Describing the evolution of mobile technology usage for Latino patients and comparing findings to national mHealth estimates

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ABSTRACT

Objectives Describe the change in mobile technology used by an urban Latino population between 2011 and 2014, and compare findings with national estimates.

Materials and Methods Patients were surveyed on medical history and mobile technology use. We analyzed specific areas of mobile health capacity stratified by chronic disease, age, language preference, and educational attainment.

Results Of 2144 Latino patients, the percentage that owned a cell phone and texted were in-line with Pew estimates, but app usage was not. Patients with chronic disease had reduced access to mobile devices ($P < .001$) and lower use of mobile phone functionalities.

Discussion Prior research suggests that Latinos can access mHealth; however, we observed lower rates among Latino patients actively seeking heath care.

Conclusion Published national estimates do not accurately reflect the mobile technology use of Latino patients served by our public safety-net facility. The difference is greater for older, less educated patients with chronic disease.

BACKGROUND AND SIGNIFICANCE

Due to insurance costs, transportation difficulties, language discordance, and many other barriers, minority and disenfranchised populations have difficulty accessing health information.[1,2] Mobile health (mHealth) uses interventions delivered via mobile phones for text, instant messaging, email, and smart phone applications (apps) to provide health services.[3,4] Importantly, mHealth allows providers to reach patient groups who struggle with access to care by expanding communication beyond doctor's offices and hospitals to virtually any location.[5] Increasingly, health care providers and systems are looking to mHealth interventions to efficiently provide health resources to patients using a technology they already own.[4,6–8]

Latino patients in particular are often confronted with significant barriers to establishing care and often have less knowledge of and access to preventive care information.[2,9,10] In the United States, Latinos are the least likely ethnic group to have health insurance and a medical home.[1,11,12] Additionally, traditional methods of health education may not account for Latino-specific language and cultural barriers.[13,14] As suggested by Victorson et al.[12] in the eSalud paper, all these factors combine to make Latinos ideal targets for culturally appropriate and effective mHealth interventions.

Although limited, the few studies focused on this have shown that the United States Latino population has the access, ability, and desire to effectively utilize mHealth.[12,15–17] One recent study demonstrated low-income Latinos had a higher demand for mHealth information than their non-Hispanic White, Black, and Asian counterparts.[18] In 2011, the Pew Research Center, a nonprofit, nonpartisan think tank, released a report, *Latinos and Digital Technology*, stating that Latino-American mobile phone ownership had grown from 80% to 86% between 2009 and 2010.[17] However, successful mHealth programs require that patients not only own phones but also have the knowledge to access and use the functions their phones have.[19] The Pew report states that Hispanics exceed their non-Hispanic White counterparts in accessing the Internet, sending/receiving email, and sending/receiving instant messages on mobile phones.[17] However, the Pew results are based on a random sample of the Latino population, and are unable to demonstrate whether patients who are actively seeking health resources share this level of mobile phone ownership and knowledge.

OBJECTIVES

To evaluate the percentage of Latino patients presenting to an urban safety-net facility that own mobile phones and describe their knowledge of specific phone functionalities over time, with particular emphasis on patients with chronic disease.

MATERIALS AND METHODS

We performed a cross-sectional survey of consecutive adult patients in 2 waves at (Los Angeles County Hospital of the University of Southern California) LAC + USC Medical Center, one of the largest safety-net health care systems in the United States. Trained research assistants (RAs) approached patients in the emergency department and 3 county-sponsored general medicine clinics between July 2011 and May 2012. The survey was repeated with a second sample of consecutive patients between July and August 2014. RAs systematically enrolled patients during normal business hours. All patients were

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surveyed on their demographic data including gender, age, race, ethnicity, language preferences, education level, marital status, and country of birth. Patients self-evaluated their overall health and chronic diseases. We evaluated patients' mobile phone knowledge using questions from the 2010 Pew Report (questions in Appendix A). Patients were excluded if they were critically ill, had altered mental status, did not speak either English or Spanish, or were unable or unwilling to provide consent. RAs administered surveys verbally if study participants preferred to have questions read to them. Approval was obtained from our local IRB prior to study initiation.

Patients' data were retained for this analysis if they self-identified as Latino/Hispanic. Specific measures of mobile technology use and patient demographics were modeled as categorical variables (see Table 1 for stratification categories). Patients were considered to have a chronic disease if they reported a history of diabetes, high blood pressure, high cholesterol, heart disease, lung disease, liver disease, kidney disease, HIV/AIDS, history of stroke, cancer, arthritis, blindness, depression, or mental health issues. Using chi-squared tests, we compared the 2011 and 2014 percentages of cell phone ownership, ability to send/receive text messages, send/receive email, access the Internet on a mobile phone, the use of nonvoice apps, and the ability

to send/receive instant messages. We aggregated data from the 2 survey waves and completed analyses of the specific areas of mobile health capacity stratified by presence or absence of chronic disease, age, language preference, and educational attainment using chi-squared tests.

RESULTS

A total of 5146 patients were screened for eligibility in our study (1155 patients in 2011 and 3991 in 2014). A total of 1943 patients were ineligible to participate because they were critically ill, had altered mental status, were currently in police custody/psychiatric ward, were non-English/non-Spanish speaking, were under 18 years old, had taken the survey previously, or listed no documented reason. Of 3203 eligible patients, 89.1% were enrolled in our study. Of the 2855 patients who provided consent, 711 were removed as they did not self-identify as being Latino or Hispanic, leaving a final sample for analysis of 2144 patients. Details regarding study inclusion are summarized in Figure 1. Latino patients' demographics were similar between the 2 time periods. Respondents were on average 48 years old and were 51% male, and only 13% of patients had college- or graduate-level education. The majority of respondents were foreign born (79%), and

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Table 1: Knowledge of mobile phone functionality of Latino patients at LAC+USC medical center stratified by patient demographics													
	Cell phone ownership		Ability to send/ receive text messages		Access any nonvoice application		Access the Internet		Ability to send/receive email		Ability to send/ receive instant messages	
	N (%)	P-values	N (%)	P-values	N (%)	P-values	N (%)	P-values	N (%)	P-values	N (%)	P-values
Age		< .001		< .001		< .001		< .001		< .001		< .001
18–29	253 (87)		247 (85)		179 (62)		219 (76)		174 (60)		150 (52)	
30–49	734 (83)		653 (74)		338 (38)		410 (46)		309 (35)		348 (39)	
50–64	556 (75)		342 (46)		102 (14)		131 (18)		116 (16)		125 (17)	
65+	110 (49)		41 (18)		5 (2)		4 (2)		7 (3)		13 (6)	
Gender		.757		.941		.467		.411		.292		.745
Male	854 (77)		664 (60)		331 (30)		405 (36)		325 (29)		333 (30)	
Female	799 (77)		619 (60)		293 (28)		359 (35)		281 (27)		303 (29)	
Education		< .001		< .001		< .001		< .001		< .001		< .001
No schooling completed	119 (60)		54 (27)		19 (10)		28 (14)		16 (8)		19 (10)	
Primary school	583 (73)		397 (49)		144 (18)		174 (22)		115 (14)		160 (20)	
High school	705 (81)		606 (70)		317 (37)		396 (46)		315 (36)		325 (37)	
College	230 (91)		213 (84)		136 (54)		158 (62)		154 (61)		127 (50)	
Graduate degree	16 (84)		13 (68)		8 (42)		8 (42)		6 (32)		5 (26)	
Language preference		< .001		< .001		< .001		< .001		< .001		< .001
Spanish	1146 (75)		815 (53)		333 (22)		422 (27)		306 (20)		393 (26)	
English	507 (84)		468 (77)		291 (48)		342 (56)		300 (50)		243 (40)	
USA-born		.005		< .001		< .001		< .001		< .001		< .001
Yes	349 (82)		323 (76)		211 (50)		243 (57)		209 (49)		165 (39)	
No	1304 (76)		960 (56)		413 (24)		521 (30)		397 (23)		471 (27)	
Have chronic disease		< .001		< .001		< .001		< .001		< .001		< .001
Yes	1111 (75)		815 (55)		359 (24)		436 (29)		357 (24)		378 (25)	
No	542 (83)		468 (71)		265 (40)		328 (50)		249 (38)		258 (39)	

Figure 1: Flow chart of patients who met inclusion/exclusion criteria for the study population.
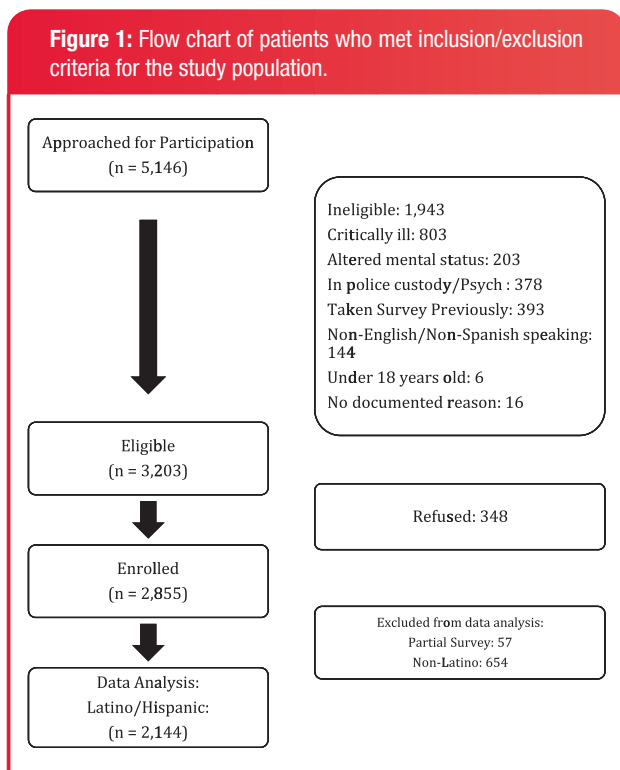
71.6% reported Spanish as their preferred language. The majority of patients (69%) reported having a chronic disease. Complete patient demographics are summarized in online appendix.

Between 2011 and 2014, the percentage of Latino patients who reported owning a mobile phone increased from 72% to 79%. Similarly, the percentage of patients who were able to send/receive text messages increased from 54% to 63%. Regarding more advanced mobile functions, our patients experienced growth over the previous 2 years and either matched or surpassed 2010 Pew estimates in email, Internet use, and instant messages at the end of the survey period. However, app use remained far below Pew estimates from 2010 (58%) despite increasing from 13% to 36% over the study period. Full findings regarding patient knowledge of studied mobile phone functionality are detailed in Figure 2.

Patients with a chronic disease had reduced access to mobile devices and lower use of all mobile phone functionalities. A total of 77% Latino patients in 2011 and 66% of Latino patients in 2014 reported having a chronic disease. Overall, only 75% of patients with chronic disease owned a cell phone, compared with 82% of patients without a chronic disease ($P < .001$). Similarly, 55% of patients with a chronic disease sent/received text messages, compared with 71% of respondents without chronic disease ($P < 0.001$). Despite growth over the study period, patients with chronic disease were less likely to use advanced mobile phone functions. For example, there was a significant difference between patients with chronic diseases who reported using mobile Internet compared with patients without (29% vs 50%, $P < .001$). Complete details regarding patients with chronic disease are contained in Figure 3.

In examining other patient characteristics that may impact knowledge regarding mobile phone functionality, respondents who were foreign-born, older, had less education, and were less proficient in English used both basic and advanced mobile phone functionalities at significantly lower rates (all $P < .001$). For example, 82% of our

respondents aged 18–29 reported sending/receiving text messages, compared with only 22% of those age > 60. Of note, more patients in every demographic category examined were able to use text messaging than any of the more advanced mobile functions. Additional details regarding knowledge of mobile phone functionality are broken down by demographic characteristics in Supplemental Table 1.

DISCUSSION

Overall, our results indicate that mHealth interventions using mobile phones are a viable tool to target low-income Latinos since there is a high penetration of mobile phone ownership in this population. Apps have been used successfully in specific populations, as they can enhance communication with health professionals, are interactive, and contain numerous resources under one platform.[21] However, our data shows that the vast majority of Latinos seeking health care at our urban safety-net setting cannot use apps. Fortunately, text-message–based programs have had similar success at targeting hard-to-reach populations.[20] Arora et al.[22] used a text-message–based program to target patients seen in the emergency department with poorly controlled diabetes and were able to demonstrate patient satisfaction as well as improved medication adherence. Vyas et al.[23] used text messaging to successfully educate Latino adolescents about sexual/reproductive health. To date, there are no studies directly comparing the effectiveness of apps against text-message–based programs. It is possible that if apps are shown to be more effective, they may have a greater impact on population health despite the fact that penetration is lower. However, without this evidence, text-message–based solutions hold great promise due to the fact that they are accessible to a significantly larger proportion of patients who can benefit from mHealth.

Building successful mHealth programs for Latinos requires that messages be accurate, relevant, and respectful of patients' cultural norms.[12,24,25] Per the Centers for Disease Control and Prevention, mHealth programs that are able to achieve this are more likely to be impactful than those that do not deliver messages in a culturally sensitive and language-specific manner.[26–28] Similarly, messages will need to take into consideration values and attitudes surrounding illness for this patient population. Future research should explore how to design content for mHealth programs that will resonate with Latino patients in order to effect real changes.

LIMITATIONS

There are several limitations to this study. First, self-reported data on mobile phone use is subject to recall bias. Additionally, study participants' mobile devices were not checked to verify capabilities. So while their phones might have the ability to perform certain functions, survey questions only captured whether patients actively used them. However, our strategy mirrors other national studies regarding mobile phone use, including the Pew Report survey, and, practically, it is what patients can do on their phones that actually matters. Additionally, we sampled Latino patients at a single site. The population of Latino patients in Los Angeles may differ from Latino populations in other parts of the country, limiting the generalizability of findings. Nevertheless, the Los Angeles basin has one of the largest populations of urban, low-income Latinos in the country, making this an optimal location to study a vulnerable population. Lastly, we use Pew report data from 2010 as a comparison to our study population. Given the rapid advance in both mobile technology and affordability, it is possible that the Pew data from 2010 is an underestimate of current mobile technology usage, but they have not yet published a more recent report on Latinos to use as a point for comparison. However, since estimates of current use in our sample are still lower than 2010

Figure 2: Latino patients' mobile phone fuction usage compared with national estimates.
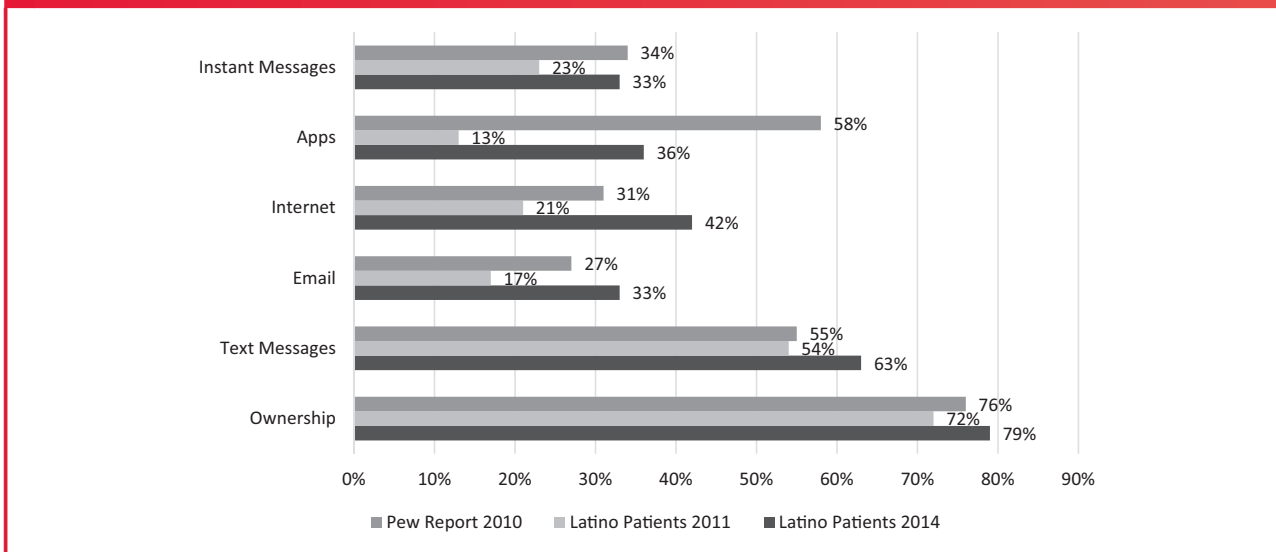
Figure 3: Latino patients with chronic disease mobile phone fuction usage compared with national estimates.

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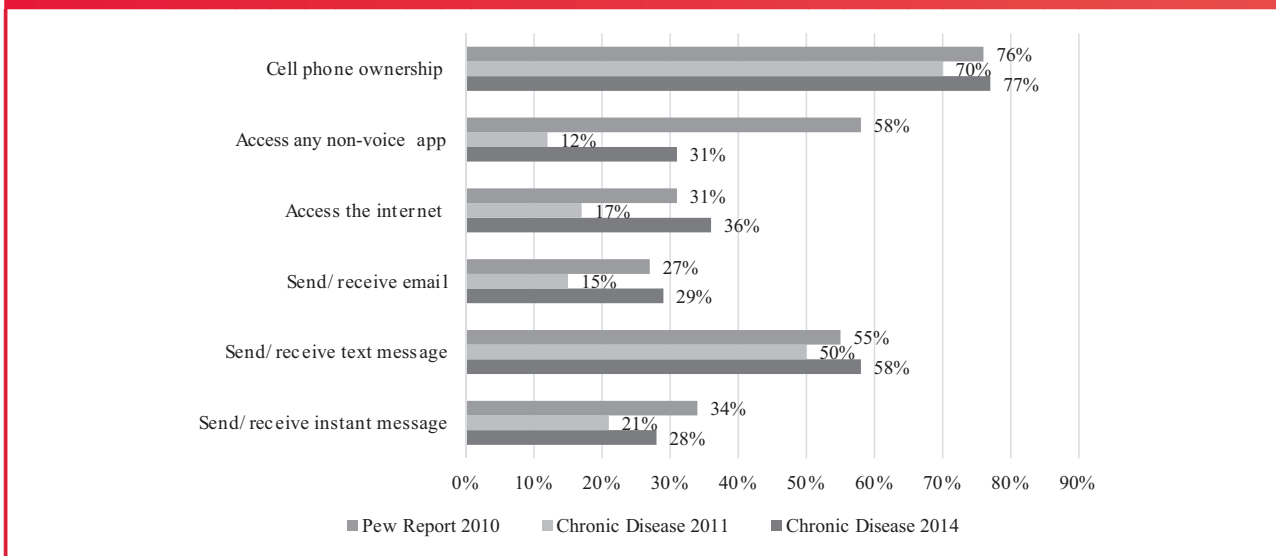
estimates, our differences would likely be even greater if compared to more recent national estimates.

CONCLUSION

Latino patients have traditionally struggled to access medical care in the United States, and as a result have faced health disparities compared to the general population.[2,9,10,12] mHealth presents a potential solution since it allows health care providers to effectively and efficiently communicate with hard-to-reach, low-income Latinos. However, we found that our patients actively seeking health care use advanced mobile phone functions (email, instant messaging, Internet, and apps) at rates lower than national estimates, and patients with chronic disease fall significantly further behind. Although over the past 3 years, our patients have increased mobile phone use in all categories, their nonvoice app estimates are still below national estimates

from 2010, limiting the potential reach of app-based mHealth programs to only 40% of our population. However, the majority of patients, regardless of chronic disease status, own cell phones and can send/receive text messages. The expansion of mHealth programming has the potential to reduce barriers to health information for resource-poor Latino patients, but in order to appreciate these benefits, we have to tailor technology toward the specific needs and capabilities of this vulnerable population.

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COMPETING INTERESTS

The authors have no competing interests to declare.

CONTRIBUTORS

S.A. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. S.A., E.B., and M.M. were responsible for study concept and design. T.A., C.N.L., and R.R. were responsible for acquisition of data. K.F., C.C., S.A., T.A., R.R., and E.B. were responsible for analysis and interpretation of data. C.C. was responsible for drafting the article. K.F., S.A., and E.B. were responsible for writing the manuscript. S.A., S.T., C.N.L., M.M., E.B., and K.F. were responsible for statistical analysis, writing, and critical revision of the article for important intellectual content. S.A., E.B., and K.F. take responsibility for the paper as a whole.

SUPPLEMENTARY MATERIAL

Supplementary material is available online at http://jamia.oxfordjournals.org/.

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