

ORIGINAL RESEARCH

Communication Technology Access, Use, and Preferences among Primary Care Patients: From the Residency Research Network of Texas (RRNeT)

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Objective: The digital revolution is changing the manner in which patients communicate with their health care providers, yet many patients still lack access to communication technology. We conducted this study to evaluate access to, use of, and preferences for using communication technology among a predominantly low-income patient population. We determined whether access, use, and preferences were associated with type of health insurance, sex, age, and ethnicity.

Methods: In 2011, medical student researchers administered questionnaires to patients of randomly selected physicians within 9 primary care clinics in the Residency Research Network of Texas. Surveys addressed access to and use of cell phones and home computers and preferences for communicating with health care providers.

Results: In this sample of 533 patients (77% response rate), 448 (84%) owned a cell phone and 325 (62%) owned computers. Only 48% reported conducting Internet searches, sending and receiving E-mails, and looking up health information on the Internet. Older individuals, those in government sponsored insurance programs, and individuals from racial/ethnic minority groups had the lowest levels of technology adoption. In addition, more than 60% of patients preferred not to send and receive health information over the Internet, by instant messaging, or by text messaging.

Conclusions: Many patients in this sample did not seek health information electronically nor did they want to communicate electronically with their physicians. This finding raises concerns about the vision of the patient-centered medical home to enhance the doctor-patient relationship through communication technology. Our patients represent some of the more vulnerable populations in the United States and, as such, deserve attention from health care policymakers who are promoting widespread use of communication technology. (J Am Board Fam Med 2012;25:625–634.)

Keywords: Cell Phone, Communication, Computers, Family Medicine Research

The digital revolution is changing the manner in which patients communicate with their health care

providers. Policymakers, such as those who conceived of the patient-centered medical home, are working to bridge the digital divide between practitioners and patients by rewarding clinics using health communication technologies.^{1,2} For instance, family medicine clinics with interactive websites allowing patients to view medical records, view test results, renew prescriptions, request appointments, and send secure messages are required for advanced certification levels.³ Communication technologies such as cell phones now provide patients with the capacity to monitor diseases, communicate with their care providers, send and receive personal health information, and receive health promotion messages in a timely and inexpensive manner.^{4–7}

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Such changes have redefined the patient-physician relationship.^{8,9} Moreover, communication technology is creating opportunities for the provision of care to vulnerable populations through shared decision making, collaboration, patient empowerment, and access to health care.¹⁰⁻¹³ Knowledge of patients' access and use of communication technologies can assist physicians in identifying the best avenues for providing health information.

Adoption and use of communication devices has increased significantly in the United States during the past 10 years.^{14,15} The Pew Research Center¹⁶ has described overall access to cell phones and computers, suggesting that 88% of Americans have a cell phone and 57% have a computer. Despite increased technology use across the United States, some groups have decreased access to Internet technologies. According to the US Centers for Medicaid and Medicare, 42% of Medicaid patients are living below the federal poverty level.¹⁷ Individuals in government health insurance programs may lack the resources to purchase cell phones and computers. Other studies have identified barriers to access and adoption of modern communication devices among older adults, individuals from underrepresented groups, and individuals with low incomes.¹⁷⁻²²

Overall access to Internet health information may be less among some patient groups than previous studies have reported. For instance, the Pew Research Center recently evaluated home broadband access, and found that approximately two thirds of African Americans and Hispanics had access, whereas three fourths of whites had access.²³ They evaluated Internet and cell phone use and found that whites had significantly higher use.²³ Patients who own computers without Internet access and cell phones without data plans or text messaging would have a limited ability to acquire relevant health information through newer communication channels. Moreover, patients with cell phones on short- versus long-term contracts or patients with phone numbers that have changed may be unable to maintain communication with their health care provider over time. In addition, patient preferences for communicating health information over the Internet and by text may vary. For instance, in 2010 the Pew Research Center found that 35% of cell phone owners had smart phones, but only 17% of smart phone owners looked up health information.²⁴

Our patients represent some of the more vulnerable populations in the United States and may have

far less access to communication technologies than the Pew Research Center's findings would suggest. The purpose of this study was to examine communication technology access, use, and preferences among a largely government-insured, diverse patient population receiving health care in 9 Texas primary care clinics. We wanted to determine if patient age, sex, insurance type (Medicare vs private insurance), and ethnicity influenced patient access to digital devices and Internet communication channels.

Methods

Setting

This study was a cross-sectional survey of patients attending primary care visits in 9 primary care clinics affiliated with the Residency Research Network of Texas (RRNeT), a practice-based research network. RRNeT is a collaboration of 10 family medicine residency programs in which approximately 100 faculty and 300 residents see more than 300,000 patients per year. Approximately half of the patients are members of government-sponsored health insurance programs. This study was approved by institutional review boards at all participating sites.

Subjects

Medical student research assistants enrolled patients during May and June of 2011. Investigators identified all physicians (family physician or family medicine residents) working in each half-day clinic session. For each session, medical students randomly selected one physician and invited all consecutive patients of that physician to participate in the study about patient visits. After obtaining informed consent from the patient, the medical student accompanied the physician during the visit and administered a 1-page confidential patient questionnaire. Medical students invited 689 adult patients to answer questions about communication technology, and 533 (77.4%) completed the questionnaire. The data were entered into a central database shared by all 9 health clinics.

Measurement

Patients provided basic demographic information including age, sex, race/ethnicity, and health insurance status. They responded to questions about adoption and use of electronic communi-

cation devices, especially cell phones and home computers, on a 1-page anonymous survey. Additional questions were asked about use of electronic devices to send and receive health information. Finally, patients were asked about their preferences for communicating with a health care provider and preferences for receiving health information (refer to Table 1 for survey questions).

Analysis

This analysis was limited to adult patients aged 21 and older. Chi-squared tests examined group differences in technology access, use, and preferences.

Groups were defined by age, sex, insurance status, and race/ethnicity. Health insurance status was used as an estimate for socioeconomic status, with private insurance (generally provided by employers to full-time workers) indicative of higher levels of economic stability. Patients with Medicare were aged ≥ 65 or disabled. Adults receiving Medicaid had extremely low income or were low-income pregnant women. Patients covered by “county health plans” were enrolled in tax-supported, locally administered programs that assist uninsured patients with payment for health care services. People in a county plan or who self-pay have no health

Table 1. Age Differences in Communication Technology Access, Use, and Preferences

Communication Technology Use	Young Adults n = 145	Middle Age n = 276	Seniors n = 112	Totals n = 533	P
Age, years	21–39	40–64	65–99		
Do you have a phone?					
No phone (% no)	0	4.4	4.7	3.2	
Cell phone or landline (% yes)	100.0	95.6	95.3	96.8	.035
Do you have a cell phone?					
No cell phone (% no)	4.2	16.5	29.2	15.7	
Month to month contract (% yes)	47.2	40.8	19.8	38.3	
Longer-term contract (% yes)	48.6	42.6	50.9	46.0	<.001
Do you have the same phone number as you had a year ago?					
No cell phone (% no)	6.5	20.9	33.0	19.8	
My number is different now (% yes)	25.0	18.7	5.5	17.5	
Yes, my number is the same (% yes)	68.5	60.4	61.5	62.7	<.001
Do you use text messaging on your cell phone?					
No cell phone (% no)	4.1	17.2	30.3	16.3	
No text messaging (% no)	8.3	30.8	58.7	30.4	
Yes, I use text messaging (% yes)	87.6	52.0	11.0	53.3	<.001
Do you have a computer at home? (% yes)	74.3	60.4	47.7	61.6	<.001
Do you conduct Internet searches? (% yes)	66.2	48.6	25.9	48.6	<.001
Do you look up health information on the Internet? (% yes)	64.3	47.1	28.4	47.9	<.001
Do you use E-mail? (% yes)	64.8	44.2	33	47.5	<.001
Do you use instant messaging? (% yes)	33.1	15.6	4.5	18.0	<.001
Do you use Facebook or Myspace? (% yes)	57.9	27.9	5.4	31.3	<.001
Do you use YouTube? (% yes)	46.9	21.7	2.7	24.6	<.001
Would you like sending information to your doctor by E-mail? (% yes)	56.6	36.2	16.1	37.5	<.001
Would you like sending information to your doctor by text? (% yes)	35.9	18.8	2.7	20.1	<.001
Would you like sending information to your doctor by Internet? (% yes)	17.9	13.0	4.5	12.6	.005
Would you like receiving your own health information by E-mail? (% yes)	50.3	34.4	18.8	35.5	<.001
Would you like receiving your own health information by text? (% yes)	32.4	18.1	2.7	18.8	<.001
Would you like receiving your own health information by Internet? (% yes)	20.7	13.4	4.5	13.5	<.001

Values provided as percentages unless otherwise indicated.

insurance coverage, characteristic of unemployed adults or part-time workers.

Logistic regression analyses examined the combined influence of patient characteristics on communication technology access, use, and preferences. Outcomes, coded as 0 (no) or 1 (yes), included 9 variables related to access (cell phone or computer ownership); use (use of texting, E-mail, and Internet searches); and preferences, which included receiving or sending health information by E-mail or Internet. Predictors included age, male sex, race/ethnicity, Spanish language, and insurance status. Age was entered as a continuous variable, whereas the categorical predictors were entered as dummy variables; non-Hispanic whites served as the comparison group for race/ethnicity and private health insurance served as the comparison for insurance status. All variables were entered into the 9 models in block 1.

Patient demographics and technological resources for patient care varied substantially among the RRNeT clinic sites. Therefore, we entered “site” as block 2 in the logistic regression model to determine its additional influence on outcomes. Practice 8, located in central Texas, had the highest proportion of privately insured patients and was selected as the contrast site.

Results

The questionnaire was completed by 533 of the 689 patients asked to participate, for a response rate of 77% (Table 2). Approximately one third were men, half were Hispanic, 13% were African American, and 3% were Asian. The mean age was 51 years; 27% were young adults (aged 21–41 years), 59% were middle aged adults (aged 41–64 years), and 21% were seniors (aged ≥ 65 years). With regard to health insurance status, 28% of patients had private insurance, 48% had government insurance (Medicare or Medicaid), 22% had coverage through a Texas county payment plan, and 5% were self-pay.

Telephone Access and Use

Nearly all of our patients (97%) owned a telephone and 84% owned a cell phone (Table 1). Of our total sample, 38% indicated they had cell phones with month-to-month contracts, whereas 45% indicated that they had cell phones with longer-term contracts. A majority of patients (63%) reported that they kept the same cell phone number from

Table 2. Patient Characteristics (N = 533)

Demographics	Descriptive Statistics
Sex*	
Men	175 (32.8)
Women	357 (67.0)
Age, years (mean [SD])	50.72 (16.90)
Ethnicity [†]	
Hispanic	279 (52.3)
White	166 (31.1)
African American	70 (13.1)
Asian	17 (3.2)
American Indian	8 (1.5)
Survey language*	
English	477 (90.0)
Spanish	51 (10.0)
Insurance type [†]	
Private insurance	149 (28.0)
Medicare	123 (23.1)
Medicaid	131 (24.6)
County plan	116 (21.8)
Self-pay	27 (5.1)
Unknown	32 (6.0)
Workers' compensation	2 (0.4)

Data provided as n (%) unless otherwise indicated.

*Some missing data.

[†]Participants could check more than one response.

the previous year, whereas 18% reported that their cell phone number had changed. A total of 53% of patients reported using text messaging on their cell phones.

Computer Access and Use

Most patients (62%) owned a computer (Table 1). However, of the entire sample only 48% of patients reported conducting Internet searches, sending and receiving E-mail, and looking up health information on the Internet. Approximately 18% of patients reported using instant messaging and almost a third of patients reported accessing the websites MySpace and Facebook, whereas a quarter of patients accessed the YouTube website.

Communication Technology Preferences

A small group of patients were interested in sending or receiving health information by E-mail, text, or the Internet (Table 1). About one third of patients “would like” to send or receive health information by E-mail. About 1 in 5 patients “would like” to send or receive health information by text,

and very few (12.6% to 13.5%) wanted to send or receive health information using the Internet.

Age Differences

Younger patients were more likely to own, use, and prefer communication technology; all comparisons were statistically significant (Table 1). With Bonferroni correction for multiple comparisons, 15 of 17 comparisons remained significant ($P < .003$). Younger patients were more inclined to own cell phones and computers; to use text messaging on their cell phones; to conduct Internet searches, send E-mail, and use instant messaging; to access websites such as Facebook and Myspace; and to search the Internet for health information. Younger patients also had more positive preferences for using communication technology to communicate with their health care providers and indicated a willingness to communicate by E-mail, text messaging and over the Internet.

Sex Differences

In our sample, a higher percentage of men than women (88% vs 82%) owned cell phones and owned cell phones with longer-term contracts (56.5% vs 41.1%; $P = .002$). Also, more men than women (71% vs 58%) indicated having the same phone number as in previous years ($P = .037$). More men preferred receiving health information by E-mail (41% vs 33%; $P = .055$), whereas more women preferred receiving health information by text message (22% vs 13%; $P = .012$) (data not shown).

Insurance Status Differences

Insurance type had a significant influence on access to, use of, and preferences for using communication technology to communicate with one's health care provider (Table 3). Bonferroni correction revealed significant differences in 14 of 17 comparisons. More patients with private health insurance had cell phones with longer-term contracts and the same phone number as in previous years compared with patients enrolled in government insurance plans. More patients with private health insurance used text messaging on their cell phones, owned computers, conducted Internet searches, looked up health information on the Internet, sent E-mails, sent instant messages, and accessed websites such as Facebook and YouTube. Only 35% of Medicaid and 32% of Medicare patients reported conducting

Internet searches. More uninsured patients looked up health information on the Internet than patients enrolled in government-sponsored insurance programs, but they searched less than patients with private insurance. Patients with private insurance also had more positive preferences for using computers and cell phones to communicate health information by E-mail, text messaging, and the Internet.

Racial/Ethnic Differences

Bonferroni correction showed that non-Hispanic whites were most likely to own cell phones and computers and use the Internet for searches and E-mail (Table 4). In addition, non-Hispanic whites were most likely to "like" receiving their own health information by E-mail.

Logistic Regression Analysis

Logistic regression analysis examined the combined influence of demographic predictors and clinic site on communication technology access, use, and preferences. Block 1 entered the demographic predictors; block 2 entered the clinic sites. Clinic site had a modest influence after controlling for patient characteristics; only 2 of 9 analyses showed significant contribution of block 2 (sites). Cell phone ownership was greater in clinic 7 and clinic 9 ($P < .05$); and preference to send E-mail was lower in clinic 2 ($P < .05$). Table 5 presents block 1 (demographic) findings from 9 logistic regression models; each column represents one model. Cells show the odds ratios for each predictor.

Age, race/ethnicity, and insurance status all were strongly linked to access to, use of, and preferences for communication technology. Sex had no effect. Young age was a consistent predictor across all outcomes. Hispanic and African-American patients had significantly lower access to and use of communication technology when compared with non-Hispanic whites. Spanish-speaking patients were less likely to use the computer for Internet searches or E-mail. Having Medicaid insurance or county plan/self-pay—markers for low income—were consistently predictive of low access, use, and preferences. After controlling for age, Medicare insurance was predictive of low preferences for sending or receiving health information using the computer.

Table 3. Insurance Plan Differences in Communication Technology Access, Use, and Preferences

Communication Technology Use	Primary Health Insurance Source					Totals (n = 479)*	P
	Private Insurance (n = 117)	Medicare (n = 91)	Medicaid (n = 128)	Self-Pay (n = 27)	County Plan (n = 116)		
Do you have a phone?							
No phone (% no)	0.9	5.7	3.9	0	5.2	3.6	
Cell phone or landline (% yes)	99.1	94.3	96.1	100.0	94.8	96.4	.233
Do you have a cell phone?							
No cell phone (% no)	6.0	21.6	18.5	11.1	19.5	15.8	
Month to month contract (% yes)	20.7	27.3	54.8	51.9	43.4	38.2	
Longer-term contract (% yes)	73.3	51.1	26.6	37.0	37.2	45.9	<.001
Do you have the same phone number as a year ago?							
No cell phone (% no)	9.4	24.7	26.7	18.2	20.0	20.2	
My number is different now (% yes)	8.2	8.2	21.8	22.7	23.8	16.8	
Yes, my number is the same (% yes)	82.4	67.1	51.5	59.1	56.2	63.0	<.001
Do you use text messaging on your cell phone?							
No cell phone (% no)	7.7	23.6	20.0	11.1	19.8	17.1	
No, no text messaging (% no)	22.2	51.7	30.4	18.5	23.3	30.0	
Yes, I use text messaging (% yes)	70.1	24.7	49.6	70.4	56.9	53.0	<.001
Do you have a computer at home? (% yes)	78.6	53.3	46.8	74.1	61.2	61.0	<.001
Do you conduct Internet searches? (% yes)	73.5	31.9	35.2	66.7	45.7	48.2	<.001
Do you look up health information on the Internet? (% yes)	67.8	33.3	39.2	55.6	44.3	47.2	<.001
Do you use E-mail? (% yes)	70.1	41.8	33.6	59.3	39.7	47.0	<.001
Do you use instant messaging? (% yes)	31.6	7.7	9.4	33.3	14.7	17.1	<.001
Do you use Facebook or Myspace? (% yes)	46.2	9.9	26.6	48.1	30.2	30.3	<.001
Do you use YouTube? (% yes)	43.6	6.6	17.2	37.0	22.4	24.0	<.001
Would you like sending information to your doctor by E-mail? (% yes)	65.0	20.9	20.3	40.7	38.8	37.0	<.001
Would you like sending information to your doctor by text? (% yes)	29.9	8.8	20.3	22.2	17.2	19.8	.005
Would you like sending information to your doctor by internet? (% yes)	26.5	7.7	5.5	11.1	12.9	13.2	<.001
Would you like receiving your own health information by e-mail? (% yes)	59.8	23.1	21.1	33.3	33.6	34.7	<.001
Would you like receiving your own health information by text? (% yes)	25.6	9.9	21.1	14.8	17.2	18.8	.056
Would you like receiving your own health information by internet? (% yes)	27.4	7.7	8.6	11.1	12.1	14.0	<.001

Values provided as percentages.

*Some missing data.

Discussion

We found that many respondents have limited or inconsistent access to different forms of communication technology, and few desire to communicate electronically with their physicians. Younger and white respondents were more likely to possess electronic communication devices and to be interested in communicating with physicians electronically. We also identified lackluster Internet use, E-mail use, and health information searches among pa-

tients enrolled in government-sponsored health insurance programs. A 2006 study evaluating patients' health information Internet searches yielded small differences among patients from different age and socioeconomic groups.²⁴ In contrast, our study found considerable differences between patient groups in terms of their access to health information on the Internet. These differences were especially salient when considering patient age, ethnicity, and type of insurance.

Table 4. Ethnicity/Racial Differences in Communication Technology Access, Use, and Preferences

Communication Technology Use	Hispanics (n = 273)	Non-Hispanic White (n = 163)	African American (n = 72)	Totals (n = 508)*	P
Do you have a phone?					
No phone (% no)	4.0	1.2	5.7	3.4	
Cell phone or landline (% yes)	96.0	98.8	94.3	96.6	.143
Do you have a cell phone?					
No cell phone (% no)	18.8	9.1	20.6	15.9	
Month to month contract (% yes)	43.2	28.7	42.6	38.4	
Longer-term contract (% yes)	38.0	62.2	36.8	45.7	<.001
Do you have the same phone number as a year ago?					
No cell phone (% no)	20.9	13.0	28.6	19.6	
My number is different now (% yes)	18.5	15.7	18.4	17.7	
Yes, my number is the same (% yes)	60.6	71.3	53.1	62.7	.118
Do you use text messaging on your cell phone?					
No cell phone (% no)	19.0	10.4	21.4	16.6	
No, no text messaging (% no)	28.1	36.8	20.0	29.8	
Yes, I use text messaging (% yes)	52.9	52.8	58.6	53.6	.024
Do you have a computer at home? (% yes)	52.4	73.8	63.8	60.8	<.001
Do you conduct Internet searches? (% yes)	40.6	60.0	50.0	48.1	<.001
Do you look up health information on the Internet? (% yes)	39.5	60.6	50.0	47.8	<.001
Do you use E-mail? (% yes)	37.1	64.2	47.1	47.2	<.001
Do you use instant messaging? (% yes)	14.0	20.6	24.3	17.5	.060
Do you use Facebook or Myspace? (% yes)	25.2	35.8	41.4	30.8	.008
Do you use YouTube? (% yes)	19.1	27.9	30.0	23.4	.039
Would you like sending information to your doctor by E-mail? (% yes)	30.9	46.1	38.6	36.8	.006
Would you like sending information to your doctor by text? (% yes)	18.7	21.2	22.9	22.1	.672
Would you like sending information to your doctor by internet? (% yes)	10.8	13.3	14.3	12.1	.607
Would you like receiving your own health information by e-mail? (% yes)	27.3	47.9	35.7	35.1	<.001
Would you like receiving your own health information by text? (% yes)	18.0	17.6	25.7	18.9	.292
Would you like receiving your own health information by internet? (% yes)	11.5	13.30	20.0	13.3	.173

*Remaining patients checked "Asian" or "other." They were not included in this analysis because of small sample sizes.

The Pew Research Center has suggested a much broader adoption of the Internet, which may lead physicians to assume that there is a considerable amount of the utility in placing health information online. According to Pew Research Center,²⁴ approximately 82% of Americans and 53% of the elderly use the Internet, whereas in our sample, 48% of patients and 26% of seniors indicated that they did so. Less than 40% of individuals receiving Medicaid and Medicare reported conducting Internet searches and searching for health information. The disparities are considerable and lead us to believe that tech-

nology use among the poor and the elderly is much lower than previously reported. Efforts to place health information on the Internet simply will not reach those who would benefit the most: those with low incomes and the elderly.

Generally, our patients' preferences for communicating health information seemed to be out of alignment with health policy and the capabilities of some providers. Few patients in our study preferred communicating health information by E-mail, text message, or over the Internet. This is consistent with previous studies, revealing a much lower than expected use of web-based health care communica-

Table 5. Logistic Regression Predicting Communication Technology Access, Use, and Preferences

Characteristics	Access		Use			Preferences for . . .			
	Cell phone	Computer	Internet	Email	Text	Receiving Email	Receiving Internet	Sending Email	Sending Internet
BLOCK 1									
Age	0.944*	0.960*	0.939*	0.943*	0.900*	0.956*	0.958*	0.949*	0.970 [†]
Male sex [‡]	—	—	—	—	—	—	—	—	—
Ethnicity (overall effect)	—	*	*	*	§	†	—	§	—
Hispanic	0.401 [§]	0.308*	0.297*	0.258*	—	0.392*	—	0.434 [†]	—
African American	0.326 [§]	0.464 [§]	0.409 [§]	0.388 [†]	—	—	—	—	—
Asian	—	—	—	—	0.174 [†]	—	—	—	—
Spanish language	—	—	0.300 [†]	0.224*	0.212*	—	—	—	—
Insurance (overall effect)	—	*	*	*	†	*	†	*	*
Medicare	—	—	0.386 [†]	—	—	0.367 [†]	0.382 [§]	0.304*	0.343 [§]
Medicaid	—	0.221*	0.153*	0.170*	0.271*	0.138*	0.271*	0.091*	0.198*
County	0.294 [§]	0.535 [‡]	0.370*	0.372*	—	0.348 ^{***}	0.391 [†]	0.361*	0.471 [§]
Model χ^2 (<i>df</i> = 9)	57.24	84.15	136.77	125.38	207.59	99.91	49.20	117.79	35.46
Nagelkerke R ²	0.202	0.224	0.339	0.315	0.480	0.266	0.180	0.305	0.136
Hosmer-Lemeshow goodness of fit (<i>P</i>)	.482	.900	.835	.232	.118	.935	.440	.596	.432

Values provided as odds ratios unless otherwise indicated.

**P* < .001.

[†]*P* < .01.

[‡]Sex is not significant and therefore the characteristic male sex does not contain any data.

[§]*P* < .05.

tion systems.²¹ Moreover, a generational and socio-economic divide remains, as younger patients and patients with private insurance plans have more positive preferences for electronic communication with their health care providers. Young people and individuals with private health insurance are already using smart phones and looking up health information on the Internet at higher rates than other patient groups.^{25,26} Some research has shown that uninsured patients are more inclined to look up health information on the Internet. This is fairly consistent with our findings regarding self-pay patients, although privately insured patients reported searching for health information the most.²⁴ Older patients may prefer not to use technology to communicate what is perceived as sensitive health information.

Our patients' preferences for using technology to communicate with their care provider generally corresponded with access to and use of such devices. However, not all patients with access preferred to communicate with their health care provider through these channels. Previous research has suggested that perceived benefits of using technology must outweigh perceived costs,^{26,27} which can include patients' lack of familiarity with newer

health information outlets, and perceived limitations (eg, lack of sensitivity or inability for health workers using these channels to meet patient needs.)²⁹ It is likely that perceptions of technology use for health purposes will never match the positive perceptions associated with directly communicating with a health professional.

The most vulnerable patients may be older patients with low incomes. These patients have a higher likelihood of becoming ill and perhaps have a higher need for health information. They likely would benefit from reciprocal and timely communication with a health professional offering services online, through E-mail, or by instant or text messaging. Unfortunately, older, low-income patients have less access to communication technology and prefer not to use it. Generally, they seem to prefer "personal touch" to "high tech." In practices with increasing use of this health information technology, a decrease in time spent face to face may have unintended negative consequences for the doctor-patient relationship.

One limitation of this study involved the conduct of multiple χ^2 tests. Although *P* values close to 0.05 may lend themselves to spurious associations, our analysis showed consistent patterns of differ-

ences across survey responses. Furthermore, most comparisons by age and insurance status met the Bonferroni correction criteria of $P < .003$. Finally, the logistic regression analyses reduced the type I error inherent in multiple comparisons.

Our study population was limited to a predominantly low-income and elderly population in one region of the United States. More than 70% characterized themselves as ethnic or racial minorities, and almost half of our patients indicated that they were enrolled in government-sponsored health insurance programs. In the general US population, about 30% of individuals are Hispanic or African American, and 55% have some type of employment-based insurance, whereas 30% receive government-sponsored insurance and more than 15% are uninsured.²⁹ Therefore, it is difficult to argue that these findings are characteristic of the general US patient population.

However, the patients in this study represent some of the most vulnerable populations in the United States and, as such, deserve attention from health care policymakers who are promoting widespread use of communication technology to provide health information. We might anticipate that communication technology will become more widespread over time. Decreasing costs make the technology more accessible, and young people's comfort with cell phones and computers suggest use and preferences will expand as young patients age. Still, we must be mindful of obstacles to this form of contact and provide a menu of communication strategies that address the preferences and needs of our populations, including people with low income or language barriers. As we strive for expansion of the patient-centered medical home, patient-centeredness must be at the core of its structure. Being patient centered means understanding our patients' resources, skills, and preferences. We conducted this study to gain a better understanding of our own patients; likewise, we encourage all practices to "know thy patients" to tailor practice resources to patient capabilities.

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References

1. Kilo CM, Wasson JH. Practice redesign and the patient centered medical home: history, promises, and challenges. *Health Aff (Millwood)* 2010;29:773–8.
2. Bates DW, Bitton A. The future of health information technology in the patient centered medical home. *Health Aff (Millwood)* 2010;29:614–21.
3. Finkelstein J, Barr MS, Kothari PP, Nace DK, Quinn M. Patient-centered medical home cyber infrastructure: current and future landscape. *Am J Prev Med* 2011;40(5 Suppl 2):S225–33.
4. Pirris, SM, Monaco EA, Tyler-Kabara EC. Telemedicine through the use of digital cell phone technology in pediatric neurosurgery: a case series. *Neurosurgery* 2010;66:999–1004.
5. Krishna S, Boren SA, Balas EA. Healthcare via cell-phones: a systematic review. *Telemed J E Health* 2009;15:231–40.
6. Blake H. Innovation in practice: mobile phone technology in patient care. *Br J Prof Nurs* 2008;13:160–5.
7. Wise J, Operario D. Use of electronic reminder devices to improve adherence to antiretroviral therapy: a systematic review. *AIDS Patient Care STDS* 2008;22:495–504.
8. Iverson SA, Howard KB, Penny BK. Impact of internet use on health-related behaviors and the patient-physician relationship: a survey-based study and review. *J Am Osteopath Assoc* 2008;108:688–711.
9. Schwartz KL, Roe T, Northrup J, Meza J, Seifeldin R, Neale AV. Family Medicines use of the Internet for health information: a MetroNet study. *J Am Board Fam Med* 2006;19:39–45.
10. Ackerman MJ, Filart R, Burgess LP, Lee I, Poropatich RK. Developing next-generation telehealth tools and technologies: patients systems and data perspectives. *Telemed J E Health* 2010;16:93–5.
11. Krishna S, Boren SA. Diabetes self-management care via cell phone: a systematic review. *J Diabetes Sci Technol* 2008;2:509–17.
12. Ramos LR, Xavier AJ, Sigulem, D. Computation and Networking—Compunetics—promoting digital inclusion of elderly, cognitively impaired and Alzheimers patients. *Gerontechnology* 2005;3:123–5.
13. Safran C. The collaborative edge: patient empowerment for vulnerable populations. *Int J Med Inform* 2003;69:185–90.
14. Baran SJ, Davis DK. Mass communication theory. Foundations ferment and future. 6th ed. Boston: Wadsworth; 2009:1–392.
15. Rice RE. Influences, usage and outcomes of internet health information searching: multivariate results from the Pew Surveys. *Int J Med Inform* 2006;75:8–28.
16. Zickuhr K, Smith A. Digital differences: overview. Available from: <http://pewinternet.org/Reports/2012/Digital-differences/Overview.aspx>.

17. U.S. Centers for Medicare & Medicaid Services, Office of the Actuary. Project America. Health care: Medicare/Medicaid: Characteristics of Medicaid Enrollees. Available from: <http://www.project.org/info.php?recordID=314>. Accessed January 1, 2011.
18. Jeram JCK, Kent B, Searchfield GD. Communication experiences for the older hearing impaired: the uptake and usage of modern communication devices. *Health Care Inform Rev Online [Serial online]* 2010; 14:36–41. Available from: http://www.hinz.org.nz/uploads/file/Journal_Jun10/Jerram_P36.pdf. Accessed July 17, 2012.
19. Prieri M, Diamantinir D. Young people, elderly and ICT. *Procedia Soc Behav Sci* 2010;2:2422–6.
20. Tirado M. Role of mobile health in the care of culturally and linguistically diverse US populations. *Perspect Health Inf Manag* 2011;8:1e.
21. Livingston G. Latinos and digital technology, 2010. February 2011. Available from: <http://www.pewhispanic.org/files/reports/134.pdf>. Accessed February 15, 2012.
22. Eung-Hun Kim, Stolyar A, Lober WB, et al. Challenges to using an electronic personal health record by a low income elderly population. *J Med Internet Res* 2009;11:4.
23. Warehem J, Levy A, Wei S. Wireless diffusion and mobile computing: implications for the digital divide. *Telecomm Policy* 2004;28:439–57.
24. Zickhur K, Madden M. Older adults and internet usage. Available from: <http://www.pewinternet.org/Reports/2012/Older-adults-and-internet-use.aspx>. Accessed June 8, 2012.
25. Bundorf KM, Wagner TH, Singer SJ, Baker LC. Who searches the internet for health information? *Health Serv Res* 2006;41(3 Pt 1):819–36.
26. Katz SJ, Nissan N, Moyer CA. Crossing the digital divide: evaluating online communication between patients and providers. *Am J Manag Care* 2004;10:593–8.
27. Or CK, Karsh B. A systematic review of patient acceptance of consumer health information technology. *J Am Med Inform Assoc* 2009;16:550–60.
28. Fox S. Mobile health 2010. Available from: <http://pewresearch.org/pubs/1767/mobile-phone-search-health-medical-information>. Accessed February 15, 2012.
29. US Department of Commerce, US Census Bureau. Health insurance. Highlights: 2010. Available from: <http://www.census.gov/hhes/www/hlthins/data/incpovhlth/2010/highlights.html>. Accessed June 5, 2012.