ORIGINAL ARTICLE

Driving health behavior: The roles of personal health information use and attitudes towards health in women's cancer screenings

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ABSTRACT

Objective: Our interest in patient attitudes and beliefs and how they contribute to health and health seeking behaviors is based on growing interest in fostering more patient-centered care. This is particularly relevant for cancer screening in women, where the procedures may be viewed as deeply personal and emotionally invasive. There is convincing evidence that health attitudes and beliefs are strong associates of cancer screening among women. The goal of this paper is to examine if accessibility and use of personal health information (PHI) is a positive predictive of cancer related health detection behaviors among United States women. This study is relevant and timely considering the growing focus on prevention in patient-centered care delivery.
Methods: Using data from the 2017 Health Information National Trends Survey (HINTS), this paper employed multivariable path analysis to investigate whether PHI use is related to engaged women's health detection behaviors, and if this relationship is mediated by self-perceived health status and patient attitudes regarding confidence in their self-care abilities.
Results: This study found that PHI use worked directly on health detection behaviors for intermediate levels of health information only. Our findings also suggest that patient attitudes may only act as a mediator at low levels of information use and when both confidence in self-care abilities and self-assessed health status are considered simultaneously.
Conclusions: As prevention continues to be a key focus of health care, efforts promoting enhanced population health are critically important. With greater expansion of patient portals, health systems and providers are expecting access to greater PHI will promote increased engagement by patients in their self-health. The results of our research suggest that PHI is positive for patients up until a point and that health care delivery professionals may wish to assess the amount and type of information made readily available to the patients they serve related to breast and cervical cancer screenings.

Key Words: Women's health, Personal health information use, Health engagement, Health detection

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1. INTRODUCTION

Preventative health behaviors detect the presence of disease and encompass cancer screenings, which specific to women include mammography and papanicolaou tests (commonly referred to as pap smears). Preventative health detection is infrequent, often taking place only every few years and is typically performed by a health care professional. Although mammograms and pap smears are readily available, adherence to recommended screening frequency guidelines are less than optimal. For example, among women between 50 and 74 years, over a quarter reported not receiving a mammogram in the past two years.[1] Additionally, among 50 to 74 year old women, only 6% who are at less than 200% of the federal poverty level and 60% who do not graduate from high school had a mammogram in the last 2 years.[2] HealthyPeople 2020 has set targets to increase the proportion of women between 21 and 65 years' old who are screened for cervical cancer using a pap test every 3 years. Currently, about 80 percent of women in this age group received a pap test every three years. However, among women at less than 200% of the federal poverty level only 71% were screened, highlighting a persistent disparity in cancer detection screening in women.[2]

Our interest in patient attitudes and beliefs and how they contribute to health and health seeking behaviors is based on growing interest in fostering more patient-centered care. This is particularly relevant for cancer screening in women, where the procedures may be viewed as deeply personal and emotionally invasive. There is convincing evidence that health attitudes and beliefs are strong associates of cancer screening among women, but fear and fatalistic views of the disease have a countervailing and negative influence on the likelihood of cancer screening.[3–5] In addition, beliefs that an individual's own health is fair or poor has been found to be related to lower likelihood of getting a mammogram in the past two years.[6]

A key challenge for providers, therefore, is how to shift patient attitudes and beliefs in order to encourage participation in health screening behaviors. One strategy could be through enhanced communication between providers and their patients through the use of health information technology. The abundance of health information technology has brought about a rapidly increasing amount of personal health information (PHI) available to patients, and in a myriad of routes including through patient portals.[7] Increasing interest has been focused on examining the efficiency of patient portals in relaying to patients results from lab tests, procedures, their medical history, and other PHI, among other functionalities.

Moreover, communication between patients and clinical providers may impact health outcomes and behavior either indirectly or directly.[8] If a patient has received a message from her physician office that she has not received a mammogram in several years, it will directly result in her scheduling a mammogram. However, research to date has not linked the use of PHI to a comprehensive group of recommended health behaviors or clarified the means (such as a shift in health beliefs or attitudes) by which behaviors may be improved by health information. But even in the case of direct clinician-patient communication, personal characteristics can moderate the effect. Namely, race and ethnicity, nativity, and Body Mass Index (BMI) are documented as being negatively associated with health care engagement and preventative health behaviors while higher education and income, urban dwelling, engagement in healthy eating and routine exercise, and being married are protective and positively associated with preventative health care behaviors, screenings, and engagement in routine health care.[9–11]

Therefore, the purpose of this research is to fill this void by investigating whether PHI access and availability is associated with positive cancer related health detection behaviors among United States women. We examine the role of self-perceived patient health as possible mediators of the association between health detection behaviors and PHI use, thereby extending the literature. We are interested primarily in two patient attitudes: confidence in a patient's self-care abilities and self-reported health status. The results from the research are likely to be of interest to designers of technology intended to encourage use of patient-level information in efforts to understand the potential impacts of the technology and the profile of the patients who are likely to access their PHI. Likewise, this study may of particular importance to organizations who have invested, or are thinking about investing, in efforts promoting use of patient-level information (e.g., patient portals). Finally, care providers may be likely to utilize the findings as a means by which to better promote critical health detection behaviors with their patients. This study is particularly relevant and timely considering the growing focus on prevention in patient-centered care delivery.

The conceptual framework outlining the study relationships and associated hypotheses are found in Figure 1. We hypothesize women accessing their PHI more often will have more positive assessments of their health status and greater confidence their self-care ability. Women have greater confidence in their self-care ability and who have more favorable assessments of their health status will be more likely to engage in mammography and pap smear testing.
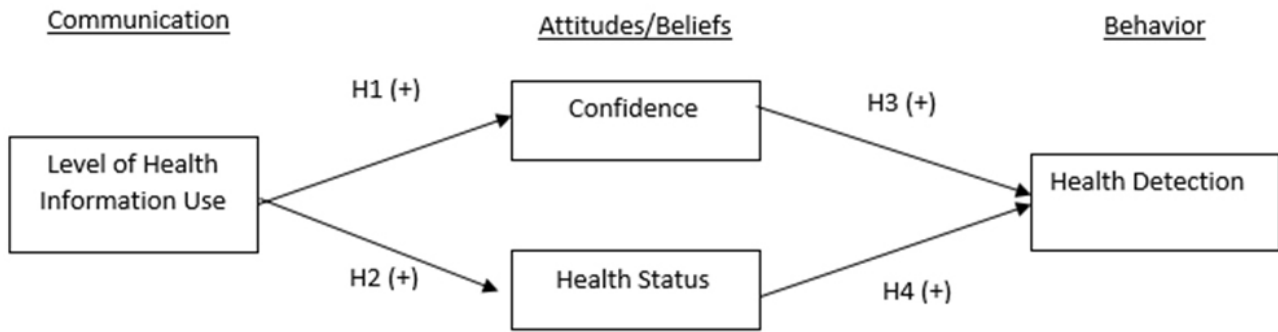
Figure 1. Conceptual framework

2. MATERIALS AND METHODS

2.1 Materials studied

Data for this study was obtained from the 2017 Health Information National Trends Survey (HINTS), a nationally-representative cross-sectional study developed by the US National Cancer Institute to track behavior trends in relevant to cancer and is publically available online.[12, 13] The data was chosen because it contains data of how health information technology is accessed and used. HINTS 5 Cycle 1 was collected between January and May, 2017 through a single-mode mail survey, and with a response rate of 32.4%. More information about HINTS 5 2017 sampling design and survey can be found from the U.S. Department of Health and Human Services, 2017.[13]

2.2 Methods

The study employed a multivariable path analysis to investigate the direct and indirect relationships between PHI use, patient behaviors, and patient attitudes. A multivariable path analysis enables testing of a theory of causative ordering among a group of variables by handling these associations as a series of regression models whose parameters and SEs are simultaneously estimated.[14, 15] Consequently, it allows a robust, parsimonious, and comprehensive approach to examining indirect and direct impacts of exogenous variables.

The outcome variables of interest were comprised of two detection variables that are routinely used to screen for breast and cervical cancers. The two detection variables were whether female respondents received a mammogram and a pap test according to the National Cancer Institute (NCI) recommended guidelines. The National Cancer Institute (NCI) recommends women 50-74 should receive a mammogram every two years and women over the age of 21 should get a pap test every three years. Female respondents were first asked if they had ever received a mammogram and a pap test, and then asked how long ago they had their most recent test. Female respondents between the ages of 50 and 74 who reported receiving a mammogram within the last two years

were coded as 1 while female respondents within this age range that had not received a mammogram within the last two years were coded as 0. Likewise, female respondents over the age of 22 who had received a pap test within the last three years were coded as 1 while female respondents over 22 who had not received a pap test in the last three years were coded as 0.

Two mediating variables were included in the study to examine the mediating influence of patient attitudes and beliefs: Confidence in self-care abilities and self-assessed health status. Confidence in self-care abilities were evaluated with a categorical variable asking: "Overall, how confident are you about your ability to take care of your own health?" Response categories were reported as a 5-point Likert scale ranged from not confident at all to completely confident. Self-assessed health status was evaluated with a question that asked "In general, would you say your health is...". Responses were reported as a 5-point Likert scale ranging from poor to excellent.

Four dummy variables were included to account for PHI usage: 1. No PHI use; 2. Low PHI use; 3. Medium PHI use; and 4. high PHI use. The question used to create these variables asked "How many times did you access your PHI on-line through a secure website or app in the last 12 months?" Responses of "none" were assigned as no PHI use, responses of "1 to 2 times" were assigned low health PHI use, responses of "3 to 5 times" and "6 to 9 times" were assigned medium PHI use, responses of "10 or more times" were assigned as high PHI use.

Introducing the controls for the impact of respondent-level attributes with the health detection outcomes, we included eight socio-demographic variables. Age was operationalized with a continuous variable. Gender was included as a dummy variable (1 = male; 0 = female). Employment was also included as dummy variable (1 = employed when the survey took place; 0 = not employed when the survey took place). Nativity was operationalized with a single dummy variable

(1= foreign-born; 0 = Born in the United States). To assess level of education completed, we used a dummy variable indicating whether the respondent had completed education above high school (1 = completed university/college level education; 0 = less than university/college education completed). A single dummy variable was incorporated to control for the impacts of a respondent's income (1 ≥ $50,000; 0 ≤ $50,000). A respondent's marital status was operationalized with a single dummy variable (1 = currently married; 0 = not currently married). Race/ethnicity was included as a categorical variable four categories: 1. White and Non-Hispanic; 2. Latino/Hispanic; 3. Black; 4. Other. The density of the neighborhood of residence was evaluated with a dichotomous variable indicating whether the neighborhood of residence was located in an urban area (1 = urban; 0 = suburban/rural).

We controlled for two patient health characteristics likely to be associated with health. BMI was included in the analysis as a continuous variable indicating body fat composition of the respondent based on weight and height. We also included a measure of the number of health conditions reported by the respondent. The number of health conditions was measured as a sum of the reported chronic conditions. Respondents were questioned if a health professional or physician had ever diagnosed them with high blood pressure/ hypertension, diabetes, arthritis, chronic lung disease, or depression/anxiety disorder (1 = Yes; 0 = No). The variable was composed by adding across these five chronic conditions for each respondent (range 1-5).

3. RESULTS

Table 1 presents sample descriptive statistics. The majority of female respondents over the age of 22 (74.42%) reported having a pap smear test in the last three years while only 46.27% of the female respondents between the ages of 50 and 74 reported having a mammogram in the last three years. Over 2/3 of the respondents reported PHI use (68.47%), 15.65% reported low PHI use, 13.27% reported medium PHI use, and 2.9% reported high PHI use. The average age in our sample was 56 years old. On average, respondents reported having 1.33 chronic conditions and the average BMI was 28.68. Fifty percent of the respondents reported being employed (51.11%), and 55.16% reported being married. One third of the sampled reported a yearly household income over $50,000 (32.87%). Almost 60% of the sample was female (59.90%), the majority lived in an urban neighborhood (86.11%) and 10.65% of the sample were foreign born. Finally, 2/3 were of white Non-Hispanic race or ethnicity (67.24%), 14.32% black, and 14.81% Hispanic/Latino race or ethnicity.

Table 1. Description of the sample (n = 3,030)

	Mean/N	SD/%
Dependent variables		
Pap Test (N/%)	1388	74.42
Mammogram (N/%)	641	46.27
Attitudes/Beliefs variables		
Confidence (Mean/*SD*)	3.89	0.85
Health Status (Mean/*SD*)	3.39	0.96
Modifying Factor variables		
No Health Information Usage (N/%)	1,947	68.47
Low Health Information Usage (N/%)	447	15.65
Intermediate Health Information Usage (N/%)	379	13.27
High Health Information Usage (N/%)	83	2.91
Control variables		
Age (Mean/*SD*)	56.45	16.10
Gender (1 = male) (N/%)	1,169	40.10
Employed (1 = yes) (N/%)	1,445	51.11
Nativity (1 = foreign born) (N/%)	310	10.65
Education (1 = college education) (N/%)	1,274	43.95
Income (1 = greater than $50,000) (N/%)	772	32.87
Marital status (1 = married) (N/%)	1,593	55.165
Race/Ethnicity		
White (N/%)	1,812	67.24
Hispanic (N/%)	399	14.815
Black (N/%)	386	14.32
Population Density		
Urban (N/%)	2,510	86.11
Suburban (N/%)	283	9.71
Rural (N/%)	122	4.19
BMI (Mean/*SD*)	28.68	6.50
Number of Conditions (Mean/*SD*)	1.33	1.23

Multivariate Results. Figure 2 reports the relationships between PHI use and the mediating variables of confidence in self-care abilities and self-assessed health status. In comparison to no PHI use, respondents reporting low PHI usage were related to higher levels of confidence in self-care abilities (OR = 1.176, $p < .05$) and better self-assessed health status (OR = 1.298, $p < .001$). Higher levels self-assed health status, in turn was related to the detection behavior of getting a mammogram per recommended guidelines (OR = 1.361, $p < .05$) (see Table 2).

PHI Use. The use of PHI had a direct effect on the two detection behaviors only for intermediate levels of PHI use, found in Table 3. Specifically, in comparison to those reporting no PHI use, respondents reporting intermediate PHI use were associated with over 200% higher odds of getting a pap test per recommended guidelines (OR = 2.726, $p < .01$). Similarly, respondents reporting intermediate PHI use were associated with 2x higher odds of getting a mammogram per recommended guidelines (OR = 2.257, $p < .01$) in comparison to respondents with no PHI use.

Table 2. Path analysis results

	Pap Test Odds Ratio	Mammogram Odds Ratio
Level of Health Information Use		
No Use	-	-
Low Use	1.455	1.028
Intermediate Use	**2.726**[**]	**2.257**[**]
High Use	0.685	2.190
Attitudes/Beliefs		
Confidence	1.354	1.115
Health Status	0.917	**1.361**[*]
Control variables		
Age	0.986	**1.088**[***]
Employed (1 = yes)	**2.726**[***]	1.473
Nativity (1 = foreign born)	1.006	1.954
Education (1 = college education)	**2.382**[***]	0.896
Income: (1 = greater than $50,000)	1.053	**0.845**[*]
Marital status (1 = married)	**2.219**[***]	**1.902**[**]
Race/Ethnicity		
White	--	--
Hispanic	1.074	0.847
Black	1.255	**2.094**[*]
Population Density		
Rural	--	--
Urban	**2.396**[*]	1.664
Suburban	1.208	1.290
BMI	0.999	1.004
Number of Conditions	1.022	**1.399**[***]

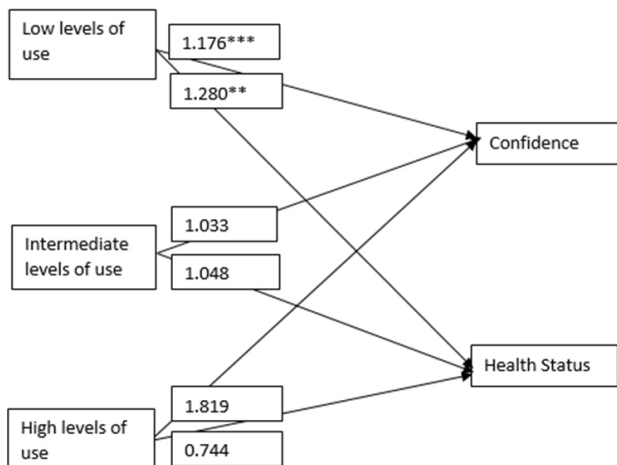*Note.* N = 2,947; [***]$p < .001$; [**]$p < .01$; [*]$p < .05$

Figure 2. Odds ratios of primary predictor variables and the direct relationships with mediating variables, [***]$p < .001$, [**]$p < .01$, [*]$p < .05$

Indirect Relationships. After introducing the controls for the direct impacts of PHI use, the indirect association between

PHI use, attitudes, and health detection behaviors was also mostly limited to low PHI use (see Table 3). In comparison to respondents reporting no PHI use, respondents reporting low PHI use were associated with higher odds of getting a mammogram per recommended guidelines (OR = 1.103, $p < .05$) relative to non-users of PHI.

Control Variables. Also found were a series of statistically significant associations between the control variables and health detection behaviors. In general, employed, college educated, and urban respondents were associated with higher odds of getting a pap test per recommended guidelines (OR = 2.726, $p < .001$; OR = 2.382, $p < .001$; OR = 2.396, $p < .05$; respectively). Older respondents and respondents with higher numbers of comorbid conditions are associated with higher odds of getting a mammogram per recommended guidelines (OR = 1.088, $p < .001$; OR = 1.399, $p < .001$; respectively). Black respondents were associated with higher odds of getting a mammogram per recommended guidelines relative to white respondents (OR = 2.094, $p < .05$). On the other hand, respondents with a household income greater than $50,000 were associated with lower odds of getting a mammogram (OR = 0.845, $p < .05$). Married respondents were associated with higher odds of both getting a pap test and a mammogram per recommended guidelines (OR = 2.219, $p < .001$; OR = 1.902, $p < .01$; respectively).

Table 3. Associations between PHI use and health detection behaviors

	Pap Test Odds Ratio	Mammogram Odds Ratio
Low Use of PHI		
Low Use →	1.455	1.028
Low Use → Confidence →	1.050	1.195
Low Use → Health Status →	0.978	1.084
Total indirect effect	1.027	1.103[*]
Total effect	1.495	1.135
Intermediate Use of PHI		
Intermediate Use →	2.726[**]	2.257[**]
Intermediate Use → Confidence →	1.010	1.003
Intermediate Use → Health Status →	0.996	1.015
Total indirect effect	1.006	1.018
Total effect	2.740[**]	2.298[**]
High Use of PHI		
High Use →	0.685	2.190
High Use → Confidence →	0.941	0.978
High Use → Health Status →	1.026	0.913
Total indirect effect	0.966	0.893
Total effect	0.661	1.955

Note. [**]$p < .01$; [*]$p < .05$

4. DISCUSSION

The intention of this research was to explore whether the use of PHI was related to the women's health detection behaviors of mammography and pap smears, and to assess two possible attitudinal mechanisms by which PHI use may promote these health detection behaviors. Cancer screening behaviors are important to examine as these actions have been shown to significantly reduce cancer mortality rates.[16]

This study found that PHI use worked directly on health detection behaviors for intermediate levels of health information only. One explanation for this finding is that screenings, which are facilitated by the health care system, may reflect a triangulation of the application of medical guidelines within health care organizations, personal use of health information, and individual characteristics. Further, the integration of the health care system may have been related to patient trust in the system-supplied information as found by Hesse et al., who noted that trust in information sources was significantly influenced by age, gender, and education.[17] Another explanation for the non-significant association at high levels of PHI use is that there may be a point at which the information becomes too much and creates overload cognitively, thereby diminishing the positive impact of providing PHI.[18, 19] Bawden and Robinson (2009) argued this reflects what they term as the "dark side" of information; when too much information overloads the individual and results in poor decision making and/or anxiety and distress – clearly not what information provision is intended to achieve.[20] If this is indeed the case, these results indicate that greater PHI use may not always equate to better health behaviors, or at least may have waning returns after a certain point.[19] It may be the case that a person's ability to absorb or synthesize the health information in ways that are beneficial and not overwhelming may vary as a result of individual sociodemographic and situational characteristics. This is an area of potential future as studies have shown the influence of these factors on preventative and health screening behaviors.[21, 22]

We also examined the role of two patient attitudes as potential mediators of the association between PHI use and health detection behaviors. Our findings suggest that patient attitudes may only act as a mediator at low levels of information use and when both confidence in self-care abilities and self-assessed health status are considered simultaneously. These findings are similar to those of Hornik and colleagues (2013) that found exposure to non-medical sources of information was positively linked to mammography screening behaviors but variation was found across levels of heath information access.[23] Bandura's (1997) theory of self-efficacy, having the confidence one's ability to execute a behavior, may be an underlying mechanism at work in these results.[24] As individuals have greater confidence in themselves, they may be more likely to participate in health detection behaviors. This is supported by studies that have found self-efficacy to be a driving force behind actions and health behaviors.[25, 26] Our findings suggest that these particular patient attitudes about their health, confidence in self-care abilities and self-assessed health status, are relatively weak underlying mechanisms for how use of PHI may be translated into health behaviors. Untangling the relationship among one's health information access, self-efficacy, and self-screenings/detection behaviors is complex and could be an area of additional research in this area.

5. CONCLUSIONS

As prevention continues to be a key focus of the health care system, efforts to promote enhanced population health – including cancer screening – are critically important. PHI has been argued to be a panacea for improving health related behaviors. With greater expansion of patient portals, health systems and care providers are expecting that access to greater personal health informant will promote increased engagement by patients in their self-health. However, the results of our research indicate that PHI is positive for patients up until a point and that health care delivery professionals may wish to assess the amount and type of information made readily available to the patients they serve related to cervical and breast cancer screenings.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare they have no conflicts of interest.

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