

Patient Factors Associated with Utilization of Online Portal Health Information in the post-pandemic era: A Cross-Sectional Analysis of a National Survey

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Abstract

Background: Patients' electronic access to their health information can improve long-term health outcomes. Few studies have evaluated barriers that may limit access to portal health information.

Objective: The purpose of this study was to assess the prevalence of portal use and the factors associated with patients' portal access.

Methods: This study utilized data from the 2022 National Cancer Institute's Health Information National Trends Survey (HINTS 6). Adult patients (age ≥ 18) who responded to the survey question about patient portal access were included. A multivariate logistic regression analysis was performed to determine characteristics associated with portal access.

Results: 5958 patients were included (weighted n = 158,529,517), with a mean age of 55.6 and were mostly female (50.6) and white (73.6%). 61.3% of all respondents reported accessing portals over the last 12 months, and 43.8% used multiple portals. Most participants (90.5%) reported utilizing portals to access test results, followed by downloading personal health information (31.9%). The likelihood of portal use significantly increased by 24.9 percentage points (pp) (95% CI, 19.4, 30.5) and 19.5 pp (95% CI, 15.1, 23.9) when patients were offered access to portals, or when a healthcare provider encouraged patient to access portal, respectively. Having a college education and living in urban areas increased the probability of portal use by 6.9 pp (95% CI, 3.1, 10.8) and 6.9 pp (95% CI, 1.3, 12.6), respectively. Of note, males and those of Hispanic background were less likely to be offered portal access by 10.8 pp (95% CI, 6.3, 15.2) and 6.9 pp (95% CI, 1.7, 12.1), respectively.

Conclusions: This study demonstrates that most Americans use patient portals, though certain patient populations continue to face greater difficulty accessing them. Interventions targeted at equality in offering access to patient portals and encouraging patients to use them could advance equitable and widespread access to patient portals.

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Patient Factors Associated with Utilization of Online Portal Health Information in the post-pandemic era: A Cross-Sectional Analysis of a National Survey

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Abstract

Introduction: Patients' electronic access to their health information can improve long-term health outcomes. Few studies have evaluated barriers that may limit access to portal health information prior to the COVID-19 pandemic such as preference for in-person visits, lack of perceived need to use a patient portal system and lack of comfort or experience with computers. With the increased use of telehealth during the pandemic, patients' comfort with portal applications and digital health literacy has improved. The purpose of this study was to assess the prevalence of portal use and factors associated with patients' portal access after the COVID-19 pandemic.

Methods: This study utilized data from the 2022 National Cancer Institute's Health Information National Trends Survey (HINTS 6). Adult patients (age ≥ 18) who responded to the survey question about patient portal access were included. A multivariate logistic regression analysis was performed to determine characteristics associated with portal access.

Results: 5,958 patients were included (weighted $n = 158,529,517$), with a mean age of 55.6 and were mostly female (50.6%) and white (73.6%). 61.3% of all respondents reported accessing portals over the last 12 months, and 43.7% used multiple portals. Most participants (89.9%) reported utilizing portals to access test results, followed by downloading personal health information (31.9%). The likelihood of portal use significantly increased by 24.9 percentage points (pp) (95% CI, 19.4, 30.5) when patients were offered access to portals by healthcare providers or insurers compared to those not offered access or did not know if they were offered access. The likelihood of portal use also increased by 19.5 pp (95% CI, 15.1, 23.9) among patients with a healthcare provider encouraging them to access portals, compared to patients who did not receive encouragement to do so. Having a college education vs. an education below college level and living in metropolitan areas vs. non-metropolitan regions increased the probability of portal use by 6.9 pp (95% CI, 3.1, 10.8) and 6.9 pp (95% CI, 1.3, 12.6), respectively. Of note, males (compared to females) and those of Hispanic background (compared to non-Hispanic individuals) were less likely to be offered portal access by

10.8 pp (95% CI, 6.3, 15.2) and 6.9 pp (95% CI, 1.7, 12.1), respectively.

Conclusions: This study demonstrates that most Americans use patient portals, though certain patient populations such as those with less than college degree education or living in non-metropolitan area continue to face greater difficulty accessing them. Interventions targeted at equality in offering access to patient portals and encouraging patients to use them could advance equitable and widespread access to patient portals.

Keywords: Patient portal; Utilization; Health Disparity; post-pandemic

Introduction

Electronic health tools are becoming increasingly available as they help facilitate patient independence within the healthcare system [1, 2]. Patient portals are a unique tool allowing patients to access, manage, and share their medical records outside clinical care settings [2]. Potential uses of patient portals include viewing appointment summaries, test results, and medication lists. By empowering patients to take ownership over their health while improving patient-physician communication in the outpatient setting, patient portals offer many tangible benefits that may improve long-term health outcomes [2]. Furthermore, accessing patient records supplements in-person communication with providers and reduces patient reliance on in-person visits for accessing pertinent health information [3].

Despite the reported benefits of patient portal usage, as of 2019, only 37% of Americans were accessing patient portals nationwide [4], which increased to 68% in 2022 among patients who had healthcare visit in the last 12 months [5]. Prior to the COVID-19 pandemic, among individuals who did not use a patient portal, the most common reasons were a preference for in-person visits and a lack of perceived need to use a patient portal system. Other barriers included a lack of comfort or experience with computers, having no internet access and privacy concerns [6, 7]. With the increased use of telehealth during the pandemic, patients' comfort with portal applications and digital health literacy has improved [8], and therefore, it is important to re-evaluate patients' factors associated with more portal use. Studies published after the pandemic have predominantly focused on racial and ethnic disparities in portal use [5, 9]. However, disparities across other patient factors are less studied.

The purpose of this study was to assess patient factors associated with patient access to online health portals after the COVID-19 pandemic. Understanding these factors can allow healthcare providers and organizations to better engage their patients in the use of electronic healthcare tools such as patient portals.

Methods

This publicly available survey study did not use any private identifiable information and thus did not constitute human subject research requiring institutional review board oversight, falling under exempt category 2 of the our institutional Human Research Protections guidelines [10]. An administrative exempt self-determination was filed with our institutional IRB (IRB#6379).

Study Design & Data Source

We performed a cross-sectional analysis of data from the Health Information National Trends Survey 6 (HINTS 6) [11]. HINTS 6 is a national survey conducted by the National Cancer Institute in 2022. The target population was civilian, non-institutionalized adults over the age of 18 residing in the United States. The intention of the survey was to understand the American public's use of cancer-related information. Participants were recruited based on a random sample of addresses stratified by rural or urban designation and stratified by minority concentration in the region. One adult was selected from each household and offered the opportunity to respond to the survey in either paper or web-based formats.

Study Population

HINTS 6 recruited a nationally representative sample of 6,252 individuals with a 28.1% overall response rate. For this study, participants who had missing responses to the question inquiring about access to patient portals ($n = 294$) were excluded, and therefore, 5,958 individuals were included in this study sample.

Measures

The primary outcome was access to patient portals, determined based on the survey question "How many times did you access your online medical record or patient portal in the last 12 months?" Those who indicated zero instances of portal access were labelled as non-users, while respondents who selected any non-zero number were labelled as users of patient portals.

Secondary outcomes included reported use of multiple online portals, use of a portal

organizer app, functions used within portals, healthcare providers or insurers offering access to patient portals, and healthcare providers encouraging access to portals. The use of multiple online portals was assessed through the survey question “Do you have one, or more than one patient portal or online medical record?” with responses categorized as “one” vs. “more than one”. Respondents indicating use of “more than one” were asked about portal organizer app usage through a yes or no question “Have you ever used an app like ‘Apple Health Records’ or ‘CommonHealth’ to combine your medical information from different patient portals or online medical records into one place?” Additionally, functions used within patient portals were also assessed through a single question “In the past 12 months, have you used your online medical record or patient portal to...” with answer options: 1) look up test results, 2) download personal health information, 3) electronically send health information to a third party, and 4) view clinical notes.

Patients were also asked, “Have you ever been offered online access to your medical records (for example, a patient portal) by your healthcare provider or health insurer?” The response options allowed patients to select either “yes,” “no,” or “don’t know,” separately for healthcare provider or insurer. Encouragement of portal use by healthcare providers was assessed using responses to the yes or no question “Have any of your health care providers, including doctors, nurses, or office staff ever encouraged you to use an online medical record or patient portal?”

The independent variables included patients’ sociodemographics. These included age, sex, race, ethnicity, marital status, education, household income, and health insurance. Rural or urban living was assessed using the 2013 Rural-Urban Continuum Codes, designed to delineate metropolitan and non-metropolitan areas based on population size. Patients’ satisfaction with internet connection at home, and report of at least one health-related social need in the last 12 months (food insecurity, housing instability, and transportation access problem) as a proxy for individual socioeconomic status was collected as independent variables as may impact patients’ utilization of portal[12]. Patient well-being was assessed by frequency of provider visits in the previous 12

months, overall quality of healthcare received in the past 12 months, general health as a proxy for quality of life, and existing medical conditions (e.g. cancer, diabetes, etc.). Health literacy was determined based on a single question about participant confidence in filling out medical forms, which has been validated as useful in identifying inadequate health literacy [13], and has been shown to be associated with portal use [8].

Analyses

All data were analyzed using survey weights based on population estimates to account for non-response and coverage error, making the results more generalizable to the population, based on HINTS protocols. As is best practice with the HINTS data, jackknife replicate weights were used to provide bias-corrected variance estimates [11].

Descriptive statistics were used to summarize the sample's sociodemographic and clinical characteristics as well as patient portal access in the last 12 months, functions used within the portal, and healthcare/insurer offering or encouraging access to portals. A weighted percentage for descriptive statistics is reported.

Weighted univariable logistic regression models using average marginal effect were used to determine which sociodemographic and clinical characteristics (independent variables) were associated with patient use or non-use of patient portals (primary outcome) as well as offering access to patient portals by either healthcare provider or insurer (secondary outcome). Selected independent variables were those that have either been associated with portal use in prior literature (e.g. health literacy [8], race [14], internet access or socioeconomic status[12]) or expected to be associated with portal use. A weighted multivariable logistic regression model was constructed. Independent variables included in the model were those that were statistically significant in the univariable model or have been shown to be associated with the outcome [8, 14] or were expected to be associated with the outcome. Multicollinearity among variables was examined. All data analysis was conducted using Stata/MP 17.0 and SPSS (version 29; IBM SPSS Statistics). Statistical significance was

defined as a p-value < 0.05.

Results

Sample Characteristics

The sample population consisted of 5,958 individuals (weighted n = 158,529,517). A majority of participants were female (50.6%) and White (73.6%), with a mean age of 55.6. A total of 33.1% were college graduates or higher, and 63.1% of the sample indicated an annual household income of greater than \$50,000. A large percentage of participants resided in metropolitan regions (87.6%), compared to rural areas. The baseline characteristics of participants are shown in Table 1.

Table 1. Baseline characteristics of study participants.

Characteristics	n = 5,958
<i>Demographics</i>	
Age, n (%)	Missing = 76
18-40	1,396 (21.3%)
41-64	2,393 (43.3%)
65+	2,203 (35.4%)
Sex, n (%)	Missing = 255
Female	3,442 (50.6%)
Male	2,261 (49.4%)
Race, n (%)	Missing = 455
Asian	299 (5.9%)
Black	999 (12.6%)
Other	321 (7.9%)
White	3,884 (73.6%)
Ethnicity, n (%)	Missing = 460
Not Hispanic or Latino	4,526 (83.3%)
Hispanic or Latino	972 (16.7%)
Marital Status, n (%)	Missing = 265
Married	2,573 (51.0%)
Not married (Other)	3,120 (49.0%)
Education, n (%)	Missing = 251
College Graduate or Higher	2,694 (33.1%)
Below College Level	3,013 (66.9%)
Annual Household Income, n (%)	Missing = 552
< \$50,000	2,331 (36.9%)
≥ \$50,000	3,075 (63.1%)
Rural or Urban Communities, n (%)	Missing = 0
Metro	5,185 (87.6%)
Non-metro	773 (12.4%)
<i>Social Determinants of Health</i>	
Health Insurance, n (%)	Missing = 36

Insured	5,429 (89.4%)
Uninsured	493 (10.6%)
Report of at least one health-related social need in the last 12 months ^a, n (%)	Missing = 188
Never	5,213 (75.6%)
Yes, Sometimes or Often	582 (24.4%)
Satisfaction with Internet Connection at home, n (%)	Missing = 1030
Not Satisfied	1,645 (32.1%)
Satisfied	3,283 (67.9%)
<i>Health Characteristics and Healthcare Provider Interactions</i>	
Frequency of Provider Visits in the last 12 months, n (%)	Missing = 53
Never	670 (13.9%)
At least once	5,235 (86.1%)
Quality of HealthCare received in the past 12 months, n (%)	Missing = 726
Poor or Fair	450 (8.3%)
Good, very good, or excellent	4,782 (91.7%)
Existing Medical Conditions, n (%)	Missing = 68
No medical conditions	1,712 (36.3%)
At least one medical conditions	4,178 (63.7%)
General Health, n (%)	Missing = 83
Poor or Fair	1,047 (16.8%)
Good, very good, or excellent	4,828 (83.2%)
Confident Filing Medical Forms, n (%)	Missing = 19
No	788 (14.4%)
Yes	5429 (85.6%)

n = unweighted sample size. % = weighted percentage.

^a Includes food insecurity, housing instability, and transportation access problem.

Patient Portal Access

A total of 61.3% of respondents accessed patient portals within the past year. Of those, 33.4% and 31.5% indicated they accessed their portals between 1 to 2 times and 3-5 times, respectively. Furthermore, 43.7% of participants reported using multiple patient portals from different healthcare providers. The most prevalent reason for portal use was to view test results, with 89.9% of participants indicating they utilize this function. Other reasons for use included viewing clinical notes (69.7%), downloading personal health information (31.9%), and sending health information to third parties (20.4%). Only 5.4% used an app like Apple Health Records or CommonHealth to combine their medical information from different portals into one place. A total of 71.4% and 68.4% reported that their healthcare provider offered and encouraged them to access patient portals, respectively, while 38.9% were offered access to portals by their insurers. Overall, 75% reported

being offered portal access either by healthcare provider or insurer (Table 2).

Table 2. Patient portal access among study participants.

Characteristics	n = 5,958
Patient portal access in the last 12 months, n (%)	Missing = 0
Never	2304 (38.7%)
One time or more	3654 (61.3%)
Using Multiple Online Portals, n (%)	Missing = 1428
Only one	2544 (56.3%)
More than one	1986 (43.7%)
Using Portal Organizer App, n (%)	Missing = 3894
No	1870 (94.6%)
Yes	104 (5.4%)
Healthcare provider Offering Access to portals, n (%)	Missing = 37
No or Don't Know	1614 (28.5%)
Yes	4307 (71.4%)
Healthcare provider Encouraging Access to portals, n (%)	Missing = 35
No	1913 (31.6%)
Yes	4010 (68.4%)
Insurer Offering Access to portals, n (%)	Missing = 530
No or Don't Know	3336 (61.1%)
Yes	2092 (38.9%)

n = unweighted sample size. % = weighted percentage.

Associations Between Sample Characteristics and Portal Use

Univariable and multivariable analyses of factors associated with portal use are shown in Table 3. In multivariable analysis, the likelihood of portal use was 24.9 percentage points (pp) higher (95% CI, 19.4, 30.5) when patients were offered access to a portal through their healthcare providers or insurer. Similarly, portal usage was 19.5 pp higher (95% CI, 15.1, 23.9) if a healthcare provider encouraged a patient to access portals. Lastly, having a college education and living in urban areas were associated with a 6.9 pp (95% CI, 3.1, 10.8) and 6.9 pp (95% CI, 1.3, 12.6), higher likelihood of portal use, respectively.

Table 3. Univariable and Multivariable Factors Associated with Portal Use

	Univariable analysis Average Marginal Effect (95% CI)	p-value	Multivariable analysis Average Marginal Effect (95% CI)	p-value
<i>Demographics</i>				

Age	--			
18-40	Reference		Reference	
41-64	0.034 (-0.023, 0.093)	.23	-0.003 (-0.051, 0.045)	.90
65+	-0.103 (-0.163, -0.047)	.001	-0.032 (-0.086, 0.022)	.24
Sex				
Female	Reference		Reference	
Male	-0.123 (-0.165, -0.083)	<.001	-0.039 (-0.080, 0.001)	.06
Race				
Asian	0.006 (-0.139, 0.152)	.93	0.045 (-0.057, 0.147)	.38
Black	-0.112 (-0.173, -0.050)	<.001	-0.019 (-0.089, 0.051)	.59
Other	-0.079 (-0.196, 0.038)	.18	0.055 (-0.023, 0.133)	.16
White	Reference		Reference	
Ethnicity				
Not Hispanic or Latino	Reference		Reference	
Hispanic or Latino	-0.151 (-0.214, -0.088)	<.001	-0.027 (-0.092, 0.038)	.41
Marital Status				
Not married (Other)	Reference		Reference	
Married	0.151 (0.102, 0.200)	<.001	0.045 (-0.001, 0.092)	.06
Education				
Below College Level	Reference		Reference	
College Graduate or Higher	0.259 (0.219, 0.298)	<.001	0.069 (0.031, 0.108)	.001
Annual Household Income				
< \$50,000	Reference		Reference	
≥ \$50,000	0.241 (0.198, 0.284)	<.001	0.052 (-0.006, 0.110)	.09
Rural or Urban Communities				
Non-metro	Reference		Reference	
Metro	0.096 (0.042, 0.151)	.001	0.069 (0.013, 0.126)	.02
<i>Social Determinants of Health</i>				
Health Insurance				
Uninsured	Reference		Reference	
Insured	0.245 (0.155, 0.333)	<.001	-0.007 (-0.125, 0.111)	.91
Report of at least one health-related social need in the last 12 months^a				
Never	Reference		Reference	
Yes, Sometimes or Often	-0.108 (-0.166, -0.051)	<.001	0.010 (-0.048, 0.069)	.73
Satisfaction with Internet Connection at home				
Not Satisfied	Reference		Reference	
Satisfied	0.108 (0.058, 0.157)	<.001	0.036 (-0.007, 0.078)	.09
<i>Health Characteristics and Healthcare provider Interactions</i>				
Quality of Care				
Not Good	Reference		Reference	
Good	0.143 (0.080, 0.206)	<.001	0.013 (-0.064, 0.091)	.73
Medical Conditions				
No medical	Reference			

conditions				
At least one medical condition	0.076 (0.036, 0.116)	<.001	0.014 (-0.029, 0.056)	.52
General Health				
Poor or Fair	Reference		Reference	
Good, very good, or excellent	0.091 (0.021, 0.161)	.01	-0.020 (-0.083, 0.042)	.51
Confident Filing Medical Forms				
No	Reference		Reference	
Yes	0.168 (0.108, 0.228)	<.001	0.042 (-0.032, 0.116)	.26
Healthcare provider or Insurer Offering Access to portals				
No or Don't Know	Reference		Reference	
Yes	0.486 (0.462, 0.511)	<.001	0.249 (0.194, 0.305)	<.001
Healthcare provider Encouraging Access to portals				
No	Reference		Reference	
Yes	0.438 (0.425, 0.452)	<.001	0.195 (0.151, 0.239)	<.001

^a Includes food insecurity, housing instability, and transportation access problem.

Associations Between Sample Characteristics and Portal Access Offer

Univariable and multivariable analyses of factors associated with portal access offered by either healthcare provider or insurer are shown in Table 4. In multivariable analysis, the likelihood of being offered portal access was 8.6 pp higher (95% CI, 4.9, 12.3) among married individuals, 7.1 pp higher (95% CI, 2.0, 12.2) among college graduates, 7.2 pp higher (95% CI, 1.0, 13.4) among those with annual household income of \$50,000 or more, 10.6 pp higher (95% CI, 3.0, 18.2) among those insured, 5.3 pp higher (95% CI, 0.4, 10.2) among those satisfied with their home internet connection, and 10 pp higher (95% CI, 4.4, 16.0) among those with at least one medical condition. The likelihood of being offered access to a portal was 10.8 pp lower (95% CI, 6.3, 15.2) among males and 6.9 pp lower (95% CI, 1.7, 12.1) among those of Hispanic ethnic background.

Table 4. Univariable and Multivariable Factors Associated with Offering Portal Access

	Univariable analysis Average Marginal Effect (95% CI)	p-value	Multivariable analysis Average Marginal Effect (95% CI)	p-value
Demographics				
Age				
18-40	Reference		Reference	
41-64	0.085 (0.026, 0.145)	.005	0.025 (-0.034, 0.084)	.40

65+	0.059 (0.012, 0.106)	.01	0.012 (-0.061, 0.085)	.74
Sex				
Female	Reference		Reference	
Male	-0.121 (-0.160, -0.081)	<.001	-0.108 (-0.152, -0.063)	<.001
Race				
Asian	-0.095 (-0.236, 0.045)	.18	0.045 (-0.159, 0.068)	.42
Black	-0.039 (-0.092, 0.015)	.15	0.003 (-0.061, 0.069)	.91
Other	-0.147 (-0.283, 0.012)	.03	-0.010 (-0.095, 0.074)	.81
White	Reference		Reference	
Ethnicity				
Not Hispanic or Latino	Reference		Reference	
Hispanic or Latino	-0.151 (-0.194, -0.108)	<.001	-0.069 (-0.121, -0.017)	.01
Marital Status				
Not married (Other)	Reference		Reference	
Married	0.157 (0.117, 0.199)	<.001	0.086 (0.049, 0.123)	<.001
Education				
Below College Level	Reference		Reference	
College Graduate or Higher	0.172 (0.125, 0.218)	<.001	0.071 (0.020, 0.122)	.007
Annual Household Income				
< \$50,000	Reference		Reference	
≥ \$50,000	0.183 (0.144, 0.224)	<.001	0.072 (0.010, 0.134)	.02
Rural or Urban Communities				
Non-metro	Reference		Reference	
Metro	0.017 (-0.037, 0.071)	.53	0.013 (-0.050, 0.077)	.68
<i>Social Determinants of Health</i>				
Health Insurance				
Uninsured	Reference		Reference	
Insured	0.242 (0.173, 0.311)	<.001	0.106 (0.030, 0.182)	.007
Report of at least one health-related social need in the last 12 months^a				
Never	Reference		Reference	
Yes, Sometimes or Often	-0.119 (-0.170, -0.069)	<.001	-0.016 (-0.089, 0.058)	.67
Satisfaction with Internet Connection at home				
Not Satisfied	Reference		Reference	
Satisfied	0.073 (0.019, 0.127)	.009	0.053 (0.004, 0.102)	.04
<i>Health Characteristics and Healthcare provider Interactions</i>				
Medical Conditions				
No medical conditions	Reference			
At least one medical condition	0.101 (0.058, 0.143)	<.001	0.010 (0.044, 0.160)	.001
General Health				

Poor or Fair	Reference		Reference	
Good, very good, or excellent	0.090 (0.032, 0.148)	.003	-0.005 (-0.057, 0.048)	.86
Confident Filing Medical Forms				
No	Reference		Reference	
Yes	0.141 (0.088, 0.194)	<.001	0.042 (-0.012, 0.098)	.12

^a Includes food insecurity, housing instability, and transportation access problem.

Discussion

In this retrospective analysis of online portal access using a nationally representative sample in 2022 after COVID-19 pandemic, we found that 61.3% of Americans use patient portals, a 27% increase compared to 48.1% in 2020 [7]. Further, 75.0% of patients were being offered access to portals by either healthcare provider or insurer, a 12% increase from 67.0% in 2020 [7], and 68.4% were encouraged to use portals by their provider. Both factors were associated with a significantly higher likelihood of patients' portal use consistent with prior studies [5, 9, 15]; however, there remained significant disparity in portal use based on patients' rural/urban location or education.

In recent years, governing bodies have sought to increase access to and use of patient portals while limiting information blocking, defined as a practice that interferes, prevents, or discourages the distribution of electronic health information (EHI) [7]. According to the recently passed 21st Century Cures Act (henceforth the Cures Act), EHI must be made immediately available to patients, including laboratory and imaging diagnostic tests. Several studies indicate that this increases patient ownership of their health by improving their knowledge and understanding of their health conditions [16-18]. This presents a need for equitable patient portal access, however there are barriers preventing the widespread use of portals among patients.

Despite reported benefits of portal use, portals are not offered to approximately one-third of patients. Commonly cited reasons for not offering portals include potential increased clinical workload (e.g., increased messaging to providers) as a result of patients accessing their test results prior to interpretation by their provider might be a contributing factor to providers not offering portals [16, 17]. Other cited reasons include some providers believing there will be increased patient

anxiety when reviewing results prior to talking to providers. However, a prior systematic review has shown a reduction or no change in patient anxiety following the use of patient portals [19].

While others have found decreased portal use among patients who are male or from minority racial or ethnic backgrounds [5, 7], our study did not show any significant association with these specific factors in multivariable analysis adjusting for offering patient portal. This discrepancy is likely because males and Hispanic people were 10.8 pp and 6.9 pp less likely to be offered portal access. Although 79.9% of individuals of White background were offered portal access--a disproportionately higher rate than 73.8% of patients of Black background--we did not observe any significant racial difference in offering access to portals in multivariable analyses [5]. Interestingly, one study reported no significant differences in understanding of EHI among users regardless of race, suggesting that equitable access opportunities can increase portal use [5]. Our study underscores provider education to reduce bias when offering portals.

Furthermore, our study showed that college graduation and living in urban regions were independently associated with increased patient portal use, consistent with prior literature [20, 21], and lower portal use among those with lower levels of education or living in rural areas will not improve with increased offering of portal. For these populations, access or digital literacy barriers likely contribute to lower portal use. Tailored interventions to increase digital health literacy can further facilitate portal use [8, 22].

In our study, 43.7% of patients reported using multiple patient portals. An additional potential barrier to access is the overwhelming number of patient portals that exist, which are rarely integrated with one another, potentially hindering motivation to utilize portals. This might be seen more pronounced among patients with multiple health conditions, which may require them to use different patient portals for different providers they visit [23]. Though developing more integrated patient portals would be ideal, factors such as stakeholder alignment and differential IT infrastructure among hospitals make this a difficult feat to attain [24].

As we strive to increase equitable portal access, an expansion in patient portal function may also become more prominent. Currently, patients can communicate with providers between appointments and view a variety of diagnostic tests and imaging results, however, the potential of the tool as a self-management health aid is being explored within the literature. For example, a self-assessment survey was tested among patients with chronic kidney disease in outpatient clinics [25]. This offers patients access to printouts containing learning needs and treatment plans as well as the opportunity to create physician-accessible notes allowing their providers to relay take-home messages for individual patients. Another portal centered around diabetes mellitus care called Diabetes NetPLAY fostered weekly communication for weight management through social media-type posts containing a weekly topic, research, fitness tips, and physical activity myths, as well as interactive components such as physical activity logbooks and weekly counsellor messages [25]. Another study suggested that portals can be used to identify lung cancer screening candidates through an algorithm considering patient age and smoking history [26]. This population-level intervention through portals can facilitate earlier detection of malignancy, leading to better patient prognoses and lower mortality. While these functionalities may be forecasted to improve health outcomes, it is important to emphasize the need for increased access to patient portals as these technologies will only benefit patients who utilize the portals to their full capacity. Creating flyers about portal access and posting them in the waiting area and exam rooms, use of printed after-visit summaries with instructions on how to use portals, and sending patients an enrollment invitation to access their results after a visit are some of the ways to increase portal offerings and encouragement among patients. A systematic review has shown interventions focusing on technical training and assistance for patients may increase portal use in vulnerable populations.[27]

Strengths and Limitations

Notable strengths of this study include the use of a large database with of 5,958 patients and an ethnically diverse patient population. A major limitation of this study is the depth through which

questions were answered by participants. For example, patients were never prompted to discuss specific reasons as to why they chose to use or not use portals. This makes it difficult to discern what patients may subjectively feel is their largest obstacle or barrier to using their online health portals. Future studies assessing factors associated with portal use ought to better determine the exact reasons why patients may not use portals. In doing so, these answers can then be correlated with demographic factors, as done by our study, to elicit a better understanding of the obstacles to portal use amongst larger patient populations.

Conclusion

The findings of this cross-sectional analysis of the 2022 HINTS 6 database identified several factors associated with increased portal use, such as college education, living in urban regions, access to portals offered by healthcare providers or insurers and encouraging use of portals. We further identified disparities in offering of portals to patients, with married individuals, college graduates, those with an annual household income of \$50,000 or more, insured, satisfied with their home internet connection, and those with at least one medical condition being more likely to be offered portal access, while men and those of Hispanic ethnic background being less likely. The results of this study highlight the opportunity to advance equitable portal access and patient empowerment through physician encouragement of patient portal use.

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Author Contributions

Conceptualization, GS; methodology, GS, IM and KG; formal analysis, GS and KG; data curation, IM and KG; writing—original draft preparation, IM and KG; writing—review and editing, GS, IM and KG; All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

G. Sadigh receives an honorarium from the *Journal of the American College of Radiology* in her role as Associate Editor. G Sadigh receives research support from NIH/NCI. Other authors have no conflicts of interest related to the material discussed in this article.

Data Availability

The HINTS 6 database is publicly available for download. Furthermore, the recoded data sets generated and analyzed during this study are available from the corresponding author upon request.

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