit patient data such as weight and blood pressure while maintaining patient confidentiality. Kiosks are considered economical ways to provide information and help patients manage disease between doctor visits, even though some potential kiosk users may avoid them because they prefer direct interaction with health care providers or desire to limit health information input [25]. Prior research supports their promise for low-literate and low-income populations; three-quarters of the (low-literacy level) users in one study [26] found the educational material easy to use, as did 55% in another study where half the participants had less than a high-school education [27].

Health information kiosks have been effective in several countries for many topics, including cancer, Alzheimer's and tuberculosis [26–32], but while the use of kiosks is well established, no published research has investigated their use for the growing Latino population. If effective, kiosks could play a vital role in providing low-cost, replicable and scalable benefits to this under-served group, but identification of appropriate modifications that increase ease and frequency of use for immigrant Latino patients and families is critical for expansion and replication. For example, kiosk location affects usage by the general population [33], but normative preferences for Latinos in this regard are unknown. Additionally, many information kiosks are deliberately designed to isolate individuals as they acquire information in public areas; because many Latino source cultures are collectivistic, Latinos might prefer group learning environments over those that isolate individuals [34], and kiosks allowing more socially-embedded information seeking [35] might be more culturally consonant.

Methods

This study addressed the potential for electronic information kiosks to effectively provide health information for the Latino immigrant population. Three key questions guided the project:

- To what extent are kiosks an appropriate means of providing diabetes information to this population?
- To what extent and in what ways are health information kiosks utilized?
- What characteristics influence kiosk usability and desirability as a health information source?

Intervention Via Health Information Kiosks

The health information kiosks for the project comprised a web-enabled desktop computer housed in a cabinet and linked to high-speed internet, with a touch-screen LCD monitor, printer, speaker, and telephone. Kiosk management software controlled the operating system, tracked user navigations, and recorded information entered by the user.

Kiosk content incorporated both existing and newly developed diabetes information resources in Spanish and in English (Table 1); a bilingual, bicultural graduate student in public health selected topics for inclusion. Information could be accessed in English or in Spanish, spoken or printed. The kiosk also included an optional user survey. Bilingual print resources on diabetes care, prevention and education were available at each location during the study.

Kiosk appearance and physical layout were hypothesized to impact usage by Latinos [18, 35]; e.g., providing a seating area might encourage longer engagement with the health information, but might also limit access for users who preferred or needed assistance from family members or peers. Thus, one of the kiosks (Kiosk Information Systems Arch model, Illustration 1) required standing but allowed for potentially easier viewing by groups. The other (LifeClinic kiosk, Illustration 2] had seating; it also measured weight and blood pressure.

For 4 months (July–October 2006), kiosks were placed in two community locations in a medium-sized city (about 112,000 in 2006) in northeast Georgia—a Latino-frequented pharmacy and a library branch/community center in a Latino mobile home park. (This independent pharmacy, located in a strip mall near one of the main highways, has a Spanish-speaking pharmacist, and was recommended as a well-known establishment for Latino clientele. The community center is in the center of a trailer park with over 200 trailers, almost exclusively occupied by Latino families, in a semi-rural area on the outskirts of the city). Each kiosk design was used for 2 months at the community center; a sit-down kiosk remained at the pharmacy location for the duration.

Illustration 1 Stand-up style kiosk

Illustration 2 Sit-down style kiosk

Participants

Participant recruitment was designed for two conditions. At the pharmacy, employees agreed to use flyers and personal contact to encourage Latino clients to visit the kiosk. At the community center, a peer *promotora* (herself diabetic and

Table 1 Kiosk content

Content	Source
Home page	In Spanish or English, with read-aloud in either language; developed for study
Local community resources (pharmacies, doctors, clinics, transportation, interpretation, and diabetes clinics, including Spanish-speaking services)	In Spanish or English, with read-aloud in either language; developed for study
Diabetes content modules (type 2 diabetes, type 1 diabetes, hypoglycemia, introduction to diabetes, blood glucose meter, meal planning, taking insulin, eye problems, foot care)	In Spanish or English, with read-aloud in either language; from Patient Education Institute/X-Plain.com. See http://medlineplus.gov/esp for sample tutorials
User survey	In Spanish or English; developed for study

Latina) from the local community was hired to encourage kiosk use.

In addition to individuals (Latino or otherwise) who spontaneously utilized the kiosks, recruited participant cohorts of 10 adults at each site were sought for a longitudinal study. Selection criteria included age 18 or older, Latino/a, with diabetes or pre-diabetes, and willing to participate for 4 months; participants received a gift card as an incentive. At the community center, 10 participants were recruited, of whom eight took part for the duration of the study (Table 2). However, at the pharmacy, no participants were located despite efforts of pharmacy and project staff. While participant-specific demographic information related to country of origin, length of time in the U.S., etc. was not collected, general demographics of the state [36] and community show that most of the Hispanic/Latino population (about 68% as of 2004) is of Mexican origin, though for the less than 2% who are 65 or older, less than half are Mexican origin [37]. Of the total group (all ages), 60% are foreign-born, and 73% speak a language other than English at home; about 37% immigrated to the U.S. since 2000 [37], making this a relatively new and not fully integrated group. At the time of the study, about 8.6% of the project location county's population was Hispanic/Latino, versus 7.5% for the state as a whole [36].

During the data collection period, public use of both kiosks was available. Automated site software indicated that 14 public kiosk users (which likely also included some focal participants, but this was not definitively determined) completed the voluntary, online feedback survey (Table 3).

Table 2 Characteristics of focal participants

Gender	Age	Participation status
F	59	Full participant (*promotora*)
M	51	Full participant
F	35	Full participant
F	50	Full participant
F	87	Full participant
F	70	Hospitalized prior to final interview
M	60	Participated but declined final interview
F	60	Participated but declined final interview
F	65	Left community while study underway
F	50	Left community while study underway

Data Collection and Analysis

Data were collected via the kiosk site monitoring system (all users), voluntary usage survey (14 users) and post-study discussion questions (five longitudinal users). Kiosk management software reported public usage such as sites visited, length of visit, etc. Data on user demographics, ease of use, and assessment of participant learning were requested through the voluntary online survey (19 forced-choice items).

Additionally, the eight longitudinal participants were invited (and five agreed) to take part in a post-study discussion that entailed responding to nine open-ended questions about kiosk usage, satisfaction, preferences and recommendations, conducted in Spanish by a Latina graduate student in education with experience in program evaluation. Four participants answered these questions in a small-group discussion; one participated by phone. Response data were transcribed, translated into English and coded thematically. Data from all three sources were triangulated to help ensure validity, given the limiting factor of the small sample sizes in each data source.

Evaluation design and data collection protocols were approved by the Institutional Research Board at the researchers' university.

Results

Outcomes from this study addressed kiosk appropriateness for providing diabetes information to the Latino population, kiosk usage extent and patterns, and characteristics influencing kiosk usability for this population. Data collected through the kiosk site monitoring system and participants' discussions combined to create a clear picture of the appropriateness of the kiosks and educational content for the target audience.

All 14 online survey respondents reported that they had learned something new from the kiosk and that they had

Table 3 Demographics of kiosk survey participants

Age	Gender	Diabetes status	Ethnicity
18–30: 1	Female: 8	Diagnosed as Diabetic: 12	Hispanic/Latino: 10
31–40: 2	Male: 6	Diabetes suspected but not formally diagnosed: 1	White: 3
41–50: 1		Not diabetic: 1	Asian: 1
51–60: 5			
61–70: 4			
Over 70: 2			

found information they were looking for. Twelve indicated that they would follow up with a healthcare professional. All 14 agreed that they would share the information they learned and that they would make changes in their diet and lifestyle. Longitudinal participants said the most useful information was that related to diet and exercise. They noted that the diet and exercise tips were "easy to follow" and that they had already begun making lifestyle changes. Focus-group comments included statements such as "I have begun cooking healthier," "I am trying to get more exercise in my daily activities," and "I am teaching my children about healthy habits [learned from the kiosk] to prevent them from getting diabetes since it runs in my family."

While social desirability bias may have influenced the respondents' assessment of the extent to which they were using the information, on the whole it appears that participants found the kiosks viable for accessing diabetes information. Of the online survey respondents, 12 agreed (with two not responding) that the kiosk was a "good way to gain information." Longitudinal participants noted that as a delivery system kiosks had specific advantages; for instance, one participant expressed that "all the information is readily available and it takes less time than if I would go to the doctor." In addition to being in Spanish, the information offered through the kiosk modules was characterized as easy to understand because "it is broken down."

Perhaps the most obvious finding was that the kiosks were indeed used, though not necessarily in depth. During the 4-month study period, automated kiosk software recorded 192 visits, though it was not possible to determine how many were unique users nor which kiosk was used. Usage ranged from 0 to 36 visits per week (mean weekly usage, 10.7; standard deviation, 10.7). We would characterize this usage as moderate, given the available audience of potential users.

Participants entered the educational modules 53 times but fully completed the modules only in nine instances (Table 4). Literacy per se was likely not the only reason, because modules offered read-aloud options in Spanish or English. However it is possible that the informational modules used were too linguistically complex for the target users' literacy levels, despite the read-aloud option. Readability levels of the Spanish Introduction to Diabetes module, for example, were estimated at grade 5.0 following Crawford [38] and at almost grade 7.0 following Gilliam et al. [39]; while the study participants' literacy levels were not directly assessed, recent data show that some 40% of Latino immigrant adults nationally have only a primary level of education or less [40]. Rather than working through the full commercially prepared modules, it appears that users targeted specific information; voluntary user surveys supported this interpretation, as 100% of respondents indicated they found information they were seeking.

Table 4 Online content modules accessed and completed (July–September 2006)

Title and language of content module	Number of modules accessed but not completed	Number of modules completed
Type 1 diabetes (English)	9	3
Type 2 diabetes (Spanish)	8	1
Diabetes—introduction (Spanish)	4	2
Type 1 diabetes (Spanish)	4	2
Diabetes—introduction (English)	4	0
Eating healthy (Spanish)	3	1
Diabetes and meal planning (Spanish)	3	0
Hypoglycemia (Spanish)	2	0
Type 2 diabetes (English)	2	0
Using blood glucose meter (Spanish)	1	0
Diabetes—eye complications (Spanish)	1	0
Taking insulin (English)	1	0
Taking insulin (Spanish)	0	0
Using blood glucose meter (English)	0	0
Diabetes—foot care (Spanish)	0	0

Factors such as time needed to fully explore modules also may have influenced completion rate.

Overall, the kiosks were rated as convenient and usable. For instance, 13 out of 14 online survey participants stated that the kiosk was easy to use. All 14 stated that they felt comfortable using it and would use it again, as did all focus group participants. However, failure to recruit longitudinal users at the pharmacy, despite a publicly situated kiosk and employees informing potential participants about the study, suggests that this target population felt more comfortable using kiosk technology when supported by a human resource such as a *promotora* to provide additional encouragement for using potentially intimidating "new" technology. Indeed, in the voluntary online survey, 3 of 14 users explicitly responded that their "experience [would] have been better if [they] had someone assisting" in using the kiosk.

Longitudinal participants used each kiosk model for 2 months. Comparing the models, discussion group respondents preferred the sit-down kiosk. Users appreciated the blood pressure and weight-monitoring devices as well as being seated while navigating through the information. (This can be an important consideration for elderly or infirm potential users; as one participant observed, "Old people need to sit down"). Participants did not report loss of potential access by helpers from the sit-down model vis-à-vis the stand-up one, however.

Kiosk location merits additional study [32]. Some participants reported feeling uncomfortable accessing health information in a public setting, with comments such as "old people don't like to be there [in the library center] around the children." One participant even suggested placing the kiosk at the *promotora*'s house because it would be "more accessible", "more private", and "you don't need to wait for the library to be open." Convenience and privacy issues may also have contributed to the relatively sparse usage at the pharmacy location.

Discussion and Contribution of Study

Resources that bring knowledge to potentially marginalized communities are a critical part of the solution for information poverty [5]. This study provides "proof of concept" that electronic, web-enabled touch-screen information kiosks with bilingual, read-aloud capabilities can be a viable tool for the Latino community to learn about diabetes-related information, and by extension, other health-education topics. Concurrently, it suggests relevant considerations for continued research and outreach with such tools.

Educational resources, diet recommendations, and ability to monitor blood pressure and weight were key features of interest to the Latino participants. Although kiosk resources also included local resources for diabetes care, these were not a primary "draw" for study participants, probably because many members of the target population do not have health insurance, a primary-care physician, or convenient access to health care. Since potential scalability of health-information kiosks is an important concern for future implementation, this may in fact be an advantage, as it implies that adding specific local contact information would not be necessary to provide a useful informational package for the Latino immigrant population. Additionally, the issue of readability level of provided content also needs to be addressed in future research, to ensure content's appropriateness and accessibility for this population.

For mainstream populations, viable locations for clients to access health information have included pharmacies and health care clinics [30, 31] and community-based locations such as churches, shopping malls, and even fast-food restaurants [27, 29, 30]. However, our findings suggest that for Latinos, even pharmacies with bilingual personnel may not be a preferred placement. Past research suggests that peer and community contacts serve as informal "gatekeepers" of health information for immigrant populations [22]. This study demonstrated the vital importance of community members such as the *promotora*, who played a critical role in dispelling uneasiness, demonstrating kiosk use, and encouraging community members to try it. It is worth noting that while potential users may have been intimidated by the unfamiliar prospect of kiosks, actual users reported little or no difficulty in utilizing them. Future research may clarify whether other frequently-visited sites (in our community, this might include supermarkets, social service agencies, flea markets, religious organizations, etc.) would be appropriate for kiosk placement, both with and without *promotoras*.

For study participants asked to choose between models, kiosk features themselves seemed to carry more importance than did the hypothesized cultural need for group access to the screen [34]. Future research should include observation of actual use, as it seems likely in retrospect that even the sit-down model accommodated multiple users such as the participants and *promotora*.

Because participants found the sit-down model more comfortable, they reported spending more time navigating the educational modules. The extra features of blood pressure and weight measurement also encouraged use; in fact, staff at the community center site specifically requested keeping this kiosk at the site after the study's completion, due to community interest in using those functions.

While this study included a relatively small number of participants, the outcomes clearly support the promise of technology such as these kiosks for helping reduce health-information disparities between mainstream and immigrant/minority populations. Future research should continue to refine the best practices for culturally and linguistically relevant placement, content, support, and utilization of such innovations for improving health communication and education of diverse populations.

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