Health Information-Seeking Behaviors and Disparities Among Patients with Type 2 Diabetes: Testing Predictors of the Frequency of HISB with Doctors and Online

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Successfully managing chronic illness warrants ongoing education and health information access in order for patients to continue to engage in health behaviors. The chronic nature of type 2 diabetes presents a unique burden for patients self-managing their health on a daily basis. Data from the Annenberg National Health Communication Survey was analyzed to discover possible motivators for health information-seeking behaviors online and with health care providers, the two most popular sources for health information. Two separate multinomial logistic regression models tested health status, trust for health information, health locus of control as predictors of health information-seeking behaviors online and with a health care provider. Gender, race, age, education and marital status were included as control variables. The results demonstrate that health status, and an external health locus of control focused on powerful others predicted the frequency of HISB with a health care provider. Trust and age were significant predictors of HISB online. Practical and theoretical implications and future directions for research are discussed.

Keywords: health information-seeking behaviors; trust; health locus of control; Comprehensive Model of Information Seeking; chronic illness management

According to the Centers for Disease Control and Prevention (CDC) (2014b), 11% of Americans are living with diabetes. Among adults, about 1.7 million new cases of diabetes are diagnosed each year (CDC, 2014a). Type 2 diabetes is the most common form of diabetes, accounting for up to 95% of newly diagnosed adults each year (CDC, 2014a). When diabetes is not controlled, fat and glucose stay in the patient's blood, causing long-term harm to vital organs and an array of complications, thus increasing the cost of health care (CDC, 2011; 2014b). In 2012, the cost of diabetes in the US reached $245 billion in direct medical costs and lost productivity (CDC, 2014b).

Since there is no cure for diabetes, self-management as a critical element of care that is often seen as a lifestyle condition and must be supported by information access and lifelong education (Longo et al., 2010). People's decisions to manage their chronic illness(es) are influenced by multiple, interacting individual, social and structural factors (Johnson, Donohue, Atkin, & Johnson, 1995; Sallis, Owen, & Fisher, 2008), and communication plays an integral, constitutive role in the way those factors influence decision-making. According to a recent systematic review, only about one-fourth of scholarly literature on HISB includes patient populations, and the current study's inclusion of a type 2 diabetic study sample contributes to understanding more about illness-oriented HISB (Anker, Reinhart, & Feeley, 2011). The primary aim of the current research was to understand the factors that influence health information-seeking behaviors (HISB) online and with health care providers, since communication such as HISB facilitate the healthy behaviors needed in order to manage diabetes (Bigsby & Hovick, 2018; Longo et al., 2010).

Health Information Seeking Behaviors

Historically, the most used and trusted source of health information has been a patient's physician. HISB, as an action-oriented construct, takes into account the frequency of accessing and sources of health information (Lambert & Loiselle, 2007). It is important for patients managing chronic illnesses to have regular access to information. There are obvious benefits of HISB for diabetic patients, especially as a result of HISB directed toward learning about nutrition, exercise and blood glucose tracking (Longo et al., 2010). Forty-five percent of Americans living with two or more chronic conditions also have diabetes, which demonstrates the compounding influence one's health has on the need to seek information for proper health management (Pew Research Center, 2016). Years after their diabetes diagnosis, participants in nine focus groups held in the Midwest expressed the need for periodic re-education as they, 1) realized the magnitude of information to learn, 2) encountered confusing or conflicting information, or 3) discovered updated information (Longo et al., 2010).

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HISB is a critical step in the enactment of discretionary health-related behaviors for diabetes self-management. The Comprehensive Model of Information Seeking (CMIS) (Johnson & Meischke, 1993) highlights the multidimensional forces that shape an individual's health information-seeking behaviors. Stemming from several behavior change and media use theories, the CMIS more holistically describes the psychosocial processes and structural influences related to HISB in context. The CMIS identifies three primary classes of variables: Antecedents, Information Carrier Characteristics, and Information Seeking Actions (Johnson et al., 1995). Antecedents (e.g., sociodemographics) featured in the CMIS representing the "underlying imperatives to seek information" (Johnson et al., 1995, p. 277) are similar to the tenets of the Health Belief Model, which has been criticized for its limited inclusion of communication variables. In turn, the CMIS' Information Carrier Characteristics (e.g., accessibility and credibility) draw from the Model of Media Exposure and Appraisal and represent the intention to seek information from certain sources. Lastly, Information Seeking Actions (e.g., channel selected, frequency) reflect the nature of information seeking as the communication outcome, and its assumption – that HISB is goal oriented wherein individuals choose among information sources based on their immediate needs – draws from the framework of Uses and Gratifications (Johnson et al., 1995).

Longo and colleagues (2010) found that patients with diabetes sought out sources they trusted and cross-referenced information using both online sources and health care providers. Health information can be found through a myriad of sources, and research indicates that health care providers and online sources are among the most used sources for health information (e.g., Brashers, Goldsmith, & Hseih, 2002; Dutta-Bergman, 2004; Rains & Ruppel, 2016). The current study examined sociocultural predictors of HISB online and with a health care provider.

HISB online. Searching for health information has been consistently reported as one of the most prevalent online activities among adults in the US (Weaver et al., 2010). As of 2014, 87% of Americans used the internet, and 72% of users said they looked online for health information in the past year (Pew Research Center, 2016). Longo and colleagues (2010) found that participants with type 2 diabetes reported accessing health information primarily online. Diabetes and health-related sites such as diabetes.com, WebMD, American Diabetes Association and Mayo Clinic as well as various sites devoted to cooking, exercise and stress reduction were identified as popular sources of health information (Longo et al., 2010). Using the internet increases patients' participation in their management of chronic conditions and increases their ability to make informed decisions about their health. Furthermore, Bounsanga, Voss, Crum, and Hung (2016) found that HISB online was significantly associated with positive health status.

The increasing accessibility of health information decentralizes responsibility for health maintenance and re-positions the patient as the primary decision-maker for treatment, and HISB are key facilitators for managing diabetes (Longo et al., 2010). Despite the power of the internet with its convenience and relatively minimal cost, diabetes patients reported relying *more* on health care providers for their health information (Longo et al., 2010). Patients may still have challenges making use of the online information or be left with unanswered questions (Lee, 2008). As a result, this may be why health care providers remain among the most used sources for health information.

HISB with health care provider. Patients must understand their illness, and the risks and benefits of their options before making informed decisions, and information from health care providers plays an important role in empowering patients to make those health decisions (Street, Makoul, Arora, & Epstein, 2008). Generally, health professionals have long been considered the most widely used source of information among diabetics, both immediately after diagnosis and over a lifetime of treatment (Longo et al., 2010; Pew Research Center, 2016). Street and colleagues have argued for continued examination of how patient-provider communication either directly or indirectly affects health outcomes, and the current study examined predictors of HISB with a health care provider as an important health communication outcome and indirect predictor of improved health and diabetes management.

Health Status

Ayers and Kronenfeld (2007) noted that while research should continue examining behaviors of individuals with specific diseases, it may not necessarily be the presence of any particular illness that determines HISB, but rather the uncertainty stemming from an individual's entire health status that motivates one to engage in HISB. The CMIS characterizes health status as a dimension of Antecedents of HISB described as personal experience,

explaining that the potential efficacy of information seeking to yield benefits plays a role in an individual's decision to seek information (Johnson et al., 1995). In addition to expert diagnoses, one's perception of their health status, as an indicator of health burden, may also predict HISB.

Current health status has been shown to precede the relationship between HISB online and with health care providers (Grilli, Ramsay, & Minozzi, 2009). However, there have been conflicting findings when testing self-rated health status as a predictor of online HISB. Some research finds that people who report poor or fair health status are more likely to engage in HISB online (Baker, Wagner, Singer, & Bundorf, 2003; Houston & Allison, 2002) while other researchers report the opposite relationship (Cotten & Gupta, 2004) or no significant relationship (Atkinson, Saperstein, & Pleis, 2009; Goldner, 2006a). Individuals' perceptions of their health status may be related to generational differences, diagnoses, social comparisons, and cultural values, all of which may also play a role in HISB patterns.

Trust for Health Information

Evidence suggests that trust strongly influences HISB as described in the CMIS (Johnson et al., 1995; Lambert & Loiselle, 2007; Smith, 2011). In response to lack of knowledge concerning health decisions, previous findings (e.g., Lee, Scheufele, & Lewenstein, 2005) demonstrate that patients will rely on trust of health information – as a cognitive shortcut – to help guide their decisions. Quality of health information, especially with the lack of oversight on accuracy of online information, remains a prominent concern (Lee, 2008).

People's level of trust of the Internet, versus other information sources, is an important factor related to seeking health information online (Lemire, Paré, Sicotte, & Harvey, 2008; Zulman, Kirch, Zheng, & An, 2011). While a convenient source of health information, the internet can be overwhelming for many people, and it is difficult to know which online information to trust. Lee and Hornik (2009) argue that HISB online and trust have a synergistic relationship in terms of HISB with a health care provider. As individuals learn more about their health online, they may be more motivated to visit a physician to the extent they trust the provider. Furthermore, "the more individuals trust the health information provided by a source, the more likely they are to seek health information from that source" (Yang, Chen, & Muhamad, 2016, p. 1143).

Lee and Hornik (2009) also recognize a possible opposite direction of influence wherein there may be a ceiling effect for patients who already have high trust in their provider – that is, there may not be much room for HISB online to increase HISB with a provider. People who have a lot of trust in their physician are already visiting them as much as necessary (Lee & Hornik, 2009). However, a specific chronic health concern like type 2 diabetes may motivate even an individual with low trust to engage in HISB online and with a provider, in which case trust would have no direct effect on HISB. In addition to characteristics of information such as its source's trustworthiness, we must also consider an individual's sociocultural foundation of their health decisions and behaviors.

Health Locus of Control

Health locus of control (HLC) – beliefs about the ability to control one's own health outcomes – is a widely tested construct derived from Social Learning Theory (Rotter, 1954), which asserts that behavior change occurs only when the action is expected to maximize rewards and minimize punishments (Wallston & Wallston, 1981; Wallston, 1992). These expectancy beliefs are based on an individual's HLC, which identifies the causal factors one attributes to the state of their health (Rotter, 1966). The place – or locus – of control is recognized along three distinct dimensions: internal HLC, the extent to which health is within one's control; chance HLC, the extent to which health is regarded as a result of fate, luck or chance; and powerful others HLC, the extent to which one's health is placed in hands of "powerful others" (e.g., physicians) (Armitage, Norman, & Conner, 2002; Wallston & Wallston, 1981).

HLC was designed to be tested as an independent variable to predict health behavior in combination with other belief and attitude variables, and has been tested in a variety of health behavior contexts, and health care utilization (Armitage et al., 2002; Kim & Baek, 2017; Wallston & Wallston, 1981). Internal HLC beliefs have been consistently found to be more positively related to a healthy diet compared to chance and powerful others HLC (Cobb-Clark, Kassenboehmer, & Schurer, 2014; Milte, Luszcz, Ratcliffe, Masters, & Crotty, 2015). And powerful others HLC has been found to play a role in promoting health outcomes such as health care utilization (Street et al.,

2009). HLC, in the context of health information seeking, operates as a measure of an individual's beliefs about the outcomes of the information seeking (e.g., Is there anything I can do about my health condition?), which is classified as an Antecedent of HISB in the CMIS (Johnson et al., 1995). We know that patients do not proceed toward behavior change in a rational, linear fashion, but rather they make decisions regarding self-management depending on current needs, seeking only information that seems important and relevant at the moment (Longo et al., 2010; Slater, 1999).

Wallston (1992) argued that health locus of control is most relevant when people place a high value on their health. Those who have been diagnosed with a chronic illness likely face daily reminders of the value of their health. The current study regarded patients with type 2 diabetes as having higher health value than someone who does not have daily reminders to manage their chronic condition. More so, HLC has been found to be more successful in predicting behaviors of chronic patient populations than in predicting preventive behaviors in a general population (Wallston & Wallston, 1981). Research has suggested that individuals' perceived control over their health (high internal HLC) and their self-efficacy – beliefs about their ability to perform health behaviors – will affect how they adjust to a chronic illness (Willis et al., 1997). Diabetics who are considered to be believers in control (high internal and powerful others, and low chance scores) were found to have the best blood glucose control and to be closest to their ideal weight (Bradley, Lewis, Jennings, & Ward, 1990).

As a person grows older, it is expected that their health locus of control shifts from internal to external, associated with the influence of powerful others such as health care providers (Grotz, Hapke, Lampert, & Baumeister, 2011; Zielińska-Więczkowska, 2016). Those who are aging are more likely to develop multiple chronic conditions, thus leading to more medical interventions, interactions with health care providers and dependence on the medical system and a resignation related to uncontrollable degenerative aging processes (Grotz et al., 2011; Zielińska-Więczkowska, 2016).

Theoretically, strong internal HLC is considered to be the most facilitative of preventive healthy behaviors (Wallston & Wallston, 1981; Zielińska-Więczkowska, 2016). A higher score for internal HLC is indicative of taking more responsibility for one's health, having high self-efficacy for health behaviors, and positively correlates strongly with participants' subjective health rating (Zielińska-Więczkowska, 2016). Those scoring higher on the powerful others HLC and chance HLC, both representing an external HLC, feel that their health is beyond their control. Grotz and colleagues (2011) found that individuals who scored high on the chance HLC were less likely to seek health information than those who had weaker attitudes about chance. An individual's belief that their health is subject to happenstance is particularly undesirable among health care professionals trying to motivate patients to take preventive action for the sake of their own health.

Previous research (e.g., Wallston & Wallston, 1981; Wallston, 1992) has tested health locus of control beliefs as a predictor of HISB. Wallston and Wallston recommend that researchers not test health locus of control beliefs as a sole predictor of behavior, but should also measure other relevant attitudes about the behavior such as trust for the source of health information. In order to continue exploring the facilitators of behavior change and chronic illness management from an ecological perspective, the current study sought to identify sociocultural predictors of HISB online and with health care providers.

RQ 1: Among participants with type 2 diabetes, which dimensions of health status, trust for health information, and health locus of control are predictors of health information-seeking behaviors online?

RQ 2: Among participants with type 2 diabetes, which dimensions of health status, trust for health information, and health locus of control are predictors of health information-seeking behaviors with a health care provider?

Method

The current research used publicly available data from the Annenberg National Health Communication Survey (ANHCS), a survey designed to capture national trends on health-related media exposure, behavior, knowledge and beliefs, and policy preferences. Data collection was conducted by Knowledge Networks for the Annenberg Schools of Communication at the University of Pennsylvania and University of Southern California (ANHCS, 2013a). The nationally representative data ($N = 29,094$) was collected online monthly from January 2005

to December 2012 (ANHCS, 2013a), with the response rate ranging from 14% to 31% (ANHCS, 2013b). The study sample was limited to participants who self-reported a type 2 diabetes diagnosis (*n* = 1,106), which is in line with the most recent findings from Pew Research Center (2016) stating that individuals most commonly seek information about specific diseases and treatments. Reflecting the tenets of the Comprehensive Model of Information Seeking, which argues that Antecedents including individuals' sociocultural characteristics, and Information Carrier Characteristics, together motivate Information Seeking Action, the following measures were included in the multinomial logistic regression models.

Measures

HISB. Two outcome variables were tested in the statistical models, which are identified as the Information Seeking Action element in the Comprehensive Model of Information Seeking (CMIS). For RQ 1, HISB online was measured by asking how often the participant searched for health information on the internet in the past 30 days (a lot, some, a little, or not at all). For RQ 2, HISB with a health care provider was measured using a single item that asked how many times participants consulted a doctor about their health in the past 12 months. To accommodate for zero cell frequency among categories in relation to the outcome variable, responses were recoded from five into four categories (never, one to two times, three to six times, once a month or more).

Health status. As an Antecedent of HISB according to the CMIS, self-reported health status was included in the current tests. Participants' perception of their health was measured by a single item asking individuals to rate their general health. To eliminate zero cell occurrence, responses were recoded from six to four categories: excellent/very good, good, fair, poor/very poor.

Trust for Health Information. One dimension of Information Carrier Characteristics identified by the CMIS is credibility and was tested as a motivator for HISB. For RQ 1, trust for health information online was measured using a single item asking how much participants trust information about health from the internet. For RQ 2, the variable was measured using a single item asking how much participants trust the information about health from their doctor or other health care professional. Originally, responses for both items were coded into four categories (e.g., a lot, some, a little, and not at all). To eliminate zero cell frequency, the current study recoded responses into three categories: a lot, some, and a little or not at all.

Health Locus of Control. Instead of using Wallston and Wallston's (1981) original typology, each of the three HLC orientations were tested individually as predictors of HISB, and was considered an Antecedent of HISB by the CMIS framework. All three aspects were measured by scaling six items asking participants to respond to statements reflecting their beliefs about their health status on a six-point Likert scale ranging from strongly agree (6) to strongly disagree (1), resulting in a scale range from six (weak locus of control) to 36 (strong locus of control). Mean scores for each HLC dimension were used (Norman, Bennett, Smith, & Murphy, 1998). Examples of statements directed at internal HLC include "I am in control of my own health," and "When I get sick, I am to blame." Examples of statements assessing chance HLC include "No matter what I do, if I am going to get sick, I will get sick," and "My good health is largely a matter of good fortune." Examples of statements directed at powerful others HLC include "Regarding my health, I can only do what my doctor tells me to do," and "My family has a lot to do with my becoming sick or staying healthy."

Control Variables. Following the assertions of the CMIS (Johnson & Meischke, 1993) that socioeconomic and sociodemographic characteristics add context to understanding predictors of HISB, five control variables were included in the models. All control variables, except gender, were recoded to accommodate for cell size requirements. Race was recoded into three categories including, 1) White, 2) Black/African American, and 3) American Indian/Alaskan (*n* = 17), Asian (*n* = 16), Hawaiian/Pacific Islander (*n* = 2), 2+ races (*n* = 56). Age was recoded into three categories (18-44, 45-59, 60+) for the same reason. Marital status was also recoded from six to three categories to satisfy cell size requirements: married/living with a partner, widowed/separated/divorced, and never married. To correct for multicolinearity, education was recoded into three categories (high school or less, some college, and bachelor's degree or more).

Data Analysis

ANHCS data were analyzed using SPSS, version 24. Because some measures were only included for part of the 96-month period of the survey and the voluntary nature of the survey, a portion of the total sample size was

included in each model after list-wise deletion for missing data. After examining descriptive statistics, predictors of HISB online and with a health care provider were examined with two multinomial logistic regression analyses. Five control variables were included: age, gender, education, marital status, and race.

Findings

The current research focused only on participants who had been diagnosed with type 2 diabetes (n = 1,106). The study population was evenly represented between men (50.8%) and women (49.2%). The majority of participants were White (78.9%), married (63.7%) and at least 60 years old (48.1%). Less than one percent of the study population was between 18-29 years old. The descriptive statistics for all demographic characteristics of the study sample are reported in Table 1 with originally coded categories.

Almost half (43.8%) of respondents rated their health as good, 31.7% rated their health as fair, and 13% of participants rated their health as excellent/very good. Only 11% rated their health as poor/very poor. The internal HLC scale shows the highest mean score (24.2), followed by the powerful others HLC scale (19.6) and the chance HLC scale (18.3), which is consistent with previous research (Grotz et al., 2011).

Table 1

Demographics (N = 1106)

	%	N
Age, years		
18-29	.8	9
30-44	14.3	158
45-59	36.8	407
60+	48.1	532
Gender		
Man	50.8	562
Woman	49.2	544
Race		
White	78.9	858
Black/African American	12.7	138
American Indian/Alaska native	1.6	17
Asian	1.5	16
Hawaiian/Pacific Islander	.2	2
2+ Races	5.2	56
Education		
Less than High School	14.5	160
High School	34.6	383
Some College	27.8	307
Bachelor's Degree or Higher	23.1	256
Marital Status		
Married	63.7	704
Widowed	8.6	95
Divorced	13.3	147
Separated	2.4	26
Never Married	10.9	121
Living With Partner	1.2	13

Trust for online health information was generally low with 14% of participants reporting a lot of trust, 50.4% reporting some, and 13.1% reporting no trust. Most participants (48%) said they had not searched health

information on the internet at all in the past 30 days, and 10.7% sought health information online a lot. In comparison, the majority of participants reported they trust health information from a health care provider a lot (82%), and only 2.3% had little or no trust. Just over half (50.9%) of participants reported seeking health information from a health care provider three to six times in the past year. Only 3.3% of participants reported never seeking health information from a health care provider. Tables 2 and 3 illustrate the descriptive statistics for all variables included in the regression analyses.

Table 2

Descriptive statistics of predictors of HISB Online and with a Health Care Provider (N = 1106)

	%	N	a
Perception of Health			
Excellent/ Very Good	13.5	149	
Good	43.8	484	
Fair	31.7	350	
Poor/Very Poor	11	122	
Internal Locus of Control (M±SD)		24.2±4.6	.725
Chance Locus of Control (M±SD)		18.3±4.6	.640
Powerful Others Locus of Control (M±SD)		19.6±5.0	.693
Trust of Health Info from Health Care Provider			
A Lot	82	905	
Some	15.8	174	
A Little/Not At All	2.3	25	
Trust of Health Info from the Internet			
A Lot	14	153	
Some	50.4	549	
A Little	22.5	245	
Not At All	13.1	143	

Note. *M*=mean. *SD*=standard deviation. *a*=Cronbach's Alpha.

Table 3

Frequency of HISB Online in the last 30 days and with a Health Care Provider in the past year (n = 956)

	%	N
HISB Online in past 30 days		
A Lot	10.7	91
Some	22.3	189
A Little	18.8	160
None	48.2	409
HISB with Health Care Provider in the past year		
Never	3.3	32
Once or Twice	23.7	227
Three to Six Times	50.9	487
Once a Month or More	22	210

Model 1 testing predictors of HISB online accounted for 34.3% of variability in the outcome. Trust for online health information was the only significant predictor ($p<.001$). Participants who reported they have a lot of trust in online health information were 70 times more likely to engage in HISB online a lot, but only 5 times more

likely to seek health information online a little compared to those who report a little or no trust, controlling for age, gender, education, marital status and race. Age, as a control variable, was also found to be a significant predictor (*p*=.007). Participants ages 18-44 and 45-59 are approximately 4 and 2.5 times (respectively) more likely to seek health information online a lot in the past 30 days than those who are 60 years old or older. Little difference was found in the 45-59 age range among those who use the internet for health information a little. Tables 4 and 5 illustrate the findings from this analysis.

Table 4

Multinomial regression models testing predictors of HISB

Predictor	Online (*n*=478) Model 1				With a Health Care Provider (*n*=527) Model 2			
	Model Fitting Criteria	Likelihood Ratio Tests			Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	X^2	df	*p*	-2 Log Likelihood of Reduced Model	X^2	df	*p*
IHLC	1029.15	1.07	3	.783	1030.91	.522	3	.914
CHLC	1033.09	5.01	3	.171	1035.53	5.15	3	.161
PHLC	1028.27	.2	3	.978	1045.23	14.84	3	.002*
Health Status	1037.33	9.25	9	.414	1110.21	79.82	9	<.001*
Trust	1124.73	96.66	6	>.001**	1037.46	7.08	6	.314
Age[+]	1045.65	17.57	6	.007*	1039.67	9.29	6	.158
Gender[+]	1033.72	5.64	3	.13	1032.55	2.17	3	.538
Education[+]	1040.43	12.35	6	.055	1036.44	6.06	6	.417
Marital Status[+]	1043.28	15.21	9	.085	1040.35	9.97	9	.353
Race[+]	1035.15	7.07	6	.315	1041.99	11.61	6	.071

Note. *p<.05, **p<.001. [+]control variable. Model 1 $\chi^2(54)$ =181.43, *p* < .000 . ΔR^2 = .343 (Nagelkerke). Model 2 $\chi^2(54)$ =149.752, *p* < .000 . ΔR^2 = .277 (Nagelkerke).

Model 2 testing predictors of HISB with a health care provider accounted for 27.7% of variability in the outcome. Powerful others was the only dimension of HLC that was shown to have a significant relationship with HISB with a health care provider in the past year (*p*=.002). However, the odds ratio values reported for powerful others HLC are close to one, indicating a small difference among the categories and small influence on the outcome. In other words, participants are 1.1 times more likely to engage in HISB with a health care provider if they have strong positive attitudes about powerful others.

Health status was also found to be a significant predictor in model 2 (*p*<.001). Participants who rated their health as excellent/very good were 85 times more likely than those with poor/very poor health status to engage in HISB with a provider one to two times a year, and almost eight times more likely to engage in HISB with a provider three to six times a year, controlling for age, gender, education, marital status and race. Furthermore, those who rated their health as good were about 45 times more likely to seek health information from a health care provider once or twice per year, and 7.5 times more likely to engage in HISB with a provider three to six times a year. Tables 4 and 6 highlight the findings from Model 2.

Table 5

Odds ratios and 95% CI for statistically significant (p<.05) predictors of HISB Online.

Variable (*referent*)	A Lot OR (95% CI)	Some OR (95% CI)	A Little OR (95% CI)
Trust (A Little/Not At All)			
A Lot	70.06 (18.86-260.31)**	21.7 (8.16-57.73)**	5.1 (1.84-14.16)
Some	5.51 (1.77-17.18)	5.99 (3.1-11.56)**	2.52 (1.4-4.54)
Age (60+)			
18-44	4.12 (1.26-13.38)	3.62 (1.54-8.54)	3.17 (1.33-7.57)
45-59	2.56 (1.1-5.95)	1.16 (.66-2.06)*	.944 (.52-1.73)*

Note. *p<.05. **p<.001. Reference category is Not At All.

Table 6

Odds ratios and 95% CI for statistically significant (p<.05) predictors of HISB with a Health Care Provider.

Variable (*referent*)	Never OR (95% CI)	1-2 times OR (95% CI)	3-6 times OR (95% CI)
Health Rating (Poor/Very Poor)			
Excellent/Very Good	101.99 (.03-14.7)	85.87 (.95-1.09)**	7.95 (2.7-23.36)**
Good	22.02 (1.87-258.57)	44.95 (9.6-210.72)**	7.51 (3.52-16.01)**
Fair	4.96 (.42-57.84)	10.1 (2.13-47.82)	4.51 (2.19-9.3)**
PHLC	.829 (.72-.95)	.897 (.84-.96)	.95 (.9-1.01)*

Note. *p<.05. **p<.001. Reference category is 12+ times.

Discussion

Overall, the findings were consistent with national data on health care utilization among patients with diabetes. ANHCS data show that over 74% of respondents with type 2 diabetes reported seeking information from their health care provider one to six times per year. Accordingly, the CDC (2016) reported that 71.4% individuals with diabetes have received two or more A1C tests in 2015 and over 67% have since 2011. The A1C tests are often ordered during scheduled exams, and information-seeking is most likely also occurring then as well. The use of a U.S. nationally representative data is a major strength of this study. Since type 2 diabetes onset happens most commonly between the age of 45-64 (CDC, 2014b), the study population (of which more than 80% were over 45 years old) accurately reflects the general population.

Because of an overrepresentation among the older segment of the population, there was little opportunity to test predictors of HISB from either source among younger, unmarried individuals. This may also explain the strong relationship found showing age as a predictor of HISB online. The current study highlighted that HISB online occurred more often among respondents 59 and younger than those who are older, which directly reflects the strong negative correlation between age and internet use in the US for more than 15 years (Pew Research Center, 2016). Health care providers must be cognizant of this steadfast trend and a patient's willingness to seek health information

online, particularly among the older population that also has an increasing susceptibility to illness, and determine an effective approach to encouraging HISB for effective decision-making. Sociocultural aspects may also play a role in HISB.

Powerful others HLC was found to predict HISB with a health care provider. Despite the small influence shown here, this finding extends recent conclusions that highlight powerful others HLC as one of the important determinants of health behaviors such as HISB (Jang & Baek, 2018). Understanding the role of HLC is both theoretically and practically meaningful as scholars continue to explore predictors of health behaviors, chronic illness management and HISB. As the aging U.S. population faces multicomorbidities, it is important for health communication experts to recognize HISB patterns, and its motivators, preferences and barriers in order to facilitate the most conducive environment for patients to make informed health decisions (Grotz et al., 2011; Zielińska-Więczkowska, 2016). Health care providers must rely on research demonstrating predictors of HISB to continue their work to achieve goals set out by Healthy People 2020 for preventive care utilization among diabetics (CDC, 2016). Grotz and colleagues (2011) reported that those with a high health burden, an index including general health status and chronic illnesses, were found to have stronger attitudes about powerful others compared to those with less of a health burden, which may also explain powerful others HLC's role as strong predictor for HISB with a provider. Their argument points to the importance of training health care providers to engage in effective, meaningful interpersonal communication to enable patients' participation in decision-making and execution of health behaviors. Those with high chance HLC are probably the least likely to engage in HISB, and it would make sense that individuals with a high powerful others HLC would seek information from a source that they trust. Strong powerful others HLC does not indiscriminately determine HISB with a provider, however. We also know that individuals with poorer health status are more likely to have less income and education (Turner, Lloyd, & Roszell, 1999), which may inhibit an individual's HISB.

Another finding, that those with more positive perceptions of their health status engage in more HISB with a provider, seems to contradict Grotz and colleagues' (2011) conclusion that a more negative health status would encourage HISB with a provider. Yet, current findings also confirm observations in more recent research that reported more HISB activities among individuals with less health problems (Feinberg, Greenberg, & Frijters, 2015). Beyond HLC and health status, variables such as accessibility, ease of use, time constraints, utility of the health information sought, and everyday demands may also play a role in determining the source of an individual's health information. One possible explanation for why patients with more positively perceived health status engage in HISB with health care providers more frequently than those with negative health status, despite a presumed strong powerful others HLC, is that those with poorer health are less physically able to visit and engage with their providers. Conversely, perhaps health information from health care providers has helped interpersonal information-seekers to maintain good health, thus perpetuating a trend among healthy individuals to continue seeking wellness information from their providers.

The relatively weak relationship between powerful others HLC and HISB with a health care provider may also be explained by the multidimensionality of health behavior (Baumeister & Bengel, 2007), which echoes Weaver and colleagues' (2010) conclusion that active health information seekers do not have one commonality, and should not be treated as such. Furthermore, HLC is considered to be more dispositional than situation-specific (Armitage et al., 2002), which may also negate the role of a specific diagnosis on how an individual perceives the causes of the illness, their ability to improve their health, and HISB. Among patients with type 2 diabetes, there is still a wide range of health indicators and risks, and general communication tailoring strategies should be integrated by any source of health information. In contrast to previous research on HISB, which examined the construct in general terms (e.g., Shim, Kelly, & Hornick, 2006), the present study advances more recent research that differentiates information sources (e.g., Yang et al., 2016). It is possible that HISB with one source (i.e., internet) influences those with another source (i.e., provider) (Lee, 2008). Accordingly, HISB with online sources may also impact trust in health care providers as health information providers (Lowrey & Anderson, 2006).

The motivations that underlie HISB are a phenomenon frequently overlooked (Weaver et al., 2010), and the current study attempted to address this gap by only including participants who self-reported a type 2 diabetes diagnosis. People with type 2 diabetes have a prominent instrumental motivation to seek health information for managing their condition that might override attitudes and perceptions about health, which may have reduced the strength of the relationship between the predictors in the current models and HISB. By limiting the study sample to

individuals with type 2 diabetes, this research reduced variability in motivations for HISB and began to answer questions about how individuals seek health information about ongoing health priorities. The inclusion of health status presents a more robust analysis of motivators for HISB than simply the presence of a chronic condition. Most research on health-related uses of the Internet assumes that poor health or medical problems are the primary reasons people search for information (Lambert & Loiselle, 2007). Previous research, however, has produced conflicting results. Cotten and Gupta (2004) found that healthier individuals are more likely to search for health information online, supporting the health behavior model. Findings reported by other researchers (Baker et al., 2003; Goldner, 2006b; Houston & Allison, 2002), however, support the illness behavior model, showing that individuals in poor health are more likely to search for health information online. Additionally, the present study used a more reliable measure of HISB that assessed frequency of self-reported action as a dependent variable (Ayers & Kronenfeld, 2007) as opposed to measuring intent of use (Smith-Barbaro, Licciardone, Clarke, & Coleridge, 2001).

Understanding the psychological, socioeconomic and demographic determinants of HISB has the potential for benefitting both patients and health care providers, considering that decision-making may be counterproductive due to poor health literacy and insufficient information seeking skills, especially among patients managing chronic health conditions. Furthermore, socioeconomically advantaged or highly educated people might have had more experiences leading them to perceive control over external barriers that threaten their well-being, which could influence their HLC, thus their HISB, health care utilization, and health outcomes (Poortinga, Dunstan, & Fone, 2008). On the other hand, less educated people are more likely to rely on health professionals in managing health issues and tend to indiscriminately follow their recommendations (Jang & Baek, 2018). Additionally, the predominance of an external locus of control belief, either by chance or powerful others, has been associated with low socioeconomic status (Grotz et al., 2011), and poor mental health (Sun & Stewart, 2000; Wu, Tang, & Kwok, 2004).

Online health information may have a mobilizing effect for racial and ethnic minorities and individuals with low socioeconomic status who have been found to have lower trust in health care providers (Corbie-Smith, Thomas, & St. George, 2001). Echoing Lareau and Miczo's (2017) argument, an important practical implication of this work is that health care providers and organizations should promote health information including patient narratives both online and interpersonally.

Trust in health information may also be related to the historical experiences of communities, especially those who have been disenfranchised and exploited by the medical community (e.g., Tuskegee Syphilis Experiment). Research has found that African Americans were more skeptical of the role of computers in their everyday life, less trusting of online health information, and less likely to believe that computers increased control and efficacy in one's life (Jackson, Ervin, Gardner, & Schmitt, 2001).

The Comprehensive Model of Information Seeking provides a strong framework for recognizing the multidimensional aspects related to HISB. Despite the current study's two models demonstrating different statistically significant predictors based on source of health information, the tenets of CMIS have been supported and highlight several areas for improving future scholarship in HISB.

Limitations & Future Directions

The current research used cross-sectional data, and therefore cannot demonstrate causal relationships between health locus of control, current health status, trust and HISB. Individual responses were recorded only once for the ANHCS data, so there are no claims about directionality. Longitudinal studies are needed in order to verify the relationship between patient attitudes about their health, health status and HISB, specifically based on source. When patients are more informed about their health, there is a potential for more health behaviors and better patient-provider relationships. Future research should continue to attend to the role of HISB in managing chronic illness to better understand its effects on subsequent health behaviors, particularly among populations with specific conditions. Given the aging population of diabetics, learning more about perceptions of social support within this demographic and considering one's friends and family as sources of health information may enrich the current study's findings on HISB trends among diabetics (Yang et al., 2016).

Another limitation of this study is the measurement of HISB. Despite examining the sources for and frequency of HISB, the ANHCS dataset reflects a predominant approach to understanding HISB as illness-motivated and does not distinguish from different types of information sought (e.g., wellness-oriented or illness-

oriented) (Weaver et al., 2010). HISB is also not always best understood as a unidimensional concept, and future research should strive for better ecological validity (Anker et al., 2011). Motivations for wellness information-seeking (i.e., information to prevent illness and/or maintain health) may vary widely from motivations for illness information-seeking (i.e., information to resolve or manage an illness state). Future examination of the interrelationships among health literacy, health value, health status, socioeconomic elements such as level of health insurance or income, perception about importance of information, and HISB may demonstrate stronger relationships, as noted in previous research (e.g., Birru et al., 2004; Cotten & Gupta, 2004; Wallston, 1992). For example, HLC beliefs have been found to be better predictors when they are tested as moderators for perceived behavioral control or self-efficacy (Armitage, 2003). Health value may also be considered as a moderator of the HLC-HISB relationship. Future research on HLC should assess attitudes about locus of control using an ecological framework that acknowledges a comprehensive set of predictors of health outcomes and barriers to HISB. The approach would also recognize the moderating relationship among some of those variables and the complexity of such health communication outcomes. Furthermore, the ANHCS data provides self-reported health status and HISB, and corroborating these findings with directly assessed health and information-seeking data would be valuable.

Accessibility issues may also be a confounding factor. By including income and health care insurance coverage levels in future models, scholars may be better able to clearly delineate barriers to HISB. More than 70% of respondents in the current study reported HISB with a health care provider 3 times or more in the past year, and almost just as many participants reported no or a little HISB online in the past 30 days. This disparity of HISB based on source may be attributed to lack of access or availability of internet, or ease of HISB with a provider compared to self-directed searches online, or simply a reflection of generational preferences and expectations among an older population. Understanding how and why individuals are obtaining health information with their care providers and online would also add meaningful depth to conclusions about HISB. Primary qualitative research must be done to advance understanding of the barriers and motivators to HISB from all sources as well as perceptions of information during information seeking.

Conclusion

More than 86 million Americans are living with prediabetes and 90% of them are unaware of their risk (CDC, 2016). One drawback of using internet as one's primary source of health information is that most information sought is intentional and self-selected, and likely to reflect pre-existing values and beliefs about one's health. Without an awareness or curiosity about prediabetes and risky behaviors leading to diabetes to motivate HISB for wellness information as opposed to illness information, we may never see a meaningful decline in type 2 diabetes occurrence. Past research has found that the more frequently an individual uses the internet to retrieve health information, the greater odds to change health behavior (Ayers & Kronenfeld, 2007), and providers may do well to acknowledge the integral role of HISB and communication on health behavior and recognize that their patients may be receiving health information outside of the health care setting. By understanding the psychosocial motivators for HISB examined in the present study and the growing body of literature with an ecological approach, health communication experts and health care providers may consider tailoring diabetes-related information and utilizing dissemination techniques that will reach the most vulnerable populations as well as those who may be able to reap the most benefit.

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