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Original Article

Predisposing, Enabling, and Need Factors Associated with Health Information Technology Use for Personal Health Management among Adults in the United States: Application of Andersen's Behavioral Model

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Abstract

Introduction: Health information technology (HIT) can facilitate informed decisions regarding health conditions. This study aimed to examine the predisposing factors, enabling factors, and need factors associated with the use of HIT for personal health management. Individuals with chronic conditions might further need to use HIT tools to improve their health outcomes.

Methods: This study used secondary data with a sample size of 3,865 from the 4th cycle of 2020 Health Information National Trends Survey (HINTS) 5. Using multivariable logistic regression, we used four regression models to examine the association between the dependent and independent variables, such as multiple chronic conditions and sociodemographic characteristics. The dependent variables representing the use of HIT were "looked for health or medical information for yourself", "used e-mail or the Internet to communicate with a doctor or doctor's office", "looked up medical test results", and "made appointments with a healthcare provider."

Results: Adults with 3 or more chronic conditions had higher odds of looking for health or medical information for themselves (Adjusted Odds Ratio AOR=1.9; Confidence Interval CI:1.09-3.32), using e-mail or the Internet to communicate with a doctor or doctor's office (AOR=1.84; CI, 1.20-2.81), and looking up medical test results (AOR=2.04; CI, 1.19-3.50) when compared to those with no chronic conditions. Compared to individuals who had less than a high school degree, those with a college degree were more likely to look for health or medical information for themselves (Adjusted Odds Ratio AOR=7.21; Confidence Interval CI, 2.34-22.23), use e-mail or the Internet to communicate with a doctor or doctor's office (AOR=3.01; CI, 1.47-6.17), look up medical test results (AOR=4.34; CI, 2.46-7.65), and make appointments with a healthcare provider (AOR=2.84; CI, 1.40-5.76). Enabling factors strongly associated with HIT use were having a regular provider and having access to the Internet.

Conclusion: This study provides evidence about the factors that influence the use of health information technology for personal health management.

Keywords: Health information technology, Multiple chronic conditions, Self-management, internet use, Healthcare utilization

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Introduction

With access to the Internet and technology gadgets at its historically high level, adults in the United States and around the globe have experienced increased use of Health Information Technology (HIT) (1-3). The use of HIT comprises the utilization of computer hardware and software to store, retrieve, synthesize, share, and use healthcare information for care coordination, communication, and decision-making (1-3)policies and regulations required hospitals to implement advanced capabilities of certified electronic health records (EHRs. Some benefits associated with HIT use include the practice of precision medicine, access to medical knowledge, patient management by the providers, and chronic disease management by persons with chronic disease

as 93% of adults in the United States use some aspects of HIT for their chronic disease management (2, 4-6). Also, the HIT has helped consumers with a better understanding of diseases (e.g. through online health communities for patients) and improved access to available resources such as communities of practice and medical reference materials (7).

Understanding the use of Health Information Technology can provide a better perspective on its role as a determinant of health due to its influence on healthcare utilization and the self-management of chronic conditions (8). Chronic conditions are of great global health importance due to the high prevalence of chronic conditions. An estimated one in three adults suffer from multiple chronic conditions, and three in five deaths are attributable to four non-communicable chronic conditions -- cancer, chronic lung diseases, cardiovascular disease, and diabetes (9-12). Chronic conditions require the involvement of the patient in management, and HIT use has been associated with improved health outcomes among these populations of interest (13, 14).

Andersen's Behavioral Model (15) serves as a framework to understand the factors associated with HIT use for personal health management. The model suggests that an individual's use of healthcare is influenced by 3 major factors: predisposing factors, enabling factors, and need factors. Predisposing factors include demographic factors, social structures, and beliefs that increase the probability of using services. Enabling factors include income, access to regular care, and rurality can facilitate or act as barriers to healthcare use. An individual's perceived needs or clinically evaluated needs can directly cause healthcare use (15, 16). While several studies have been conducted on how HIT can be used to prevent, monitor progression, and manage health among people with chronic conditions, other researchers have examined the role of electronic health records or mobile apps for personal health management (2, 7, 13, 14, 17). It is important to understand the factors that act as barriers or facilitators to HIT use for personal health management. The objective of this study is to examine the predisposing, enabling, and need factors associated with the use of HIT for personal health management.

Methods

Data Source

We conducted this study using secondary data from the 4th cycle of the Health Information National Trends Survey (HINTS) 5. The survey is a self-administered, nationally representative study of civilian, non-institutionalized adults aged 18 and older, conducted by the National Cancer Institute in the United States (18). The HINTS survey administration commenced in 2003 and assesses the American population's knowledge of, attitude toward, and use of health information technology. A two-stage sampling design was used and a final sample size of 15,347 was calculated. This fourth cycle of the survey was conducted from February to June 2020 with a 37% response rate, and a total of 3,865 participants completed the surveys (18).

Variables

Dependent Variable

The dependent variables of interest measuring health information technology (HIT) use for personal health management are: (1) having looked for health or medical information for yourself, (2) having used e-mail or the Internet to communicate with a doctor or doctor's office, (3) having looked up medical test results, and (4) having made appointments with a healthcare provider. All these four dependent variables were binary coded (Yes/No) according to answers to the question of whether they had used a computer, smartphone, or other electronic means to do any of these four activities in the past 12 months.

Independent Variables

The independent variables were categorized using Andersen's Behavioral Model. The variables that operationalized the predisposing factors according to Andersen's Behavioral Model in this study were gender, age (ranging from 18 years to 75 years and older), race (Non-Hispanic White, Non-Hispanic Black or African American, Hispanic, Non-Hispanic Asian, Non-Hispanic Other), and educational level (ranging from less than high school to college graduate or more).

To operationalize the enabling factors of Andersen's Behavioral Model, we included household income (ranging from <$20,000 to $75,000 or more), a regular provider, access to the Internet, and rurality (this was re-coded using the 2013 USDA rural-urban continuum codes in the dataset and grouped as 1-3=urban and 4-8=rural) in the regression model.

The individual's need for healthcare utilization was operationalized using the number of chronic conditions provided by the survey respondents. The number of chronic conditions was obtained by summing the "Yes" responses to the following questions - "Has a doctor or other health professionals ever told you that you had any of the following medical conditions: (1) Diabetes or high blood sugar; (2) high

Table 1: Descriptive Statistics of Survey Respondents

Variables	Frequency (not weighted)	% (weighted)
Dependent Variables		
Use HIT to look for Online Health Information for themselves		
No	1,151	27%
Yes	2,677	73%
Use HIT to communicate with doctor		
No	1,996	53%
Yes	1,800	47%
Use HIT to look up test results		
No	2,156	57%
Yes	1,629	43%
Use HIT to make appointments		
No	1,906	51%
Yes	1,891	49%
Independent Variables		
Predisposing Factors		
Gender		
Man	1,487	49%
Woman	2,052	51%
Race		
Non-Hispanic White	2,133	63%
Non-Hispanic Black or African American	481	11%
Hispanic	596	17%
Non-Hispanic Asian	161	5%
Non-Hispanic Other	119	3%
Age Group		
18-34 years	484	26%
35-49 years	703	26%
50-64 years	1,142	28%
65-74 years	869	12%
75+ years	540	9%
Educational Level		
Less than High School	273	8%
High School Graduate	705	23%
Some College	1,081	39%
College Graduate or More	1,663	30%
Enabling Factors		
Annual Household Income		
< $20,000	624	15%
$20,000-<$35,000	451	11%
$35,000-<$50,000	460	13%
$50,000-<$75,000	592	18%
$75,000 or more	1,321	42%
Rural Residence		
No	3,435	88%
Yes	430	12%
Regular Provider		
No	2,628	38%
Yes	1,162	62%
Internet Access		
No	712	14%
Yes	3,148	86%
Need Factor		
Number of Chronic Conditions		
0	1,340	41%
1	1,285	31%
2	780	18%
3 or more	460	9%

blood pressure or hypertension; (3) a heart condition such as heart attack, angina, congestive heart failure; (4) chronic lung disease, asthma, emphysema, or chronic bronchitis; (5) depression or anxiety disorder?" A maximum number of 5 is attainable and this was recoded into 0, 1, 2, and 3 or more chronic conditions based on the response distribution.

Analysis

We conducted descriptive statistics to describe the respondents' characteristics using frequency and weighted percentage. Multivariable logistic regression was performed to assess the use of health information technology for personal health management. Four models were computed for each of the dependent variables. Analyses were conducted using STATA version 16 svy commands, and all analyses were based on the survey design of HINTS (19).

Ethical Considerations

The study was deemed exempt by the Georgia Southern University Institutional Review Board.

Results

Descriptive Results

Table 1 shows that more than 70% of all respondents had used HIT to look for online health information for themselves, 47% to communicate with their doctor, 43% to look up test results, and only 49% had used HIT to make appointments. Although 41% of the survey respondents did not have a chronic condition, 31% had 1 chronic condition, 18% had 2 chronic conditions, and 9% had 3 or more conditions.

Roughly half of the study population (51%) were women. Most of the respondents were Non-Hispanic White (63%) and were between 50-64 years (28%). Almost half (42%) of the respondents had a household income of $75,000 or more, and only 12% resided in rural areas. Sixty-two percent (62%) of the respondents had a regular healthcare provider, and only 14% did not have access to the Internet.

Multivariable Logistic Regression- HIT Use to Look for Health or Medical Information

As shown in Table 2, in Model I, compared to respondents with no chronic conditions, respondents with 3 or more chronic conditions had almost two times higher odds (Adjusted Odds Ratio AOR=1.9; CI:1.09-3.32) of using HIT to look for health or medical information for themselves (Table 2). Women were more likely (AOR=1.43; CI, 1.04-1.94) to look for health or medical information for themselves when compared to men. Older adults aged 75 years and older (vs 18-34 years) had lower odds of looking for health or medical information for themselves (AOR=0.41; CI,0.21-0.79). Respondents with higher levels of education such as those having some college (AOR=3.61; CI,1.27-10.25) and a college graduate & more (AOR=7.21; CI,2.34-22.23) were more likely to use HIT to look for health or medical information for themselves than those with less than high school education. Having access to the Internet (vs. no access to the Internet) increased the odds of looking for health or medical information for themselves (AOR=6.67; CI,4.25-10.48).

Multivariable Logistic Regression- HIT Use to Communicate with their Doctor

In Model II, respondents who had at least one chronic condition (vs. no chronic condition) were more likely to use HIT to communicate with their doctor: 1 chronic condition (AOR=1.75; CI,1.24-2.47), 2 chronic conditions (AOR=1.91; CI,1.15-3.16), and 3 or more chronic conditions (AOR=1.84; CI, 1.20-2.81). Other predictors of interest with lower odds of using HIT to communicate with their doctor were being 75 years and older vs. 18-34 years old (AOR=0.49; CI,0.27-0.90) and residing in a rural area vs. urban area (AOR=0.62; CI,0.41-0.95). Having a regular healthcare provider vs. no regular healthcare provider (AOR=2.53; CI,1.83-3.51) and Internet access vs. no Internet access (AOR=6.94; CI, 3.99-12.08) had higher odds of using HIT to communicate with a doctor. Being a college graduate or more increased the chances of using HIT to communicate with their doctor when compared with those with less than a high school degree (AOR=3.01; CI,1.47-6.17).

Multivariable Logistic Regression- HIT Use to Look Up Test Results

In model III, the odds of using HIT to look up the test results were higher if the respondent had 1 chronic condition (AOR=1.41; CI,1.06-1.88), 2 chronic conditions (AOR=2.39; CI,1.49-3.83), and 3 or more chronic conditions (AOR=2.04; CI, 1.19-3.50) when compared to those with no chronic conditions. Women were also more likely to use HIT to look up the test results when compared to men (AOR=1.43; CI, 1.04-1.95). Compared to people with less than high school education, those with some college education (AOR=2.24; CI, 1.33-3.78) and a college degree or higher (AOR=4.34; CI,2.46-7.65) had higher odds of using HIT to look up the test results. Households with incomes earning $75,000 or more (vs. less than $20,000) were more likely to use HIT to look up the test results (AOR=1.69; CI, 1.04-2.74). Respondents

Table 2: Logistic Regression of Health Information Technology Uses and its Correlates

	Model I		Model II		Model III		Model IV	
	Used HIT to look for Online Health Information for themselves in past 12 months		Used HIT to communicate with doctor or doctor's office in past 12 months		Used HIT to look up test results in past 12 months		Used HIT to make appointments in past 12 months	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Need Factor								
Number of Chronic Conditions								
0	--		--		--		--	
1	1.25	[0.76,2.05]	1.75**	[1.24,2.47]	1.41*	[1.06,1.88]	1.34	[0.93,1.95]
2	1.5	[0.96,2.36]	1.91*	[1.15,3.16]	2.39**	[1.49,3.83]	1.31	[0.87,1.99]
3 or more	1.9*	[1.09,3.32]	1.84*	[1.20,2.81]	2.04*	[1.19,3.50]	1.58	[0.96,2.59]
Predisposing Factors								
Gender								
Man	--		--		--		--	
Woman	1.43*	[1.04,1.94]	1.17	[0.86,1.60]	1.43*	[1.04,1.95]	1.31	[0.96,1.78]
Race/ethnicity								
Non-Hispanic White	--		--		--		--	
Non-Hispanic Black or African American	1.05	[0.60,1.85]	1.09	[0.69,1.74]	0.95	[0.63,1.43]	1.16	[0.78,1.73]
Hispanic	1.33	[0.81,2.20]	1.21	[0.79,1.88]	1.09	[0.70,1.70]	1.71*	[1.12,2.60]
Non-Hispanic Asian	1.32	[0.68,2.56]	0.74	[0.41,1.35]	1.37	[0.72,2.62]	1.48	[0.74,2.94]
Non-Hispanic Other	1.38	[0.50,3.78]	1.88	[0.77,4.55]	1.9	[0.78,4.59]	2.56*	[1.11,5.90]
Age Group								
18-34 years	--		--		--		--	
35-49 years	1.27	[0.73,2.22]	1.14	[0.74,1.76]	1.23	[0.79,1.90]	0.95	[0.59,1.52]
50-64 years	0.96	[0.54,1.70]	0.82	[0.56,1.21]	1.04	[0.63,1.71]	0.67	[0.46,0.99]
65-74 years	0.65	[0.38,1.09]	0.8	[0.52,1.22]	1.02	[0.61,1.71]	0.56*	[0.36,0.88]
75+ years	0.41*	[0.21,0.79]	0.49*	[0.27,0.90]	0.68	[0.33,1.35]	0.45*	[0.26,0.79]
Educational Level								
Less than High School	--		--		--		--	
High School Graduate	2.04	[0.74,5.58]	1.15	[0.50,2.60]	1.54	[0.84,2.83]	1.15	[0.50,2.61]
Some College	3.61*	[1.27,10.25]	1.31	[0.60,2.84]	2.24**	[1.33,3.78]	1.56	[0.68,3.59]
College Graduate or More	7.21**	[2.34,22.23]	3.01**	[1.47,6.17]	4.34***	[2.46,7.65]	2.84*	[1.40,5.76]
Enabling Factors								
Annual Household Income								
<$20,000	--		--		--		--	
$20,000-<$35,000	0.62	[0.34,1.13]	1.09	[0.67,1.77]	0.76	[0.43,1.34]	1.17	[0.68,2.02]
$35,000-<$50,000	0.74	[0.41,1.36]	1.01	[0.59,1.71]	0.94	[0.59,1.51]	1.08	[0.63,1.87]
$50,000-<$75,000	1.03	[0.58,1.84]	1.39	[0.78,2.48]	1.04	[0.65,1.66]	1.44	[0.80,2.60]
$75,000 or more	1.34	[0.70,2.56]	1.35	[0.80,2.28]	1.69*	[1.04,2.74]	1.33	[0.74,2.39]
Rural Residence								
No	--							
Yes	0.79	[0.45,1.38]	*0.62	[0.41,0.95]	0.94	[0.62,1.41]	0.71	[0.45,1.12]
Regular Healthcare Provider								
No	--							
Yes	0.76	[0.50,1.16]	2.53***	[1.83,3.51]	2.85***	[1.95,4.17]	2.02***	[1.44,2.85]
Internet Access								
No	--							
Yes	6.67***	[4.25,10.48]	6.94***	[3.99,12.08]	4.16***	[2.52,6.84]	1.66*	[1.08,2.55]

who had a regular healthcare provider vs. no regular healthcare provider (AOR=2.85; CI,1.95-4.17) and had Internet access vs. no Internet access (AOR=4.16; CI, 2.52-6.84) had higher odds of looking up the test results using HIT.

Multivariable Logistic Regression- HIT Use to Make Appointments

The study results in model IV showed no association between the use of HIT to make appointments and having a chronic condition. However, compared to Non-Hispanic White, respondents who were identified as Hispanic (AOR=1.71; CI,1.12-2.60) and Non-Hispanic Others (AOR=2.56; CI, 1.11-5.90) were more likely to make appointments using HIT. Having a college degree or more vs. less than high school also increased the likelihood of using HIT to make appointments (AOR=2.84; CI,1.40-5.76). Other factors associated with making appointments using HIT were aged 65-74 years (AOR=0.56; CI, 0.36-0.88) and 75 years and older (AOR=0.45; CI, 0.26-0.79) vs. 18-34 years, having a regular healthcare provider (AOR=2.02; CI,1.44-2.85) vs. no healthcare provider and having access to the Internet (AOR=1.66; CI, 1.08-2.55) vs. no access to the Internet.

Discussion

In this study, we examined the factors associated with HIT utilization for personal health management among American adults. Our results showed that 43% to 49% of the US population used HIT to communicate with doctors or doctors' offices, look up test results, and make appointments (refer to Table 1), indicating that the U.S. has achieved the Healthy People 2020 objectives regarding electronic personal health management.

Predisposing Factors

Our study showed that female gender was associated with HIT use to look for online health information for themselves and to look up the test results. Individuals who were 75 years or older were less likely to use HIT to look for online health information for themselves, communicate with their doctor or doctor's office, and make appointments. Gender and age was consistently argued to be among predisposing factors for HIT utilization (20). Women were more likely to use HIT to look for personal health information and test results but not communicate with healthcare providers or make appointments (21). Research studies consistently show that globally women are more likely than their male counterparts to use health services partly due to their higher engagement in healthcare-related online activities and increased use of general social media. Furthermore, due to their role as the health care liaison for their family members, this could be an opportunity for public health practitioners to engage them as family gatekeepers in promotion of HIT tools to improve health outcomes (22, 23).

Although younger generations have grown up with technology, our results did not show that the younger generation was more likely to use HIT. Young people are relatively healthy, so they might be less in need of using HIT. However, our study finding is surprising that the age group above 75 years isn't the only group found less likely to use HIT for personal health management. Previous studies have found that individuals aged 65 years and above are also less likely to use HIT due to reasons such as reduced health literacy, mistrust of the online source, and skills needed to access HIT (24, 25). Older people have more care needs due to the likelihood of having more morbidities, but they lack the skills to use HIT which could be an indication that there are barriers to HIT adoption and use among older people that need to be explored. The interaction of low HIT utilization in old age and multiple morbidities can complicate the elimination of technology barriers among this age group. This is an important finding for policymakers and health professionals because globally significantly higher prevalence of chronic diseases is seen among the older population, and if they are unable to use HIT tools for personal health management, their quality of care and satisfaction with the care process might be reduced. Age-friendly HIT tools can also be developed for the geriatric population to encourage adoption and use for personal health management.

Our study showed that Hispanics and Non-Hispanic others are more likely than Non-Hispanic Whites to use HIT for making clinical appointments. Our study also found that the association between other races and HIT use is not statistically significant compared to their referent group, non-Hispanic Whites. Our finding differs from what has been reported in the literature, as non-Hispanic Whites have been the predominant group in HIT use (26). For instance, racial/ethnic minorities have been reported to have more chronic health problems and more significant disabilities than non-Hispanic Whites (27). This area warrants further research, better focusing on investigating a notable delineation of the effect of these factors. The engagement in HIT used to make appointments among Hispanics may be explained by language and cultural barriers that make them prefer online scheduling rather than direct communication

with schedulers. The current study also found that education is also a predisposing factor for HIT use, and higher levels of education were consistently associated with the four types of HIT use that were examined. This was consistent with previous studies examining the association between education and HIT use (16, 24, 28). Education is related to health literacy, which may limit the ability of individuals with lower education levels to understand basic health information and make health decisions related to HIT use. Developers of these HIT tools should take into consideration individuals with language barriers or low educational level and make it easier for them to use.

Need Factors

Our study found that individuals with comorbidities, especially those with two or more chronic conditions, were more likely to use HIT to seek online health information, communicate with their doctor or doctor's office, and look up lab test results. The findings are generally congruent with those of previous studies, showing that people who have information needs due to multiple chronic conditions are actively making use of HIT for personal health management (17). For instance, Asan et al. (2018) found individuals with diabetes, cardiovascular disease, or hypertension were more likely to seek information through HIT than those without any of these chronic conditions (29). In contrast, Zhang et al. (2022) found that American adults with one chronic condition were significantly higher than those with MCCs and those without chronic conditions (30). While examining the prevalence of HIT use in American adults with diabetes, Wang et al. (2022) found that diabetic patients with obesity were more likely to search for health information on the Web and use eHealth services (31). There is need for further research on the specific type of HIT support needed based on the individual's chronic conditions.

While Andersen's model suggests that people with more needs should have more utilization of HIT for personal health management, our findings showed no association between the use of HIT to make appointments and the presence of a need factor (i.e., multiple chronic conditions). This might be a result of the complexity associated with making appointments with some healthcare providers. HIT used for making appointments must be very user-friendly, so patients can better utilize it.

Enabling Factors

While our finding is similar to previous studies that found an association between household income and HIT use (16, 25, 32, 33), we found that high household income was positively associated with only one dimension of HIT use- to look up the test results. This could be because people with high household incomes are likely to be fully employed and would prefer to save the time needed to retrieve the results in person. Income is also correlated with health literacy, and high-income learners are likely to have Internet access.

We found that people residing in rural areas were less likely to communicate with their doctor or doctor's office using HIT which is consistent with other studies (14). For instance, Chen et al. (2018) found that there was a huge disparity between rural and urban health outcomes; it appears that the disparities extended to HIT adoption and use (34). Studies have suggested several reasons for the rural disparity in HIT use, including lower levels of education and income, and minority race (34, 35). Increasing Internet access for these underserved populations will likely improve HIT uptake and use for better health outcomes (33).

Also, our findings support the evidence that having a regular source of care providers improved the chances of HIT use (16). We found a strong association between having a regular source of providers and 3 out of the 4 dimensions of HIT use for personal health management. This could be because of rising levels of trust in the security of HIT, which encourages bidirectional communication between the provider and patient. Having a regular source of care could also lead to higher levels of health literacy due to increased access to health care and health resources (16).

Regarding enabling factors of the Andersen framework, Internet access is a strong predictor of all four types of HIT use. Internet access is very critical to HIT use to improve health outcomes, and without Internet access using HIT seems to be impossible. Our finding is consistent with similar studies, like that of Yang et al., 2021 (33) that found that increased Internet access could improve the use of HIT.

Overall, using Andersen's behavioral framework in this study has identified issues of importance to health professionals and policymakers regarding how health information technology can improve population health outcomes. There is a need for more attention to reducing disparities in access to social determinants of health, so that health information technology can be better leveraged to achieve health equity.

Limitation

Our study had some limitations. First, a cross-

sectional design did not allow the lag time desirable for clearly establishing the direction of the association between having comorbidities and HIT use. However, it is plausible that people with more chronic conditions needed health information more, so they were more likely to use HIT. Secondly, our study is based on secondary data, so our analysis was confined to the variables available in the data such as digital literacy. Moreover, the response rate of the HINTS 5 cycle 4 was low (37%) as mail surveys tend to have a lower response rate, which may have made the survey responses less representative. However, the sample size was relatively large for reliable analyses. Future studies on the use of HIT should focus on how people with health needs (e.g., people with chronic conditions) can be more digitally engaged in care delivery.

Conclusion

The most commonly used HIT was the use of HIT to look for online health information, followed by the use of HIT to make appointments, the use of HIT to communicate with doctors, and the use of HIT to look for test results. Overall, barriers to using HIT included older age (aged>75), lower education, and living in rural areas; facilitators included regular health care providers and Internet access. Special assistance is needed to assist those older patients and those with lower education levels. Easy access to the Internet and primary care providers may help to promote the use of HIT among persons with multiple chronic conditions.

Authors' Contribution

EA: conceptualization, methodology, data analysis, manuscript writing; KK: conceptualization, methodology, data analysis, manuscript writing; GS: conceptualization, methodology, data analysis, manuscript writing; TN: manuscript writing; HL: manuscript writing; HT: manuscript writing. All authors read and approved the final manuscript

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References

1. Totten AM, Womack DM, Eden KB, McDonagh MS, Griffin JC, Grusing S, et al. Telehealth: Mapping the Evidence for Patient Outcomes From Systematic Reviews. AHRQ Comparative Effectiveness Technical Briefs. Rockville (MD)2016.
2. Diamantidis CJ, Becker S. Health information technology (IT) to improve the care of patients with chronic kidney disease (CKD). *BMC Nephrol*. 2014;15:7. doi: 10.1186/1471-2369-15-7.
3. Yen PY, McAlearney AS, Sieck CJ, Hefner JL, Huerta TR. Health Information Technology (HIT) Adaptation: Refocusing on the Journey to Successful HIT Implementation. *JMIR Med Inform*. 2017;5(3):e28. doi: 10.2196/medinform.7476.
4. Chen J, Lin Y, Shen B. Informatics for Precision Medicine and Healthcare. *Adv Exp Med Biol*. 2017;1005:1-20. doi: 10.1007/978-981-10-5717-5_1.
5. Dehnavi Z, Ayatollahi H, Hemmat M, Abbasi R. Health Information Technology and Diabetes Management: A Review of Motivational and Inhibitory Factors. *Curr Diabetes Rev*. 2021;17(3):268-79. doi: 10.2174/1573399816666200719012849.
6. Pew Research Center [Internet]. Internet/Broadband Fact Sheet. Pew Research Center: Internet, Science & Tech. c2021. [cited 2022 Jan 1]. Available from: https://www.pewresearch.org/internet/fact-sheet/internet-broadban
7. Dunsmore AA, Hamilton AL, Layden E, Gunn E. Building communities of practice with social media. *Clin Teach*. 2022;19(2):185. doi: 10.1111/tct.13469.
8. Andersen R, Newman JF. Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund Q Health Soc*. 1973;51(1):95-124.
9. Anderson E, Durstine JL. Physical activity, exercise, and chronic diseases: A brief review. *Sports Med Health Sci*. 2019;1(1):3-10. doi: 10.1016/j.smhs.2019.08.006.
10. Centers for Disease Control and Prevention [Internet]. About Chronic Diseases. Cent Dis Control Prev. [cited 2021 Apr 28]. Available from: https://www.cdc.gov/chronicdisease/about/index.htm
11. Hajat C, Stein E. The global burden of multiple chronic conditions: A narrative review. *Prev Med Rep*. 2018;12:284-93. doi: 10.1016/j.pmedr.2018.10.008.
12. Buttorff C, Ruder T, Bauman M. Multiple chronic conditions in the United States. Santa Monica: Rand Santa Monica, CA; 2017. doi: 10.7249/TL221.
13. Duplaga M. A cross-sectional study assessing determinants of the attitude to the introduction of eHealth services among patients suffering from chronic conditions. *BMC Med Inform Decis Mak*. 2015;15:33. doi: 10.1186/s12911-015-0157-3.
14. Greenberg AJ, Falisi AL, Finney Rutten LJ, Chou

WS, Patel V, Moser RP, et al. Access to Electronic Personal Health Records Among Patients With Multiple Chronic Conditions: A Secondary Data Analysis. *J Med Internet Res*. 2017;19(6):e188. doi: 10.2196/jmir.7417.
15. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36(1):1-10.
16. Mahmood A, Kedia S, Wyant DK, Ahn S, Bhuyan SS. Use of mobile health applications for health-promoting behavior among individuals with chronic medical conditions. *Digit Health*. 2019;5:2055207619882181. doi: 10.1177/2055207619882181.
17. Samal L, Fu HN, Camara DS, Wang J, Bierman AS, Dorr DA. Health information technology to improve care for people with multiple chronic conditions. *Health Serv Res*. 2021;56 Suppl 1(Suppl 1):1006-36. doi: 10.1111/1475-6773.13860.
18. National Cancer Institute [Internet]. Health Information National Trends Survey | HINTS. hints.cancer.gov. c2022. Available from: https://hints.cancer.gov/
19. StataCorp L. Stata statistical software: release 16 College Station, TX: StataCorp LLC, 2019. 2020.
20. Kontos E, Blake KD, Chou WY, Prestin A. Predictors of eHealth usage: insights on the digital divide from the Health Information National Trends Survey 2012. *J Med Internet Res*. 2014;16(7):e172. doi: 10.2196/jmir.3117.
21. Alhusseini N, Banta JE, Oh J, Montgomery S. Understanding the Use of Electronic Means to Seek Personal Health Information Among Adults in the United States. *Cureus*. 2020;12(10):e11190. doi: 10.7759/cureus.11190.
22. Lupton D, Maslen S. How Women Use Digital Technologies for Health: Qualitative Interview and Focus Group Study. *J Med Internet Res*. 2019;21(1):e11481. doi: 10.2196/11481.
23. Bidmon S, Terlutter R. Gender Differences in Searching for Health Information on the Internet and the Virtual Patient-Physician Relationship in Germany: Exploratory Results on How Men and Women Differ and Why. *J Med Internet Res*. 2015;17(6):e156. doi: 10.2196/jmir.4127.
24. Calixte R, Rivera A, Oridota O, Beauchamp W, Camacho-Rivera M. Social and Demographic Patterns of Health-Related Internet Use Among Adults in the United States: A Secondary Data Analysis of the Health Information National Trends Survey. *Int J Environ Res Public Health*. 2020;17(18). doi: 10.3390/ijerph17186856.
25. Onyeaka HK, Romero P, Healy BC, Celano CM. Age Differences in the Use of Health Information Technology Among Adults in the United States: An Analysis of the Health Information National Trends Survey. *J Aging Health*. 2021;33(1-2):147-54. doi: 10.1177/0898264320966266.
26. Gandrakota N, Ali MK, Shah MK. Trends in Health Information Technology Use Among the US Population With and Without Cardiovascular Risk Factors, 2012-2018: Evidence From the National Health Interview Survey. *JMIR Public Health Surveill*. 2021;7(9):e29990. doi: 10.2196/29990.
27. Rajamani G, Kurina L, Rosas LG. Investigating Health Information Technology Usage by Sociodemographic Subpopulations to Increase Community Engagement in Healthcare: An Analysis of the Health Information National Trends Survey. *AMIA Annu Symp Proc*. 2021;2021:1029-38.
28. Jella TK, Cwalina TB, Sachdev RR, Otteson T, Fowler N. Sociodemographic disparities in the use of health information technology by a national sample of head and neck cancer patients. *Am J Otolaryngol*. 2022;43(2):103308. doi: 10.1016/j.amjoto.2021.103308.
29. Asan O, Cooper Ii F, Nagavally S, Walker RJ, Williams JS, Ozieh MN, et al. Preferences for Health Information Technologies Among US Adults: Analysis of the Health Information National Trends Survey. *J Med Internet Res*. 2018;20(10):e277. doi: 10.2196/jmir.9436.
30. Zhang D, Zhou W, Poon PK, Kwok KO, Chui TW, Hung PHY, et al. Vaccine Resistance and Hesitancy among Older Adults Who Live Alone or Only with an Older Partner in Community in the Early Stage of the Fifth Wave of COVID-19 in Hong Kong. *Vaccines (Basel)*. 2022;10(7). doi: 10.3390/vaccines10071118.
31. Wang SY, Yeh HC, Stein AA, Miller ER, 3rd. Use of Health Information Technology by Adults With Diabetes in the United States: Cross-sectional Analysis of National Health Interview Survey Data (2016-2018). *JMIR Diabetes*. 2022;7(1):e27220. doi: 10.2196/27220.
32. Finney Rutten LJ, Blake KD, Greenberg-Worisek AJ, Allen SV, Moser RP, Hesse BW. Online Health Information Seeking Among US Adults: Measuring Progress Toward a Healthy People 2020 Objective. *Public Health Rep*. 2019;134(6):617-25. doi: 10.1177/0033354919874074.
33. Yang X, Yang N, Lewis D, Parton J, Hudnall M. Patterns and Influencing Factors of eHealth Tools Adoption Among Medicaid and Non-

Medicaid Populations From the Health Information National Trends Survey (HINTS) 2017-2019: Questionnaire Study. *J Med Internet Res*. 2021;23(2):e25809. doi: 10.2196/25809.

34. Chen X, Orom H, Hay JL, Waters EA, Schofield E, Li Y, et al. Differences in Rural and Urban Health Information Access and Use. *J Rural Health*. 2019;35(3):405-17. doi: 10.1111/jrh.12335.
35. Krakow M, Hesse BW, Oh A, Patel V, Vanderpool RC, Jacobsen PB. Addressing Rural Geographic Disparities Through Health IT: Initial Findings From the Health Information National Trends Survey. *MedCare*. 2019;57 Suppl 6 Suppl 2:S127-S32. doi: 10.1097/MLR.0000000000001028.