

Predictors of Online Health Information Seeking Among Women with Breast Cancer: The Role of Social Support Perception and Emotional Well-Being

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This study attempts to examine the role of social support perception and emotional well-being on online information seeking among cancer patients within the context of CHESS, a well-established Interactive Cancer Communication System (ICCS). Factor and regression analyses conducted among 231 breast cancer patients revealed that social support perception and emotional well-being interacted with each other to influence online health information seeking. Patients with low social support perception and high emotional well-being were most likely to seek health information, whereas patients with high social support perception and high emotional well-being sought out the same information least. Practical implications of the study findings are further discussed.

Key words: Online information search, Social support availability, Emotional well-being, Interactive Cancer Communication System (ICCS), e-Health intervention.

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According to recent information from the American Cancer Society, nearly 200,000 women were diagnosed with and over 40,000 women died from breast cancer in 2010. This ranks breast cancer the second leading cause of cancer death in women in the U.S. (American Cancer Society, 2010).

For individuals contending with the disease, breast cancer diagnosis and its subsequent treatments are physically, mentally, and emotionally painful and traumatic experiences. Ashing-Giwa and his colleagues (2007) have found that breast cancer patients often experience psychosocial difficulties such as isolation and loneliness as well as emotional obstacles such as depression and anxiety.

As technology rapidly improves, many individuals with health problems turn to the Internet to seek out relevant health information as an active coping strategy. Recently, the Pew Internet & American Life Project conducted a national survey and found that 86% of Internet users living with disability or chronic illness have looked online for information (Fox, 2007). Related data indicate that approximately 8 million American adults with health concerns searched for information on at least one health topic on a typical day. Those with chronic conditions reported that their online searches positively affected treatment decisions, their interactions with medical professionals, their ability to cope with various health conditions, as well as dieting and fitness regimen (Fox, 2009). Specifically, more than 55% of patients reported that they felt relieved or comforted by the health information they found online and also reassured to make appropriate decisions about their health care during their online search for health information (Fox, 2006). Along the same lines, a recent survey conducted by the National Cancer Institute revealed that about 56% of breast cancer patients who have been on the Internet visited a website to seek cancer related information to manage their illness (Nelson et al., 2004).

Despite the fact that online health information search has become a common activity for individuals with various health concerns, limited attention has been paid to psychosocial characteristics of patients that would influence such information seeking behaviors. Research needs to examine the psychosocial factors that encourage cancer patients to seek out information about their diseases. Previous research has been hindered by an overreliance on self-reported measures of information seeking and processing (e.g., Cotton & Gupta, 2004; Rutten, Squiers, & Hesse, 2006), which are susceptible to social desirability concerns as well as recall problems.

This study addresses both of these limitations. It focuses on two key psychosocial factors thought to shape communicative behaviors: perceived social support and emotional well-being. These factors are expected, individually and in combination, to influence the seeking of breast cancer information and the inclination toward specific information. We examine these relationships using measures of actual online health information seeking among breast cancer patients within an ICCS. By examining actual online health information seeking behaviors of patients who used the Comprehensive Health Enhancement Support System (CHESS) — a well established and widely studied ICCS (Interactive Cancer Communication System), this work can examine what women actually did with this information technology. The goal of this work is to gain a better understanding of the role of different psychosocial factors in explaining the nature of online information seeking behaviors in terms of both *content* and *form*.

Social Support Perception and Online Information Seeking

Social support has been one of the most frequently studied psychosocial concepts in the area of health communication (Thoits, 1995). As a coping resource, social support can be defined as functions performed for an individual by significant others in various networks, such as family members, friends, and coworkers (House & Kahn, 1985; Thoits, 1995). Social support is believed to create a sense of belonging in a network with people that can provide a variety of resources (Berkman, 1984; House, Robbins, & Metzner, 1982; White & Cant, 2003). Previous research found that online social support was positively related to beneficial health outcomes such as enhanced coping mechanisms among breast cancer patients, while social isolation is associated with detrimental health outcomes (Oktay, 1998).

Social support also seems to buffer the harmful effects of a stressful life event on psychosocial and physical well-being of individuals with health problems (e.g. Cobb, 1976; Cohen & Wills, 1985).

Research has shown that social support networks of friends and family serve as a resource for providing essential information as well as a validation tool for encouraging cancer patients to seek out more health related information to better cope with their illness (Basch, Thaler, Shi, Yakren, & Schrag, 2004; Coulton, 1990; Echlin & Rees, 2002; Elf & Wikblad, 2001; Johnson & Meischke, 1993). After diagnosis, most cancer patients experience extreme degrees of physical, mental, and emotional vulnerability. During this period, patients themselves are often unable to think logically or retain necessary information about their disease (Echline & Rees, 2002). Family members of cancer patients, therefore, search for cancer-related information on behalf of the patients (Heyman & Rosner, 1996). After interviewing 12 prostate cancer patients and their partners, Lavery and Clarke (1999) confirmed that significant others (e.g. spouses) were the ones that frequently searched for cancer-related information and raised discussions as to possible treatment options with the patient. Also, the 2001 Pew Internet survey revealed that 38% of the survey respondents sought out health-related information online to help other patients manage their health issues (Rice, 2006). It follows, then, the more patients perceive that they receive social support from others — and the information flows that accompany it — the less likely they themselves are to seek out information about their illness.

Expanding this line of research, Shaw and his colleagues argued that low levels of social support perception might encourage cancer patients to seek more health-related information on their own because the lack of social support may indicate an informational void (Shaw, DuBenske, Han, Cofta-Woerpel, Bush, Gustafson, & McTavish, 2008). Since friends and family in social support networks tend to provide and direct essential health information to individual patients, those who lack those social resources may realize the need for more information acquisition from other channels, such as e-Health systems (Coulton, 1990; Echlin & Rees, 2002; Shaw et al., 2008). Based on the Cognitive-Social Health Information Processing (C-SHIP) framework, Shaw and his colleagues (2008) confirmed that lower levels of social support perception in fact was associated with more active information seeking behaviors. Based on these arguments, we propose the first hypothesis:

H1: Social support perception will be negatively associated with online health information seeking behaviors in an ICCS.

Emotional Well-Being and Online Information Seeking

Previous research highlights the centrality of emotional well-being for understanding health-related behaviors in individuals (Mayne, 1999). This holds especially true when an individual experiences a life-threatening health crisis such as breast cancer that can evoke negative emotions like fear, anger, worry, anxiety, and feelings of meaninglessness and shame (Taylor, Lichtman, & Wood, 1984). Moreover, Harris (1998) claimed that unexpected or forced psychological adjustments such as emotional trauma due to cancer-related experiences could influence the degree to which cancer patients seek out relevant information.

Scholarly research, however, has produced mixed results. Previous studies in psychology have argued that there are two types of motivation, approach and avoidance, which can cause certain emotional and behavioral response tendencies (see Davidson, Saron, Senulis, Ekman, & Friesen, 1990; Lang, 1995). By promoting approach motivation, positive feelings urge actions such as exploring and learning in individuals, whereas negative feelings motivate individuals to focus more selectively and act in rather defensive ways such as being protective and initiating withdrawal mechanisms. Similarly, regarding

potential effects of positive emotional states on health-related behaviors, the Broad-and-Build Theory of Positive Emotions by Fredrickson (2001) argues that cultivating positive emotions in an individual contributes to improving his or her overall cognitive abilities because the positive emotional states reinforce broadening attention and cognition. The theory also claims that positive emotional states enable creative, flexible, innovative, and integrative ideas and help to build better coping mechanisms. In contrast, negative emotions serve as a key factor for inhibiting constructive ideas and thinking, so that they reduce psychological and physical well-being of cancer patients.

Based on this theory, Han and his colleagues (2008) examined the role of positive emotion expressions in online social support groups of women with breast cancer. After analyzing online messages from 96 active patient participants, the authors found strong negative relationship between writing positive emotional words and breast cancer-related concerns. The study also found that more negative emotion expressions were associated with higher levels of breast-cancer-related concerns (Han, Shaw, Hawkins, Pingree, Mctavish, & Gustafson, 2008). Likewise, in their analysis of the 2000 General Social Survey, Cotton and Gupta (2004) also confirmed that healthy individuals with more positive feelings (e.g. happiness) were more likely to seek out health-related information online. Further, individuals with positive emotions tended to use offline and online health information in a more balanced manner. These accounts support the view that positive emotions seem to facilitate more active online health information seeking than negative emotions among patients who go through painful surgery and treatment processes.

Nabi (2002, 2003), however, conducted a series of experimental studies that examined effects of negative emotions on information seeking behaviors in the context of health prevention campaign messages. With the topic of drunk driving, angry individuals were almost twice as likely to seek out blame-related cause and retributive solution information, whereas fearful individuals were more likely to search for information concerning societal-level causes and protection-related solutions. Similarly, Griffin and colleagues (2008) explored various concepts of the Risk Information Seeking and Processing (RISP) model and their potential relationships with an environmental crisis. Specifically, the study looked at the relationship between emotional reactions and risk information seeking and processing, and found that angry emotions directed at risk-managing agencies were related to more active information-seeking and systematic processing strategies (Griffin et al., 2008).

Further, among cancer patients, Shaw et al. (2008) found that negative emotions were positively related with time spent in cancer-relevant information seeking. Using the Cognitive-Social Health Information Processing (C-SHIP) model (Miller, Shoda, & Hurley, 1996) as a conceptual framework, these scholars tested the relevance of various cognitive and affective constructs in online cancer information processing. The C-SHIP model argues that individuals differ in terms of cognitive and affective factors such as values, beliefs, emotional reactions, and competencies, and these factors work together to generate and/or influence health related behaviors (Shaw et al., 2008). The study found that emotional well-being was negatively correlated with total time spent in information services, whereas negative emotions were linked with a preference for narrative information and psychosocial information seeking. They suspected that the isolated nature of their living situations might limit face-to-face interactions with other cancer patients, contributing to their fulfilling social support and information needs by going online to seek out psychosocial information in a narrative form.

Based on the conflicting findings as to the role of emotional well-being on online health information seeking above, the following research question is proposed.

RQ1: What is the relationship between emotional well-being and online health information seeking behaviors in an ICCS?

Although some studies suggested that these mixed results are a function of the context- or topic-sensitive nature of the investigation, one could also argue that these differences may be due to more complex, interactive relationships among different psychosocial factors. For example, Lee and her colleagues (2008) investigated the moderating effect of health self-efficacy on the relationship between negative emotions and online health information use of cancer patients. Their study found that negative emotions and health self-efficacy, in fact, interacted with one another to influence health information use. Subjects with high levels of health self-efficacy and negative emotions were more likely to engage in health information seeking behaviors, while those with low health self-efficacy and the same negative emotions were less likely to engage in health information use (Lee, Hwang, Hawkins, & Pingree, 2008).

It is, therefore, possible that social support perceptions and emotional well-being may work jointly to shape online health information seeking behaviors among cancer patients. Arguably, the hypothesized relationship for social support perception — i.e., that those without social support will seek information on their own — may be amplified by the emotional states of cancer patients. Whether positive or negative emotional states might amplify this hypothesized relationship remains uncertain, and is the basis of the following research question:

RQ2: Does emotional well-being amplify or attenuate the relationship between social support perception and online information seeking behaviors in an ICCS?

Online Health Information Seeking Within CHES as an Active Coping Strategy

The Interactive Cancer Communication System (ICCS) within which the hypothesis and research questions are examined is the Comprehensive Health Enhancement Support System (CHES). This system is designed to overcome the problems and limitations of the Internet and provide an integrated and comprehensive system of services to cancer patients to improve their disease management. CHES is a nonprofit ICCS developed by researchers at the University of Wisconsin-Madison. The CHES website serves as an accessible intervention platform to patients, assists patients in monitoring their health conditions as well as provides relevant information, social support, and interactive services (see Gustafson et al., 1993, 1999, 2002, 2008; Shaw et al., 2006, 2007). That is, CHES has provided three major types of health services: information, communication, and interactive services. First, *information* services can deliver comprehensive health related information to cancer patients. Through the computer-mediated environment, cancer patients can select information they want to when using different information services. Questions and Answers, Resource Guide, Resource Directory, Instant Library, Web Link, Video Gallery, and Personal Stories are well representative examples of these information services. In the version of CHES examined here, most of the services are text-based, although some information presented as Personal Stories is delivered through audiovisual formats (e.g., Gustafson et al., 2008). Second, *communication* services offer interpersonal support through such means as Discussion Group and Ask an Expert (Gustafson et al., 1993, 2002). The Discussion Group offers a place for anonymous peer-to-peer interactions, whereas the Ask an Expert function can provide patient-to-expert interactions through the secured internal CHES e-mail system. Last, CHES *interactive* services include such tailored functions as Action Plan, Decision Aid, Health Tracking, and Journaling. Since information, communication, interactive services in CHES serve different benefits to cancer patients, for the purpose of this study, our analyses were only focused on the CHES information service use.

Method

Participants

The data used in this study were collected as a part of a larger Digital Divide Pilot Project (DDPP). DDPP was a population-based study, which attempted to reach low-income women with breast cancer with an e-Health system. Among many factors that contributed to the digital divide such as race, poverty, and disability, poverty is the prime indicator (Gustafson et al., 2002). When a woman in poverty is diagnosed with breast cancer, her quality of life, which is already low from other life circumstances, become devastatingly low. The primary goal of the DDPP, therefore, is to test the feasibility of disseminating an Internet-based cancer support system (e.g. CHESS) to assist low-income women with breast cancer, given the tremendous potential of the Internet to help the underserved (Gustafson et al., 2005).

Underserved women with breast cancer in rural Wisconsin and Detroit, Michigan were given access to the CHESS for 4 months. The participants were at or below 250% of the federal poverty level - not homeless - within 1 year of diagnosis with early-stage breast cancer or metastatic breast cancer. The 4-month intervention was implemented with the assumption that the CHESS intervention effects would occur at least after 2 months of the intervention (see Gustafson et al., 2001, 2005, 2008). Of 341 eligible patients who were initially recruited, 286 completed the study. Both the pretest and a 4-month posttest surveys were conducted with a sample of 231, resulting in 81% retention rate. Detroit recruitment started in June 2001 and ended in April 2003 and Wisconsin recruitment was from May 2001 to April 2003. Study participants were identified through a variety of sources, including the National Cancer Institute's Cancer Information Service, hospitals and clinics, public health departments, and the Medicaid program (Gustafson et al., 2005).

Procedures

Once a patient was referred to the study, a research team member explained the purpose, reviewed eligibility criteria, and covered the risks and benefits of participating, including the need to complete pre and posttest surveys and have their computer use monitored. Once submitting their pretest, all study participants were loaned a computer and given Internet access for 4 months. They received personal training to learn how to use the computer and the Internet, with the majority of time spent teaching participants how to use CHESS.

Measures

This particular study examined the relationships of social support perception and emotional well-being on various information seeking behaviors of breast cancer patients. The reliability and validity of the independent variables have been extensively tested in the area of health communication (e.g., Brady et al., 1997; Cella et al., 1993; Gustafson et al., 2005; Shaw et al., 2007). The dependent variables of interest were constructed from actual measures of patients' online behaviors within CHESS based on their use of particular information services and topics.

Social support perception

Social support perception, as a main independent variable of the study, was measured using six items (pretest $M = 2.99$, $SD = .85$, Cronbach's $\alpha = 0.88$), on a 5-point scale (0 = not at all, 4 = very much). Participants were asked to indicate the degree to which they agreed with the following statements: (1) "There are people I could count on for emotional support," (2) "There are people who will help me

understand things I am finding out about my illness,” (3) “I am pretty much all-alone,” (4) “There are people I could rely on when I need help doing something,” (5) “There are people who can help me find out the answers to my questions,” and (6) “There are people who will fill in for me if I am unable to do something.”

Emotional well-being

Emotional well-being, as another main independent variable of the study, was also assessed on a 5-point scale (0 = not at all, 4 = very much). Participants endorsed the degree to which they agreed with the following statements: (1) “I feel sad,” (2) “I feel like my life is a failure,” (3) “I feel nervous,” (4) “I am worried about dying,” (5) “I feel like everything is an effort,” and (6) “I am worried that my illness will get worse.” These six items were reversed before creating an emotional well-being scale (pretest $M = 2.44$, $SD = .98$, Cronbach’s $\alpha = 0.87$), indicating higher scores mean better emotional well-being.

Information seeking behaviors

This study employed online health information seeking behaviors as a primary outcome variable. To record CHES use of breast cancer patients, CHES research team developed a browser to automatically collect information use data at an individual keystroke level as patients utilized the system. This allows the research team to create a log file with each user’s code name, date, time spent, and URL of every web page requested from the CHES web server database (see Shaw et al., 2008 for details). For each CHES information service and topic sought out, the amount of use was operationalized as total time spent (in minutes) browsing each type of information¹.

Factor Analysis

As for individual item inclusion, all the information service use within the CHES website was identified and analyzed by 1) information style and 2) information topic use. All eight information style items as well as all 14 information topic items were included, and for proper subcategorization purposes, a series of exploratory factor analyses² were conducted with these CHES information service items.

In terms of information style (across information topic use), all eight information services were first factor analyzed by using a principal component analysis with Promax rotation. The cutoff criterion for factor extraction was Eigen Value greater than 1. This analysis yielded two factors explaining a total of 54.86 % of the variance. Factor 1 was labeled as narrative information ($M = 4.11$, $SD = 9.26$) due to the high loadings by the following items, respectively: video gallery; personal stories; consumer guides. The factor 2 was labeled as instructive information ($M = 4.66$, $SD = 7.34$) due to the heavy loadings by the following, respectively: dictionary; resource directory; questions & answers; instant library; web links.

With regards to information topic use (across information style use), a total of fourteen information topics within CHES were factor analyzed using the same Promax rotation method. The initial cutoff criterion for factor extraction was Eigen Value greater than 1. This analysis yielded three factors explaining a total of 68.69% of the variance for the entire set of variables. To perform more parsimonious model testing, two alternative factor retention criteria were further conducted: the Minimum Average Partial (MAP) test (Velicer, 1976) and a scree plot analysis. Both analyses also revealed three factor solutions, supporting the initial factor extraction based on the Eigen Value greater than 1 (O’Connor, 2000). Factor 1 was labeled as psychosocial management ($M = 2.94$, $SD = 6.65$) due to the high loadings by the following items: personal and family care; health care system management; if treatment stops working; learning about breast cancer; recurrence management. The factor 2 derived was labeled as basic surgery information ($M = 1.17$, $SD = 3.70$) due to the high loadings by the following

factors: ovarian removal surgery; breast reconstruction surgery; basic surgery information. Then, the factor 3 derived was labeled as tumor removal information ($M = .90, SD = 2.66$) due to the high loadings by the following: pain; lumpectomy (breast tumor removal).

Moreover, four information topics – chemotherapy, mastectomy, lymph node dissection, and radiation therapy – produced heavy cross loadings and thus, were excluded from the above factor analyses. Because these surgical and therapeutic procedures play a key role and have significant impacts on most breast cancer diagnoses and treatments, however, the study included these items for further analyses (National Cancer Institute, 2011). An additional factor analysis was performed with these four excluded items due to their importance and centrality in the process of breast cancer treatment as the most common surgery and treatment options. After running the factor analysis³, we found that all four items loaded as a single factor, which was labeled as core breast cancer treatment information and included in the subsequent regression analysis. Details about the factor analyses are provided in Table 1 and 2. The categorization of information services by information style and topic is shown in Table 3.

As for information service use by information style, additional details as to the subcategories (e.g. narrative and instructive information style) can be useful to provide a clear picture. The narrative information category provides real-life written and audiovisual accounts of patients’ experiences with cancer diagnosis, treatment decisions in an engaging, conversational, and rather descriptive manner (e.g., Gustafson et al., 2005, 2008; Shaw et al., 2008). The services also provide personal stories of how to manage physical, emotional, practical disease-related concerns. Consumer guide information contains available health service descriptions such as identifying a good health care provider and being an effective consumer of needed and desirable health services. The video gallery has sound and motion videos of women who are at different stages of breast cancer talking about their real experiences. Personal stories are narrative written forms of interview accounts as to how other breast cancer patients have coped with their diseases. In contrast, instructive information services allow cancer patients to access hard-science based information to convey facts, statistics, and a review of current up-to-date knowledge about breast

Table 1 Factor loadings over .40, communalities, and descriptive statistics for 8 items from CHES information services by information style (N = 271)

Information Style	Narrative Style	Instructive Style	Communality
Factor Loadings			
Video Gallery	.97		.77
Personal Stories	.86		.71
Consumer Guide	.51		.57
Dictionary		.81	.53
Resource Directory		.72	.43
Questions & Answers		.58	.69
Instant Library		.52	.46
Web Links		.43	.23
Descriptive Statistics			
<i>Number of items</i>	3	5	–
<i>Eigen Value</i>	3.23	1.16	–
<i>Variance (%)</i>	40.31%	14.55%	–
<i>Cronbach’s Alpha</i>	.74	.67	–

Table 2 Factor loadings over .40, communalities, and descriptive statistics for 10 items from CHES information services by information topic (N = 272)

Information Topic	Psychosocial Management Topic	Basic Surgery Topic	Tumor Removal Topic	Communality
Factor Loadings				
Personal & family care	.89			.86
Health care system management	.88			.73
If treatment stops working	.83			.60
Learning about breast cancer	.75			.71
Recurrence management	.55			.48
Ovarian removal surgery		.83		.73
Breast reconstruction surgery		.81		.69
Basic surgery information		.68		.49
Pain			.89	.79
Lumpectomy (breast tumor removal)			.85	.77
Descriptive Statistics				
<i>Number of items</i>	5	3	2	–
<i>Eigen Value</i>	4.21	1.52	1.14	–
<i>Variance (%)</i>	42.06	15.21	11.42	–
<i>Cronbach's Alpha</i>	.87	.68	.75	–

cancer and related health care (Shaw et al., 2008). For instance, the questions and answers category conveys short answers as to many frequently asked questions, and the instant library category provides full articles on specific breast cancer topics. Web Links contain links to selected health-related Internet sites, and resource directory gives descriptions and contact instructions for cancer and social support service organizations. In addition, a dictionary category provides definitions of important medical and professional terms.

Control Variables

The study included four sociodemographic controls: age, ethnicity (a dummy variable with Caucasian coded 0 and Non-Caucasian coded 1), education, and living situation (a dummy variable with “Living alone” coded 1 and “Not living alone” coded 0) (Shaw, Han, Baker et al., 2007; Shaw et al., 2006). For ethnicity, non-Caucasians include African-American, Asian/Pacific Islander, Latina, Native American Indian, and Other. Clinical characteristics of cancer patients were also included in the study due to their potential confounding influences on the information seeking behaviors. Those were stage of cancer (Stage 0 through Stage IV, Inflammatory, and N/A), time duration between diagnosis and intervention (Days), recurrence (a dummy variable with “Yes” coded 1 and “No” coded 0), existence of peer advocate (a dummy variable with “Yes” coded 1 and “No” coded 0) and functional well-being (pretest) (Namkoong et al., 2010; Schag et al., 1984). For functional well-being, participants were asked their level of agreement on a 5-point scale (0 = not at all, 4 = very much), whether (1) they are able to work (including work in home), (2) their work (including work in home) is fulfilling, (3) they are able to enjoy life in the moment, (4) they are sleeping well, and (5) they are enjoying the things they usually do to relax (pretest: $M = 2.32$, $SD = 1.00$, Cronbach's $\alpha = .84$).

Table 3 Sub- categories of CHESS information service: information style and topic

By Information Style	
Narrative Style	Consumer Guide Video Gallery
Instructive Style	Personal Stories Questions & Answers Instant Library Web Links Resource Directory Dictionary
By Information Topic	
Core BC Treatment Topic	Chemotherapy Mastectomy Lymph Node Dissection
Psychosocial Management Topic	Radiation Therapy Personal and family care Health care system management If treatment stops working Learning about breast cancer
Basic Surgery Topic	Recurrence management Basic surgery information Ovarian removal surgery
Tumor Removal Topic	Breast reconstruction surgery Lumpectomy (Breast tumor removal) Pain

Analytical Framework

To test the proposed hypothesis and research questions about potential effects of social support perception and emotional well-being on information seeking behaviors, the study employed ordinary least squares (OLS) hierarchical regression analyses. The nine demographic and clinical characteristic variables such as age, education, and cancer stage, were entered in a first block as control variables. A second block consisted of social support perception and emotional well-being, the two main independent variables. The interaction term was entered in the final block to test if there was a moderating effect of emotional well-being on the relationship between social support perception and health information seeking behaviors. The interaction term was constructed by multiplying the standardized values of the main effect variables to reduce potential multicollinearity problems (see Cohen, Cohen, West, & Aiken, 2002).

Results

A total of 231 breast cancer patients who used the CHESS website were used for the subsequent analyses. Table 4 presents sociodemographic and clinical characteristics of the study sample and Table 5 shows descriptive statistics for the variables of interest in the study.

Hypothesis 1: Main Effects of Social Support Perception

As for information style (across information topic), the study found a statistically significant main effect of social support perception on narrative information seeking ($\beta = -.23, p < .01$). That is, women with

Table 4 Demographic and clinical characteristics

	Participants (<i>n</i> = 231)
Age	
Mean (SD)	51.58 (11.82)
Ethnicity	
Caucasian	144 (62.3%)
Non-Caucasian	87 (37.7%)
Education	
Some junior high	2 (0.9%)
Some high school	24 (10.4%)
High school degree	72 (31.2%)
Some college	69 (29.9%)
Associate or technical degree	28 (12.1%)
Bachelor's degree	28 (12.1%)
Graduate degree	8 (3.5%)
Live alone	
Yes	63 (27.3%)
No	168 (72.7%)
Peer advocate	
Yes	116 (50.2 %)
No	115 (49.8 %)
Stage of cancer	
Stage 0	21 (9.1 %)
Stage I	42 (18.2 %)
Stage II	63 (27.3 %)
Stage III	32 (13.9 %)
Stage IV	13 (5.6 %)
Inflammatory	9 (3.9 %)
Unknown	42 (18.2 %)
Diagnose to intervention (Days)	
Mean (SD)	117.48 (130.30)
Functional well-being (<i>n</i> = 279)	
Mean (SD)	2.32 (1.00)
Recurrence	
Yes	197 (85.3 %)
No	34 (14.7 %)

Note. Non-Caucasians include African-American, Asian/Pacific Islander, Latina, Native American Indian, and Other.

breast cancer reported using narrative style information more when they perceived low levels of social support than high levels of social support (see Table 6). Also, the same statistically significant patterns were observed in some of the information topic categories. The breast cancer patients sought out more information about how to deal with their cancer-related psychosocial concern management ($\beta = -.24$, $p < .01$) as well as information about core breast cancer treatment options ($\beta = -.21$, $p < .01$), when

Table 5 Descriptive statistics for the variables of interest (4 months)

	<i>N</i>	<i>M</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Social support perception	279	2.99	.85	.67	4.00
Emotional well-being	279	2.44	.98	.00	4.00
Narrative information use	271	4.11	9.26	.00	116.89
Instructive information use	271	4.66	7.34	.00	49.28
Core BC treatment information use	272	3.16	6.74	.00	62.38
Psychosocial management information use	272	2.94	6.65	.00	86.39
Basic surgery information use	272	1.17	3.70	.00	42.35
Tumor removal information use	272	.90	2.66	.00	24.69

Note. Social support perception and emotional well-being are measured on a five point scale (0 = not at all agreed, 4 = very much agreed) and all the information use is measured with total time spent (in minutes) seeking each type of information.

they had low social support perception. For other information topics, however, no main effects of social support perception were statistically significant (see Table 7). Notably, in the absence of perceived social support, participants not only seek out core treatment information but also select information focusing on psychosocial topics presented in a narrative style, seemingly filling gaps in their support system.

Research Question 1: Main Effects of Emotional Well-Being

For research question 1, no statistically significant main effects of emotional well-being on different online information seeking were observed.

Research Question 2: Interaction Effects

As for Research Question 2, statistically significant interactions between social support perception and emotional well-being of cancer patients were observed for certain information seeking behaviors. First, for information style categories, both narrative information seeking ($\beta = -.15$, $p < .05$) and instructive information seeking ($\beta = -.14$, $p < .05$) were influenced by the interaction of social support perception and emotional well-being (see Figure 1 and 2). In other words, the negative relationships between social support perception and both narrative and instructive information seeking behaviors were in fact, greater for those who reported high levels of emotional well-being than those who experienced low levels of emotional well-being. In addition, the same relationship patterns were statistically significant for core breast cancer treatment ($\beta = -.17$, $p < .05$) and psychosocial management ($\beta = -.19$, $p < .01$) information seeking under the information topic category (see Figure 3 and 4). The negative relationship between social support perception and these information seeking behaviors was again reinforced when patients had high levels of emotional well-being than those with low levels of emotional well-being. Interestingly, the patients with low levels of social support and high sense of emotional well-being sought out information in a narrative style, about interpersonal, psychosocial matters most, seemingly as a way to compensate for the perceived deficiency in their social networks.

Discussion

This study investigated whether social support perception and emotional well-being of breast cancer patients individually and jointly influenced various online health information seeking behaviors within

Table 6 Regression analysis predicting CHES information service use: information style (4 months)

Criterion Variable	Information Style	
	Narrative Style	Instructive Style
Block 1: Control Variables (Pretest)		
Age	.03	.09
Ethnicity (Non-Caucasian = 1)	-.13 [#]	-.13 [#]
Education	-.09	-.08
Live alone (Yes = 1)	-.07	.08
Peer advocate (Yes = 1)	-.04	.07
Stage of cancer	-.07	-.09
Diagnosis to intervention	-.14 [*]	-.13 [#]
Functional well-being	-.02	.03
Recurrence (Yes = 1)	-.01	.03
R ² (%)	4.3%	6.8% [#]
Block2: Main Effect (Pretest)		
Social support perception	-.23 ^{**}	-.11
Emotional well-being	.11	-.04
Δ R ² (%)	3.6% [*]	1.1%
Total R ² (%)	7.9% [#]	7.9% [#]
Block 3: Interaction Effect (Pretest)		
Social support perception X Emotional well-being	-.15 [*]	-.14 [*]
Δ R ² (%)	2.0% [*]	1.6% [*]
Total R ² (%)	9.9% [*]	9.6% [*]

Note. Cell entries are final standardized Beta (β) for Block 1, 2, and 3. $n = 230$.

[#] $p < .10$, ^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$.

the Comprehensive Health Enhancement Support System (CHES). After conducting a series of exploratory factor analyses, the study categorized various CHES information services by information style (narrative and instructive style) and information topic (core breast cancer treatment, psychosocial management, basic surgery, tumor removal topics). This was done with the assumption that cancer patients would seek out various types of cancer-related information differently as an active copying strategy to improve their emotional states and fill the need for social networking and support. Specifically, in the case of information topic, extracted factors represent the important areas on which individual patients spend time. For instance, the first factor regarding information topic indicates that patients spend time reading psychosocial information such as personal/family care, health care management, and recurrence management on the CHES website. Based on actual information use data during the 4-month intervention period, the results from this study provide important insights into the relationship of perceptions of social support, emotional well-being, and purposeful information use.

In terms of the main effects of social support perception on online health information seeking, our findings were consistent with previous research results (e.g., Fogel, Albert, Schnabel, Ditzkoff, & Neugut, 2002; Shaw et al., 2008). Breast cancer patients with low levels of social support perception were likely to seek out different types of health information online to cope with their lack of social support. The

Table 7 Regression analysis predicting CHES information service use: information topic (4 months)

Criterion Variable	Information Topic			
	Core BC Treatment	Psychosocial Management	Basic Surgery	Tumor Removal
Block 1: Control Variables (Pretest)				
Age	.08	.03	.05	.07
Ethnicity (Non-Caucasian = 1)	-.11	-.19**	-.04	-.15*
Education	-.10	-.06	-.02	-.03
Live alone (Yes = 1)	-.03	-.05	-.11	.05
Peer advocate (Yes = 1)	.00	.00	-.10	.03
Stage of cancer	-.10	-.11	.02	-.09
Diagnosis to intervention	-.17*	-.13 [#]	.14*	-.10
Functional well-being	.06	.01	-.07	.07
Recurrence (Yes = 1)	.01	.02	-.12 [#]	.04
<i>R</i> ² (%)	5.4%	5.3%	6.5% [#]	4.8%
Block2: Main Effect (Pretest)				
Social support perception	-.21**	-.24**	-.10	-.10
Emotional well-being	.06	.10	.03	.00
ΔR^2 (%)	2.9%*	4.0%**	0.7%	0.7%
Total <i>R</i> ² (%)	8.3% [#]	9.3%*	7.2%	5.5%
Block 3: Interaction Effect (Pretest)				
Social support perception x Emotional well-being	-.17*	-.19**	.04	-.11
ΔR^2 (%)	2.5%*	3.0%**	0.2%	0.9%
Total <i>R</i> ² (%)	10.9%*	12.3%**	7.4%	6.4%

Note. Cell entries are final standardized Beta (β) for Block 1, 2, and 3. $n = 231$.

[#] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

fact that the cancer patients with low social support perception tend to seek information in a narrative style and with a focus on psychosocial concern indicates that the void in their social network can, in fact, serve as a key determinant of the style and type of information sought. With regards to emotional well-being, the study found no main effects on any other types of online health information seeking behaviors.

Providing evidence for a moderating role of emotional states, the study revealed statistically significant interaction effects of emotional well-being with social support perception on health information seeking behaviors within CHES. The interaction was significant for both narrative and instructive style information search and psychosocial management and core breast cancer treatment information topic use. It was found that breast cancer patients sought out cancer related information most when they had high levels of emotional well-being and low levels of social support perception, while they used cancer related information services least when they had both high levels of emotional well-being and social support perception. The same consistent patterns were revealed across narrative style, instructive style, psychosocial management topic, and core treatment topic information-seeking behaviors.

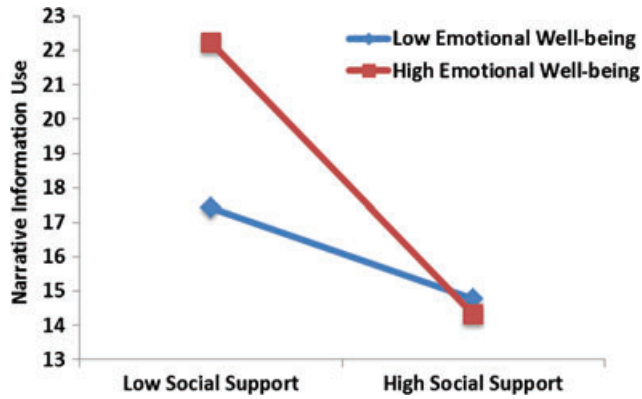


Figure 1 Interaction between social support perception and emotional well-being on narrative information use (Time spent in minutes)

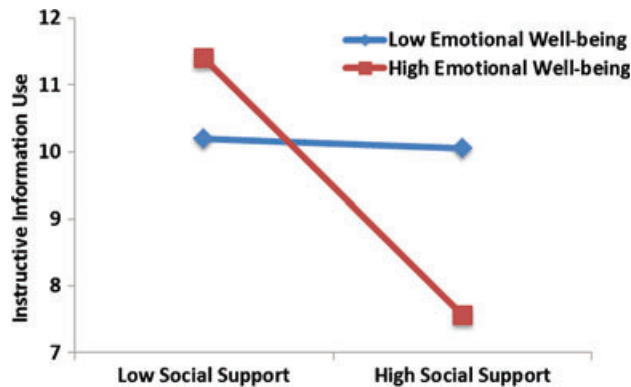


Figure 2 Interaction between social support perception and emotional well-being on instructive information use (Time spent in minutes)

Notably, significant differences in the relationship between social support perception and information seeking behaviors were observed with high emotional well-being patients and not low emotional well-being patients. In other words, the gap between the effects of low and high social support perception on information seeking behaviors was larger among breast cancer patients with higher levels of emotional well-being. It seems that if cancer patients feel overly sad and worried, those negative feelings consume all their energies. Therefore, whether or not they have high social support perception does not really influence their online information seeking behaviors. On the contrary, if cancer patients have high emotional well-being about their current health condition, what matters the most when determining their information seeking behaviors is whether they feel they have enough social support. Those with low perceived social support actively seek out all the possible cancer-related information to compensate for deficiency in social networks, whereas those with high perceived social support become the least likely to seek information. This finding supports the view that the more patients perceive that they receive social support from others — and the information flows that accompany it — the less likely they themselves are to seek out information about their illness.

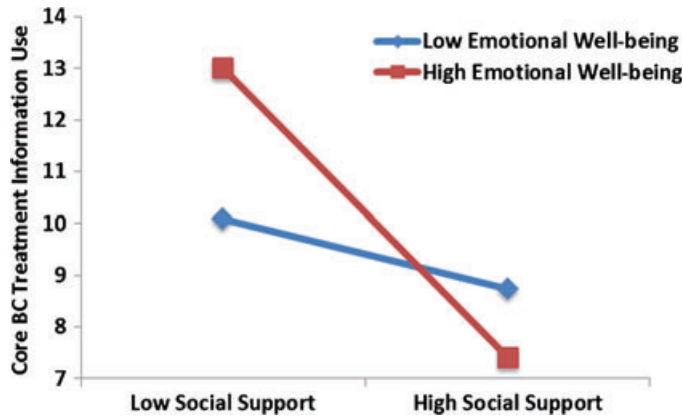


Figure 3 Interaction between social support perception and emotional well-being on core breast cancer treatment information use (Time spent in minutes)

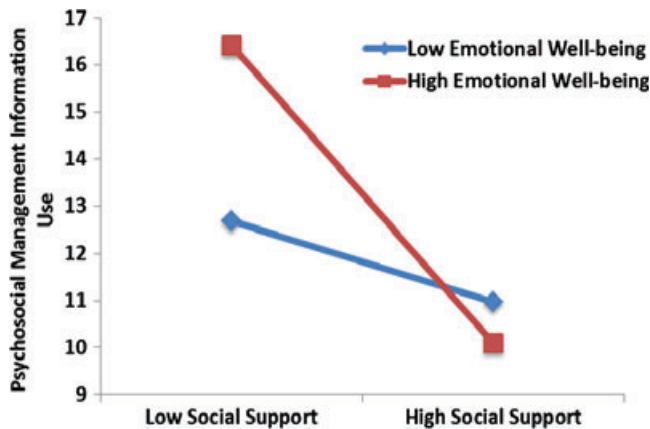


Figure 4 Interaction between social support perception and emotional well-being on psychosocial management information use (Time spent in minutes)

Although the study yields meaningful findings, it is not without limitations. First, besides social support perception and emotional well-being, there could be other factors that also contribute to explaining online health information seeking behaviors of cancer patients. For instance, in the study by Lee et al. (2008), it was health self-efficacy that moderated the relationship between negative emotions and online health information use. No single study, however, can or should cover all possible relationships caused by various contributing factors. Second, this data is collected from 2001 to 2003 when the Internet was less well developed as a health information resource, suggesting the results observed here may be tested in a contemporary information environment to examine whether they hold. We contend the findings from this study are still meaningful and applicable to today's environment because people at or below 250% of the federal poverty level still do not have enough Internet access in their homes. In fact, only about 36% of the U. S. households with incomes less than \$25,000 use broadband Internet, compared with 91.5% of those with incomes exceeding \$75,000

(National Telecommunications and Information Administration, 2010). In other words, the digital divide still exists and having the opportunity to use various CHES information services among the underrepresented could reduce this problem both at individual and societal levels.

Despite of these limitations, this study provides several important implications for future health communication research and interventions. First, it is noteworthy that this study has taken a novel methodological approach to analyze the actual use data to examine cancer patients' online information searching behaviors. Although self-report data could provide some insights as to people's perception and attitudes, they are often influenced by social desirability pressure or tainted by the limitation of recall and memory. By tracking the time and the URL of all the CHES information service web pages visited, this study was able to investigate patients' online information seeking patterns in greater detail. As Greenberg and his colleagues (2005) claim, these web tracking techniques can provide more detailed, accurate, and richer information about users' search patterns and in turn, contribute to deepening our understanding of information-selection and learning process of individuals regarding health related issues.

Moreover, although important, little research thus far has investigated moderating roles of patient's emotional factors when understanding health information acceptance in an e-health system (Or & Karsh, 2009). By exploring the interactive relationships of social support perception and emotional well-being, this study helps provide a clearer picture of *what* and *how* existing psychosocial conditions of cancer patients influence their actual information use. Finding consistent information seeking patterns with different types of cancer information (e.g. narrative style, psychosocial concerns, as well as instructive, and core treatment information) indicates that by investigating only a single factor, we cannot fully appreciate rather complex, interactive nature of decision-making processes among cancer patients. This may be why some previous studies have generated confusing findings about the same phenomena.

Further, the findings from this study can advise health professionals to use more individualized strategies to help cancer patients who are in different psychosocial states. For those with high social support and high emotional well-being who do not feel the need to use CHES information services, face-to-face interactions with clinicians may be more effective to alleviate their cancer related concerns. Conversely, ICCS may be most effective with those who lack social support but have the emotional well-being to manage their illness.

Finally, Keselman and his colleagues (2008) emphasized that in the field of health informatics, research should draw upon communication theories to account for social and emotional aspects that may influence health information seeking and acquisition behaviors of patients. Since further systematic research on the effects of various user characteristics when predicting information seeking is needed, the results of this investigation can guide e-health system designers to accurately evaluate a current system and create a more effective interactive communication tool that provides a range of tailored information contents and presentation strategies to educate patients with different information needs.

Notes

- 1 Square root transformation was conducted in an attempt to correct the positive skewness observed in each information service use, but the same patterns were revealed as in the original raw data. The raw data, therefore, were used for all the subsequent analyses done in this paper.
- 2 Because we expect that the use of different CHES information services would be correlated with one another, Promax rotation – one of the oblique rotation techniques that provide a more accurate and realistic representation of how factors are related to one another (Fabrigar, Wegener, MacCallum, & Strahan, 1999) – was chosen for the subsequent factor analyses.
- 3 The factor analysis table with the excluded items was omitted in the paper.

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