ORIGINAL RESEARCH

Barriers to Patient Portal Access and Use: Evidence from the Health Information National Trends Survey

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Background: **Patient access to their medical records through patient portals (PPs) facilitates information exchange and provision of quality health care. Understanding factors that characterize patients with limited access to and use of PPs is needed.**

Methods: **Data were from the 2017–2018 Health Information National Trends Survey 5, Cycles 1 and 2, a nationally representative survey of US adults ≥ 18 years old (n = 6789). Weighted multivariate logistic regressions modeled the associations between patient characteristics and access to, facilitators of use, and use of PPs and their functions.**

Results: **Individuals without (vs with) a regular doctor (adjusted odds ratio [aOR], 0.4; CI, 0.3-0.5) or health insurance (aOR, 0.4; CI, 0.2-0.7), those with high school (aOR 0.4; CI, 0.3-0.5) or with vocational/some college (aOR, 0.5; CI, 04.-0.7) education (vs college/postgraduate), or those with limited English proficiency (vs those who speak English very well) (aOR, 0.7; CI, 0.5-0.9) were less likely to report accessing their personal medical records. Women (vs men) were more likely to report accessing their medical records (aOR, 1.5; CI, 1.2-1.8). Similar patterns were found for PPs access and facilitators of use. Less consistent associations emerged between patient characteristics and use of PP functionalities.**

Conclusions: **PP access and use are low. Having a primary care clinician, patient's educational attainment, and being a woman were factors associated with PP access and use, but not race/ethnicity. Once access was achieved, use of PP functionalities was generally uniform across demographic segments. Facilitating PP access and use among all patient populations is warranted. (J Am Board Fam Med 2020;33:953–968.)**

Keywords: **Electronic Health Records, Information Technology, Limited English Proficiency, Logistic Models, Medical Informatics, Patient Portals, Personal Health Records, Primary Health Care, Surveys and Questionnaires, Telemedicine**

Introduction

Patient engagement is a top priority for US health care systems.[1] The adoption of electronic health records (EHRs) is a system-level strategy to involve patients in their health care and increase their ability to make informed decisions.[2,3] EHRs have

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tethered patient portals (PPs) where health care providers provide patients around-the-clock access to their health information (cf: personal health records that are patient owned/controlled).[4] When activated, PPs facilitate the exchange of protected health information electronically between patients and clinicians and allow patients to message their doctor, schedule appointments, and refill medications.[5] Although use of PPs has been linked to better medication adherence and higher patient satisfaction,[6,7] less is known about patients' use and access of PPs, a key determinant of EHRs wide adoption and impact.[2,8]

Through the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act, federal policies incentivized the adoption and meaningful use of EHRs to leverage health information technology to improve health care.[1,9–11] This shift toward a digital ecosystem reflects an emphasis on person-centered care and an overhaul of health care systems to increase efficiency, achieve health equity, and reduce cost.[12] Indeed, on a systems level, EHRs are associated with improved health care quality and efficiency.[13] These federal policies resulted in an increase in adoption of basic EHRs from 9.4% to 83.8% and of comprehensive EHRs from 1.6% to 40% between 2008 and 2015 in nonfederal acute care hospitals.[14]

The Promoting Interoperability Program incentivized health care providers to demonstrate meaningful use of EHRs through progressive demonstration of core objectives. Specifically, eligible professionals and hospitals must give patients the ability to "view online, download, and transmit their health information and hospital admission information" to meet meaningful use objectives for adoption and use of EHRs.[15,16] However, literature has largely focused on the architecture of EHRs, facilitators of and barriers to adoption by hospitals and clinicians, and privacy and security concerns.[8] Patient studies have focused on perceptions of the utility and adoption of PPs,[17] PPs access and use in specific settings,[18,19] and/or among specific patient populations.[19–23]

The dearth of national studies on disparities in patient access and use of PPs exclude patients, an important stakeholder in PPs adoption and impact.[24] Furthermore, inequitable access to and use of PPs raise concerns for their potential to exacerbate health disparities.[2] For example, Lin et al[25] showed that of 95% of patients who had access to their electronic information, only 10% had actually used their information where low rates of access and use of electronic medical information were observed among patients in hospitals located in counties with high proportions of residents eligible for both Medicare and Medicaid, with high proportions of Hispanics, or with low computer ownership and internet access. Among insured individuals who had visited their clinicians in the past year, racial and ethnic groups and individuals on Medicaid were less likely to be offered PPs access.[23] Indeed, studies identified significant barriers to PPs access and use such as limited Internet access, limited technical skills, potential security breaches and, for limited health literacy individuals, challenges with reading and writing.[24,26,27] Because many of these barriers are more prevalent among racial and ethnic minority groups and persons of less privileged socioeconomic status,[28] identifying factors associated with PPs access and use is important. In a national sample of US adults, we examined the extent to which patient characteristics, particularly race/ethnicity and socioeconomic status, were associated with 1) levels of access to and use of PPs and factors facilitating such use, and 2) use of PPs functionalities.

Methods

Data were from the 2017–2018 Health Information National Trends Survey 5, cycles 1 (H5C1) and 2 (H5C2). H5C1 and H5C2 were nationally representative, self-administered, mail surveys of US adults ≥ 18 years that evaluated public perceptions and use of PPs. Participants (n = 6789) were sampled from a random selection of nonvacant residential addresses stratified by minority concentration (stage 1) and a selection of an adult within the household using Next Birthday Method (stage 2). High minority concentration areas had ≥ 34% Latinos or Blacks and constituted 63.8% and 69.4% of sample addresses in H5C1 and H5C2, respectively. All other addresses constituted low minority concentration areas and comprised 36.2% and

Author contributions: SET conceptualized the study, ran preliminary analyses, and drafted the manuscript; AM and SC reviewed the literature; SET and EJPS interpreted the data and critically reviewed the manuscript for intellectual content. All authors approved the manuscript as submitted. International Management Systems, Inc., a professional statistical support service, performed the data analysis.

Notes: This study was initiated while AM and SC were affiliated with the National Institutes of Health.

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31.6%. Census tract level characteristics were based on the 2011 to 2015 American Community Survey (ACS) for H5C1 and 2012 to 2016 ACS for H5C2. Data were collected between 01/25 and 05/05/2017 for H5C1 and between 01/26 and 05/02/2018 for H5C2. The overall household response rate was 32.3% and 32.8% for H5C1 and H5C2. Additional information on the Health Information National Trends Survey can be found online (hints.cancer.gov).

Measures

Access to PPs was assessed with, "Do any of your doctors/health care providers maintain your medical records in a computerized system?" and "Have you ever been offered online access to your medical records by your health care provider?" [1 = yes, 0 = no/do not know]. Facilitators of using PPs included: "Have your health care provider/doctors/nurses/office staff ever encouraged you to use an online medical record?" [1 = yes, 0 = no] and "How confident are you that safeguards are in place to protect your medical records?" [1 = very confident, 0 = somewhat confident/not confident]. Use of PPs was assessed with: "How many times did you access your online medical record in the past 12 months?" and "How many times did you access a family member's online medical record through a secure website/app?" [1 = 1 or more times and 0 = 0 times].

Those who have accessed their PPs at least once in the past year (n = 2151) were asked questions about their knowledge and use of PPs functionalities. The stem question for PPs content knowledge was: "Do any of your online medical records include 1) laboratory test results, 2) current list of medications, 3) a list of health/medical problems, 4) an allergy list, 5) summaries of your office visits, 6) clinical notes, and 7) an immunization or vaccination history" [1 = yes, 0 = no/do not know]. The stem question for PPs function use was: "In the past 12 months, have you used your online medical record to 1) make appointments with a health care provider; 2) request refill of medications; 3) fill out forms or paperwork related to your health care; 4) request correction of inaccurate information; 5) securely message health care provider and staff (eg, email); 6) look up test results; 7) monitor your health; 8) download your health information to your computer or mobile device such as a cell phone or tablet; 9) add health information to share with your health care provider such as health concerns, symptoms, and side effects; and 10) help you make a decision about how to treat an illness or condition" [1 = yes, 0 = no].

Data on gender, age, race/ethnicity, income, education, employment, marital status, place of birth, English language proficiency, having health insurance and a regular provider, and general health were collected. Internet use, means to access the Internet, and mobile device ownership were collected. Census region and rural-urban classification were provided.

Analyses

Weighted missing percentage for demographic characteristics was highest for income (9.7%) and race/ethnicity (8%). Missingness on all other variables, including outcome variables, was $< 4\%$. Little's test showed that missingness on variables collected at both waves was not completely at random ($\chi^2 = 16505.72$; $df = 14235$; $P < .001$).[29] Outcome variables between participants with observed and missing values differed on key demographic characteristics (data not shown). We imputed data using hot-deck method with a weighted donor selection method (n = 20 donors).[30] All bivariate comparisons and models were based on imputed data.

Using SAS 9.4 (SAS Institute Inc., Cary, NC), weighted multivariate logistic regression modeled the associations between patient characteristics and PPs access and use. We excluded variables with a correlation of 0.40 or higher to avoid overadjusting for patient characteristics. These variables were income, employment, place of birth, and cellphone ownership, which were correlated with education ($r = 0.44$), age ($r = 0.50$), language proficiency ($r = 0.43$), and smartphone ownership ($r = -0.64$), respectively, at $P < .0001$ level. All analyses incorporated the final sample weight to calculate population estimates and 100 replicate weights to calculate standard error of estimates using jackknife replication method.

Results

Sample characteristics are listed in Table 1.

Associations between Patient Characteristics and PPs Access and Use

Roughly 3 quarters of participants (76.9%) reported their provider maintained electronic medical records

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Table 1. Weighted Sample Characteristics of 6789 Participants in the 2017–2018 Health Information National Trends Survey 5, Cycles 1 and 2, US

	n	% Weighted	LL	UL
Gender				
Men	2759	48.9	48.7	49.1
Women	4030	51.1	50.9	51.3
Age, years				
18 to 39	1248	30.6	28.7	32.4
40 to 59	2391	42.3	40.5	44.1
≥ 60	3150	27.1	26.9	27.4
Race/ethnicity				
Latino	995	15.8	15.5	16.2
White	4297	65.2	64.7	65.7
Black	923	10.5	10.0	11.0
Other*	574	8.4	8.2	8.7
Annual household income				
< $20,000	1254	17.3	15.9	18.8
$20,000 to $49,999	1829	26.1	24.5	27.7
$50,000 to $74,999	1237	18.5	17.0	20.0
≥ $75000	2470	38.1	36.2	39.9
Education				
< High school	504	8.8	7.6	10.0
High school graduate	1279	22.6	21.4	23.8
Vocational school, some college	2040	36.4	35.3	37.6
College graduate, postgraduate	2967	32.2	31.9	32.4
Employment				
Employed	3423	57.9	55.8	59.9
Unemployed	3366	42.1	40.1	44.2
Marital status				
Single	1169	30.2	30.0	30.5
Married, living as married	3595	53.9	53.1	54.7
Separated, widowed	2024	15.9	15.1	16.6
Place of birth				
United States	5826	85.5	84.4	86.5
Foreign born	963	14.5	13.5	15.6
Speak English				
Very well	6042	88.3	87.2	89.3
Well, not well, not at all	747	11.7	10.7	12.8
Regular provider				
Yes	4848	65.4	63.6	67.3
No	1941	34.6	32.7	36.4
Health insurance				
Yes	6441	91.6	91.5	91.7
No	348	8.4	8.3	8.5
General health				
Excellent/good	5638	84.1	82.6	85.6
Fair/poor	1151	15.9	14.4	17.4
Census region				
Northeast census region	1065	17.9	17.9	17.9
Midwest census region	1249	21.0	21.0	21.0
South census region	2893	37.6	37.6	37.6

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Table 1. Continued

	n	% Weighted	LL	UL
West census region	1582	23.5	23.5	23.5
Rural/urban designation				
Metro	5863	86.1	84.8	87.3
Urban	834	12.4	11.2	13.7
Rural	92	1.5	1.0	2.0

LL, lower limit; UL, upper limit.
n = 6789; Imputed subjects have 20 records, thus imputed *n* is 1/20th of a subject rounded to the nearest integer.
*Asians, Pacific Islanders, and multiple races.

but only 47.2% reported being offered access to them, 39.2% reported their provider encouraged their use, 27.2% were confident electronic medical records were safe, and 29.3% and 9.3% reported accessing their own or their families' medical records in the past year.

Gender, education, marital status, and having a regular clinician were factors associated with access, facilitators of use, and use of PPs (Table 2). Age, language proficiency, and having health insurance were also associated with PPs access and use but not race and ethnicity. We highlight some findings and refer the reader to the tables for a complete overview of significant associations.

Access

Women (vs men) were more likely to report providers offered them access to electronic records (48.4% vs 36.5%; adjusted odds ratio [aOR], 1.7). Compared with those with college education or higher (58.9%), persons with less than high school education (27.9%; aOR, 0.4), high school graduates (37.8%; aOR, 0.6), and persons with vocational/some college degree (40.4%; aOR, 0.6) were less likely to report their providers offered them access to electronic records. Patients without (vs with) a regular clinician (31.6% vs 49.2%; aOR, 0.3) or health insurance (17.7% vs 45.0%; aOR, 0.5) were less likely to report their providers offered them access to electronic records.

Facilitators of Use

Women (vs men) were more likely to report providers encouraged use of electronic records (39.4% vs 29.5%; aOR, 1.6). Compared with those with college education or higher (49.1%), high school graduates (31.2%; aOR, 0.4) and persons with vocational/some college degree (31.1%; aOR, 0.6) were less likely to report their providers encouraged use of electronic records. Patients without (vs with) a regular clinician were less likely to report their providers encouraged their use (20.0% vs 43.2%; aOR, 0.5). Individuals without (vs with) a regular doctor (22.9% vs 28.0%; aOR, 0.7) or who reported fair or poor (vs excellent/good) health (22.3% vs 27.1%; aOR, 0.7) had less confidence in the safety of electronic records.

Use

Women (vs men) were more likely to report past year access to their own electronic records (30.2% vs 23.0%; aOR, 1.5). Compared with those with college education or higher, high school graduates were less likely to report that they accessed their personal (44.2% vs 17.8%; aOR, 0.4) or family's (15.5% vs 3.8%; aOR, 0.3) electronic records. Similarly, individuals with vocational/some college education were less likely to report that they access their personal (44.2% vs 25.7%; aOR, 0.5) or their family's (15.5% vs 7.8%; aOR, 0.5) electronic records. Patients without (vs with) a regular clinician were less likely to report that they accessed their personal (17.7% vs 32.0%; aOR, 0.4) or family's (5.4% vs 10.8%; aOR, 0.6) electronic records. Individuals with limited English proficiency (20.9% vs 27.8%; aOR, 0.7) or those without health insurance (11.9% vs 28.1%; aOR, 0.4) were less likely to report having accessed their personal records in the past year compared with those who speak English very well and those with health insurance.

Although 82% (n = 5280; 95% CI, 80.6-83.3) reported having internet access and any mobile device ownership was at 98% (n = 6656; 95% CI, 97.5-98.4), notable differences still exist in internet access and mobile device ownership especially by age, race and ethnicity, education, and language

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Table 2. Multivariate Logistic Regression Models of Associations between Patient Characteristics and Patient Portals Access and Use in the Health Information National Trends Survey 5, Cycles 1 and 2, US

	Access		Facilitators of Use		Use Behavior	
	Provider Maintains Medical Records, aOR (95% CI)	Provider Offers Medical Records Access, aOR (95% CI)	Provider Encourages Medical Record Use†, aOR (95% CI)	Confident Medical Records Safe, aOR (95% CI)	Access Own Medical Record, aOR (95% CI)	Access Family Medical Record†, aOR (95% CI)
Gender (ref: men)						
Women	**1.7 (1.4-2.0)**	**1.7 (1.5-2.0)**	**1.6 (1.3-2.0)**	1.2 (0.9-1.4)	**1.5 (1.2-1.8)**	1.6 (1.0-2.3)
Age (ref: 18 to 39 years)						
40 to 59 years	1.2 (0.9-1.6)	0.9 (0.8-1.2)	0.9 (0.7-1.3)	0.9 (0.7-1.1)	1.1 (0.9-1.4)	0.9 (0.6-1.3)
≥ 60 years	1.4 (1.0-1.8)	0.8 (0.7-1.0)	0.8 (0.6-1.0)	1.0 (0.8-1.3)	**0.8 (0.6-0.9)**	0.7 (0.4-1.2)
Race/ethnicity (ref: White)						
Latino	1.2 (0.9-1.5)	0.9 (0.7-1.1)	0.8 (0.6-1.2)	1.3 (0.9-1.8)	0.9 (0.7-1.2)	1.1 (0.7-1.8)
Black	1.2 (0.8-1.7)	0.8 (0.7-1.0)	1.0 (0.8-1.5)	1.0 (0.8-1.4)	0.9 (0.7-1.2)	0.8 (0.4-1.6)
Other*	0.9 (0.5-1.4)	0.8 (0.6-1.0)	0.8 (0.6-1.2)	0.9 (0.7-1.3)	1.2 (0.9-1.7)	1.2 (0.7-2.1)
Education (ref: college/post grad)						
< High school	**0.5 (0.3-0.8)**	**0.4 (0.3-0.7)**	0.5 (0.2-1.0)	1.4 (0.9-2.1)	**0.3 (0.2-0.5)**	0.7 (0.3-1.7)
High school grad	**0.6 (0.4-0.7)**	**0.6 (0.4-0.7)**	**0.4 (0.3-0.6)**	1.0 (0.8-1.4)	**0.4 (0.3-0.5)**	**0.3 (0.1-0.5)**
Vocational, some college	**0.6 (0.5-0.8)**	**0.6 (0.5-0.8)**	**0.6 (0.5-0.8)**	1.2 (0.9-1.5)	**0.5 (0.4-0.7)**	**0.5 (0.4-0.8)**
Marital status (ref: married, living as married)						
Single	**0.6 (0.4-0.8)**	**0.5 (0.4-0.6)**	**0.4 (0.3-0.6)**	1.0 (0.8-1.3)	**0.6 (0.5-0.8)**	**0.2 (0.1-0.6)**
Separated, widowed	**0.7 (0.5-0.9)**	**0.6 (0.5-0.7)**	**0.6 (0.5-0.8)**	1.0 (0.9-1.3)	**0.6 (0.5-0.7)**	**0.4 (0.2-0.8)**
Speak English (ref: very well)						
Well, not well, not at all	**0.7 (0.5-0.9)**	**0.6 (0.4-0.8)**	0.8 (0.5-1.2)	0.8 (0.6-1.1)	**0.7 (0.5-0.9)**	1.2 (0.7-2.2)
Health insurance (ref: yes)						
No	**0.5 (0.3-0.9)**	**0.5 (0.3-0.8)**	0.7 (0.3-1.5)	0.9 (0.5-1.4)	**0.4 (0.2-0.7)**	0.8 (0.3-2.3)
Regular provider (ref: yes)						
No	**0.3 (0.2-0.4)**	**0.4 (0.4-0.5)**	**0.5 (0.4-0.6)**	**0.7 (0.6-0.9)**	**0.4 (0.3-0.5)**	**0.6 (0.4-0.9)**
General health (ref: excellent/good)						
Fair/poor	0.9 (0.7-1.1)	0.9 (0.8-1.2)	1.0 (0.8-1.4)	**0.7 (0.5-0.9)**	0.9 (0.7-1.1)	1.0 (0.6-1.6)
Census region (ref: Northeast)						
Midwest	0.8 (0.6-1.2)	0.9 (0.7-1.3)	1.0 (0.7-1.7)	1.2 (0.9-1.6)	1.2 (0.9-1.7)	1.1 (0.6-2.1)
South	**0.7 (0.5-0.9)**	0.8 (0.6-1.0)	0.9 (0.7-1.5)	1.1 (0.9-1.4)	1.0 (0.8-1.4)	1.2 (0.7-2.1)

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Table 2. Continued

	Access		Facilitators of Use		Use Behavior	
	Provider Maintains Medical Records, aOR (95% CI)	Provider Offers Medical Records Access, aOR (95% CI)	Provider Encourages Medical Record Use†, aOR (95% CI)	Confident Medical Records Safe, aOR (95% CI)	Access Own Medical Record, aOR (95% CI)	Access Family Medical Record†, aOR (95% CI)
West	0.8 (0.6-1.1)	0.9 (0.6-1.1)	1.1 (0.8-1.7)	0.9 (0.7-1.2)	1.3 (0.9-1.7)	1.5 (0.9-2.6)
Rural/urban designation (ref: metro)						
Urban	1.0 (0.7-1.5)	**0.7 (0.5-0.9)**	**0.6 (0.4-0.9)**	1.0 (0.8-1.4)	**0.6 (0.4-0.8)**	0.9 (0.5-1.9)
Rural	0.7 (0.3-1.5)	0.6 (0.3-1.2)	0.6 (0.2-1.6)	0.9 (0.4-2.1)	0.7 (0.4-1.4)	0.5 (0.01-30.3)

aOR, adjusted odds ratio; CI, confidence interval.
n = 6789.
*Asians, Pacific Islanders, and multiple races.
†Question was omitted in 2018 H5C2, so n = 3285 based on H5C1 only.
Bolded cells are statistically meaningful.
Participants in H5C2 were asked the number of times that they accessed their own medical records only if they responded "yes" to whether they have been offered online access to medical records. Participants then reported who offered them access (i.e., healthcare provider, health insurer, someone else). To harmonize the data, we coded participants who said "no/don't know" to "have you been offered online access to your medical records?" as "no" and those who selected "healthcare provider" to "who offered you online access to your medical records?" as "yes."
Logistic regression analysis modeled the probability of 1 (eg, provider maintained electronic medical records, provider offered access to electronic medical records).

proficiency (data not shown). Therefore, we added these factors to the models for accessing personal and family electronic records (Appendix Table 1). We found that internet access and device ownership were independently associated with accessing personal electronic records in the past year. Individuals not having (vs having) broadband (31.2% vs 37.7%; aOR, 0.7) or Wi-Fi (24.3% vs 37.2%; aOR, 0.7) access or not owning (vs owning) a tablet (15.2% vs 37.6%; aOR, 0.6) or a smartphone (11.0% vs 33.5%; aOR, 0.5) were less likely to report accessing their personal records.

Associations between Patient Characteristics and Use of PP Functionalities

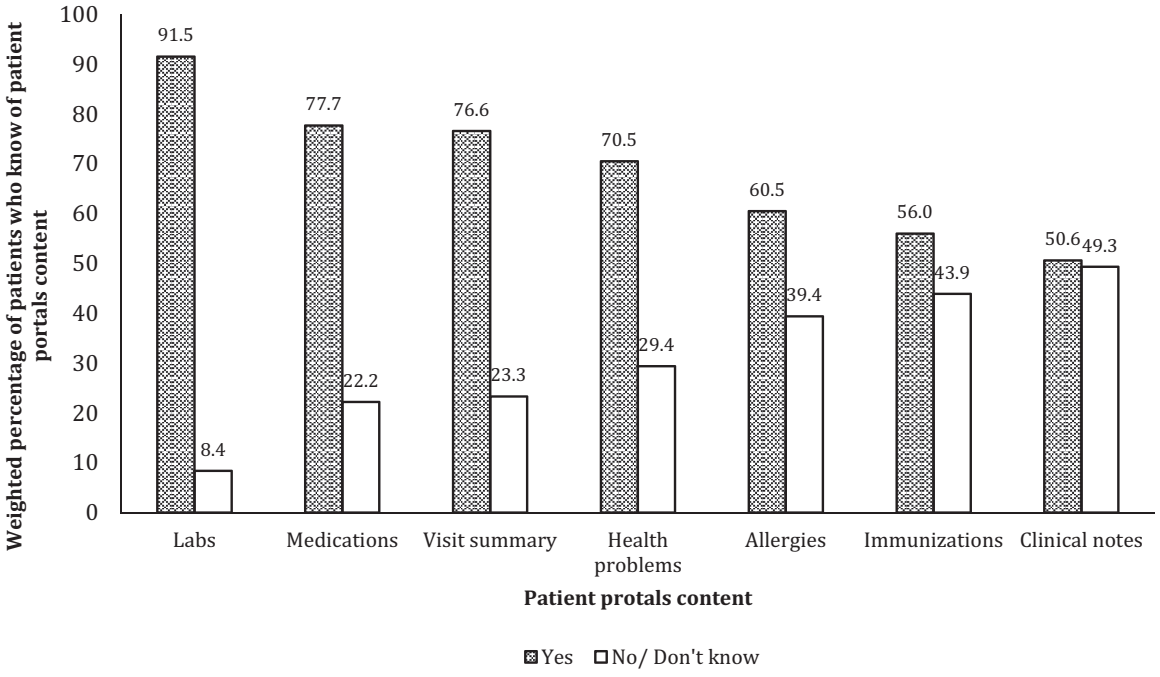
Knowledge of PP functions varied, with laboratory test results (91.5%) being the most known function and clinical notes (50.6%) being the least (Figure 1). Use of PP functions varied, with viewing test results (84.3%) being the most used function and requesting corrections (7.1%) being the least. All other functions were reportedly used by 50% or less of participants.

Few patient characteristics were associated with PP functions use (Table 3). Individuals aged ≥ 60 years (vs 18 to 39 years old) were more likely to use PPs to refill medications (41.2% vs 40.3%; aOR, 1.7) but less likely to message their health care provider (45.4% vs 54.6%; aOR, 0.7), make decisions (14.5% vs 32.1%; aOR, 0.5), or download health information (18.2% vs 17.2%; aOR, 0.6). Compared with college/postgraduates (42.7%), individuals with vocational/some college education (36.5%; aOR, 0.7), high school graduates (39.1%; aOR, 0.6), and those with less than high school education (23.3%; aOR, 0.3) were less likely to report using PPs to complete forms. Persons with less than high school education (vs college and postgraduates) were also less likely to use PPs to make decisions (17.0% vs 24.6%; aOR, 0.4) or download information (20.3% vs 22.6%; aOR, 0.3). Individuals who do not have (vs have) a regular provider were less likely to report using PPs to message health care provider (39.6% vs 49.5%; aOR, 0.7). Reported use of PPs to refill medications was less likely among individuals with limited English proficiency (37.6% vs 39.4%; aOR, 0.5) but more likely among those with fair or poor health (53.0% vs 37.2%; aOR, 1.6) compared with those who are language proficient and those with excellent/good health.

West census region (vs Northeast) residents were more likely to report using PPs to view test results (88.1% vs 70.5%; aOR, 2.8), message their

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Figure 1. Knowledge of patient portals content among 2151 participants in the 2017–2018 Health Information National Trends Survey 5, Cycles 1 and 2, US.



N = 2,151 (those who accessed their own medical records one or more times in the past 12 months)

For labs and medications, results are based on H5C1 only (*n* = 1,033)

provider (59.5% vs 37.7%; aOR, 2.5), make appointments (52.4% vs 26.2%; aOR, 3.5), and add information (30.5% vs 14.1%; aOR, 2.4).

Discussion

This analysis of a nationally representative US sample showed low levels of PPs access and use and identified disparities in access and use by patient's educational level but not by race and ethnic minority status. Furthermore, respondents with a primary care clinician were more likely to report PPs access and use. Concerns about the security of electronic medical data were magnified among persons without a regular clinician and those who reported fair or poor health. Given the health benefits of having a regular primary care clinician[31–34] and improved health outcomes of PPs use,[6,7] identifying ways to address low levels of access to and use of PPs in general and disparities by socioeconomic factors and race/ethnicity in specific should be a priority of medical systems. Assuring that all patients, regardless of system or setting, have an identified "regular" clinician who coordinates comprehensive primary care is one step to address PPs access and use disparities and attenuate concerns about data security.

Rates of PP use are low. Consistent with previous research,[25] under a half reported that they were offered access to their electronic records, with only a third reported accessing their own medical data. This suggests that access does not necessarily translate to use. Policy initiatives could promote the accessibility and use of electronic medical data to patient populations especially in resource-constrained health care settings. One such initiative is raising the thresholds for demonstrating meaningful use under the Centers for Medicare and Medicaid Services' Promoting Interoperability Program. Current levels are set to *at least 1 unique patient*,[35] primarily to accommodate concerns from professionals and hospitals around patient-related factors that are beyond their control (eg, Internet access). Raising these thresholds could promote structural changes (eg, improved portals usability) to improve patient access and use of electronic medical data above and beyond individual-level factors.[25,36]

Having a regular health care provider was the only factor consistently associated with PP access,

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Table 3. Multivariate Logistic Regression Models of Associations between Patient Characteristics and Use of Patient Portals Functionalities in the 2017–2018 Health Information National Trends Survey 5, Cycles 1 and 2, US

	View Results,† aOR (95% CI)	Message Healthcare Provider, aOR (95% CI)	Make Appointment,† aOR (95% CI)	Refill Medication, aOR (95% CI)	Complete Forms, aOR (95% CI)
Gender (ref: men)					
Women	1.1 (0.6-2.0)	0.9 (0.7-1.2)	0.8 (0.5-1.2)	0.9 (0.7-1.2)	1.0 (0.8-1.4)
Age (ref: 18 to 39 years)					
40 to 59 years	1.3 (0.7-2.3)	0.8 (0.5-1.1)	0.9 (0.5-1.5)	1.1 (0.7-1.7)	1.0 (0.7-1.6)
≥60 years	0.7 (0.4-1.4)	**0.7 (0.5-0.9)**	0.8 (0.4-1.3)	**1.7 (1.1-2.5)**	0.8 (0.5-1.0)
Race/ethnicity (ref: White)					
Latino	0.5 (0.3-1.0)	0.8 (0.5-1.2)	1.0 (0.5-2.1)	0.9 (0.7-1.4)	0.9 (0.6-1.5)
Black	0.8 (0.4-1.8)	1.0 (0.7-1.6)	1.6 (0.8-3.0)	1.0 (0.7-1.7)	0.7 (0.4-1.0)
Other*	0.8 (0.3-1.9)	0.7 (0.4-1.3)	1.5 (0.8-2.5)	1.2 (0.7-1.9)	0.7 (0.4-1.0)
Education (ref: college/post grad)					
<High school	1.7 (0.4-6.5)	1.0 (0.3-2.9)	0.2 (0.04-1.0)	1.7 (0.6-5.0)	**0.3 (0.1-0.9)**
High school grad	0.9 (0.3-2.7)	1.0 (0.7-1.5)	1.1 (0.6-2.1)	0.9 (0.7-1.4)	**0.6 (0.4-0.8)**
Vocational, some college	1.1 (0.6-2.1)	1.0 (0.8-1.4)	0.9 (0.6-1.4)	1.0 (0.7-1.4)	**0.7 (0.5-0.9)**
Marital status (ref: married, living as married)					
Single	0.8 (0.4-1.7)	1.3 (0.9-2.0)	1.4 (0.8-2.5)	1.3 (0.9-1.9)	1.3 (0.9-1.9)
Separated, widowed	0.9 (0.4-1.8)	0.9 (0.6-1.3)	0.9 (0.6-1.6)	0.9 (0.7-1.3)	0.9 (0.7-1.3)
Speak English (ref: very well)					
Well, not well, not at all	0.8 (0.3-1.8)	0.8 (0.4-1.3)	1.4 (0.6-3.3)	**0.5 (0.3-0.9)**	0.7 (0.3-1.3)
Health insurance (ref: yes)					
No	0.6 (0.1-5.7)	0.9 (0.4-2.5)	0.9 (0.2-4.5)	0.6 (0.2-1.9)	0.6 (0.1-2.2)
Regular provider (ref: yes)					
No	0.8 (0.4-1.6)	**0.7 (0.5-0.9)**	1.0 (0.6-1.9)	0.8 (0.5-1.2)	0.8 (0.6-1.1)
General health (ref: excellent/good)					
Fair/poor	1.1 (0.5-2.7)	1.3 (0.8-1.9)	1.1 (0.7-1.9)	**1.6 (1.1-2.3)**	1.4 (0.9-2.1)
Census region (ref: Northeast)					
Midwest	0.7 (0.3-1.7)	1.0 (0.7-1.6)	0.9 (0.5-1.8)	0.7 (0.5-1.1)	1.2 (0.7-2.1)
South	1.2 (0.6-2.3)	1.0 (0.8-1.5)	1.5 (0.8-2.9)	0.9 (0.7-1.4)	**1.8 (1.2-2.7)**
West	**2.8 (1.3-6.3)**	**2.5 (1.7-3.9)**	**3.5 (1.8-6.8)**	1.5 (0.9-2.2)	1.6 (1.0-2.5)
Rural/urban designation (ref: metro)					
Urban	1.0 (0.4-2.6)	0.9 (0.6-1.7)	1.3 (0.7-2.5)	1.0 (0.7-1.6)	0.7 (0.4-1.2)
Rural	1.9 (0.1-54.8)	0.8 (0.3-2.6)	2.4 (0.5-12.4)	1.8 (0.5-6.4)	1.4 (0.4-4.6)

Continued

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Table 3. Continued

	Monitor health† aOR (95% CI)	Make decisions aOR (95% CI)	Add information aOR (95% CI)	Download information aOR (95% CI)	Request correction aOR (95% CI)
Gender (ref: men)					
Women	0.7 (0.5-1.1)	0.8 (0.6-1.2)	1.0 (0.8-1.4)	0.8 (0.5-1.1)	1.4 (0.8-2.3)
Age (ref: 18 to 39 years)					
40 to 59 years	0.9 (0.6-1.7)	0.7 (0.5-1.0)	1.1 (0.8-1.7)	0.8 (0.5-1.0)	0.8 (0.4-1.6)
≥60 years	0.7 (0.4-1.2)	**0.5 (0.3-0.8)**	0.9 (0.6-1.4)	**0.6 (0.4-0.9)**	0.7 (0.3-1.7)
Race/ethnicity (ref: White)					
Latino	0.9 (0.4-2.1)	1.0 (0.6-1.8)	1.0 (0.7-1.8)	1.0 (0.7-1.7)	1.2 (0.6-2.6)
Black	1.6 (0.8-3.2)	1.7 (1.0-2.9)	1.0 (0.7-1.8)	1.1 (0.7-1.9)	1.6 (0.8-3.0)
Other*	1.2 (0.6-2.4)	1.0 (0.6-1.9)	0.7 (0.4-1.4)	0.9 (0.6-1.7)	0.9 (0.4-2.1)
Education (ref: college/post grad)					
<High school	0.7 (0.1-4.4)	**0.4 (0.2-0.9)**	0.5 (0.2-1.2)	**0.3 (0.1-0.8)**	1.2 (0.3-4.6)
High school grad	0.9 (0.4-1.7)	0.9 (0.5-1.5)	0.9 (0.6-1.5)	0.5 (0.2-1.0)	0.6 (0.3-1.5)
Vocational, some college	0.8 (0.5-1.2)	0.8 (0.6-1.2)	0.8 (0.6-1.2)	0.9 (0.6-1.3)	0.9 (0.6-1.6)
Marital status (ref: married, living as married)					
Single	0.9 (0.5-1.8)	0.9 (0.6-1.4)	1.5 (0.9-2.2)	0.9 (0.5-1.6)	1.2 (0.6-2.4)
Separated, widowed	0.7 (0.4-1.3)	0.8 (0.5-1.2)	0.9 (0.7-1.3)	1.3 (0.8-1.9)	1.6 (0.8-3.2)
Speak English (ref: very well)					
Well, not well, not at all	1.2 (0.4-3.5)	1.1 (0.6-2.2)	0.9 (0.4-1.7)	1.6 (0.8-3.2)	2.2 (0.9-5.2)
Health insurance (ref: yes)					
No	0.5 (0.05-4.3)	1.1 (0.3-4.6)	0.8 (0.2-4.0)	0.7 (0.2-3.0)	0.7 (0.02-22.2)
Regular provider (ref: yes)					
No	0.6 (0.4-1.2)	0.7 (0.5-1.1)	0.7 (0.5-1.0)	1.0 (0.7-1.5)	0.9 (0.5-1.7)
General health (ref: excellent/ good)					
Fair/poor	0.9 (0.5-1.7)	1.5 (0.8-2.7)	1.3 (0.9-2.0)	1.2 (0.7-2.1)	1.7 (0.9-3.2)
Census region (ref: Northeast)					
Midwest	1.9 (0.9-3.5)	1.0 (0.6-1.9)	1.6 (0.9-2.6)	0.9 (0.5-1.9)	1.3 (0.6-3.0)
South	1.5 (0.9-2.6)	0.9 (0.6-1.5)	1.8 (1.0-3.1)	1.3 (0.8-2.1)	1.3 (0.7-2.7)
West	1.8 (0.9-3.4)	1.5 (0.9-2.5)	**2.4 (1.4-4.2)**	1.1 (0.7-1.9)	1.9 (0.9-3.9)
Rural/ Urban designation (ref: metro)					
Urban	1.6 (0.9-3.0)	0.9 (0.5-1.7)	1.1 (0.7-2.0)	1.7 (0.9-2.8)	1.1 (0.4-2.8)
Rural	2.0 (0.3-10.9)	1.2 (0.2-7.7)	2.2 (0.6-8.7)	**3.9 (1.2-12.8)**	3.0 (0.1-70.1)

aOR, adjusted odds ratio; CI, confidence interval.
n = 2,151 reflects those who accessed their own medical records one or more times in the past 12 months.
*Asians, Pacific Islanders, and multiple races.
†Question was omitted in 2018 H5C2, so *n* = 1033 (those who accessed their own medical records one or more times in the past 12 months based on H5C1 only).
Bolded cells are statistically meaningful.
Logistic regression analysis modeled the probability of 1 (e.g., patient viewed results, patient messaged healthcare provider).

facilitators of use, and use. Having a regular doctor represents an environment conducive of PP use where factors such as physician encouragement and endorsement incentivize patients' adoption of PPs.[24,37] Research should examine the mediating effect of provider encouragement on the relationship between PP access and use and how this may affect the educational disparities and heightened privacy concerns observed. Lack of health insurance was also associated with decreased access to and use of PPs. This is consistent with previous literature that shows that having a regular provider and health insurance status independently affect access to health care.[38,39]

Our findings are consistent with previous studies on PP access and use by educational attainment.[20,21,40] Aggressive efforts must be directed to increase registration of underserved patients (eg, onsite registration)

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beyond those suggested for the general population (eg, promotional activities).[26,41,42] Emphasis on PP access must be coupled with efforts to make information understandable to all patients, particularly those less educated who have difficulties comprehending their records.[6,43] Disparities still exist in Internet access and mobile device ownership, which negatively impacted PP use in our study.[44] We argue that federal[45] and private[46] programs that provide cellphones and internet access to underserved communities should be advertised and supported, particularly because Internet access and mobile device ownership might offset age and language proficiency-driven disparities in PPs access and use as observed in our study.

We did not identify differences in PP access and use by race and ethnicity.[20,21,40] It might be that the variance in PP access and use was explained by more dominant sociodemographic characteristics (eg, educational attainment) in our study. In a systematic review of facilitators of PP use, racial and ethnic disparities were found in only 6 of 16 studies.[37] These findings imply that PPs use is not limited by race/ethnicity but driven by other modifiable factors such as educational attainment and having insurance and a primary care clinician. Studies should examine whether there was an improvement over time in providing access to minorities and the conditions under which minorities are likely to access and use PPs.

Findings on language proficiency underline the need for health literate systems where PPs should accommodate persons with limited literacy and potentially other languages for limited English-proficient patients.[47] Patients with limited English proficiency may be more likely to be seen in safety-net community clinics that have not fully activated their portals. The responsibility of using PPs fell predominantly on women. This gender difference is consistent with literature showing that women are the main health decision makers for their families.[19,48] Less use of PPs reported by single and separated/widowed individuals is another manifestation of the effects of social relationships on health.[49]

Consistent with previous studies,[18,19,40] viewing laboratory results, messaging health care providers, completing forms, making appointments, and refilling medications were the top used functions, which mapped onto the top known functions. Indeed, a study of Veterans Affairs' *MyHealtheVet* showed that the main reason for nonuse was lack of awareness (61.3%).[18] Efforts to increase awareness of PPs functionalities are a necessary precursor to use, particularly because certain function are linked to positive outcomes (eg, refill medication, medication adherence).[50,51] There are lessons to be learned from the high PPs function use in the West Census region. For example, California's healthy PPs adoption rate may be attributable to state investments especially in rural areas.[52]

Lack of confidence in security of electronic records and the less frequent use of some PP functions (eg, monitor health) highlight the necessity of examining PP utility to patients in enhancing communication with clinicians and promoting trust, managing chronic disease–related decisions, and facilitating lifestyle behavioral change among patients with the highest needs.[2] Research should gauge patients' preferences for procedural factors in using PPs,[53,54] their perceptions of PP usability, and track their actual PPs use online by socioeconomic status, race/ethnicity, and health literacy.[55,56]

Limitations

Limitations include the absence of factors that were associated with patients' access and use of PPs in the literature (eg, health literacy).[21] Some associations could be attributed to confounders: for example, the association between having a regular provider and PP access and use could be attributed to patients' underlying chronic conditions.[41] Beyond patient-level characteristics, organizational and contextual factors are key determinants in EHRs adoption (eg, practice size and ownership structure,[57,58] location,[14] eligibility for HITECH financial incentives[59,60]), which dictate the PP functionalities available to patients. For example, one study showed that private for-profit hospitals (vs private non-profit) were more likely to adopt basic EHRs, which involve a limited set of functionalities implemented in a limited number of clinical units, whereas large hospitals with $\geq$400 beds (vs with $<$100 beds) were more likely to adopt comprehensive EHRs, which involve expanded functionalities implemented in most clinical units.[36] Thus, place-based analyses and data linkages to contextualize patients' PP access and use are warranted.

Conclusion

Using a nationally representative sample of US patients, we identified disparities in PP access and use, driven primarily by patients' educational attainment and whether they have a regular doctor, but not by race and ethnicity. EHRs represent a natural

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migration to electronic platforms in health care, stimulated by federal policies and incentive programs. Despite the mantra that PPs facilitate access to and provision of quality care, actual use of PPs remains low and concerns about data security persist. A wide adoption of PPs rests on patient awareness; perceived utility, usability, and quality; and demand.[24] Critical to this goal is closing the disparity gap in PPs access and use, especially among individuals of low socioeconomic status, particularly through policy initiatives. Current EHRs are far from being patient centered, but until then, PPs should at least be accessible to all, especially those most in need.[43,61]

Data Availability

The dataset analyzed during the current study is publicly available from Health Information National Trends Survey:https://hints.cancer.gov/default.aspx.

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Appendix Table 1: Multivariate Logistic Regression Models of Associations between Patient Characteristics, Internet Access, and Electronic Device Ownership, and Use of Personal and Family Patient Portals in the 2017–2018 Health Information National Trends Survey 5, Cycles 1 and 2, US

	Access Own Medical Record, aOR (95% CI)	Access Family Medical Record, aOR (95% CI)
Gender (ref: men)		
Women	**1.5 (1.2-1.8)**	1.6 (1.0-2.3)
Age (ref: 18 to 39 years)		
40 to 59 years	1.1 (0.9-1.4)	0.9 (0.6-1.4)
≥ 60 years	1.1 (0.9-1.5)	0.9 (0.5-1.6)
Race/ethnicity (ref: White)		
Latino	0.9 (0.7-1.2)	1.1 (0.7-1.9)
Black	0.9 (0.7-1.2)	0.8 (0.4-1.5)
Other*	1.2 (0.9-1.7)	1.2 (0.7-2.0)
Education (ref: college/post grad)		
< High school	**0.5 (0.3-0.9)**	0.8 (0.3-2.2)
High school grad	**0.5 (0.4-0.7)**	**0.3 (0.2-0.6)**
Vocational, some college	**0.6 (0.5-0.7)**	**0.5 (0.4-0.8)**
Marital status (ref: married, living as married)		
Single	**0.7 (0.5-0.9)**	**0.2 (0.1-0.6)**
Separated, widowed	**0.8 (0.6-0.9)**	**0.5 (0.3-0.9)**
Speak English (ref: very well)		
Well, not well, not at all	0.8 (0.6-1.1)	1.3 (0.6-2.4)
Health insurance (ref: yes)		
No	**0.4 (0.2-0.7)**	0.9 (0.3-2.5)
Regular provider (ref: yes)		
No	**0.4 (0.3-0.5)**	**0.6 (0.4-0.9)**
General health (ref: excellent/good)		
Fair/poor	1.0 (0.8-1.3)	1.1 (0.7-1.8)
Census region (ref: Northeast)		
Midwest	1.3 (0.9-1.8)	1.2 (0.6-2.2)
South	1.0 (0.8-1.4)	1.2 (0.7-2.1)
West	1.2 (0.9-1.6)	1.4 (0.8-2.5)
Rural/urban designation (ref: metro)		
Urban	**0.6 (0.4-0.8)**	0.9 (0.5-2.1)
Rural	0.7 (0.3-1.5)	0.5 (0.01-29.3)
Dial-up (ref: yes)		
No	1.7 (0.7-4.1)	1.0 (0.2-4.5)
Not ascertained†	0.6 (0.2-1.5)	1.0 (0.2-4.5)
Broadband (ref: yes)		
No	**0.7 (0.6-0.8)**	0.7 (0.5-1.0)
Cell network (ref: yes)		
No	1.2 (1.0-1.5)	0.9 (0.7-1.4)
Wi-Fi (ref: yes)		
No	**0.7 (0.6-0.9)**	0.8 (0.5-1.3)
Tablet (ref: yes)		
No	**0.6 (0.5-0.7)**	0.8 (0.5-1.3)
Smartphone (ref: yes)		
No	**0.5 (0.4-0.6)**	0.6 (0.3-1.2)

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aOR, adjusted odds ratio; CI, confidence interval.
n = 6789 for access own medical records and n = 3285 for access family medical records.
*Asians, Pacific Islanders, and multiple races.
Among those who responded yes to "Do you ever go online to access the Internet or World Wide Web, or to send and receive email?" any internet use was at 82.0% (n = 5280; 95% CI, 80.6-83.3) with dial-up access at 2.3% (n = 140; 95% CI, 1.7-3.0), broadband access at 52.5% (n = 2749; 95% CI, 50.2-54.9), cell network at 66.2% (n = 3099; 95% CI, 64.3-68.1), and Wi-Fi access at 82.1% (n = 4178; 95% CI, 80.5-83.6).
Any electronic device ownership was at 98.0% (n = 6656; 95% CI, 97.5-98.4) with tablet ownership at 59.8% (n = 3894; 95% CI, 57.7-61.8), smartphone ownership at 79.5% (n = 5008; 95% CI, 78.2-80.8), and cellphone ownership at 15.5% (n = 1317; 95% CI, 14.1-16.8).
†"Not ascertained" (n = 750) were those who reported no internet access and, thus, were not asked questions about means to access the internet via dial up, broadband, cell network, Wi-Fi.
Table includes odds ratio for "not ascertained dial up" only because SAS calculates the first odds ratio for a group of linearly related outcomes, which is the case for "not ascertained" for dial-up, broadband, cell network, and Wi-Fi.
Bolded cells are statistically meaningful.
Logistic regression analysis modeled the probability of 1 (e.g., patient accessed their own medical records).

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