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The Difference in the Online Medical Information Searching Behaviors of Hospital Patients and Their Relatives versus the General Public

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ABSTRACT

The purpose of this study is two-fold: to explore the differences in online medical information searching behaviors, including evaluative standards and search strategies, of the general public (general group) and those of hospital patients and their relatives (hospital group); and to compare the predictive relationship between the evaluative standards and search strategies of the two groups. A Medical Information Searching-behavior Survey (MISS) was administered. A total of 247 people in the hospital group were surveyed while they were in hospital, and 293 volunteers in the general group were surveyed. The results reveal that the hospital group showed higher tendencies to verify online medical information with mixed evaluative standards and to use more sophisticated search strategies than the general public group after comparing the descriptive results. From the results of regression analysis, the evaluative standards of the hospital group play a less important role in their search strategies. In contrast, the significant relationships between the evaluative standards and search strategies are relatively complex in the general group. Even though some of their evaluative standards are significant factors for predicting search strategies, other factors should be considered in future studies to fruitfully explain their online medical information searching behaviors.

Keywords

Online medical information, Evaluative standard, Search strategy

Introduction

With the explosion of online information in recent years, the Internet has become a preferred source of medical information in our society (Lemire, Pare, Sicotte, & Harvey, 2008; Kammerer, Braten, Gerjets, & Stromso, 2013). Related studies have demonstrated that many people around the world have become accustomed to searching for medical and health information on the Internet (McMullan, 2006; Oh, Kreps, Jun, Chong, & Ramsey, 2012; Renahy, Parizot, & Chauvin, 2010). The growth in online information provides Web users with more opportunities to manage their own health problems and to make decisions about medical issues (Morahan-Martin, 2004; Renahy et al., 2010). That is, in contemporary information society, widely accessible online medical information provides more possibilities to facilitate Web users' health management (Eysenbach, Powell, Kuss, & Sa, 2002), and thus to expand the health care system (Haux, 2002).

However, the plentiful information on the Internet can not only make Web users feel overwhelmed (Loeber & Cristea, 2003), but it also suffers from low credibility (Metzger, 2007), including inadequate medical information (Hong, 2006; Morahan-Martin, 2004). For example, Web users usually get a great deal of medical information when they are searching with a search engine, but they rarely visit those search results beyond the first page (Morahan-Martin, 2004). Although the Internet is a favorite channel of seeking health information, Oh et al. (2012) reported a higher percentage of trust in traditional media (i.e., newspapers or magazines). The quality of numerous sources of online medical information is one of the issues that has received considerable attention (Hanif, Read, Goodacre, Chaudhry, & Gibbs, 2009; Lemire et al., 2008), as the questionable quality of the information has resulted in potential dangers related to its unsuitable use (Benigeri & Pluye, 2003; Benotsch, Kalichman, & Weinhardt, 2004). Additionally, in some developed nations, the growth of aging population implies the societal need of credible online medical information for health management (Seçkin, 2010).

To respond to this crucial problem, standards and filtering tools have been developed by previous studies (Hanif et al., 2009). On the one hand, many institutions have established standards for evaluating the quality of online medical information, such as the JAMA benchmarks from the Journal of the American Medical Association and the HON

(Health On the Net) codes from Health on the net foundations. These standards provide many criteria (e.g., authority, accuracy, attributions of source, and so on) for web users to assess, control and assure the quality of the information they find. On the other hand, some quality controls or filtering tools to help them to access trustworthy online medical information have also been established. For example, Sladek, Tieman, Fazekas, Abernethy, & Currow (2006) built a search filter to select appropriate information from the medical literature.
However, Hanif et al. (2009) indicated that the quality of the websites can still vary even if they possess a benchmark, and the filtering system might give users a false sense of security. Metzger et al. (2007) have reviewed students' cognitive models for evaluating online information and highlighted the importance of related issues, and recommended that the study of users' perceptions or beliefs when evaluating the credibility of online information should be explored further. After reviewing 129 related studies, Anker, Reinhart, & Feeley (2011) reported that the previous studies were mainly conducted to measure users' perceptions of source quality or credibility. Studies investigating how Web users assess the credibility of online medical information are relatively few in number. As online medical information begins to play an active role in people's management of their personal health, exploring Web users' personal perceptions or beliefs regarding evaluating online medical information and the way they select online medical information is essential (Rains, 2007), and is thus one of the research purposes in this study.

A framework of medical information searching behaviors

In order to explore the standards Web users adopt to filter or select online information, Tsai (2004) conducted an interview study and then proposed a theoretical framework, called "Information commitment." The framework is an attempt to illustrate Web users' online searching behaviors, including their evaluative standards and information search strategies on the Internet.

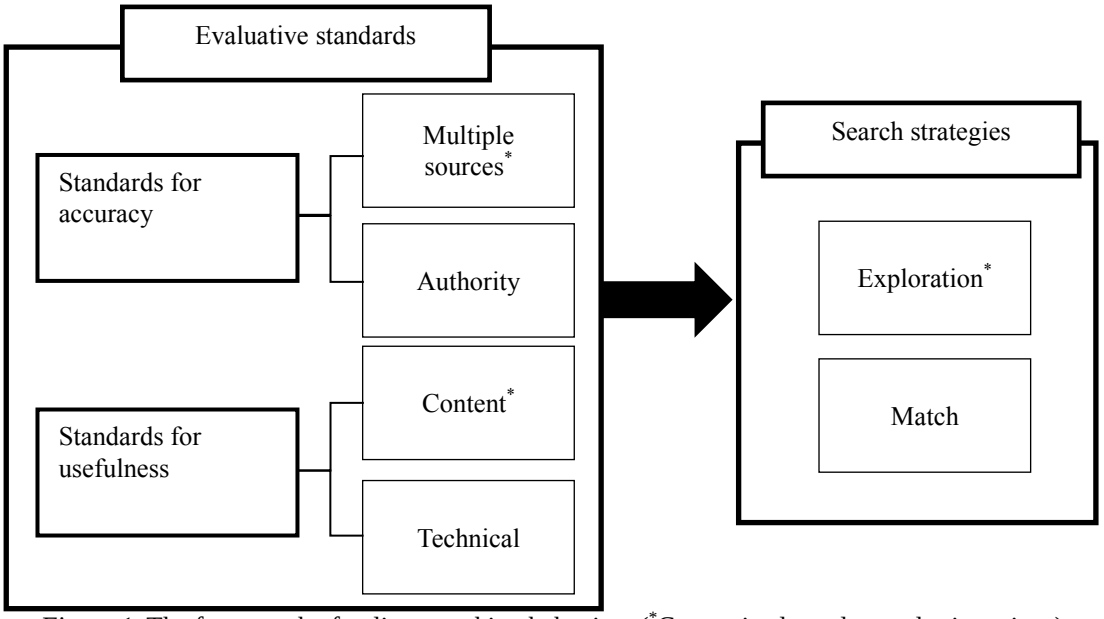

Figure 1. The framework of online searching behaviors (*Categorized as advanced orientations)

As shown in Figure 1, the framework consists of two components: "Evaluative standard" and "Search strategy." In the first component, two aspects and four orientations are identified. The first aspect is related to "Standards for Accuracy," including "Multiple Sources" and "Authority" orientations. Web users would verify the accuracy of web information by either triangulating information from multiple sources or checking the authority of the website. The second aspect covers "Standards for Usefulness," including "Content" and "Technical" orientations. Web users would consider the relevancy of the content to determine its usefulness on the one hand, or its ease of retrieval on the other. The second component is "Search Strategy," which refers to the approach that Web users employ to seek information online. It investigates their preferences toward information selecting and processing when fulfilling the purpose of search. In this regard, two orientations are also identified. Web users will use "Elaboration" to integrate collected information, or "Match" to compare existing Web information with intended searches. Among these six

orientations, "Multiple Sources," "Content" and "Elaboration" are categorized as advanced, and are often adopted by experts, while the remaining three are categorized as less advanced, and are often used by novices (Tsai, 2004).

Wu and Tsai (2005, 2007) then undertook subsequent studies to validate the framework. An instrument for exploring college students' evaluative standards and search strategies of online information was then developed. After exploratory and confirmatory factor analyses, the results showed that the framework is coherent with Tsai's study (2004) and the instrument is an adequate tool with sufficient reliability and validity. Accordingly, the framework and the instrument might be suitable for exploring Web users' online medical information searching behaviors, including their evaluative standards and search strategies.

The possible disparity of online medical information searching behaviors

In a previous study, Liang and Tsai (2009) argued that medical students showed different online information searching behaviors from university students in general, and gender difference existed in the students' usage of certain searching strategies. Moreover, researchers have indicated that disparities exist in access to and needs of online health information among individuals (Anker et al., 2011; Renahy et al., 2010). Web users with more perceived health risks, such as patients or their relatives, have shown tendencies to search for medical information online (Rice, 2006; Yun & Park, 2010). For example, relatives and patients showed higher motives for online medical information seeking than general populations in Rice's report. Anker et al. (2011) concluded that Web users' personal health conditions play an important role in their searching behaviors. Most patients believe that getting enough medical information will be helpful and empowering when discussing their condition with their physicians and making crucial decisions about their health (Rains, 2007). Based on the above literatures, Web users' online searching behaviors display individual differences, and the disparity of online medical information searching behaviors may exist in different groups. The stronger motives held by relatives and patients might make certain differences from general public. However, researchers have rarely conducted comparative studies to illustrate the differences and to examine the role of relatives' and patients' immediate health concerns in their online medical information searching behaviors.

Thus, the present study hypothesized that, people facing medical problems, such as patients and their relatives, are assumed to have a greater need for abundant and accurate medical information, and consequently use different evaluative standards and search strategies from those used by the general public. To compare the different populations' (i.e., hospital patients and their relatives versus the general public) online medical information searching behaviors is one of the research purposes in this study.

The relationships between Web users' evaluative standards and their online search strategies

Tsai (2004) has asserted that Web users' evaluative standards play an important role in their search strategies. Wu and Tsai (2005) then identified the implicit component (i.e., evaluative standards) and the explicit component (i.e., search strategies) from the Information commitment framework, and indicated that the implicit component influences the explicit component. In their study, students who used multiple sources and relevance of web content to evaluate the accuracy and usefulness of online information tended to employ the elaborative information search strategy, while those who used the authority and technical elements of online information tended to use the "Match" search strategy. The results imply that Web users' different evaluative standards could lead to different search strategies when searching for medical information on the Internet.

As previously mentioned, patients and relatives showed higher motives and more pressing needs in searching online medical information, and may exhibit different searching behaviors from general public. Accordingly, it is hypothesized that the predictive relationships between standards and search strategies may be also different between these two populations. However, the interplay between the evaluative standards and search strategies was mainly explored in single target. The relationships across different groups should be explored, but there is a lack of related research.

In sum, this study aimed to investigate the possible disparities of online medical information searching behaviors existed in different groups, and then compare their predictive relationship between the evaluative standards and

search strategies. For fulfilling these research purposes, an instrument for measuring online medical information searching behaviors was validated as well. The research questions are specified as below:

- Is there any difference in online medical information searching behaviors between hospital patients and their relatives and the general public? If yes, what are they?
- How do people's evaluative standards predict their search strategies in these two groups? Is there any difference in the predictive relationship between these two groups?

Methods

Participants

The participants of this study were 540, ranging in age from 30 to 69 years old (M = 45.1 years), who self-reported that they had experience of searching online for medical information in Taiwan. The average was 3.67 when asked their frequency of searching for medical information on the Internet on a 7 point Likert-scale (from always [7] to never [1]). Over half of the participants (62%) spent less than 20 hours online per week.

These participants consisted of two groups: hospital group and general public group. The hospital group included 247 patients and their relatives (135 males and 112 females) who aged from 30 to 69. The general public included 293 (140 males and 153 females) whose age was from 30 to 62. In terms of frequency of searching online medical information, their average was 3.71 and 3.64 (7 point Likert-scale) in the hospital group and general public groups, respectively. The participants in both groups showed medium frequencies. All of them were volunteers recruited in the hospital or public places.

Instrument

In order to investigate the participants' evaluative standards and search strategies, a questionnaire called Medical Information Searching-behavior Survey (MISS) was employed in this study. The MISS, which was mainly modified from Wu and Tsai's (2005) questionnaire, comprised three aspects: (1) standards for accuracy of online medical information, (2) standards for usefulness of online medical information, and (3) search strategies for online medical information. The modified items were examined by three experts who are all unversity professors and experienced researhcers, and their reliability and validity were also examined through exploratory factor analysis (EFA). As previously mentioned, each aspect contains two orientations. The six orientations that include 36 items construct the main structure of the MISS (items are presented in Table 1):

- *Multiple sources as accuracy scale (Multiple sources) with 5 items*: measuring the extent to which web users will validate the correctness of unknown online medical information by various sources, such as related websites, prior knowledge, peers or other printed materials.
- *Authority as accuracy scale (Authority) with 7 items*: assessing the extent to which web users will examine the accuracy of unknown online medical information by the "authority" of the websites or sources.
- *Content as usefulness scale (Content) with 5 items*: measuring the extent to which web users will assess the usefulness of the online medical information by the relevancy of its content.
- *Technical issues as usefulness scale (Technical) with 7 items*: assessing the extent to which web users will judge the usefulness of the online medical information by the ease of retrieval, the ease of searching or the ease of obtaining information. Therefore, their standard for evaluating online medical information is more closely related to some technical issues.
- *Elaboration as search strategy scale (Elaboration) with 6 items*: measuring the extent to which web users will have purposeful (metacognitive) thinking or integrate online medical information from several websites to find the best fit that fulfills their purpose.
- *Match as search strategy scale (Match) with 6 items*: investigating the extent to which web users will tend to start searching from a single search engine, or find only a few websites that provide the most fruitful and fitting information when they search for online medical information. Their strategy is oriented towards matching the purposes of their search.

The MISS in the present study employed a six point Likert-scale in which statements were presented with bipolar strongly disagree/strongly agree anchors (from strongly disagree = 1 to strongly agree = 6). As previously mentioned, three of the six scales ("Multiple sources," "Content," and "Elaboration") are categorized as sophisticated information searching behaviors, while the remaining three ("Authority," "Technical," and "Match") are categorized as less sophisticated. Therefore, the people who score higher in the former three scales could be recognized as possessing more sophisticated online medical information searching behaviors.

Data collection and analysis

In the present study, a convenient sampling method was adopted to collect data. According to the research purposes, the participants consisted of hospital group and general public group. On the one hand, the researchers went to hospital and asked patients or their relatives to answer the MISS. The total number of the hospital group was 405. On the other hand, the researchers invited people who showed interests in searching online medical information to answer the MISS in parks and train stations. The total number of the general public group was 497. Uncompleted data were excluded. The valid sample included 540 adults in total.

In order to validate the MISS, EFA with principle component analysis was conducted. The items with factor loadings less than 0.5 were excluded. Then, for comparing the difference in the online medical information searching behaviors of the two groups, the average scores of the six subscales were calculated and compared by a *t*-test. Moreover, in order to answer the second research question, multiple regressions were conducted to illustrate how evaluative standards predict the search strategies in each group. Comparing the regression models of the two groups will be helpful to understand the differences in the predictive relationships between the evaluative standards and the search strategies of the two groups.

Results

The validation of the MISS

To clarify the structure of MISS, EFA was used. The EFA results revealed that a total of six factors were extracted with eigenvalues exceeding 1.0: "Multiple sources," "Authority," "Content," "Technical," "Elaboration" and "Match." Six items with factor loadings of less than 0.5 were removed to increase its total explained variance and reliability coefficients. In sum, these factors which consisted of 30 items accounted for 61.11% of variance. The factors and responding factor loadings of the items are presented in Table 1. Moreover, the reliability (alpha) coefficients for these factors are 0.74, 0.80, 0.87, 0.79, 0.86, and 0.86 respectively, and the overall alpha is 0.86. Therefore, the MISS is suggested to be a sufficiently reliable tool for assessing online medical information searching behaviors.

Table 1. Factor loadings, Cronbach's α values and descriptive results for the six scales of the MISS (n = 540)

Item	Measure	Factor loadings	Alpha value	Means (SD)
Multiple sources 1	I will compare with relevant medical knowledge I have learned to judge whether the online medical information is correct.	.64	.74	4.96 (0.53)
Multiple sources 2	I will discuss with teachers or peers, and then judge whether the online medical information is correct.	.73		
Multiple sources 3	I will explore relevant content from books (or print materials), and then evaluate whether the online medical information is correct.	.76		
Multiple sources 4	I will try to find more websites to validate whether the online medical information is correct.	.68		
Authority 1	I will believe in its accuracy if the online medical information is posted in well-known websites.	.61	.80	4.67 (0.69)

Authority 2	I will believe in its accuracy if the online medical information appears in government websites.	.61		
Authority 3	I will believe in its accuracy if the online medical information is posted in professional (official) websites.	.82		
Authority 4	I will believe in its accuracy if the online medical information appears in some websites recommended by experts when I view or navigate the information on the Internet.	.78		
Authority 5	I will believe in its accuracy if the online medical information is presented professionally.	.70		
Content 1	If its content fits my searching goal, I will consider the online medical information as useful to me.	.72	.87	4.99 (0.59)
Content 2	If it can provide more related links, the online medical information is useful to me.	.80		
Content 3	If it can help me search further for relevant information, I will think the online medical information is useful to me.	.81		
Content 4	If the online medical information is closer to my searching purpose, I will believe more in its usefulness.	.72		
Content 5	If it is highly related to my intended searching content, the online medical information is useful to me.	.68		
Technical 1	If the website provides enough online medical information, I will stop searching further and believe in its usefulness.	.73	.79	4.60 (0.80)
Technical 2	If it is presented by animation, I will think the online medical information is useful to me.	.70		
Technical 3	If it does not take much time to be retrieved, the online medical information is useful to me.	.79		
Technical 4	If it does not require a password or registration, I will think the online medical information is useful to me.	.72		
Elaboration 1	I am used to searching for online medical information from different websites (or pages).	.68	.86	4.75 (0.66)
Elaboration 2	I am used to summarizing a variety of online medical information.	.80		
Elaboration 3	I can use some acquired online medical information for advanced search to find the best-fit information.	.80		
Elaboration 4	I will continue to judge what kind of online medical information I need during the searching process.	.67		
Elaboration 5	I can integrate the online medical information obtained from a variety of websites.	.76		
Elaboration 6	I can compare different online medical information from related websites (or pages).	.70		
Match 1	Sometimes I will forget the purpose of my search during the searching process.	.68	.86	3.91 (0.96)
Match 2	Sometimes I do not know how to start the searching of online medical information that I want.	.76		

Match 3	I usually enter the first few websites suggested by the search engine.	.80
Match 4	I usually use a search engine to find one website which is most fitted to my search purpose.	.79
Match 5	When I find the first relevant website, I will not search for others.	.80
Match 6	I am eager to find a single website that contains the most fruitful information.	.74

Note. Overall alpha = .86; Total variance explained is 61.11%.

Scores on the six scales

For investigating online medical information searching behaviors, Table 1 also shows the mean scores and standard deviations of the six scales of the MISS. The participants scored highest on "Content" (an average of 4.99), followed by "Multiple sources" (an average of 4.96), "Elaboration" (an average of 4.75), "Authority" (an average of 4.67), "Technical" (an average of 4.60), and "Match" (an average of 3.91). The average scores for the first four scales (i.e., evaluative standards) are all higher than four points, and the mean scores for the "Multiple sources" and "Content" scales are close to five points. This reveals that the participants in this study might opt to employ all these evaluative standards, a so-called "mixed standards" tendency. Moreover, using "Multiple sources" for accuracy and "Content" for usefulness, which are considered as more sophisticated evaluative standards, is much preferred. Regarding search strategies, on the one hand, the participants showed a neutral preference for employing "Match" as a search strategy (M = 3.91). On the other hand, using "Elaboration" as a search strategy was preferred (M = 4.75).

Group differences in information searching behaviors

To compare the differences in the MISS of the two groups (people in hospital and the general public), a series of t-tests were used. Table 2 shows the results of the comparison of the MISS scales identified by the t-tests. The results indicated that the hospital group showed higher tendencies to use "Multiple sources" (t = 2.53, p < .05) , "Authority" (t = 4.44, p < .001), "Content" (t = 4.15, p < .001), and "Technical" (t = 2.86, p < .01) as evaluative standards, and "Elaboration" (t = 2.47, p < .05) as their search strategy to seek online medical information, but less orientation toward using "Match" (t = -3.90, p < .001) than the general public group.

The hospital group showed a higher tendency than the general public group on all standards for judging the accuracy and the usefulness of online medical information. In other words, hospital patients and their relatives appear to show stronger preferences for filtering the online medical information with mixed standards. Moreover, they also preferred to use sophisticated search strategies (i.e., Elaboration), and to show less orientation toward using the match strategy.

Table 2. Comparison of the MISS Scales between the General public (n = 293) and the Hospital (n = 247) groups

Scale	Groups	Mean	t value
Multiple sources	Hospital	5.03	2.53*
	General	4.91	
Authority	Hospital	4.80	4.44***
	General	4.55	
Content	Hospital	5.10	4.15***
	General	4.90	
Technical	Hospital	4.71	2.86**
	General	4.51	
Elaboration	Hospital	4.82	2.47*
	General	4.69	
Match	Hospital	3.73	-3.90***
	General	4.05	

$^{*}p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

The predicting relationships between groups

In order to examine the predictive power of evaluative standards for online medical information in their search strategies within each group, multiple regression analyses were used.

Table 3. Multiple regression estimates for predicting search strategies

Predictors	General public group				Hospital group			
	Elaboration		Match		Elaboration		Match	
		SE		SE		SE	β	SE
Multiple sources	0.27***	0.07	-0.18**	0.10	0.26***	0.08	-0.16*	0.13
Authority	0.03	0.06	0.28***	0.08	-0.01	0.07	-0.02	0.11
Content	0.17*	0.07	-0.10	0.10	0.30***	0.08	-0.10	0.14
Technical	0.12	0.05	0.34***	0.07	0.04	0.05	0.03	0.09
R^2	0.22		0.19		0.23		0.05	
Adjust R^2	0.21		0.18		0.22		0.03	

$^{*}p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

Table 3 shows the results of the multiple regression models of the two groups. In the general public group, "Multiple sources" (β = 0.27, $p < 0.001$) and "Content" (β = 0.17, $p < 0.05$) could significantly and positively predict "Elaboration," and explained 22% of usage of the "Elaboration" search strategy. "Authority" (β = 0.28, $p < 0.001$) and "Technical" (β = 0.34, $p < 0.001$) were significant and positive predictors for "Match," while "Multiple sources" (β = -0.18, $p < 0.01$) was also a significant but negative predictor for the "Match" search strategy. These three factors accounted for 19% of variance. Among the general public group, those who tended to assess the accuracy and usefulness of online medical information by "Multiple Sources" and "Content" might be more oriented to employ the "Elaboration" search strategy. Those who tended to assess online medical information according to "Authority" and "Technical," and those who were less oriented to "Multiple sources," might be more likely to employ the "Match" strategy.

In the hospital group, "Multiple sources" (β = 0.26, $p < 0.001$) and "Content" (β = 0.30, $p < 0.001$) made a significantly positive prediction of the "Elaboration" search strategy (23% of variance explained), while "Multiple sources" (β = -0.16, $p < 0.05$) was the only significant but negative predictor for the "Match" search strategy with a relatively low explained variance (5% of variance explained). That is, those participants in the hospital group who were inclined to use "Multiple Sources" and "Content" were more likely to employ "Elaboration" as a search strategy. On the other hand, those who showed fewer tendencies to judge the accuracy from multiple websites were likely to use the "Match" strategy.

These results show that these two models share some commonalities. By and large, in both groups, "Multiple sources" and "Content" are significant positive predictors of "Elaboration," and "Multiple sources" is a negative predictor of "Match." However, divergences were also found between these two models. The "Authority" and "Technical" evaluative standards made positive prediction of the "Match" search strategy only within the general public group.

In the hospital group, the significant predictive relationships between their evaluative standards and search strategies are comparatively fewer. For example, only "Multiple sources" and "Content" have predictive roles in their "Elaboration" search strategy. Though "Multiple sources" is a negative predictor for "Match," the variance explained by this variable is quite low (5%). However, the relations between "Authority," "Technical" and "Match" were not revealed in the hospital group. Therefore, a finding proposed here is that evaluative standards might play different roles in the search strategies of these two groups. Compared to the relatively rich relationships between these two components in the general public group, the evaluative standards play a more limited role in the search strategies of the hospital group.

Discussion and conclusion

In this study, the structure of the MISS is validated by EFA, and is consistent with the framework proposed by Tsai (2004). Therefore, the MISS is a sufficiently reliable tool to measure Web users' online medical information

searching behaviors. It would provide more insights to uncover their perceptions of standards toward evaluating online medical information and preferences of selecting such information.

According to the scores of each scale in the MISS, the participants in this study tend to adopt mixed evaluative standards and sophisticated search strategy. In terms of evaluative standards, this finding is similar to the result obtained from Liang and Tsai's (2009) study. Web users have to verify the information with numerous criteria simultaneously in order to access accurate online medical information. Hong (2006) indicated that depth and expertise are both contributing factors influencing Web users' credibility judgments. That is, a website which provides in-depth information (i.e., "Content" is this study) or appears to have experts (i.e., "Authority" in this study) is considered as more credible.

Due to the specific need for accurate medical information, the evaluative standards which are commonly held by novices (i.e., authority and technical) might act as basic criteria on the one hand. For example, Web user can filter some improper information and gain preliminary understandings of specific medical terminology from government or experts' websites. On the other hand, for comprehensively figure out the trustworthiness of acquired online medical information, advanced evaluative standards (i.e., multiple sources and content) are needed. Tsai (2004) has indicated that the advanced evaluative standards would lead to effective information searching, and be helpful for obtaining adequate online information. Thus, it is supposed that Web users' might use mixed standards as "basic" and "advanced" criteria for assessing online medical information might be one of the possible tendencies.

Moreover, in this study, the participants even showed higher orientations toward employing not only advanced evaluative standards, but also sophisticated search strategy. "Elaboration" was also considered as a much preferred search strategy by university students and medical students in previous studies (Liang, & Tsai, 2009; Wu, & Tsai, 2007). Due to the abundant amount of unreliable information online, it is possible to find more credible medical information with these advanced evaluative standards and search strategies.

Regarding the first research question, significant differences in the online medical information searching behaviors of the hospital group and the general public group were found in this study. First, the hospital group showed a higher orientation towards employing "mixed standards" to judge online medical information. People in hospital (patients or their relatives) have often encountered a more critical medical problem than members of the general public, and showed higher tendency to search online (Rice, 2006). They have a need to seek the most credible medical information as references to deal with their medical problems.

Second, the hospital group also tended to use more "Elaboration" and less "Match" as search strategies than the general public group. In order to deeply and carefully understand the diagnoses and the information about their diseases, they may summarize and compare the online medical information they found. Elaborating from abundant information will help them to understand the diseases they are facing and to feel empowered when they have to make decisions about their health management. Searching for medical information on the Internet, which is a database including an ever-expanding amount of information, patients and their relatives have to use more advanced search strategies to find credible and useful information.

In terms of the relationships between evaluative standards and search strategies, that is, the second research question, the findings from this study indicate that the predictive model of online medical information searching behaviors of the general public is compatible with the model of Wu and Tsai's (2005) study. For the general public, their evaluative standards of online medical information could be viewed as important predictors for their search strategies. In other words, the predictive model of the general public was similar to the original theoretical framework proposed by Tsai in 2004.

Nevertheless, the predictive relationship between evaluative standards and search strategies of people in hospital is comparatively limited. The search strategies they use cannot be well predicted by their evaluative standards as they can be for their counterparts in the general public. This finding implies that the decision of which search strategies to use might be influenced by other factors. Relevant studies have indicated that many factors (e.g., gender, age, and medical literacy) influence people's search strategies (Anker et al., 2011; Pharo & Jarvelin, 2004). As such, the relationship between evaluative standards and search strategies is vague among the people in hospital, and more factors should be considered in future studies.

Furthermore, as the Internet is becoming a popular source of medical information in recent years, people's low information literacy will impede their access and proper use of online medical information (Benigeri & Pluye, 2003). People in this information society should acquire adequate online medical information literacy to effectively judge the credibility of online medical information. In this regard, the framework of the MISS might provide some appropriate guidelines for instructional design of teaching online medical information literacy. Those evaluative standards and search strategies (i.e., "Authority," "Technical," and "Match") which are commonly held by novices could be introduced first as a basic evaluative standard and search strategy. Then, people should learn how to assess the information with advanced evaluative standards and search strategies (i.e., "Multiple sources," "Content" and "Elaboration"). To improve people's online medical literacy, such a course designed with the framework might be useful, but the actual effects should be investigated with more studies.

Additionally, using the MISS could support the development of quality control tools. First, medical information providers should make some additional efforts to help people to verify the credibility of online medical information as a form of guidance. Some ideas from the framework might be applicable, such as providing multiple sources automatically. For example, Schwarz and Morris (2011) have developed an experimental searching engine module that could provide some statistical visualization to "augment" the search results. For each search result, the module will generate a visualization including credibility indicators by checking a database. Accordingly, the medical information providers could offer more relevant credibility information as references for users to judge the information, just as the sophisticated searching standards: "Multiple sources" and "Content."

Second, designers could use the MISS to identify users' preferred evaluating standards and searching behaviors. Then, the adaptive quality control tool could provide users with many more references according to their preferred evaluating standards to judge the credibility of online medical information. On the other hand, more sophisticated standards provided by the external quality control tool might stimulate users to rethink their evaluating standards and searching skills, and then to reach the maturity of medical information literacy.

Regarding to the limitation of this study, one is the small number of participants. To clearly demonstrate users' medical information searching behaviors and validate the MISS, more participants should be surveyed. Moreover, interviews or other qualitative methods should be employed to illustrate participants' online medical information searching behaviors. It will be helpful for improving the validity and reliability of this study.

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References

Anker, A. E., Reinhart, A. M., & Feeley, T. H. (2011). Health information seeking: A review of measures and methods. *Patient Education and Counseling, 82*(3), 346-354.

Benigeri, M., & Pluye, P. (2003). Shortcomings of health information on the Internet. *Health Promotion International, 18*(4), 381-386.

Benotsch, E. G., Kalichman, S., & Weinhardt, L. S. (2004). HIV-AIDS patients' evaluation of health information on the Internet: The digital divide and vulnerability to fraudulent claims. *Journal of Consulting and Clinical Psychology, 72*(6), 1004-1011.

Eysenbach, G., Powell, J., Kuss, O., & Sa, E. R. (2002). Empirical studies assessing the quality of health information for consumers on the World Wide Web - A systematic review. *Journal of the American Medical Association, 287*(20), 2691-2700.

Hanif, F., Read, J. C., Goodacre, J. A., Chaudhry, A., & Gibbs, P. (2009). The role of quality tools in assessing reliability of the internet for health information. *Informatics for Health and Social Care, 34*(4), 231-243.

Haux, R. (2002). Health care in the information society: What should be the role of medical informatics? *Methods of Information in Medicine, 41*(1), 31-35.

Hong, T. (2006). Contributing factors to the use of health-related websites. *Journal of Health Communication, 11*(2), 149-165.

Kammerer, Y., Braten, I., Gerjets, P., & Stromso, H. I. (2013). The role of Internet-specific epistemic beliefs in laypersons' source evaluation and decisions during web search on a medical issue. *Computers in Human Behavior, 29*(3), 1193-1203.

Lemire, M., Pare, G., Sicotte, C., & Harvey, C. (2008). Determinants of Internet use as a preferred source of information on personal health. *International Journal of Medical Informatics, 77*(11), 723-734.

Liang, J.-C., & Tsai, C.-C. (2009). The information commitments toward web information among medical students in Taiwan. *Educational Technology & Society, 12*(1), 162-172.

Loeber, S., & Cristea, A. (2003). A WWW information seeking process model. *Educational Technology & Society, 6*(3), 43-52.

McMullan, M. (2006). Patients using the Internet to obtain health information: how this affects the patient-health professional relationship. *Patient Education and Counseling, 63*(1-2), 24-28.

Metzger, M. J. (2007). Making sense of credibility on the web: Models for evaluating online information and recommendations for future research. *Journal of the American Society for Information Science and Technology, 58*(13), 2078-2091.

Morahan-Martin, J. M. (2004). How Internet users find, evaluate, and use online health information: A cross-cultural review. *CyberPsychology & Behavior, 7*(5), 497-510.

Oh, K. M., Kreps, G. L., Jun, J., Chong, E., & Ramsey, L. (2012). Examining the health information–Seeking behaviors of Korean Americans. *Journal of Health Communication, 17*(7), 779-801.

Pharo, N., & Jarvelin, K. (2004). The SST method: a tool for analysing web information search processes. *Information Processing & Management, 40*(4), 633-654.

Rains, S. A. (2007). Perceptions of traditional information sources and use of the world wide web to seek health information: Findings from the health information National Trends Survey. *Journal of Health Communication, 12*(7), 667-680.

Renahy, E., Parizot, I., & Chauvin, P. (2010). Determinants of the frequency of online health information seeking: Results of a web-based survey conducted in France in 2007. *Informatics for Health & Social Care, 35*(1), 25-39.

Rice, R. E. (2006). Influences, usage, and outcomes of Internet health information searching: Multivariate results from the Pew surveys. *International Journal of Medical Informatics, 75*(1), 8-28.

Schwarz, J., & Morris, M. (2011, May). *Augmenting web pages and search results to support credibility assessment*. Paper presented at the Proceedings of the 2011 annual conference on Human factors in computing systems, Vancouver, BC, Canada.

Seçkin, G. (2010). Cyber patients surfing the medical web: Computer-mediated medical knowledge and perceived benefits. *Computers in Human Behavior, 26*(6), 1694-1700.

Sladek, R., Tieman, J., Fazekas, B. S., Abernethy, A. P., & Currow, D. C. (2006). Development of a subject search filter to find information relevant to palliative care in the general medical literature. *Journal of the Medical Library Association, 94*(4), 394-401.

Tsai, C.-C. (2004). Information commitments in web-based learning environments. *Innovations in Education and Teaching International, 41*(1), 105-112.

Wu, Y.-T., & Tsai, C.-C. (2005). Information commitments: evaluative standards and information searching strategies in web-based learning environments. *Journal of Computer Assisted Learning, 21*(5), 374-385.

Wu, Y.-T., & Tsai, C.-C. (2007). Developing an information commitment survey for assessing students' web information searching strategies and evaluative standards for web materials. *Educational Technology & Society, 10*(2), 120-132.

Yun, E. K., & Park, H. A. (2010). Consumers' disease information-seeking behaviour on the Internet in Korea. *Journal of Clinical Nursing, 19*(19-20), 2860-2868.