The Role of Online Talking in Achieving Health Behavior Change

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Abstract

In today's healthcare environment, it is difficult for consumers to get all the support they need through communication with their doctors within the 20-minute clinic visit. Social networking sites (SNSs) are becoming a common means for health communication. Users can initiate a thread by making an initial post (thread initiators). According to the transtheoretical model of behavior change (TTM), as people progress through stages of behavior change, their thoughts, feelings and actions change. changes. Our study provides important implications for public health policy makers and health Using the Transtheoretical model of behavior change, this study aims to examine whether health communication via SNSs facilitates changes in thread initiators' thoughts, feelings, and actions as reflected in their online discourses. Results show that online messages posted by thread initiators reflected their progress through the steps of behavior care professionals in using SNSs to address health issues.

Key Words: Transtheoretical model, Social Networking Sites, Content analysis

Introduction

In today's healthcare environment, it is difficult for consumers to get all the support they need through communication with their doctors within the 20-minute clinic visit. Social networking sites (SNSs) as virtual communities in which an individual can communicate with "friends" or informed others (Boyd and Ellison 2007) are becoming a common means for health communication. Nearly half of internet users who have searched for online health information reported that they have participated in health–related communication (reading or posting messages) on SNSs (Fox and Jones, 2009). There is growing interest in SNSs among health care professionals and institutions to enhance healthcare delivery: 60% of physicians (Manhattan Research, 2010) and 65% of nurses (Nicholson Kovac Inc, 2010) endorse social networks for meeting a range of healthcare needs; more than 700 of the 5,000 hospitals in the U.S. are employing SNSs for healthcare communication purposes (Bennett 2010).

Online health communication provides consumers with instant information (e.g., dynamic resource guides for improving health) and support (e.g., stress relief strategies) (e.g., Donelle and Hoffman-Goetz, 2008; Eichhorn, 2008). Research on the impact of participation by consumers in health-related SNS is limited, especially with respect to the dynamics of interactions among participants. Some of the limitations of current research include: (1) studies lack attention to individual variations in behavioral changes as a result of social interactivity in the web environment, (2) the methodology for studying this venue has not employed strategies to capture the dynamic change inherent in the interactive process, and (3) studies have not been guided by conceptual theoretical frameworks that can be used to gain an understanding of health outcomes from an online social networking intervention that employs behavior change heuristics. Without such studies, it is difficult to ascertain how or why health behavior changes occur in response to an intervention.

Participation in SNSs can be described in terms of the messages posted - initial and response posts, and in terms of the message senders - thread initiators and followers. Users can initiate a thread by making an initial post (initiators), and others may extend the thread by posting their responses (followers). After making an initial post, initiators may respond to followers' responses by making subsequent posts in which they reveal further thoughts or actions. Previous research has shown that the types of social support and the content of messages transmitted via health-related forums are tailored to thread initiators' expressed needs (Liang and Scammon, 2011).

According to the transtheoretical model of behavior change (TTM), as people progress through stages of behavior change, their thoughts, feelings and actions change (Prochaska, Redding, and Evers, 2008). A large volume of data has shown that health behavior change

strategies based on individualized stage-matched interventions are significantly more effective in facilitating positive health outcomes than a generic approach to health behavior change (Prochaska, Velicer, Fava, Rossi, and Tsoh, 2001). In this study, we aim to examine whether health communication via SNSs facilitates changes in thread initiators' thoughts, feelings, and actions as reflected in their online discourses. Specifically, we address the following two questions:

RQ1: Are there differences between the first and subsequent posts by thread initiators in terms of initiators' thoughts, feelings, and actions?

RQ2: Are differences between the first and subsequent posts by thread initiators related to characteristics of threads (e.g., sources, the number of posts by initiators)?

Theoretical Background

The Transtheoretical Model of Behavior Change (TTM)

The transtheoretical model of behavior change proposed by DiClemente and Prochaska (1982), characterizes individuals as moving through five stages of change with regard to health behaviors, including precontemplation, contemplation, preparation, actions, and a maintenance phase. An individual in the precontemplation stage is not intending to change a problem behavior within the next six months. In the contemplation stage, the individual is becoming aware of and desires to change the problem behavior within the next month. In the preparation stage, the individual considers that the pros of changing the problem behavior outweigh the cons, and attempts to make a change within the next month. In the action stage, the individual has taken actions to change the problem behavior during the past six months. Finally, in the maintenance stage, the individual has achieved behavioral changes but still needs some effort to prevent relapse (Prochaska and Velicer, 1997).

Individuals use a variety of activities as they progress through the stages, including: consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, social liberation, counterconditioning, developing helping relationships, reinforcement management, self-liberation, and stimulus control (Prochaska,and Velicer, 1997). The first five processes are covert cognitive activities (consciousness raising, environmental reevaluation, self-reevaluation), and emotion (dramatic relief, self-liberation), and thus are called experiential processes (Prochaska and Velicer, 1997). Whereas the last five processes are overt behaviors or commitments (reinforcement management, counterconditioning, stimulus control), and support (developing helping relationships), and thus are called behavioral processes (Prochaska and Velicer, 1997). Experiential processes occur during the early stages of change (e.g. precontemplation and contemplation), however, behavioral processes occur during the later stages of change (e.g., action and maintenance).

Decision balance and self-efficacy are two core constructs in TTM. Decision balance reflects individuals' weighing of pros and cons of changing (Prochaska, and Velicer, 1997). Studies have shown that the perceived pros of changing increase through the five stages of change (Hall and Rossi, 2008). Self-efficacy is defined as individuals' beliefs about their abilities to cope with high-risk situations (Prochaska and Velicer, 1997). Self-efficacy tends to increase through the stages of change (Hall and Rossi, 2008). To sum up, the TTM provides a theoretical framework to analyze the processes of change in health behavior. Specifically, the TTM identifies the variables (e.g., consciousness, evaluation, and commit-ment, decision balancing and self-efficacy) indicating the psychological processes through the five stages of change.

Context for Study

In order to study how participation in SNS might facilitate change we needed to identify a discussion topic for which we could study changes in participants' thoughts, feelings, and actions over time. Our selection of topics was based on the three criteria: (1) the topic is of widespread public health concern; (2) past public interventions to change behavior have been ineffective, and (3) the topic has been studied using the TTM.

Advance care planning (ACP) assists people in constructing and communicating their preferences for end of life care to loved one's and medical professionals. An important component of ACP is the advance directive (AD), a contract that ensures an individual's preferences and values are considered when decisions are made about their healthcare near the end of life. The Patient Self-Determination Act (Omnibus Budget Reconciliation Act 1990) requires by HIPPA regulation that all healthcare facilities provide written information to all patients sufficient to complete an AD.

The ACP/AD process increases in importance in old age; however, according to a Pew Report (2006), just over 50% of those 65+ years old endorsed an AD. It is for this reasons that public interventions have sought to improve AD completion although the efficacy of such efforts has been poor (Durbin, Fish, Bachman, and Smith 2010). Therefore, ACP/AD interventions are a growing public health concern (Wilkinson, Wenger, and Shugarman, 2007).

The initiation of ACP is the responsibility of the

individual. Research indicates that multiple factors contribute to poor AD completion by older persons. These issues can be grouped into two categories: knowledge and emotional barriers (e.g., Schickedanz et al., 2009). Formative research has suggested that these barriers can be addressed through person-to-patient face to face consultation, during an outpatient office visit or by telephone. This personal approach has, however, been minimally successful. In the 21st Century, potential alternatives to this strategy are possible through the internet.

A small number of studies have applied the transtheoretical model of behavior change to the ACP process with promising results. In one case, ACP was translated into the five stages of change: (1) precontemplation in which the individual becomes aware of the need for ACP, (2) contemplation in which the individual perceives that ACP is relevant to his or her own care needs, (3) preparation in which the individual initiates formative behaviors such as talking about ACP preferences with family or healthcare professionals, (4) action in which the individual begins to build specific ACP plans through family, friends, and his or her healthcare professionals including a more formalized AD with an attorney or through self-help processes, and (5) maintenance in which the individual identifies an AD proxy and updates his or her ACP documentation (e.g., Jezewski et al., 2009). This kind of planning has been advocated by the Association for Healthcare Research and Quality (AHRQ) in a five-step "structured discussion" in which the physician-patient dyad works through a process for completing and updating the AD document (Kass-Bartelmes et al., 2003). Implicit in this guide is the 5-stage transtheoretical model of healthcare change.

Based on the above discussion, we selected ACP/AD as the topic for the study. Our study aims to investigate the extent to which online communication facilitates individual changes regarding ACP/AD throughout the stages defined in the TTM.

Methodology

This study uses grounded theory as the research method. Grounded theory is a systematic inductive process in which researchers generate theories by collecting and analyzing data (Strauss and Corbin, 1994). As we aim to investigate the effects of social support on consumers' behavior change during the process of online discourse, we examine threaded data from a variety of online discussion groups and forums. In our data collection we had three goals: 1) identify appropriate web content; 2) focus on our theme of interest; and 3) download threads that occurred over time with multiple participants. We collected threads in which initiators seek support related to AD or living will and make at least one subsequent post in response to followers' posts. We hand coded each thread in terms of the type of source where it was found, the number of posts by initiators, and the number of posts by followers. We then coded the content of the posts included in each thread using General Inquirer (GI), a software program for content analysis of textual data. For each thread, we created two files, one with initiators' first posts and one in which all subsequent posts by initiators are combined. We first report the data collection process and the details of the dataset, and then present the coding process.

Data collection

To identify appropriate content, we used Google's search engine "discussion" filtering option, which shows search results from discussion groups and forums. We collected threaded data for two keywords: advance directive and living will. Google search engine arranges results by relevance (the most relevant results are shown in the first pages). Data collection continued until we could find no more threads that met our research requirements. In all, we downloaded 20 threads with 203 posts during the period from October 5 to October 9, 2011.

Our next step was to clean the downloaded thread data by removing the off-topic posts in each thread. We found that thread initiators control the topics of threads such that when an initiator changes the topics of their questions, followers correspondingly change the topics of their responses. In our dataset we only kept the posts that were posted before the first off-topic posts. Among the 20 downloaded threads, we identified two threads that contained a total of six off-topic posts. After removing these off-topic posts, we have 197 posts in our dataset. In this study, the unit of analysis is a discussion thread.

Coding

Our first step was to code the downloaded threads by the type of source in which they appeared, the number of posts by initiators, and the number of posts by followers. Type of source refers to the types of online forums in which threads are originally created. Since AD is a multifaceted problem involving many issues, people may post messages related to AD in multiple types of online forums. AD is an issue related to health decision making, and thus, many people post AD-related messages in health-related forums. AD is also a legal, philosophical, and ethical issue, and thus, people may post AD-related messages in forums covering broad themes. For each thread, we manually coded the type of source in which it appeared into two categories: health (e.g., www.caring.com), and non-health sites (e.g., www.cooking.com).

The next step in our coding was to content

analyze the posts within the downloaded threads. General Inquirer (GI) is a text analysis software developed by Harvard psychologist Philip Stone and available for academic research purposes (http://www.wjh.harvard.edu/~inquirer/). GI codes textual data into 182 categories using social science concepts (e.g., negativity and positivity) and calculates the occurrence of concepts in each message. Based on the process of change in TTM, we selected 33 categories indicating affect/emotion, cognition (e.g., thinking, solving), and action (e.g., attempt, goal) (Table 1). Change in valence is an important indicator of decision balance (weighting pros and cons) (Prochaska and Velicer, 2009). We included categories for valence such as Positivity and Negativity. We also use categories indicating certainty to represent change in self-efficacy. For our 20 threads, we use GI to code 40 text documents one for the first post and another for the subsequent posts for each thread.

Table 1 *Coding Strategy*

Conceptual Framework	Categories	Description	Example
Decision balancing	Positiv	Positive words	achieve
	Negativ	Negative words	abandon
Self-efficacy	SureLw	indicating a feeling of sureness, certainty and firmness.	assure
	If	indicating feelings of uncertainty, doubt and vagueness.	hesitate
	Affil	Indicating affiliation or supportiveness	affection
	Hostile	Indicating an attitude or concern with hostility	hostile
Emotion	Pleasur	indicating the enjoyment of a feeling, including words indicating confidence, interest and commitment.	attachment
	Pain	indicating suffering, lack of confidence, or commitment.	agony
	Feel	describing particular feelings, including gratitude, apathy, and optimism, not those of pain or pleasure.	eagerness
	Arousal	indicating excitation, aside from pleasures or pains, but including arousal of affiliation and hostility.	anger
	SV	verbs describing mental or emotional states. usually detached from specific observable events	love
	EMOT	related to emotion that are used as a disambiguation category, but also available for general use.	adore
Cognition	Think	referring to the presence or absence of rational thought processes.	mindful
	Know	generality or specificity, importance or unimportance, presence or absence, as well as components of mental classes, concepts or ideas.	different
	Causal	denoting presumption that occurrence of one phenomenon is necessarily preceded, accompanied or followed by the occurrence of another.	likely
	Ought	indicating moral imperative.	Imperative
	Perceiv	referring to the perceptual process of recognizing or identifying something by means of the senses.	detection
	Compare	referring to comparison	better
	Eval@	referring to judgment and evaluation, whether positive or negative, including means-ends judgments.	chic
	EVAL	a broader, different category with evaluative words that is used in disambiguation.	dismal
	Solve	referring to the mental processes associated with problem solving (mostly verbs)	solve
	EnlGain	reflecting a gain in enlightenment through thought, education, etc.	account
	EnlLoss	reflecting misunderstanding, being misguided, or oversimplified.	mistook

Conceptual Framework	Categories	Description	Example
Cognition	EnlEnds	denoting pursuit of intrinsic enlightenment ideas.	discover
Action	Need	related to the expression of need or intent.	implore
	Goal	names of end-states towards which muscular or mental striving is directed.	aim
	Try	indicating activities taken to reach a goal, but not including words indicating that the goals have been achieved	go
	Means	denoting objects, acts or methods utilized in attaining goals	access
	Persist	indicating "stick to it" and endurance.	always
	Complet	indicating that goals have been achieved, apart from whether the action may continue.	enact
	Fail	indicating that goals have not been achieved.	disable
	IAV	related to giving an interpretative explanation of an action	encourage
	DAV	straight descriptive verbs of an action or feature of an action,	run

Data Analysis and Results

To explore how the discourse within threads changed over time we conducted several analyses. First we did an overall comparison of initial posts to subsequent posts with regard to the presence of words representing the 33 categories coded using GI test analysis software. We then compared the pattern of words included in posts found on different types of sites. Finally, we examined the pattern of words related to the number of posts made by thread initiators. For these comparisons we used two types of statistical tests: paired t-tests to compare mean of groups of threads, and one-proportion z-tests for individual threads. An important assumption of paired t- test is the differences between pairs are normally distributed. We conducted a normality test for each variable and identified 12 variables with normal distributions. For this study our analysis focuses on these normally distributed variables.

Changes in Grouped Threads Over Time

For purposes of our analysis, we considered the social support from thread followers as an intervention. Thus, we grouped initiators' posts into a pre-intervention group (initial posts) and a post-intervention group (subsequent posts by the thread initiator). We performed a two-tailed t-test for paired samples comparing the differences in the pre- and post-intervention groups to assess change in the proportion of words in the categories listed in Table 1.

Overall Comparison

Focusing on the 12 normally distributed variables, we found statistically significant differences between the means for the pre- and post-intervention groups for verbs describing mental or emotional states, ("SV", mean difference = 1.44, t (19) = 1.91, p = .07); evaluative words used in disambiguation, ("EVAL", mean difference= -.72, t (19) = -1.94, p = .07); and words denoting objects, acts or methods utilized in attaining goals, ("Means", mean difference = .96, t (19) = 2.33, p = .03) (results are shown Table 2).

Table 2 *Mean Differences for the 12 Normally Distributed Variables*

Conceptual Framework	**Variable Categories**				
Emotion					
Statistics	Pleasure	Arousal	SV		
Mean difference	0.15	0.13	1.44		
t-statistic	1.39	0.58	1.91		
p-value(2-tailed)	0.18	0.57	0.07		
Cognition					
Statistics	Causal	Compare	EVAL	Solve	EnlGain
Mean difference	-0.01	-0.28	-0.72	-0.55	-0.37
t-statistic	-0.02	-1.56	-1.94	-1.6	-0.92
p-value(2-tailed)	0.98	0.13	0.07	0.13	0.37
Action					
Statistics	Need	Means	IAV	DAV	
Mean difference	0.14	0.96	0.28	-0.78	
t-statistic	0.52	2.33	0.36	-1.59	
p-value(2-tailed)	0.61	0.03	0.72	0.13	

Note: EVAL = evaluative words used in disambiguation;
EnlGain = gain in enlightenment through thought, education;
IAV = giving an interpretative explanation of an action;
DAV = descriptive verbs of an action or feature of an action

Comparison among Threads with Different Characteristics

We were interested in whether thread initiators' progress during their online discourse was different on different types of sites. We conducted within groups paired t-tests separately for threads from health sites and non-health sites. For a total of 12 threads that were created on health sites, we found a significant differences between the means for initial posts and for subsequent posts for descriptive verbs of an action or feature of an action ("DAV", mean difference = -1.37, t (11) = -2.54, p = .028). For a total of 8 threads that were created on non-health sites, we found a significant difference between the means for initial posts and for subsequent posts for "Means" (mean difference =1.75, t (7) = 3.38, p = .012). We were also interested in whether thread initiators' progress during their online discourse was related to the number of posts by initiators. We conducted within groups paired t-tests for threads with two posts by initiators and more than two posts by initiators. For 10 threads that contained only two posts by initiators, we found significant differences between the means for initial posts and for subsequent posts for "Means" (mean difference = 1.6, t (9) = 2.5, p = .034), and verbs describing mental or emotional states ("SV", mean difference = 1.6, t (9) =1.9, p = .095). Six of these threads were on health sites. For those threads we found a significant difference between the means for initial posts and for subsequent posts for "SV" (mean difference = 2.7, t (5) = 2.83, p = .037). For the four threads that were made on other sites, "Means" also showed a significant difference between the means for initial and subsequent posts (mean = 2.68, t (5) = 7.94, p = .004).

Looking at threads that contained more than two posts by thread initiators on both the health and non-health sites together (range=3~5, M = 4.5, SD = 1.96), we found a significant difference between the means for initial and subsequent posts for the variable indicating a gain in enlightenment ("EnlGain", mean difference = -.99, t (9) = -1.89, p = .092). For 6 threads that were made on health sites, verbs descriptive of actions showed a significant difference between the paired means ("DAV", mean difference = -.95, t (5) = -3.18, p = .025). For 4 threads that were created on non-health sites, no variables showed a

significant difference between the paired means.

Overall, on both health and non-health sites, thread initiators who made two posts (one initial post and one subsequent post) showed a decrease in emotion and means for attaining goals, whereas, thread initiators who made more than two posts showed an increase in gains in enlightenment through thoughts and education. On health sites, thread initiators who made more than two posts showed an increase in action as reflected in their online communication with others.

Changes in Individual Threads Over Time

We were also interested in how discourse within threads changed over time. We used z tests to compare the proportions of the total word count for each category of words for initial and subsequent posts within each thread. From this test, we can see from posters' online communication with others how individual thread initiators' thoughts, feelings, actions, and valence states change throughout the thread. The results are shown in Table 3.

Table 3 *Threads Showing Significant Difference on Variables*

ID	Website types	Variables that show significant differences (A plus/minus sign shows a significant increase/decrease in the variable mean from the initial post to the subsequent posts)									
1	heath	Persis-	Ought-								
2	heath	Compare+	Eval-	Negativ-							
3	heath	Enlgain+	Try+	DAV+	Positiv-						
4	heath	Know-	Enlgain-	Postiv-	Negativ-	Affil-					
5	heath	Know-	Compare+	Eval+	Means+	IAV+	DAV+	SV+	Postiv-	Negativ-	Affil-
6	heath	Enlends-	Postiv-								
7	heath	Know-	Need-	Postiv+							
8	heath	Try+	Negativ-								
13	health	Affil+									
14	health	Affil-									
15	health	Postiv+									
9	non-health	Enlgain+	Enlends-	Need-	Mean-	AV-	SV+				
10	non-health	Perceiv+									
11	non-health	Know-	Affil+								
12	non-health	Know-	Enlgain-								

The z test showed that among the 20 threads, 15 threads (75%) contained at least one category that had significantly different proportions of word counts in initial as compared to subsequent posts. Among the 15 threads, 11 threads were from health sites (73%) and 4 were from non-health sites (27%). This suggests that people who use health sites are more likely than people who use non-health sites to demonstrate changes in their thoughts, feelings, actions, or valence states in their online messages.

Among the 23 variables indicating thoughts, feelings, and actions, 12 variables showed significant differences between initial and subsequent posts, including six cognitive variables and six action variables. Specifically, Know (e.g., awareness or unawareness, certainty or uncertainty) showed a significant decrease in four threads. Enlgain (i.e., reflecting a gain in enlightenment through thought, education) and IAV (i.e., related to giving an interpretative explanation of an action) showed a significant increase in two threads and a significant decrease in one thread. Try (i.e., indicating activities taken to reach a goal), Compare (i.e., comparison) and DAV (i.e., straight descriptive verbs of an action or feature of an action)

showed a significant increase in two threads. Enlends (i.e., denoting pursuit of intrinsic enlightenment ideas) showed a significant decrease in two threads. Other variables showed significant changes in one or two threads. These data suggest that for changes in thoughts, thread initiators demonstrated increased comparisons and knowledge gains, but decreased pursuit of knowledge (e.g., knowing, pursuing enlightenment); for changes in actions, thread initiators demonstrated increased intent to act (e.g., try).

Among the six valence variables, Postive showed significant differences between the initial and subsequent posts in 6 threads (55%), and Negative showed significant differences between the initial and subsequent posts in 3 threads (28%). Interestingly, variables related to negativity (Negative and Ngtv) showed a significant decrease, however, variables related to positivity (Positiv, Pstv, Affil) showed significant changes in both directions, most of time showing a significant increase. These results reveal that thread initiators had more positive attitudes or feelings, and fewer negative attitudes or feelings in their subsequent posts.

Summary and Discussion

According to the Transtheoretical Model, individuals progress to the next stage when they feel ready (i.e., self-efficacy and decision balance) to make a behavior change (Greene et al., 2009). In early stages, individuals' readiness is mainly reflected in their cognitive and affective processes, whereas in later stages, individuals' readiness is primarily reflected in their commitment and evaluation of environmental support (Prochaska, Redding, and Evers, 2008). This suggests that individuals experience decreased cognitive and affective activities but increased action-oriented activities as they progress from the early to later stages. Our study demonstrates that the content of online messages posted by individuals in online forums changes over time. Our data show that thread initiators demonstrated decreased affective activities (e.g., arousal), but increased cognitive activities (e.g., from knowing to comparing) and increased actionable activities (e.g., trying) in subsequent posts as compared to initial posts. Our thread initiators continued to demonstrate cognitive activity throughout a threaded discussion suggesting that engagement in the on-line forum may stimulate cognitive activity.

A core construct of the Transtheoretical Model is individuals' weighing of pros and cons of changing (Prochaska and Velicer, 1997). The pros increase and the cons decrease across the stages of behavior change. Our analysis of valence changes shows that thread initiators expressed decreased negative attitudes and feelings and increased positive attitudes and feelings in subsequent posts compared to initial posts. However, our results did not provide evidence for another core construct, self-efficacy, as coded by words indicating certainty and sureness. For future study, we suggest coding self-efficacy using other words.

The most interesting finding of this study is the effects of the characteristics of threads on thread initiators' changes as shown in their online messages. First, initiators who posted in health-related forums demonstrated more changes than initiators who posted in non-health-related forums. It may be that people who visit health-related sites have more concern for their own or their loved ones' current health status, and thus, have more concern for the target health behaviors examined in this study. Second, initiators who made more posts in the same thread demonstrated greater changes than initiators who made fewer posts in the same threads. Individuals who made more posts tended to experience more changes, especially in cognitive processes. A key difference of computer-mediated communication (CMC) and face to face communication (FtF) is not the amount of social information exchanged but the rate of social information exchanged: social information processing in CMC is at a slower rate than social information processing in FtF. It may be that individuals using CMC have more time to manage their expression of their thoughts, feelings, and behavioral intentions than individuals using FtF. This suggests that CMC may be an ideal venue for assisting participants to move towards the behavior that is socially desired.

Implications

Our study provides important implications for public health policy makers, health care professionals (e.g, physicians, health educators) and marketers. Our study shows that thread initiators or help seekers progressed through stages as they made posts over time in online forums. However, the changes thread initiators experienced were significantly associated with the types of online forums used and the number of posts they made. This suggests that for a health issue, policy makers and health care professionals should tailor promotional or educational content to different types of online forums. For example, individuals who post on health sites may need more educational guidance to progress through the stages of changes; whereas, individuals who post on non-health sites may need more promotional support to elevate their awareness of the urgency of the behavior changes. Additionally, since thread initiators who made more posts showed more changes through the stages of change, educational campaigns encouraging individuals to actively participate in CMC, especially by initiating discussions of

topics important to them, may help encourage behavior change. Policy makers and health care professionals may use moderators to encourage thread initiators to make more posts in their initiated threads.

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