Health Communication

ISSN: 1041-0236 (Print) 1532-7027 (Online) Journal homepage: http://www.tandfonline.com/loi/hhth20

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To cite this article: Eunkyung Kim, Dietram A. Scheufele, Jeong Yeob Han & Dhavan Shah (2016): Opinion Leaders in Online Cancer Support Groups: An Investigation of Their Antecedents and Consequences, Health Communication, DOI: 10.1080/10410236.2015.1110005

To link to this article: http://dx.doi.org/10.1080/10410236.2015.1110005

HEALTH COMMUNICATION
http://dx.doi.org/10.1080/10410236.2015.1110005

Opinion Leaders in Online Cancer Support Groups: An Investigation of Their Antecedents and Consequences

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ABSTRACT

With a focus on the nature and dynamic process of social interactions among breast cancer patients, this study argues that the notion of opinion leaders can be another crucial factor in explaining positive psychosocial health outcomes within computer-mediated social support (CMSS) groups. This study investigates the relationship between opinion leaders and their psychosocial health benefits by considering two overarching questions: (a) Who are the opinion leaders? (b) What role do these opinion leaders play in explaining health outcomes? The data analyzed in this study resulted from merging human-coded content analysis of discussion group messages, action log data analysis of interactive health system usage, and longitudinal survey data. Surveys were administered to 221 women with breast cancer; participants were provided free access to and training for the CMSS groups developed by the Comprehensive Health Support System (CHESS) project. The findings suggest that opinion leaders obtained psychosocial health benefits, such as higher levels of cancer information competence, breast cancer knowledge, and better problem-focused coping strategies. Those who had a higher baseline level of breast cancer knowledge and optimism in coping with challenges in their life were more likely to act as opinion leaders. Implications for research and improving psychosocial interventions for people with health concerns are discussed.

Being diagnosed with breast cancer and undergoing various treatments can be a traumatic event for cancer patients and lead to a psychological, physical, and/or functional crisis (Spiegel & Giese-Davis, 2003). Breast cancer patients often experience anxieties and uncertainties about the prognosis of their illness; thus, their needs for information and support are likely to be high and variable during their cancer experience. Given the increasing role of e-health technology for providing education, social interaction, and resources (Eysenbach, 2001), one common way for patients to cope with these problems is to engage in interpersonal social interactions in order to organize their thoughts and feelings about their diagnosis (Davison, Pennebaker, & Dickerson, 2000). In fact, computer-mediated social support (CMSS) groups offer viable space for sharing knowledge and experience as well as providing and seeking social support in facing their illness (Hoybye, Johansen, & Tjornhoj-Thomsen, 2005; Shaw, McTavish, Hawkins, Gustafson, & Pingree, 2000). This study is particularly interested in CMSS groups as a unique form of supportive interpersonal communication.

Many scholars have argued that engagement in social support groups can empower patients, enlarge their control over their illnesses, and manage uncertainty about their situations, in turn leading to improved physical and emotional well-being (Kim et al., 2012; Rice & Katz, 2000). One of the most prevailing attributes of CMSS groups is supportive communication behavior among participants (Meier, Lyons, Frydman, Forlenza, & Rimer, 2007). Numerous studies have shown that such expression contributes to positive health outcomes, yielding increased patients' quality of life by alleviating the harmful effects of stressful experiences (Leung, Pachana, & McLaughlin, 2014; Lieberman. & Goldstein, 2005). In this supportive social interaction, advice and information support is one prevalent form of supportive communication behavior (Cutrona & Suhr, 1994). In this type of support, opinion leaders, as an informed and active individual resource, play a crucial role in giving advice and information about health to others, increasing knowledge about their areas of interest, and systematically promoting prosocial behaviors in diverse contexts (Scheufele & Shah, 2000; Weimann, 1994). Unfortunately, little is known about the nature and process of personal influence characterized as opinion leadership within online cancer support groups for breast cancer patients.

Accordingly, this study explicates the concept of opinion leaders and identifies them by assessing the "behavior" of what they actually communicated during discussions with other peer patients. We identify opinion leaders as those who influence their peers by actively giving them advice or information, which is in turn consumed by others in the context of social communication. Based on this conceptualization, the current study investigates the following questions: What are the characteristics of the key opinion leaders? Do opinion leaders

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achieve better psychosocial health outcomes? Our aim here is to provide both theoretical and practical insights into what makes CMSS groups effective and how patients facing life-threatening illnesses interact with and benefit from such systems.

Literature Review

The Conceptualization of Opinion Leaders Within CMSS Groups

The social diffusion model implies that the impact of health campaigns on a person's health behaviors is conveyed through the person's social interaction or conversation with others (Hornik & Yanovitzky, 2003). In this social interaction, the role of "personal influence," which is defined as "communication involving a face-to-face exchange between the communicator and the receiver" (Rogers & Cartano, 1962, p. 436), is consequential in predicting health attitudes and behaviors (Berkman, Glass, Brissette, & Seeman, 2000; Heaney & Israel, 2002). While identifying the specific forms of personal influence in social support behaviors, the notion of opinion leaders is, in part, thought to be another crucial factor in explaining the impact of personal influence on health-related decision making.

A number of researchers have paid attention to explicating and identifying the different dimensions of opinion leaders in social, political, marketing, and health arenas (Gladwell, 2002; Katz & Lazarsfeld, 1955; Kelly et al., 1991; Scheufele & Shah, 2000). Opinion leaders have been defined as "those individuals from whom others seek advice and information" (Rogers & Cartano, 1962, p. 435). Similarly, opinion leaders were identified as those who diffuse information or advice by discussing issues with other people in various discussion groups with the hope of shaping opinions (Weimann, 1994). More recently, Boster and his colleagues (2011) have considered three different qualities of influential others, including connectivity, persuasiveness, and mavens, and identified them as those who are well connected, very persuasive, or highly informed. Based on these criteria, our definition of opinion leaders is closely related to the notions of mavens and connectivity in that they are likely to be reliable sources of information for others with the same health problem and constantly share their information and knowledge by actively interacting with other peers. Opinion leaders are less likely to be persuaders who convince or sway others to their point of view, in that this notion is more applicable and effective in other health preventive interventions (i.e., smoking, drinking, drug use, and sexual risk behavior) or health promotion campaigns (i.e., cancer screening) than in our social support intervention among breast cancer patients.

All in all, given several important attributes of opinion leaders that emerged from various studies, they are often viewed as opinion and/or information resources and givers (Huffaker, 2010; Nisbet & Kotcher, 2009). One of the important components of opinion leadership is the ability to initiate and encourage communication and social interaction with other people. In addition, there is an underlying assumption that advice or information originated from opinion leaders is, in part at least, transmitted to other people in face-to-face communicative interaction in order to exert influences on other people. However, this basic assumption cannot be always fully met in computer-mediated communication, where it is often difficult for the sender to verify who read his or her message. In order to measure the influence in the context of computer-mediated communication, it is critical to make certain that the receiver has received the message that originated from the opinion leaders in their communicative discourse. With these considerations in mind, the present study defines opinion leaders as those who influence their peers by actively giving them advice or information about breast cancer issues, which is in turn consumed by others in the context of social communication.

The Operationalization of Opinion Leaders Within CMSS Groups

Studies have used diverse methods to identify opinion leaders: (a) sociometric methods, (b) informants' ratings methods, (c) self-designation methods, and (d) observation methods (Lazarsfeld, Berelson, & Gaudet, 1948; Weimann, 1994). Although each method has its own advantages and disadvantages, observational measurement can be considered more useful than the others for studying the natural process and effect of social interaction in the context of computer-system monitoring of actual usage of social support exchanges among patients with breast cancer with the following considerations: First, given our definition of "opinion leaders," this approach is consistent with the notion that opinion leaders can be operationalized by considering their social behaviors in their social relations to or with other people (Shah & Scheufele, 2006). Next, in the case of the patients with illnesses, there may be ethical barriers to conducting an experimental design that is designed for utilizing opinion leaders in only the experimental condition as compared to the control group because this intervention will benefit only the patients in the experiment group and cause potential risks to patients in the control group.

In utilizing an observation method in the context of CMSS groups, we were able to literally trace and assess the actual contents or topics that were exchanged between opinion leaders and nonleaders in every discourse. Therefore, the current study analyzed discussion-group usage data regarding message-relevant behavior and combined them with content analysis of messages to observe opinion leadership. Specifically, the communication behaviors of all group members were first extracted, including posted and read messages. Then the specific contents of each communication exchange, such as advice and information about cancer-related issues, were manually coded in terms of health intervention.

Each piece of advice and information about breast cancer that opinion leaders passed on to other patients is worth considering when measuring the influence and communication behavior of opinion leaders. Group members in online communities may perceive leaders based on the volume of their communication being passed to others (Huffaker, 2010). However, the number of posts by itself is not enough to gauge the flow of influence from opinion leaders to non-eaders. As claimed by Katz and Lazarsfeld (1955), when measuring the flow of influence, researchers should consider how advice seekers are related to their opinion leaders. Therefore, this study considered both (a) the number of postings made by opinion leaders and (b) the amount of reading that each of these posts received from others. For example, if person A posted a message on a discussion board but nobody read her message, this study did not identify her as an opinion leader because of the lack of relationship with others. In summary, this study identifies opinion leaders by assessing the "behavior" of what they actually communicated during the discussion with other peer patients.

The Impact of Opinion Leaders on Psychosocial Health Outcomes

Many scholars have argued that personal influence in interpersonal communication shapes health behavior (Hornik, 2002; Southwell & Yzer, 2007). Studies have found that there are several contributing factors that link opinion leadership and behavioral outcomes, including media exposure, social contacts, knowledge, and others (Weimann, 1994). Applying this logic to a health-related arena, because opinion leaders have a greater need and interest to be informed about and involved in their area of expertise (Weimann, 1994), they might be more likely to seek information and engage in discussion groups with others about their health concerns and issues within CMSS groups. This engagement ultimately leads to an intense degree of involvement with a specific issue or topic, characterized by a higher level of issue-specific knowledge (Nisbet & Kotcher, 2009; Trepte & Scherer, 2010). Similarly, opinion leaders are generally more secure about themselves and their abilities that lead to higher levels of self-esteem by those who accept their ideas or opinions (Clark & Goldsmith, 2005). As a result, opinion leaders are more likely to be knowledgeable and competent in their domain of interest and expertise. The perceived competence or knowledge can play an important role in the coping process, suggesting that this higher level of perceived competence or knowledge can be a powerful personal resource in increasing their adaptive adjustment to breast cancer and health-promoting behaviors (Bandura, 1995; Kyngas et al., 2001; Lazarus & Folkman, 1984). This cognitive function can help opinion leaders cope more effectively with their illnesses using problem-focused coping strategies. For example, people try to deal with their problem by directly reducing the stressful situation or changing their reactions to their problem. Furthermore, given that these kinds of psychosocial factors—knowledge, competence, or coping strategies—have been found to be strong predictors of quality of life (Kershaw, Northouse, Kritpracha, Schafenaker, & Mood, 2004; Lehto, Ojanen, & Kellokumpu-Lehtinen, 2005), opinion leadership is likely to correlate with higher quality of life.

Research Questions and Hypotheses

This study scrutinizes the antecedents and consequences of opinion leadership in the flow of interpersonal communication about health issues in the context of CMSS groups. We argue that individuals who offer advice and information to other patients—characterized as opinion leaders—are more likely to have a higher level of knowledge, competence, and quality of life and to cope well with their breast cancer. In an effort to clarify the linkage between opinion leadership and psychosocial health outcomes within the context of CMSS groups, this study tested the following hypotheses:

H1: Opinion leadership within CMSS groups will be positively related to cancer information competence.

H2: Opinion leadership within CMSS groups will be positively related to breast cancer knowledge.

H3: Opinion leadership within CMSS groups will be positively related to active coping.

H4: Opinion leadership within CMSS groups will be positively related to planning.

H5: Opinion leadership within CMSS groups will be positively related to quality of life.

Many studies tried to identify the profiles of opinion leaders by using both their social and personal dimensions. In particular, the following three dimensions identified by Katz (1957) guide us in the investigation: (a) who one is (i.e., the personification of certain values by the opinion leader's figure); (b) what one knows (i.e., the competence or knowledge related to the leaders); and (c) whom one knows (i.e., the strategic location in the social network). These criteria suggest that opinion leaders can be classified with the following factors: sociodemographics, the personal traits/personality, knowledge/competence, and social attributes. However, the antecedents of opinion leadership have received little attention in relation to health outcomes and CMSS groups. In order to fill this gap, the current study examined several dispositional traits of opinion leaders within CMSS groups. Therefore, we formulated the following research question:

RQ1: What are the characteristics of opinion leaders?

Methods

Recruitment and Participants

Discussion-group usage and survey data were collected from two randomized clinical trials of the Comprehensive Health Enhancement Support System (CHESS) developed by the University of Wisconsin–Madison during the period of April 1, 2005, through May 31, 2007. The CHESS system is comprised of three services: information, support, and interactive coaching. In particular, the CMSS groups within the support service are text-based, asynchronous bulletin boards that allow users to post messages anonymously or directly to other breast cancer patients (Gustafson et al., 2008).

Female breast cancer patients ($N = 661$) were recruited from three cancer institutions: Hartford Hospital (Connecticut), MD Anderson (Texas), and the University of Wisconsin–Madison. Eligibility criteria required that participants were within 2 months of breast cancer diagnosis and were able to read and write in English at least at a sixth-grade level. Participants could use their own computers or were provided with laptop computers, Internet access, and training on the CHESS system and Internet search engines for 6 months.

The participants were randomly assigned to one of six experimental conditions for a 6-month study period: (a) Internet only, (b) CHESS Information, (c) CHESS Information + Support, (d) Full CHESS (i.e., Information, Support, and Interactive Coaching), (e) Mentor only, and (f) Full CHESS + Mentor.[1] In the current study, which investigated discussion-group usage behavior, we focused exclusively on participants who could access the discussion group and had actually either posted or read at least one message during the 6 months of intervention. In our analysis, we included 221 women assigned to three conditions who met the criteria (i.e., n = 67 from CHESS Information + Support, n = 79 from Full CHESS, n = 75 from Full CHESS + Mentor). To determine differences in baseline scores (i.e., demographic and pretest value of psychosocial outcome variables) between those who were included in our analysis and those who were not, we performed both t-tests and chi-squared tests. The results revealed no statistically significant differences between our sample and those who were excluded from the analysis.[2] The participants in the current study had a mean age of 50.68 years, with ages ranging from 26 to 75 years. Education background was diverse, with about 12.8% having a high school degree, 27.9% having some college courses, 26.9% having a bachelor's degree, 8.2% having some graduate degree, and 22.4% having a graduate degree. The racial characteristics of the sample were 89.5% Caucasian and 10.5% non-Caucasian. Also, 10.5% of participants lived alone, whereas 89.5% of participants lived with others.

Procedures

In order to examine our inquiries effectively, the following three types of data were created and merged: First, examination of specific types of messages within CMSS groups has been accomplished through content analysis, which can unobtrusively identify the content and pattern of communication behaviors in messages posted by patients in CMSS groups (Neuendorf, 2002). Advice and information exchanges should be considered latent variables because they are often not directly observable; rather, their dynamics must be inferred. These communicative behaviors require careful interpretation and analysis by human coders. Therefore, this study utilized human content coding methods to identify latent and thematic constructs of advice and information exchanges as a meaningful activity of CMSS groups use.

Human-coded content analysis requires several steps. First, due to the huge volume of messages exchanged between patients (N = 10,780), 2,400 messages were randomly selected using a random integer generator to estimate advice and information exchanges for each patient. Next, based on a comprehensive literature review of communication behaviors in social support groups (e.g., Braithwaite, Waldron, & Finn, 1999; Cutrona & Suhr, 1994), we developed a coding scheme for advice and information giving. These exchanges included comments that (a) provided concrete, direct, and specific suggestions, direction, or guidance about possible courses of action or provided factual information and (b) offered the target a new or different way to look at or think about a problem or experience, including interpretations, evaluations, redefinitions, and reconceptualizations. Consistent with writing norms, a discrete message post was the unit of analysis. Two native coders were trained to classify the discussion group transcripts, and reliability estimates were conducted on a subset of 450 discussion posts between two human coders (Scott's pi = .81). Next, we integrated the message coding with action log data, which automatically tracks the message as a chain of posting/expression and reading/reception interactions on an individual keystroke level. The sequential information

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[1] Each condition was provided different numbers and types of support services. The first condition (Internet Only, n = 112) is the control group that received training on how to navigate and search for relevant information in the Internet. The second condition (CHESS Information Services, n = 118) received only the CHESS information services. The third condition (CHESS Information and Support Services, n = 109) received both the information and support services from CHESS. The Full CHESS condition (CHESS Information + Support + Interactive Coaching Services, n = 111) received all three types of CHESS services. The fifth condition (Human Cancer Mentor Only, n = 106) received customized, confidential services from only cancer experts without the use of any CHESS services. The final condition (Full CHESS + Human Cancer Mentor, n = 105) was offered both human cancer mentoring and all CHESS services. Refer to Hawkins et al. (2011) and Baker et al. (2011) for more details about the original study design.

[2] We have categorized those who did not post or read a message as nonusers and excluded this group of people in our analysis. However, some people may think that we should include this group, which comprises a substantial number of participants, in increasing the external validity. Therefore, we have run post hoc analyses using all participants in our sample. We found a marginally significant positive relationship between opinion leadership and cancer information competence (β = .18, $p < .1$). Similarly, opinion leadership was marginally positively related to breast cancer knowledge (β = .20, $p < .1$). Similar to our previous result, we found that Life Orientation Test–Revised (LOT-R) was positively related to opinion leadership measure (β = .24, $p < .05$). Interestingly, among covariates, we have found that those who live alone were less likely to gain cancer information competence (β = –.16, p < .05). Also, those who spent more time in discussion groups were more likely to have a better quality of life (β = .16, p < .05). In summary, we found a somewhat weak but similar trend toward significance when including nonusers. Despite the fact that we did not find the same significant patterns when including nonusers, here are some reasons why it is valid to exclude nonusers (n = 104) in our analyses: First, we agree that opinion leadership should be considered as a continuous variable, rather than a simple dichotomy, because it has the potential to yield a more sensitive classification of opinion leaders (Shah & Scheufele, 2006; Weimann, 1994). When we include nonusers, it would be difficult to differentiate between nonusers and non-leaders/followers at the lower end of our scale on the basis of our conceptual definition of opinion leaders. Next, most of health intervention studies at CHESS focuses on how people use different types of computer-based system of integrated services and how different types of engagement to this intervention produce beneficial outcomes to individuals with a health crisis (Han et al., 2009). Given the fact that nonusers who are self-selected are not different from users in terms of demographics and some psychosocial factors at the baseline survey, we believe that the use of CMSS groups can offer some positive changes to health behaviors for people with health concerns. In line with this reasoning, this study puts more emphasis on how participants consume cancer online support groups and on how these users produce significant improvement on their health outcomes rather than on how users and nonusers are different in their psychological health outcomes. Finally, we opted for excluding nonusers in part due to the heavily skewed distributions of the messages written and read measures and thus potentially violating the normality assumption in subsequent analyses. While that debate (i.e., inclusion of nonusers) is beyond our scope here, future studies will also benefit from categorizing different subgroups of users (i.e., nonusers, lurkers, followers, opinion leaders, etc.) in all initial participants and comparing any differences among different groups.

about every URL visited by each user allowed us to figure out which messages a user wrote and/or read in online support groups. Thus, this action log data analysis allowed us to investigate the more nuanced nature and process of discussion-group usage patterns. Finally, these action-level, content-coded data were combined with the baseline and 6-month survey data to test our hypotheses.

Measures

Opinion leadership. Opinion leadership was one of the key variables we measured. First, after identifying a message as containing advice and information about cancer topics, we classified it using two separate dimensions: poster and reader. To be clear, if the poster read her own message containing advice and information for others, it was not counted among the messages read by others. In addition, if a message was read by another reader multiple times, each instance was cumulatively counted among the messages read by others. Next, these message-level data were transformed and aggregated into individual-level data. Based on the data, opinion leadership (M = 13.84, SD = 32.93) was measured by considering both the number of written messages that contains advice and information for others (M = 1.87, SD = 4.32, range: 0–31) and the number of those same messages read by others (M = 14.66; SD = 28.87, range: 0–169). For example, if a user posts one message containing advice and information about breast cancer and three users consume this message, she gets a value of 3 for her opinion leadership scale. If a user posts a message but nobody reads this message, she gets a value of 0.

Psychosocial factors. Baseline and 6-month postintervention surveys were analyzed. Cancer information competence (M = 2.87, SD = .70, Cronbach's α = .78 for pretest; M = 3.16, SD = .61, Cronbach's α = .79 for 6 months) assessed a woman's perceived ability to obtain and use health care information she felt she needed (Gustafson et al., 2005). Breast cancer knowledge (M = 2.37, SD = .74, Cronbach's α = .89 for pretest; M = 2.98, SD = .62, Cronbach's α = .90 for 6 months) assessed a woman's knowledge about her condition or breast cancer treatment. Coping strategies with breast cancer were measured using the Brief COPE scale, which assesses how often an individual employs each of a number of potential coping responses to a stressor (Carver, Scheier, & Weintraub, 1989). Active coping (M = 2.20, SD = .78, Cronbach's α = .69 for pretest; M = 1.95, SD = .89, Cronbach's α = .81 for 6 months) assessed coping initiative and concentration. Planning (M = 2.13, SD = .83, Cronbach's α = .76 for pretest; M = 1.63, SD = .93, Cronbach's α = .83 for 6 months) was measured to evaluate coping readiness and consideration. The quality of life measure (M = 2.87, SD = .54, Cronbach's α = .83 for pretest; M = 2.95, SD = .52, Cronbach's α = .85 for 6 months) assessed several psychosocial, social, and overall dimensions of quality of life using test–retest reliability and sensitivity to change (The WHOQOL Group, 1994).

We also include additional measures of psychosocial factors assessed at only the pretest survey, such as functional well-being, the Center for Epidemiological Studies–Depression (CES-D), breast cancer concern, and social support. Functional well-being (M = 2.55, SD = .78, Cronbach's α = .85 for pretest) was widely used and had been validated extensively in other studies, and assessed the degree of concern about potential emotional, physical, and body image consequences of cancer, its treatments, and their side effects (Brady et al., 1997). CES-D (M = .92, SD = .65, Cronbach's α = .87 for pretest) measured symptoms associated with depression (Radloff, 1977) and was widely used in the patient population (Gustafson et al., 1999). Breast cancer concern (M = 1.10, SD = .61, Cronbach's α = .64 for pretest) gauged breast cancer patients' emotional, physical, and body image concerns and distress related to treatments and side effects (Brady et al., 1997). Social support (M = 3.41, SD = .67, Cronbach's α = .89 for pretest) measured perceived and expected support in terms of emotional, informational, and instrumental support of friends, family, coworkers, and others (Gustafson et al., 2005).

Demographic and Health Characteristics

A baseline survey also included demographic factors such as age, ethnicity (Caucasian = 1 and non-Caucasian = 0), education, and living situation (living alone = 1 and not living alone = 0). Disease-related factor such as time between cancer diagnosis and start date of intervention (or time since diagnosis) was also included.

Personality traits. Personality traits were measured on a 7-point scale ranging from 0 (*disagree strongly*) to 6 (*agree strongly*), using 4 items about whether participants agreed or disagreed with the following statements: (a) extraverted, enthusiastic (M = 4.25, SD = 1.66, 2), (b) anxious, easily upset (reverse-coded) (M = 2.66, SD = 1.67), (c) sympathetic, warm (M = 5.14, SD = .92), and (d) calm, emotionally stable (M = 4.43, SD = 1.36). The Life Orientation Test–Revised (LOT-R) measure (M = 2.93, SD = .84, Cronbach's α = .83) assessed individual differences in general optimism versus pessimism; this measure has been widely used in research on the behavioral, affective, and health consequences of this personality variable (Scheier, Carver, & Bridges, 1994). The specific question wordings of all items are presented in the Appendix.

Analytical frameworks. A set of hypotheses was posed to examine whether patients who were identified as opinion leaders experienced greater improvements in health outcomes. To test this idea, we used hierarchical ordinary least squares (OLS) regression models to separately test models predicting our dependent variables. In hierarchical regression modeling, the pretest counterparts of the dependent variables were entered in the first block to examine changes in each dependent variable from the baseline to 6-month follow-up. Additional covariates were entered in blocks: (a) overall discussion group use, and (b) sociodemographics, disease-related factor, and a dummy variable of three randomized conditions that shared a component of an online support group. In addition, the research question addressed the characteristics the opinion leaders might have within CMSS groups. In order to answer this question, we also utilized a hierarchical regression analysis. Several variables as measured at baseline survey were entered in blocks to examine their relative explanatory power, including sociodemographics, personality traits, and psychological factors.

Results

Psychosocial Health Outcomes

As shown in Table 1, the regression model predicting cancer information competence accounted for a total 26.3% of the variance. Cancer information competence measured at the pretest was a strong predictor of the corresponding 6-month outcome (β = .41, $p < .001$). Among control variables, none of these variables were significant. As expected from our H1, we found a significant positive relationship between opinion leadership and cancer information competence, suggesting that those who actively give more advice and information to others are more likely to gain cancer information competence within CMSS group (ß = .27, $p < .05$). Similar to the previous result, breast cancer knowledge measured at the pretest was a strong predictor of the corresponding six-month outcome (β = .39, $p < .001$). As predicted in our H2, opinion leadership was significantly positively related to breast cancer knowledge, suggesting that those who give more advice and information to others were more likely to obtain breast cancer knowledge (β = .31, $p < .05$). In addition, the regression model predicting active coping accounted for a total 20.4% of the variance. Active coping measured at the pretest was a significant predictor of the corresponding 6-month outcome (β = .22, $p < .05$). We found considerable support for our H3, indicating that those who give more advice and information to others employed more active coping strategies in dealing with their illness (β = .32, $p < .05$). Our regression model explained 29.2% of the variance in planning. Only planning measured at pretest remained significant in the final model (β = .38, $p < .001$). Similarly, the regression model predicting quality of life accounted for a total 54.0% of the variance and only the pretest counterpart of quality of life was significant (β = .74, $p < .001$). Therefore, neither H4 nor H5 was supported.

Demographics, Personality Traits, and Psychosocial Factors

As shown in Table 2, the regression model predicting opinion leadership accounted for a total 16.9% of the variance. Opinion leaders were not different from others in terms of sociodemographic measures. In terms of personality traits, however, we found that Life Orientation Test–Revised

Table 2. Predicting opinion leadership (N = 221).

Criterion variables	Opinion leadership
Block 1: Demographics (pretest)	
Age	.00
Ethnicity	−.03
Education	−.14
Live alone (Yes = 1)	.08
Incremental R^2 (%)	*2.7*
Block 2: Personality traits (pretest)	
Extraverted, enthusiastic	−.20
Anxious, easily upset	.05
Sympathetic, warm	.14
Calm, emotionally stable	−.15
LOT-R	.33*
Incremental R^2 (%)	8.6
Block 3: Psychosocial factors (pretest)	
Breast cancer knowledge	.22*
Quality of life	−.24
Functional well-being	.11
CES–Depression	.13
Breast cancer concern	−.01
Social support	−.09
Incremental R^2 (%)	*5.6*
Total R^2 (%)	16.9

Note. Cell entries refer to the final standardized regression coefficient.
*p < .05, **p < .01, ***p < .001; two-tailed; listwise deletion.

Table 1. Hierarchical regression analyses predicting hypothesized outcome variables (N = 221).

Criterion variable	Cancer information competence	Breast cancer knowledge	Active coping	Planning	Quality of life
Block 1: Control variables (pretest)					
Cancer information competence	.41***	—	—	—	—
Breast cancer knowledge	—	.39***	—	—	—
Active coping (pretest)	—	—	.22*	—	—
Planning (pretest)	—	—	—	.38***	.74***
Quality of life (pretest)				—	
Incremental R^2 (%)	*15.3****	*20.3****	*4.3**	*13.8****	*47.2****
Block 2: Discussion-group use					
Discussion-group use	.01	−.22	.05	.26	.10
Incremental R^2 (%)	*4.1**	*0*	*7.4***	*1.2*	*2.5**
Block 3: Sociodemographics and disease factors					
Age	.02	−.02	−.06	−.13	−.06
Ethnicity	−.01	.07	−.04	.06	−.08
Education	−.04	−.03	.10	.09	−.07
Live alone (Yes = 1)	−.06	−.05	−.07	−.15	−.01
Days since diagnosis	.04	−.12	.11	−.18	.06
Info + support group	.02	.07	−.10	−.17	.07
CHESS group	−.20	−.08	−.19	−.13	−.13
Incremental R^2 (%)	*3.7**	*3.3*	*3.9*	*13.3**	*3.9*
Block 3: Main effect					
Opinion leadership	.27*	.31*	.32*	−.13	.10
Incremental R^2 (%)	*3.2**	*3.9**	*4.8**	*0.8*	*0.4*
Total R^2 (%)	*26.3*	*27.6*	*20.4*	*29.2*	54.0

Note. Cell entries refer to the final standardized regression coefficient.
*p < .05, **p < .01, ***p < .001; two-tailed; listwise deletion.

(LOT-R) was positively related to opinion leadership measure, suggesting that opinion leaders were more likely to be optimistic (β = .33, $p < .05$). Our result indicated that opinion leaders were more informed in their areas of expertise, suggesting that those who had a higher baseline level of breast cancer knowledge were more likely to act as opinion leaders (β = .22, $p < .05$).

Discussion

A number of significant findings are noteworthy. Consistent with the previous studies that have adopted the concept of opinion leadership to community-based health campaigns, this study revealed that opinion leaders have significantly improved various psychosocial health outcomes in CMSS groups (Kelly et al., 1991; Puska et al., 1986). Opinion leaders with the same health problem had a higher level of cancer information competence and breast cancer knowledge, suggesting that they become more competent and gain more knowledge about breast cancer during an e-health intervention. More importantly, opinion leaders were more likely to adopt an active coping strategy by effectively confronting and resolving the problem in order to reduce the stress around the situation. Opinion leadership, however, is not a significant determinant of quality of life of breast cancer patients, which may be not proximal outcomes for effects to be seen. In other words, several potential factors such as knowledge, competence, and coping strategies may play a mediating or moderating role in predicting quality of life. In particular, given the significant role of opinion leadership only on active coping, the intervening roles of coping strategies with breast cancer in explaining the relationship between opinion leadership and quality of life may depend on types of coping strategies used. Therefore, future study should utilize more diverse types of coping strategies (i.e., planning, suppression of competing activities, restraint coping, seeking of instrumental social support with breast cancer; e.g., Carver et al., 1989) to extend our model. In general, these results suggest that offering advice and information concerning cancer topics to their peers in online cancer support groups can be a crucial communication activity in gaining competence, knowledge, and adaptive psychological adjustment with regard to breast cancer experience.

Interestingly, unlike the traditional framework of opinion leaders where individual demographic characteristics drive their personal influence (Xu, Sang, Blasiola, & Park, 2014), our study found that sociodemographic variables provided little contribution in describing opinion leaders. This may be because, even in our randomized control trial, our sample is rather homogeneous and displays little variance in terms of race, education, and living condition. According to the group composition of the CMSS groups in the current study, 89.5% of participants were Caucasians, 85.4% of participants had college or higher levels of education, and 89.5% of participants lived with others, suggesting that these factors were less likely to predict opinion leadership. Therefore, future health intervention needs to pay more attention to diverse characteristics of patients when recruiting them to the study. For example, African-American women and other minority groups should be properly represented in CMSS composition to promote social interaction with others and avoid widening health-related disparities between different racial and ethnic populations (Thompson et al., 2013). In terms of personality traits, we found that opinion leaders hold positive expectancies for their future. We also found that opinion leaders were well informed in their areas of expertise. These two characteristics can be effective identifiers for opinion leadership in health interventions. These findings suggest that adequate representation of opinion leaders and followers in CMSS or social network composition with a consideration of these antecedent factors is a crucial way to lead effective and successful health intervention.

Our analysis provides a number of insights with theoretical, methodological, and practical implications. This study contributes to health communication and e-health campaign research by advancing the important role of interpersonal communication, suggesting that the role of opinion leaders is critical in promoting health education and behavior. Many scholars claim that achieving a high level of or adequate exposure to systematically designed messages during health intervention is crucial to a successful and effective campaign (Hornik, 2002; Hornik & Yanovitzky, 2003). This standard, in part, can be met by deliberately designing and promoting a natural social diffusion of supportive messages, particularly through changing agents—opinion leaders—within CMSS groups for successful e-health intervention (Valente & Fosados, 2006).

This study offers a novel method for assessing opinion leadership. Current studies in the fields of e-health communication require methodological advances that move beyond subjective or self-report measures when assessing the dynamics of social interaction. Our study employed an unobtrusive measure of opinion leadership behaviors using the combined sets of content analysis and action log data of computer usage. It allows researchers to overcome the problems of self-reported measure and uncover the nuanced nature and process of social interaction in CMSS groups. Even if this method may requires more time and effort, this method may be useful in online health interventions in that it is difficult to reach patients with illness in post hoc survey or interview. Moreover, this method can be applied to social media that carry the health-enhancing potential to maximize the reach and impact of health communication intervention through health-related information sharing, social connection, and social support exchanges (Chou, Hunt, Beckjord, Moser, & Hesse, 2009; Eysenbach, 2008).

The findings of the current study also have a number of practical implications for health practitioners and policymakers interested in developing effective health educations for patients. Depending on the level of engagement, cancer patients may participate in CMSS groups in a different manner (Han, Hou, Kim, & Gustafson, 2014). Since our findings suggest that cancer patients can empower themselves through productive communicative interaction with other patients, researchers and health care professionals should provide adequate communication trainings for patients so that they can communicate more effectively with such skills as initiating conversations, offering advice to other patients, and responding to other patients' problems as they have experienced them. Having confirmed the important role of opinion leadership played within CMSS groups, our study underscores the need to design future intervention that stimulates active social agents and sustains their constant involvement by creating messages aimed at potential opinion leaders. Future interventions should also target the followers who may require additional information and support, and put ample effort into encouraging their substantial engagement in communicative interactions in order to reduce possible disparities in competence, knowledge, and coping strategies between opinion leaders and followers. In particular, future intervention should target lurkers—those who "read but seldom if ever publicly contribute to an online group" (Nonnecke & Preece, 2003, p. 110)—to participate more actively in their online social networks and optimize their benefits that may accrue through the dynamic social interactions with opinion leaders.

Limitations in this study are related primarily to measurement. There has not been much consensus on defining the nature of opinion leadership, suggesting that measuring the flow of expertise and influence of opinion leaders is complex (Feick, Price, & Higie, 1986). While traditional research has emphasized the top-down or hierarchical structures of influence from opinion leaders to followers (Katz & Lazarsfeld, 1955), more recent scholarship has examined opinion leaders in the context of social networks, typically defining them as highly connected people in their respective social networks (Watts & Dodds, 2007). Unlike these approaches, the present study focused on (a) the specific content of messages, (b) others' reception of those messages as evidence of influence, and (c) the nature of social interaction between influencers and the people who turn to them independent of any formal role or hierarchical structure. However, we should acknowledge that our measure of opinion leadership may not be sufficient to directly gauge the flow of personal influence, which is often measured by opinion leaders' or followers' perception in traditional approaches and methods. Therefore, future studies need to refine and develop more sophisticated measurements of opinion leadership with a focus on personal influence and to verify our findings using diverse methods, such as self-reported measures, interviews, and so on.

Furthermore, opinion leaders here could potentially mobilize experiential knowledge of cancer, which is knowledge gained through experiences during their treatment process (Wehling, Viehöver, & Koenen, 2014). We think that this type of knowledge spurs patients' interest, but if opinion leaders may provide confusing or conflicting information about treatment options as compared to the biomedical knowledge, this may to lead negative responses for followers and limited or negative influences on them. Therefore, it would be worthwhile for future work to employ a receiver-based definition of opinion leadership by examining how the information provided by the opinion leaders are perceived as useful, credible, or controversial and how this affects the valence of followers' responses when exposed to different views and opinions in CMSS groups.

Finally, given the prevalence of participatory Internet use known as social media (Eysenbach, 2008), one might question the external validity of the present study since the current online support group system may not reflect the reality of how people interact with one another under various social media tools and platforms. As noted, CMSS groups within CHESS are text-based, asynchronous bulletin boards, but social media platforms adopt more advanced participatory and collaborative tools such as instant messaging, short message service, picture or video sharing, or video conferencing, which can effectively enhance more engagement and interaction among users. Nevertheless, the dynamic nature and process of interpersonal communication among patients examined in the current study could remain useful since the process of human communication must be still relevant for any platforms of social media. With this in mind, future research should continue to investigate how people form social interaction and networks through social media, which may allow patients to have control over information sharing, to more easily connect with many others facing similar challenges, and to promote social support exchanges efficiently.

All in all, online support groups are an important venue for delivering health education and support for patients. In particular, opinion leaders can be crucial agents of change who share pragmatic experiential knowledge and promote beneficial health decision making when communicating with other breast cancer patients.

Funding

This study was funded by P50 CA095817-05 from the National Cancer Institute.

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Appendix: Question Wording

Cancer information competence measured on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*), using five items about whether participants agreed or disagreed with the following statements: 1) I know exactly what it is that I want to learn about my health, 2) I can figure out how and where to get the information I need, 3) Health information is more difficult for me to obtain than other types of information, 4) I am satisfied with the way I currently learn about health issues, and 5) I feel that I am in control over how and what I learn about my health.

Breast cancer knowledge was measured with on a 5-point scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*), using eight items about how much patients have agreed or disagreed with each of the following: 1) The effect my treatment will have on my quality of life, 2) How to deal with breast cancer in my work and with my family, 3) What my treatments will be like, 4) The pros and cons of various treatment approaches, 5) How to know if a health care provider is good, 6) How to get through my treatments and their side effects, 7) How to get a second opinion if I want one, and 8) I knew what the side effects of my treatment would be, before I started.

Coping strategies with breast cancer was measured on a 4-point scale ranging from 0 (*I haven't been doing this at all*) to 3 (*I've been doing this a lot*), with each scale consisting of two items about how patients have attempted to cope with stress in their lives since they were diagnosed with cancer. *Active coping* was assessed using two items: 1) I've been concentrating my efforts on doing something about the situation I'm in, and 2) I've been taking action to try to make the situation better. *Planning* was measured using two items: 1) I've been trying to come up with a strategy about what to do, and 2) I've been thinking hard about what steps to take.

Quality of life was composed of several psychosocial, social, and overall dimensions of quality of life. *Psychosocial dimension* was assessed on a 5-point scale ranging from 0 (*not at all/very dissatisfied/never*) to 4 (*an extreme amount/completely/very satisfied/always*), using six items about how much participants had experienced certain things in the last 4 weeks: 1) How much do you enjoy life?, 2) To what extent do you feel your life to be meaningful?, 3) How well are you able to concentrate?, 4) Are you able to accept your bodily appearance?, 5) How satisfied are you with yourself?, and 6) How often do you have negative feelings such as a blue mood, despair, anxiety, depression? *Social dimension* was assessed on a 5-point scale ranging from 0 (*very dissatisfied*) to 4 (*very satisfied*), using three items about how much participants have experienced each of the following in the last 4 weeks: 1) How satisfied are you with your personal relationships?, 2) How satisfied are you with your sex life?, and 3) How satisfied are you with the support you get from your friends? *Overall dimension* was assessed on a 5-point scale ranging from 0 (*very poor*) to 4 (*very good*), using two items about how participants think about their life in the last 4 weeks: 1) How would you rate your quality of life?, and 2) How satisfied are you with your health?

Functional well-being was measured on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*), using seven items about how often participants have felt or experienced certain things in the last 4 weeks: 1) I was able to work, 2) My work was fulfilling, 3) I was able to enjoy life "in the moment," 4) I accepted my illness, 5) I was sleeping well, 6) I was enjoying my usual leisure pursuits, and 7) I was content with the quality of my life.

The Center for Epidemiological Studies–Depression (CES-D) was assessed on a 4-point scale ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*), using eight items about how often participants have felt this way in the past week: 1) I felt that I could not shake off the blues even with help from my family or friends, 2) I felt depressed, 3) I thought my life had been a failure, 4) I felt fearful, 5) My sleep was restless, 6) I felt lonely, 7) I had crying spells, and 8) I felt sad.

Breast cancer concern was measured on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*), using nine items about how much participants agreed or disagreed with the following statements: 1) I was short of breath, 2) I was self-conscious about the way I dress, 3) I was bothered by swollen or tender arms, 4) I felt sexually attractive (reverse coded), 5) My hair loss bothered me, 6) I worried about the risk of cancer in other family members, 7) I worried about the effect of stress on my illness, 8) My change in weight bothered me, and 9) I am able to feel like a woman (reverse coded).

Social support was assessed on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*), using six items about how true each statement is for participants: 1) There are people I could count on for emotional support, 2) There are people who will help me understand things I'm finding out about my illness, 3) I am pretty much all alone (reverse coded), 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.

Life Orientation Test–Revised (LOT-R) was measured on a 5-point scale ranging from 0 (*agree a lot*) to 6 (*disagree a lot*), using 6 items about whether participants agreed or disagreed with the following statements: 1) In uncertain times, I usually expect the best (reverse coded), 2) If something can go wrong for me, it will, 3) I'm always optimistic about my future (reverse coded), 4) I hardly ever expect things to go my way, 5) I rarely count on good things happening to me, and 6) Overall, I expect more good things to happen to me than bad (reverse coded).