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Primary Language and the Electronic Health Record Patient Portal: Barriers to Use among Spanish-Speaking Adults with Asthma

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ABSTRACT

Objectives: To assess electronic health record patient portal use among Spanish-speaking patients with asthma compared to English-speaking patients and identify barriers to use.

Methods: Using data collected for a PCORI-funded randomized controlled trial to increase patient portal use in low-income adults with uncontrolled asthma, we estimated the association between portal use, measured using surveys and actual user login data, and primary language. Open-ended survey responses were grouped into common themes.

Results: Among 301 adults with asthma: age 18-87, 90% female, 17% Spanish speakers; 44% had no portal use during the study. Spanish speakers were less likely to have ever heard of the patient portal than English speakers ($p=.001$) and reported more difficulty navigating the portal ($p\leq.001$). Spanish speakers with low health literacy had less portal use (31%) than their English-speaking counterparts (51%) ($p=.02$). Compared to high-literacy English speakers, the odds of using the portal for low-literacy Spanish speakers were 0.34 (95% CI 0.14, 0.84) ($p=.02$). Three-quarters of Spanish speakers cited barriers to portal use compared to one-quarter of English speakers, and many suggested creating a Spanish version to improve user-friendliness.

Conclusions: English-only patient portals may not meet the needs of Spanish-speaking patients with uncontrolled asthma. Health systems serving Spanish-speaking communities should implement patient portals in Spanish.

Keywords Patient Portals; Electronic Health Records; eHealth; Healthcare Disparities; Hispanic Americans

BACKGROUND AND SIGNIFICANCE:

The use of information and communication technologies such as the Internet for health and healthcare purposes (eHealth) (1), is increasing and will continue to expand among both public and private institutions (2). In particular, health care institutions in the United States have made significant investments in developing the electronic health record (EHR). The patient portal is an aspect of the EHR that offers patients the ability to access their health information and communicate electronically with their healthcare team (3, 4). EHR portals provide patients such functionalities as requesting prescription refills, viewing laboratory results, scheduling appointments with providers, and securely emailing their care team. The American Recovery and Reinvestment Act of 2009 amended the Social Security Act and through the use of incentive payments to health care providers sought to promote use of information technology in healthcare (5). That Act, and especially its Meaningful Use provisions, now known as "promoting interoperability", represent a federal incentive program to expand access to portal web sites. Among the Act's many goals has been to reduce health disparities (6, 7).

As the nation has become increasingly diverse, Spanish speakers in particular have experienced substantial growth as a population. According to the US Census Bureau, over 13% of the U.S. population speak Spanish at home and more than 5% speak English "less than very well" (8). Studies have shown how language barriers can lead to poorer quality of care such as less understanding of physician's explanation and less follow-up (9). This is of particular relevance for asthma care and management, as some Spanish-speaking groups in the U.S. (i.e. Puerto Ricans and Dominicans) face disproportionately high rates of asthma prevalence, morbidity, and mortality (10, 11). Patient portal use and accessibility could exacerbate these disparities even further. Preliminary data suggest that Spanish speakers may have lower access to patient portals: according to a nationally representative survey of access and use of health information technology (IT), of the respondents who took the survey in English, 40% were offered online access to their medical record by a health insurer or health care provider, compared to just 11% of individuals who took the survey in Spanish (12).

While health systems are beginning to implement patient portals in Spanish and other languages, this feature is not routine, and there is no published information available about how health systems have chosen to implement such language features (3, 6, 13). Further, portals that do exist in other languages may lack the full functionality and comprehensiveness of English language sites (14). Research is needed to identify use, access, and preferences of Spanish speakers in order to create user-friendly eHealth tools for this population. This study seeks to address this need by asking the following research questions: 1) How does patient portal and other eHealth use differ among Spanish-speaking patients with asthma compared to English-speaking patients overall and by literacy level? and 2) What are the barriers to patient portal and other eHealth use among Spanish-speaking patients with asthma compared to English-speaking patients?

METHODS:

Parent Study

This analysis utilized data from the Patient-Centered Outcomes Research Institute (PCORI)-funded study "Using IT to Improve Access, Communication, and Asthma in African American and Hispanic/Latino Adults" (15). This randomized-controlled trial recruited 301 African American and Hispanic/Latino adults with uncontrolled asthma from low-income urban neighborhoods who, by self-report, had used the patient portal no more than 3 times previously. Community Health Workers (CHWs) provided portal training to all participants at baseline (15). Additionally, the intervention group was randomized to receive home visits where CHWs reinforced portal use and provided care coordination, with a focus on communication and access. The intervention took place over the first

6 months of the study and participants in the intervention group received up to 4 home visits within this time frame.

Data collection was intended to occur 5 times during a 1-year follow-up. The primary outcome was asthma control. Other outcomes were asthma quality of life, emergency department (ED) visits, and hospitalizations. The study was approved by the Institutional Review Board. The present analysis uses data collected from all participants at baseline regarding their experience with the patient portal, their numeracy and functional literacy levels, and their portal use throughout the course of the study in order to quantify the association between primary language (English or Spanish) and portal use while adjusting for potential confounders.

Eligibility

Inclusion criteria for this study were age of at least 18 years, speaking English or Spanish, living in a Philadelphia neighborhood in which at least 20% of households have incomes below the federal poverty level, having a doctor's diagnosis of asthma, being prescribed an inhaled corticosteroid-containing medication, requiring prednisone or having an ED visit or hospitalization for asthma in the past year, not having used the patient portal more than 3 times prior to screening, and being a patient in a participating clinic. Exclusion criterion was having severe psychiatric or cognitive problems that would make it impossible to understand and carry out the protocol.

Recruitment Sites

Participants were recruited from 2 family medicine, 2 general internal medicine, 2 pulmonary, and 1 allergy-immunology outpatient practices located in West Philadelphia. Patients were also recruited from a primary care practice in North Philadelphia, serving a predominantly Spanish-speaking population. These health systems did not have a Spanish version of their patient portal available.

Screening, Enrollment and Baseline Data Collection

Patients at participating sites who had an electronic health record diagnosis of asthma and a prescription for an inhaled corticosteroid were contacted for screening via telephone or in person at the clinic. Interested potential participants were screened at their clinic or in their home. Eligible potential participants were consented using an IRB-approved consent form in English or Spanish according to preference. CHWs performed baseline data collection in person with participants. CHWs entered responses directly into the secure, encrypted, web-based database REDCap (Research Electronic Data Capture) (16).

Measures

Surveys

Baseline data collected included demographic; socioeconomic; health-related variables; and health literacy measures, including the validated tools S-TOFHLA (Short Test of Functional Health Literacy in Adults), ANQ (Asthma Numeracy Questionnaire), CES-D (Center for Epidemiologic Studies Depression Scale) and eHEALS (eHealth Literacy Scale). S-TOFHLA is a test of reading comprehension that can be administered in English and Spanish (17). S-TOFHLA uses a Cloze method where subjects read passages in which words are deleted and the correct missing word is selected from 4 choices. There are 2 passages with a total of 36 Cloze items: preparation for an upper gastrointestinal series (4th grade level) and the patient rights and

responsibilities section of a Medicaid application (10th grade level) (17). The score is the number correct from 0 to 26; a score of greater than 23 represents adequate reading comprehension. Participants had 7 min to complete the assessment. The Numeracy section of S-TOFHLA was not administered because we instead used an asthma-specific numeracy measure (the ANQ). The ANQ is an asthma-specific numeracy scale comprised of 4 questions assessing basic numeracy skills (e.g. arithmetic, percentages) with scores ranging from 0–4, where a score of 4 indicates high numeracy skills (18). CES-D has 20 items with a 4-point Likert scale; scores range from 0–60 with scores of 16 or greater suggestive of depressive symptoms or general distress (19, 20). eHEALS has 8 items graded on a 5-point Likert scale with scores ranging from 8 to 40, with higher scores indicating higher electronic literacy (21).

Various investigator-developed closed- and open-ended measures related to portal and eHealth use selected from surveys created for the parent study were used to compare knowledge, perceptions, and behaviors among Spanish speakers compared to English speakers (15). All of these data were collected at baseline. All surveys were translated into Spanish by a native speaker, translated back by a second bilingual speaker, and the English language versions were compared. The survey was administered by a native Spanish speaker when applicable.

User Login Data

Patient portal use data was measured over time in order to compare use among English and Spanish speakers. Portal use data included all actions performed by participants in their patient portal account from the time of their enrollment to completion of the study (1 year or longer) and were obtained with patient consent and IRB approval (15). Data were linked with each participant and de-identified. Portal use was categorized as episodes of use over time, and for the purposes of this analysis was collapsed into the categories of “no use” and “some use.” Portal use data were collected throughout the course of the study.

Analysis

The Wilcoxon rank-sum test and Pearson’s chi-squared test were used to examine the association of baseline patient characteristics with primary language and portal use over time. Unadjusted associations between primary language, literacy, and portal use were based on the chi-squared test. We then combined the primary language and functional health literacy (literacy) variables (measured using S-TOFHLA) and grouped them into 4 categories: English-speaking and adequate literacy, English-speaking and inadequate/marginal (low) literacy, Spanish-speaking and adequate literacy, and Spanish-speaking and low literacy. We performed a chi-squared test to examine the unadjusted association of primary language by literacy level and portal use. We estimated standardized associations after adjusting for participant characteristics using logistic regression, controlling only for age and gender, as we hypothesized that the other covariates included in the initial model were correlated with being a Spanish speaker in this study. Analyses were performed using Stata v 15.1 (StataCorp LLC, College Station, TX).

We grouped together similar open-ended survey responses to count the frequency of response type by primary language. We characterized responses to the prompt “Ask the patient if there are any suggestions to making [the patient portal] more user-friendly” as identifying portal use as easy, identifying barriers to use, or neutral responses and counted the frequency of each response type by primary language. Of those who identified barriers to use in their response, we categorized the barriers described into groups and counted the number of responses that fell into each category. Some responses were categorized under more than 1 group. Responses labeled by data collectors as “N/A” were removed from the analysis.

RESULTS

Participant Characteristics

Of approximately 5,000 potentially eligible patients, 814 were further assessed for eligibility. Three hundred one patients met eligibility criteria, consented to participate, and were randomized. Three participants withdrew consent, 4 were withdrawn after threatening research staff safety, 5 died over the course of the study, and 16 were lost to follow-up. A more detailed participant flow diagram (CONSORT) can be found in Apter et al. (22). Table 1 displays sociodemographic variables chosen from those of the primary PCORI-funded randomized controlled trial. Additional sociodemographic characteristics are included in Table S1. Participants 18 to 87 years were mostly female (90%). Of the 301 participants, 52 (17%) identified Spanish as their primary language. In this population, Spanish speakers exhibited lower levels of education, functional health literacy, and income. They also had higher levels of some comorbidities, including diabetes and depressive symptoms.

Baseline Survey Results

Table 2 shows responses to select patient portal and eHealth use questions by primary language. Additional responses related to communication with providers by primary language can be found in the supplement in Table S2. The following variables were associated with primary language: eHealth literacy, difficulty navigating the portal, comfort using a computer to access the Internet, and having heard of the patient portal. Spanish speakers had lower eHealth Literacy scores, reported higher difficulty of navigating the portal, reported feeling less comfortable using a computer to access the Internet, and had heard of the patient portal less frequently than English speakers.

Association between Primary Language and Portal Use

The unadjusted chi-squared table of association between primary language by literacy level and portal use is shown in Table 3. Forty-two percent ($n = 102$) of English speakers had no portal use throughout the course of the study, compared to 56% ($n = 29$) of Spanish speakers (Pearson chi-squared = 3.84, $p = .05$). Forty-nine percent ($n = 32$) of low-literacy English speakers did not use the portal during the study compared to 69% ($n = 18$) of low-literacy Spanish speakers (Pearson chi-squared = 10.4, $p = .02$). The association between primary language by literacy level and portal use controlling for age and gender was measured using logistic regression and is displayed in Table 4. In this model, the odds of low-literacy English speakers and low-literacy Spanish speakers using the portal during the study were 32% lower and 66% lower respectively than the odds of English speakers with adequate literacy using the portal (English speakers OR = 0.68, CI [0.38, 1.21], $p = .19$, Spanish speakers OR = 0.34, CI [0.14, 0.84], $p = .20$). These odds ratios correspond to standardized predicted percentages of 62% (adequate-literacy English speakers), 52% (low-literacy English speakers), 56% (adequate-literacy Spanish speakers), and 35% (low-literacy Spanish speakers), respectively.

Table S3 in the supplement shows the results of the logistic regression model of primary language by literacy level and portal use controlling for additional covariates that were considered to be potential confounders between primary language and portal use at the $p < .1$ level: these included age, gender, having diabetes, having witnessed violence in one's neighborhood in the last 6 months, social support measured using the Medical Outcomes Study social support survey (23), and responses to the prompt "I feel confident the patient portal will help me communicate better with my doctor." Ultimately, we believe that this model may have over-controlled for variables that are correlated with being a Spanish speaker in this population.

Open-Ended Survey Responses

Participants were asked (1) “Are there any suggestions to making [the patient portal] more user-friendly?” and (2) were separately prompted to complete the following sentence: “I would use the Internet more if...” Table 5 summarizes responses among English and Spanish speakers. Suggestions for making the patient portal more user-friendly were grouped into three categories: positive responses (the portal is easy to use), neutral responses (did not have any suggestions or gave neutral suggestions, e.g. asking for more features) and negative responses (barriers to portal use). Of those who responded to the first prompt (51% response rate among English speakers, 81% response rate among Spanish speakers), 25% of English-speaking respondents reported barriers to portal use, compared to 76% of Spanish-speaking respondents. Barriers commonly identified in both groups were needing more practice or help with using the portal, not having access or desire to use the portal, or preferring to call their provider. The most commonly mentioned barrier to portal use among Spanish-speaking respondents was not having access to a Spanish version of the portal (38%). Of those who responded to the second prompt (73% of English speakers, 83% of Spanish speakers), the most common responses to the prompt in both groups were “if I knew more or learned how” (25% of English speakers, 26% of Spanish speakers), and “if I had access” (25% of English speakers, 23% of Spanish speakers).

DISCUSSION AND CONCLUSION

Discussion

In this sample of low-income patients with asthma living in Philadelphia, Spanish speakers with low literacy had a lower probability of using the patient portal (measured using actual portal use data over one year) than both English speakers and Spanish speakers with adequate literacy. Spanish speakers also experienced more barriers to portal use than their English-speaking counterparts, including more difficulty navigating the portal, feeling less comfortable using a computer to access the Internet, and having heard of the patient portal less often. When asked for suggestions for making the patient portal more user-friendly, Spanish speakers most commonly suggested a Spanish version of the portal. Both groups identified barriers that reflect the financial stresses in this population and that could represent limited computer literacy, such as saying they do not like computers or that they need help navigating the portal. Both groups also commonly showed interest in learning to use the patient portal if shown how.

While patient portals and other health technologies can improve patient health behaviors and health outcomes (24, 25), our research adds to the growing literature showing that portals also have the potential to exacerbate existing health inequities. Numerous studies have found that certain patient subgroups are less likely to use portals including racial/ethnic minorities (14, 26, 27), those of lower socioeconomic status (28, 29) and older adults (14). These populations already experience disproportionate barriers to care and on average have greater medical needs (6). Recent evidence has also shown infrequent portal use among low-income patients with uncontrolled asthma, even after receiving in-person training (30). Our study builds on these findings by demonstrating that within a racial/ethnic minority, low-income, older adult patient population with asthma, Spanish speakers, particularly those with low literacy, had a lower probability of using the patient portal and faced more barriers to portal use than their English-speaking counterparts.

Using data from survey responses, Choi and DiNitto (31) found low rates of internet use in a population of older, low-income, homebound adults, reflecting findings similar to ours (while our entire sample was not homebound, some could not leave their homes easily because of high rates of comorbidities). Their survey also found, as in our study, that the odds of using the Internet were lower among Spanish speakers (31). Our study, by contrast, examined actual use of the EHR patient

portal among Spanish and English speakers with asthma in conjunction with various survey measures of general internet use.

Reasons cited in the literature for lower portal use among underserved patient populations include lack of information or technical assistance, barriers to access, medical language, privacy concerns, negative attitudes towards the portal, and lack of motivation (32–36). While participants in our study echoed many of these concerns such as requiring more knowledge, practice or assistance, requiring internet access, and not having motivation or interest in using the Internet or a patient portal, in our study Spanish speakers in particular most frequently expressed the need for a Spanish language version of the patient portal. A qualitative study from a safety-net health system serving a predominantly Spanish-speaking population reported high levels of interest in a bilingual patient portal (37). Among patients surveyed from a federally qualified health center, Spanish speakers were the subgroup most interested in using secure email to communicate with their providers (38). These findings suggest that if given proper access, Spanish speakers are willing to engage in health IT as part of their healthcare. Our research reflects this interest among Spanish speakers in a bilingual patient portal, along with the need for sufficient training and access.

Despite receiving portal training at baseline, several participants in our study expressed that they do not want to use a patient portal. Results from a nationally representative survey found that two-thirds of insured patients were not using an online patient portal in 2017; 70% of these patients selected preferring to speak to their provider directly as the reason for not using the portal, followed by 57% stating they had no need to use the portal (39). These sentiments were reflected in some patient responses in our study. These findings align with evidence that some patients fear that using the patient portal will erode their personal relationships with providers (34).

Limitations

The relatively small number of Spanish-speaking patients in our sample (17%) although representative of the demographics of Philadelphia, limited the power of the current analysis to demonstrate differences in portal usage by patient language. Nevertheless, the sample size of 52 Spanish-speaking participants was sufficient to characterize portal use and compare use by key patient characteristics. Additionally, participants were asked only their primary language, and not whether they spoke another language (for instance, those who identified Spanish as their primary language were not asked about their fluency in English). However, grouping participants by primary language and literacy level may have served as a proxy for English fluency, as it is likely that the Spanish-speaking, low-literacy group had lower English proficiency than the Spanish-speaking, adequate-literacy group.

Because the sample was 90% female, we do not know how low-income English- and Spanish-speaking men interact with portals. Additionally, because the majority of this analysis came from baseline survey data, it is possible that social desirability bias occurred, wherein participants answered questions in a manner to please the researcher administering the survey (40). We used S-TOFHLA to measure health literacy, however health literacy is a complicated construct that may not be adequately captured by this timed measure of reading comprehension. Several survey questions related to participant portal and eHealth use were developed by investigators and have not been submitted to psychometric evaluation, further limiting the validity and reliability of our results.

The study setting and population may be a limitation for generalizability, specifically among Spanish-speaking populations. The vast majority of Spanish-speaking participants in this study were Puerto Rican, living in North Philadelphia neighborhoods, reflecting the city's demographics. While all of the participants in this study had access to healthcare, many Spanish-speaking people in the United States have limited legal status which impedes access in general, let

alone to a patient portal. Finally, participants in this study were patients in two health systems with patient portals that do not reflect the variety of quality and functionality among the many patient portals in existence.

Suggestions for Further Research

Future studies examining primary language and portal use may want to focus on language by design to obtain a more balanced participant population. Further, based on the feedback we received that patients were interested in learning to use the portal and evidence suggesting that individually focused interventions are effective for increasing patient portal usage in vulnerable populations (41), future research could explore interventions that involve in-depth, repeated patient portal training sessions for interested patients. While our intervention did provide in-person portal training to all participants (including those in the control group) at baseline, and those randomized to receive the intervention also received home visits where CHWs reinforced portal use and provided care coordination (15, 22), it is likely that one training session was not sufficient for most patients in this population, particularly Spanish speakers.

Ancker and colleagues (42) found that after implementing a Spanish version of a patient portal in a safety net medical organization, Spanish speakers were less likely than English speakers to be repeat portal users, suggesting that a Spanish version is necessary but not sufficient for increasing portal use. Similarly, low-income patients with asthma were found to use the patient portal irregularly if at all despite receiving training, echoing the need for future interventions that promote access, effective education, and a user-friendly interface for this population (30).

Finally, if health systems continue to move in the direction of choosing online portals as the preferred means of communication between patients and care teams, those systems should be aware of populations that, by reason of language, literacy, health status, internet access, or personal preference, will not use the online portal. Accordingly, they should prioritize providing these patients with other avenues of communication with their provider and access to health information so that the patient portal does not exacerbate existing health disparities. Providers may need specific tiered approaches to communication, including extra telephonic support for populations who cannot or will not use the portal.

Conclusion

In this analysis of EHR patient portal use among English- and Spanish-speaking patients with asthma, we found evidence that English language patient portals may not be meeting the needs of Spanish-speaking patients. In particular, we found that Spanish speakers with low health literacy had the lowest probability of portal use in this study. Spanish speakers more commonly identified barriers to portal use than English speakers, and many suggested implementing a Spanish version would improve user-friendliness. Health systems should implement patient portals and other eHealth resources in Spanish, and perhaps other languages used in the neighborhoods and cities these health systems serve.

CONFLICT OF INTEREST STATEMENT:

The authors have no conflicts of interest to declare.

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Table 1: Demographic characteristics of patient participants by primary language, measured at baseline.

	Primary Language		
Category	All (N = 301)	English (N = 249)	Spanish (N = 52)
Age			
Median	51	50	53
Minimum, maximum	18, 87	18, 84	24, 87
Sex			
Female	270 (90%)	223 (90%)	47 (90%)
Education attainment			
High School Graduate or Higher	212 (70%)	190 (76%)	22 (42%)
S-TOFHLA ^{*†}			
Median	31	32	22
Minimum, maximum	0, 36	0, 36	0, 36
ANQ [‡]			
Median	1	1	1
Minimum, maximum	0, 4	0, 4	0, 4
Comorbidities			
Hypertension	175 (58%)	145 (59%)	30 (58%)
Diabetes	96 (32%)	73 (29%)	23 (44%)
CES-D ^{*§}	167 (56%)	123 (50%)	44 (86%)
Insurance			
Medicaid	190 (63%)	148 (59%)	42 (81%)
Other (commercial, Medicare, self-pay)	111 (37%)	101 (41%)	10 (19%)

*Missing data for reading comprehension (n = 2) and CES-D (n = 4).

†The Short Test of Functional Health Literacy in Adults (S-TOFHLA)²⁸ is a test of reading comprehension. It can be administered in English and Spanish. The score is the number correct from 0 to 26, and a score of greater than 23 represents adequate reading comprehension.

‡The Asthma Numeracy Questionnaire (ANQ); a numeracy scale comprised of 4 questions assessing basic numeracy skills (arithmetic, percentage). Scores range from 0–4, where a score of 4 indicates high numeracy skills²⁹.

§The Center for Epidemiologic Studies Depression Scale (CES-D) has 20 items with a 4-point Likert scale. Scores range from 0 to 60, with scores of 16 or greater suggestive of depressive symptoms or general distress^{30, 31}.

Table 2: Association of patient eHealth literacy, patient portal knowledge and navigation, and computer ownership and usage with primary language, measured at baseline.

Category	All (N = 301)	Primary Language		P-value *
		English (N = 249)	Spanish (N = 52)	
eHEALS [†]				<.001
Median	25	26	24	
Minimum, maximum	8, 40	8, 40	8, 40	
Heard of patient portal [‡]	136 (45%)	123 (50%)	13 (25%)	.001
Difficulty of navigating portal [§]				<.001
Median	1	1	3	
Minimum, maximum	1, 5	1, 5	1, 5	
Own a computer at home	158 (53%)	136 (55%)	22 (42%)	.11
How comfortable are you using a computer to access the internet? [¶]				<.001
Median	7	7	2.5	
Minimum, maximum	1, 10	1, 10	1, 10	

* Bolded values were considered associated with variable of interest using Wilcoxon rank-sum test or Pearson's chi-squared test: p values < .05.

[†]The eHealth Literacy Scale (eHEALS), has 8 items graded on a 5-point Likert scale, and therefore the score ranges from 8 to 40, with higher scores indicating higher electronic literacy³².

[‡]Missing data for difficulty of navigating portal (n = 90), how comfortable are you using a computer to access the Internet? (n = 1), and heard of patient portal (n = 1).

[§]Participants were asked to "rate the overall difficulty of navigating [the patient portal]" on a scale from 1 to 5 with 1 indicating the task was easy to perform and 5 indicating the task was very difficult.

[¶]Participants were asked "How comfortable are you using a computer to access the Internet on a scale from 1–10, where 1 means not comfortable at all and 10 means extremely comfortable?".

Table 3: Electronic health record patient portal use by literacy levels within primary language, unadjusted.

Primary Language and Reading Comprehension	No Portal Use (N = 131)	Some Portal Use (N = 170)	Total (N = 301)
English, Overall	102 (42%)	147 (58%)	249
English, Adequate Literacy	70 (38%)	114 (62%)	184
English, Low Literacy	32 (49%)	33 (51%)	65
Spanish, Overall	29 (56%)	23 (44%)	52
Spanish, Adequate Literacy	11 (42%)	15 (58%)	26
Spanish, Low Literacy	18 (69%)	8 (31%)	26

Unadjusted Pearson chi-squared (comparing English and Spanish speakers overall) = 3.84, $p=.05$.

Unadjusted Pearson chi-squared (comparing the four language/literacy combinations) = 10.4 $p= 0.02$.

Table 4: Electronic health record patient portal use modeled as a function of primary language and literacy, adjusted (standardized) for age and gender.

Association with Portal Use	Odds Ratio	95% Confidence Interval	P-Value	Standardized Probability
English, Adequate Literacy	REF		REF	0.62
English, Low Literacy	0.68	(0.38, 1.21)	.19	0.52
Spanish, Adequate Literacy	0.80	(0.34, 1.87)	.61	0.56
Spanish, Low Literacy	0.34	(0.14, 0.84)	.02	0.35
Patient Characteristics				
Age (10 year change)	0.79	(0.66, 0.96)	.02	
Male	0.62	(0.28, 1.36)	.23	

Modeled using logistic regression.

Likelihood ratio test = 18, df = 5, $p=.003$.

Test for differences in language, literacy: chi-squared = 6.22, $p=.10$.

2 observations were lost owing to missing values.

Standardized probabilities estimated using marginal standardization (predictive margins).

Table 5: Open-ended responses to the prompts “Are there any suggestions to making [the patient portal] more user friendly?” and “I would use the Internet more if...”, measured at baseline.

<i>“Are there any suggestions to making [the patient portal] more user-friendly?”</i>		
	English Speakers (N=249)	Spanish Speakers (N=52)
Response rate	126/249 (51%)	42/52 (81%)
Portal was easy to use	55/126 (44%)	7/42 (17%)
Neutral response*	39/126 (31%)	6/42 (14%)
Barriers to portal use	32/126 (25%)	32/42 (76%)
<i>Barriers to portal use</i>		
Need more practice or help with portal	11/32 (34%)	7/32 (22%)
Did not like using internet or portal, did not have access to internet, or preferred calling their doctor	9/32 (28%)	5/32 (16%)
Had trouble seeing the screen or asked for an audio component	9/32 (28%)	0/32 (0%)
Not having access to a Spanish version of the portal	NA	12/32 (38%)
<i>“I would use the internet more if...”</i>		
Response rate	182/249 (73%)	43/52 (83%)
I knew more/learned how	45/182 (25%)	11/43 (26%)
I had access	46/182 (25%)	10/43 (23%)
I already use the internet	32/182 (18%)	0/43 (0%)
I had a reason to	16/182 (9%)	8/43 (19%)
I do not want to use it	13/182 (7%)	3/43 (7%)
It were safe/secure	7/182 (4%)	0/43 (0%)
I had more time	0/182 (0%)	3/43 (7%)

* Neutral response indicates respondent did not have any suggestions or gave suggestions that did not identify barriers (e.g. asking for more features).