

Development and validation of motivational messages to improve prescription medication adherence for patients with chronic health problems

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ABSTRACT

Objective: Poor adherence with prescription medications is a serious problem in health care, especially true for patients with chronic diseases. Previous strategies to promote adherence have generally not resulted in long-term improvements. This research program is designed to improve on past intervention strategies by developing evidence-based and theoretically grounded communication interventions to promote increased adherence.

Methods: Phase 1 of this research program used qualitative methods to examine the uncertainties and concerns that influence medication adherence, identify messages for addressing these concerns, and develop refined motivational messages for promoting medication adherence. Phase 2 of this research program experimentally assessed chronic disease patients' evaluations of the refined motivational messages.

Results: Phase 1 qualitative research indicated that patient concerns about their need for the prescribed medication (commitment) was the primary adherence issue, followed by concerns about side effects and the safety of prescription medications, and concerns about the medication costs. These three key issues were translated into draft motivational messages which were evaluated, validated, and refined. Phase 2 experimental research showed that exposure to motivational messages increased consumers' intention to adhere with medication recommendations.

Conclusion: Follow-up intervention research is warranted to test the use of these motivational messages to promote medication adherence.

Practice implications: Pharmacies and pharmacists have the potential to perform a central role in providing consumers with the relevant information they need to make responsible decisions that lead to increased adherence with prescription medication recommendations.

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1. Introduction

Poor adherence to prescription medications is a serious and pervasive problem in the delivery of health care. Approximately 16% of patients fail to fill a new prescription (otherwise known as primary non-adherence or medication non-fulfillment), and one half patients who fill a new prescription stop taking their medications in the first six months therapy (otherwise known as medication non-persistence) [1–4]. The high rates of medication non-fulfillment and non-persistence transcend time, geography, disease, sociodemographic characteristics, and health care financing and organization. Lack of adherence with medication recommendations limits treatment effectiveness and thwarts the ability of patients to

achieve their clinical goals [5–12]. Concerted strategic efforts must be taken to increase patient adherence with prescribed medication recommendations to improve individual and public health.

Suboptimal patient adherence with prescribed medications is a complex health care problem that is influenced by a range of entrenched patient, provider, health care system, and environmental factors [4,13]. While no single adherence intervention strategy has been shown to work effectively with all patients, a large body of research suggests that improving patient adherence depends upon establishing a realistic assessment of patients' knowledge, understanding, and beliefs toward the recommended regimen and engaging in targeted clear, sensitive, and motivating communication with patients to address their perceived impediments to adherence [14–18].

Community pharmacists are well trained and highly regarded healthcare professionals who are able and willing to implement extended medication services. In the past decade, a range of pharmaceutical care and pharmacy-based disease management

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programs have been developed and trialed for delivery in primary care settings [19]. A recent study of these community pharmacy-based disease management programs targeting adherence in patients with chronic diseases have largely demonstrated positive effects on clinical outcomes other than adherence, but a direct link between the intervention and adherence improvement could not be demonstrated [19]. Thus, it is not known what type of intervention results in the greatest impact and most sustained improvement in medication adherence. Current literature suggests that the effectiveness, appropriateness, and persuasiveness of systemic communication interventions can perform a major role in promoting medication adherence [20–24]. The research program reported here is designed to build upon past adherence promotion intervention strategies by developing evidence-based and theoretically grounded communication interventions that can be used in disease management programs to promote medication adherence for patients with chronic disease.

2. Theoretical grounding

Making good decisions about prescribed medications is a complex and highly equivocal health care situation for many patients [25,26]. Patients often need relevant information to help address uncertainties they may have about prescription medications [15,21,22]. Weick's model of organizing provides a useful framework for examining the questions and concerns patients have about their prescription medications [27,28]. Weick's model describes how cycles of communication can reduce the uncertainties of complex situations that individuals confront, empower informed decision making about these complex situations, and establish rules for guiding future responses to similar complex situations. Strategic communication interventions can promote access to relevant information to help patients increase their understanding about the value and correct use of prescription medications, while helping to resolve concerns they may have that can serve as barriers to medication adherence [29].

This research program follows Weick's model by gathering data about patients' concerns about their prescription medications and using these data to guide development and implementation of evidence-based targeted communication strategies (communication cycles) to help patients address their key impediments to taking medications and motivating these consumers to adhere to recommended prescription medication regimens. The model suggests three phases for helping patients cope with complex, equivocal problems, such as following medication recommendations. The first phase – enactment – suggests examining the unique information issues that make decisions complex for patients. The second phase – selection – suggests providing insightful information to help decision makers address the complex issues they face. The final phase – retention – suggests developing strategies for preserving helpful information for guiding future decisions. In this research program, we examined the unique information concerns that chronically ill patients encounter in making decisions about following medication recommendations (enactment). We developed and tested message strategies for helping chronically ill patients address the concerns they have about medication recommendations (selection). In future research, we plan to test interventions to provide and preserve helpful information to encourage chronically ill patients to follow medication recommendations now and in the future.

Although Weick's model is appropriate for examining differences in patient decision-making processes, this study also employed the framing postulate of prospect theory to examine how specific message content impacts adherence decisions [30]. Prospect theory asserts that patients may respond differently to factually similar adherence messages based on the implied gain or

loss inherent in the message. Positive and negative frames may work in conjunction with Weick's model to create a decision framework for adherence.

3. Research phase 1: qualitative analysis of concerns of non-adherent patients

3.1. Methods

The first phase of this research program examined the uncertainties and concerns that lead patients to not follow medication recommendations about prescription medications, identified message intervention topics for addressing these concerns, and developed, prioritized, and refined motivational messages for promoting medication adherence. In-depth personal interviews were conducted with chronically ill patients who self-reported not adhering to medication recommendations to understand their concerns and barriers about prescription medications. A convenience sample of 30 interview respondents was recruited from local health clinics referred to the research team from members of the Fairfax County Health Literacy Initiative collaborative. Respondents were screened to insure that all participants had at least one major chronic health condition and all confirmed being non-adherent with medication recommendations. Interviews lasted between 15 and 40 min each, and the interviews were transcribed for analysis. Each interview sought to inductively explore patients' concerns about the need for medication, potential side effects and long-term safety issues, and affordability of medication (hereafter referred to as "the 3Cs" of commitment, concerns, and cost) [27].

The interviews were conducted to balance respondents among four groups: women younger than 50, women older than 50, men younger than 50, and men older than 50. This recruitment strategy was designed to include participants with a variety of medical conditions across age and gender. Past research suggests that age and gender can be critical factors in influencing health behaviors, including medication adherence [1,3,6]. However, McHorney's research suggests similarities in adherence responses across patients with different chronic health problems [1]. The first 30 volunteers participated in the interview stage. Interviews began with questions regarding the participant's illness and prescription list. Questions also addressed potential barriers to adherence: perceived need for medication, side effects and long-term safety of medication, and affordability of medication. Participants also discussed preferred sources of information.

The interviews were followed up with a series of focus groups with non-adherent patients with chronic disease to discover the key information and support they wanted to help them address their medication concerns. Four focus groups were conducted: one all male group over 50 years of age, one all male group under 50 years of age, one all female group over 50 years of age, and one all female group under 50 years of age. Each focus group included individuals who self-identified as having at least one chronic health condition. Participants were asked to discuss both barriers to adherence, as well as potential solutions to increase adherence to medication. A male member of the research team facilitated two focus groups with male participants (under and over 50 years old), while two focus groups with women (under and over 50 years old) were facilitated by a female member of the research team. All focus groups used the same interview guide.

3.1.1. Coding procedures for the interviews and focus groups

Using a grounded-theory approach, the modeling feature of NVIVO was used for axial coding and tagging data into relevant themes [32] that create an axis among the variables of interest. Axial coding results were reflexively compared via visual inspection

tion to actual data to assess the potential operational definition of each theme. NVIVO textual analysis software was used to create a graphic display of codes and subcodes within each 3C dimension. Finally, the transcripts from the interviews and focus groups were analyzed using NVIVO qualitative data analysis software and a library of draft motivational messages was crafted to address patient concerns about following prescribed medication recommendations.

3.2. Q-sort analysis and panel interview

A Q-sort analysis of the motivational messages was conducted with health and information professionals ($n = 8$) who work with chronically ill patients to assess the extent to which each message reflected the construct or theme from which it was created. (Q-sort analysis is a powerful, theoretically grounded, and non-reactive quantitative research tool for examining underlying opinions and attitudes by asking respondents to rank-order stimuli into an order that is significant to them to discover groupings of response patterns, supporting effective inductive reasoning [33].) The experts were leaders of the Fairfax County Health Literacy Initiative, representing major health care delivery systems, rehabilitation centers, medical libraries, public health departments, and consumer advocacy organizations. Each expert respondent was provided with a stack of cards with the motivational messages printed on each card to assess the content validity of the messages. Participants examined each message to consider the extent to which it reflected one of the 3C message types (commitment, concerns, and cost) and either a positive or negative message frame. Based upon the expert recommendations, refinements to the messages were made to eliminate confusing or contradictory language within specific messages.

4. Phase 1 results

4.1. Participant characteristics

Seventeen males and 13 females participated in the in-depth interviews, and the average age of the participants was 46 years old. Participants reported having a variety of chronic conditions,

including high blood pressure, multiple sclerosis, hypertension, diabetes, depression, HIV, and asthma.

The focus groups were comprised of 28 total participants (11 females, 17 males). The average age of the focus-group participants was 56 years old. Chronic conditions included heart disease, high blood pressure, high cholesterol, sleep apnea, diabetes, asthma, post-traumatic stress disorder, depression, osteoarthritis, irritable bowel syndrome, Sjogren's syndrome, chronic obstructive pulmonary disease, and multiple sclerosis.

Phase 1 data analysis

Analysis of the interview and focus-groups transcripts resulted in several interesting findings about medication adherence related to the 3Cs (see Table 1). First, lack of commitment about the need for and importance of the medication was the most commonly discussed reason for non-adherence, with 57% of participants reporting moderate or strong feelings about the need for the medication. Commitment seemed to be related to: (1) the physician's communication regarding the importance of the medication; (2) lifestyle changes recommended and not met by the patient; and (3) trying different medications/combinations which lead to experienced side effects.

Concerns about side effects were dependent on (1) impact on day-to-day activities and (2) whether or not the participant had symptoms related to their diagnosis. Thus, there was low concern about side effects if they were tolerable and did not impact day-to-day activities. For example, concerns about the influences of medications on liver function was mentioned, but not stressed, by those patients with low concern. Low concern for side effects was triggered by symptomatic experiences. Thus, participants who had noticeable disease-related symptoms prior to diagnosis were less concerned about side effects of medication after diagnosis, as long as the medication helped resolve their existing health problems. These patients were more concerned about the reoccurrence of disease-related symptoms without long-term dependence on medication.

Cost of medication was surprisingly less important to participants than either commitment or concerns since it is widely believed that the perceived cost of medication is a primary factor leading to poor medication adherence [34]. Specifically, cost was mentioned by only 13% of participants and was most often discussed in terms of future costs if medications increased in price or if the participant changed jobs and/or health insurance. The cost

Table 1
Qualitative interview 3C themes.

Theme 1: commitment about the need for medicine (57% of participants)	
Sources of strong commitment	Sources of weak commitment
Significant symptoms prior to diagnosis Reduction in symptoms after taking medication	Few symptoms prior to diagnosis Too much "trial and error" to find the appropriate medication Observed side-effects from medication
Theme 2: concern about side-effects and long-term safety (30% of participants)	
Sources of strong concern	Sources of weak concern
Medicine changes, such as the process of determining the right dosages/combinations Experienced side effects as a result of missing medicine Potential interactions with existing prescriptions Awareness of need to take vitamins and supplements, but does not follow through	Saw other individual's experience side effects which motivated adherence Side-effects never experienced, even during times of non-adherence Concern about dependency
Theme 3: cost of medicine (13% of interview participants)	
Strong concern about cost	Weak concern about costs
Concern that dosage will increase and lead to more money Single prescription not a worry, but multiple prescriptions (for other conditions) create burden and worry Concern about refills and purchasing flexibility that would help defray costs	No immediate concern, but future concern is related to changes in income or employment Not a concern right now because good health insurance that pays for it

of medicine was not related to one particular prescription; rather, cost was an issue when participants considered changes in their income (retirement) or prescription (dosage). This appeared to be an isolated issue separate from commitment and concern about side effects. In other words, cost of medicine seemed unrelated to commitment and concerns.

4.3. Motivational message drafts

Draft messages were created based upon the in-depth personal interviews and focus-group discussions. This was achieved through an iterative process of examining themes from the data reflecting barriers to adherence and concurrent themes reflecting potential solutions to increase adherence. Emergent categories and subcategories were further defined to ensure that each barrier/solution was addressed by at least one potential draft message. As a result, 23 “agnostic” messages (messages that covered multiple conditions and target audiences) were drafted. Each of these 23 messages was further adapted to create a positive frame (illustrating potential gains that consumers would encounter from following prescribed medication recommendations) and a negative frame (illustrating potential losses that consumers would encounter from not following prescribed medication recommendations). The final message library included a total of 46 messages.

The results of the Q-sort were used to confirm the content validity of the positive- and negative-frame variations of each message. The result was 100% agreement among the panel members about the framing of all messages. Based on panel feedback, slight wording changes were made to a few messages to improve the clarity and consistency of included language. For example, the word “commitment” related to taking medication was used interchangeably with the word “conviction” in the draft messages, so the wording was edited to create parallel language across the message set.

5. Research phase 2: experimental tests of consumer response to messages

The second phase of the research program experimentally tested the refined motivational messages with a large sample of chronically ill patients. While the primary purpose of the phase 2 study was to evaluate the motivational messages, a secondary purpose was to explore whether message framing (positive vs. negative) would influence message evaluation and impact.

5.1. Method

5.1.1. Participants

Participants in this study were recruited from the Harris Interactive Chronic Illness Panel. (CIP) This on-line panel has over six million members worldwide who have opted-in and voluntarily agreed to participate in various online research studies. Members of the Harris CIP can enroll in Harris' appreciation program, Harris Poll Online Rewards. Upon completion of eligible surveys, HIpoinTs are automatically entered into respondents' accounts. Once enough HIpoinTs are accumulated, respondent may redeem the points and select a reward from a HIpoinTs Folio that includes a variety of merchandise and gift certificates. Respondents who qualified for the message evaluation survey received 200 HIpoinTs, with a U.S. dollar equivalent of US \$2.00.

A short questionnaire was used to screen panel members into this study. To qualify for this study, individuals must be 40 years of age or older and have one of six chronic diseases (asthma, diabetes, hyperlipidemia, hypertension, osteoporosis, or depression). Participants self-identified as medication adherers, non-fulfillers (received a new prescription in the past year and did not fill it),

or non-persisters (stop taking a prescription medication in the past year without their doctor instructing them to do so) for one of the index diseases. In the end, 693 adherers, 914 non-persisters, and 361 non-fulfillers participated in this study ($N = 1968$). Because the tested messages were designed primarily for non-adherent patients, only non-persisters and non-fulfillers were used for data analysis. This working sample included 1275 individuals, who were 67.5% female, 90.1% white with a mean age of 55.33 ($SD = 9.52$) and a modal income in the range from US \$50,000 to \$74,999.

5.2. Design

This study employed a three (risk type) \times three (message type) factorial design. Using the Adherence Estimator[®] [27], participants were classified into three groups based on their highest risk for non-adherence (commitment, concern, and cost). (The Adherence Estimator[®] is a brief, three-item screener for patient propensity to adhere to prescription medications for chronic disease. One item each from the Adherence Estimator[®] assesses the domains of perceived need for medications, perceived medication concerns, and perceived medication affordability. The Adherence Estimator yields a total score as well as three risk levels for non-adherence: low, medium, and high risk) [31]. Soft quotas were set in the recruiting process to ensure that all three risk dimensions would be adequately represented in the sample. Participants in each risk group were then randomly assigned to three message conditions: no message (control), positively framed messages, and negatively framed messages. The message library resulting from the phase 1 study had nine messages addressing commitment, six messages addressing medication concerns, and eight messages addressing costs of prescription medications. For each message, a positive frame was created to emphasize the advantages and benefits individuals may gain by following message recommendations, and a negative frame was created to emphasize the disadvantages and losses individuals may suffer by not following message recommendations. The informational content of the pair of framed messages were otherwise identical. The study design and sample breakdown are summarized in Table 2.

According to this design, participants in non-control conditions were presented with messages appropriate to both their risk types and framing conditions. For example, a participant in the positive commitment condition would receive only messages addressing commitment issues that were positively framed. To reduce respondent burden, participants were each assigned three randomly selected messages from the appropriate message set. Participants completed an evaluation instrument after receiving each of the three messages which assessed their future adherence intentions. Participants in the control condition did not receive adherence messages.

5.3. Measures

All measures in this study, unless otherwise noted, used a seven-point scale representing increasing order of favorable outcome. The evaluation measures were adopted from recent work on perceived argument strength in the persuasion literature [30]. The measures included items assessing message quality (e.g.,

Table 2
Phase 2 study design and sample allocation.

	Control	Positive frame	Negative frame
Commitment	$n = 175$	$n = 175$	$n = 176$
Concerns	$n = 127$	$n = 124$	$n = 127$
Costs	$n = 123$	$n = 125$	$n = 123$

the statement said something about prescription medications that was convincing to me), message agreement (e.g., overall, how much do you agree or disagree with the statement?), message liking (e.g., how much do you like the statement?), and message engagement (e.g., how much did you feel interested/inspired/informed when you were reading the statement). These items were averaged into an overall evaluation measure for each message (Cronbach's alpha range = .84–.91).

A group of measures based on the integrative model of behavior prediction [31] were used to assess participants' intention, attitude, subjective norm, and self-efficacy regarding adhering to future prescription medications. These measures were created following established norms in the behavioral literature [32]. Intention was measured by asking how likely the participant would be to take his/her new prescription medication for as long as her health care provider (both doctors and nurses) prescribed it ($M = 4.87$, $SD = 1.87$). Attitude toward taking new prescription medication as directed was measured with six semantic differentials (e.g., bad vs. good, Cronbach's alpha = .89, $M = 5.22$, $SD = 1.27$). Subjective norm was measured with five items asking whether important others in participants' life would approve or disapprove their taking new prescription medication as directed (e.g., spouse/partner, Cronbach's alpha = .88, $M = 5.75$, $SD = 1.23$). Self-efficacy was measured by a single item asking how confident they were about taking new prescription medication as directed ($M = 3.64$, $SD = 2.02$).

Participants were also asked to rank order a number of sources (e.g., health care provider, pharmacists, etc.) and channels (e.g., patient brochure, in-person conversation, etc.) through which they would like to receive the messages. These data were collected to guide eventual design of communication intervention strategies for delivering motivational messages to consumers via preferred channels that would be presented by credible sources of health information.

5.4. Phase 2 data analysis

Data analysis was carried out in four steps. First, we first conducted a validation test of the evaluation measures used in this study. Although these measures were carefully crafted based on relevant persuasion theory and research, the extent to which they accurately captured message strength in this particular context remained a question [35–38]. This question was answered by a hierarchical multiple linear regression using message evaluations to predict intentions and cognitions about future adherence. Demographic and health risk variables were entered as control variables before the message evaluation measure was entered in the second block. The idea is that, if the message evaluation measures were good indicators of message strength, then participants who rated the messages they read as strong should be more likely to adhere to future prescription medications compared to those who rated the messages as weak.

Second, we calculated the average evaluation score for each motivational message. These scores were then used to rank messages in the library to inform future message selection and use. Third, we tested whether message framing mattered in motivational adherence messages. To that end, we conducted a series of analysis of variance (ANOVAs) to examine the effect of message framing on intention, attitude, subjective norm, and self-efficacy. Risk type and current adherence status were also included in the analysis as additional factors to control for their influences on the outcome variables. Finally, we ascertained participants' preferences for different message sources and channels. Ranking averages were used as the basis for ordering to determine the relative magnitude of message preferences for guiding eventual communication intervention strategies.

Table 3

Regression of future adherence outcomes on message evaluation.

	β			
	Intention	Attitude	Subjective norm	Self-efficacy
Block 1				
Female	-.08 [†]	.00	-.06	-.10 ^{***}
Age	.05	-.01	-.05	.01
Income	.04	-.03	.01	.08
Health status	.04	-.01	.03	.05 [†]
Nonfulfiller (vs. non-persister)	-.12 ^{***}	-.11 ^{***}	.01	-.08
Commitment Risk	-.14 ^{***}	-.18 ^{***}	-.15 ^{***}	-.09 ^{**}
Concerns risk	-.16 ^{***}	-.31 ^{***}	-.15 ^{***}	-.19 ^{***}
Costs risk	-.07	.02	.00	-.25 ^{***}
Block 2				
Aggregate message evaluation	.24 ^{***}	.28 ^{***}	.26 ^{***}	.26 ^{***}
Adj. R^2	.15	.32	.16	.18
ΔR^2	.05	.07	.06	.06

Note: Coefficients are standardized regressions weights.

[†] $p < .05$.

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

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

6. Phase 2 results

6.1. Measurement validation

To validate the evaluation measures, we averaged the overall evaluation scores across the three messages for each participant and used this aggregate evaluation measure to predict future adherence intention, attitude, subjective norm, and self-efficacy while controlling for gender, race, age, income, current health status, current adherence status, and current risk levels on commitment, concern, and cost. The results of the regression analyses are summarized in Table 3. The aggregate evaluation measure emerged as a strong and positive predictor in all regression models, accounting for 5–7% of unique variance in the outcome measure. These findings supported the validity of the message evaluation measures.

6.2. Message ranking

Each of the 46 messages (23 positively framed and 23 negatively framed) was evaluated by a sample of its target audience (e.g., commitment messages were only evaluated by patients with commitment issues; $ns = 70$ –118). The average evaluation scores of the messages ranged from 3.07 to 4.46 ($M = 3.84$, $SD = .34$). The messages were then ranked based on their average evaluation scores within their respective risk categories based on the 3C's, enabling refinement of targeted motivational message strategies.

6.3. Framing effects

The effect of message framing on intention, attitude, subjective norm, and self-efficacy was examined via a series of ANOVAs. Framing had a significant effect on intention ($F(2, 1257) = 4.25$, $p = .015$), but its effect was not significant on attitude ($F(2, 1257) = 1.29$, $p = .276$), subjective norm ($F(2, 1257) = .25$, $p = .776$), and efficacy ($F(2, 1257) = 1.24$, $p = .291$). As is shown in Fig. 1, both positively and negatively framed messages increased adherence intention compared to control ($p = .033$ and $.005$, respectively). The negative frame showed slightly greater impact than the positive frame, although the difference was not significant in post hoc comparisons ($p = .518$). The same pattern largely held for the other

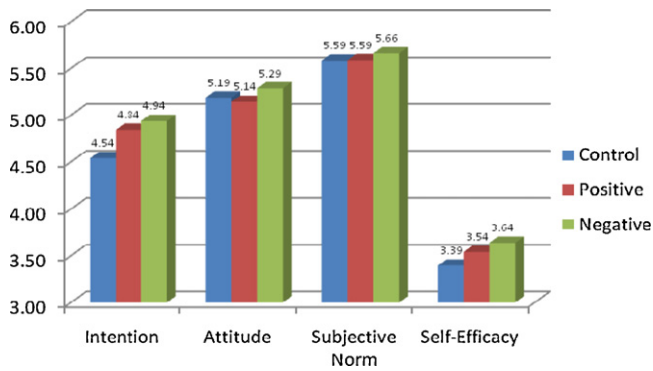


Fig. 1. Framing effects on adherence outcomes.

three outcome measures, although none of the differences were significant.

6.4. Source and channel preferences

Based on participants' average ranking, doctors and nurses were clearly identified by respondents as their most preferred source for information about prescribed medications ($M_{rank} = 1.69$, $SD = 1.27$), followed by pharmacists ($M_{rank} = 2.67$, $SD = 1.28$), patient advocacy groups ($M_{rank} = 3.95$, $SD = 1.63$), government agencies ($M_{rank} = 4.53$, $SD = 1.77$), friends and family ($M_{rank} = 4.81$, $SD = 1.67$), pharmaceutical companies ($M_{rank} = 5.10$, $SD = 1.73$), and insurance companies ($M_{rank} = 5.25$, $SD = 1.54$). These data suggest the best sources for providing consumers with motivational messages about prescribed medications.

The most preferred channel for message delivery was in-person conversation ($M_{rank} = 2.61$, $SD = 2.26$), followed by patient brochure or handout ($M_{rank} = 3.22$, $SD = 1.88$), Internet website ($M_{rank} = 3.73$, $SD = 2.00$), mailing to home ($M_{rank} = 4.56$, $SD = 2.06$), email ($M_{rank} = 4.64$, $SD = 2.09$), video or DVD ($M_{rank} = 5.79$, $SD = 1.94$), telephone call ($M_{rank} = 6.24$, $SD = 2.32$), group presentation ($M_{rank} = 6.34$, $SD = 2.04$), and text message ($M_{rank} = 7.87$, $SD = 1.57$).

7. Discussion and conclusion

7.1. Discussion

The multi-methodological field research program was designed to develop and validate motivational messages and communication intervention strategies to encourage prescription medication adherence among chronically ill patients. Successful attempts to improve patient adherence depend upon establishing realistic assessments of patient knowledge and beliefs toward recommended medication regimens and engaging in targeted motivating communication interventions to address impediments to adherence. Results of this research suggest that consumers have important information concerns about the appropriateness, safety, and expense of their medications. These concerns could be addressed through the provision of strategically targeted messages, delivered via preferred communication channels, by credible sources. Implementation of this messaging strategy could therefore provide consumers with needed information that will motivate adherence with medication recommendations. Health care professionals, such as primary care physicians, nurses, and pharmacists were found to be credible and trusted sources for providing relevant information concerning prescribed medications that should be employed in addressing patient medication concerns. This innovative research program should advance behavior-change theory and suggest specific communication strategies for improving medication adherence.

The qualitative research suggested that perceived need for prescription medications (commitment) was the primary adherence issue (57%) for the 58 participating patients with chronic disease, followed by concerns about side effects and the safety of prescribed medications (30%), and concerns about the costs of medications (13%). While the sample of consumers studied in this research program were patients with chronic diseases who have tremendous needs for adhering with ongoing medication recommendations, it will be important in future research to determine whether these results are similar or different for the general public of health care consumers. These key issues were translated into draft motivational messages. Data from the experimental research showed that exposure to motivational messages (as opposed to receiving no messages) increased consumers' intention to adhere with medication recommendations in the future. (Of course intention to adhere does not always translate into consistent and sustained medication adherence behavior. Our results suggested that while consumers' intentions to adhere increased, this was not always followed by increases in consumer attitudes, subjective norms or self-efficacy toward adherence. It appears that repeated and reinforcing multidimensional communication interventions may be needed to move consumers toward increased adherence with medication recommendations.) The framing manipulation of the messages did not produce statistically significant effects, although mean differences across several outcome variables suggested a slight advantage for the loss-frame over the gain-frame messages, a finding found in previous message framing studies [33]. Moreover, the regression analysis validated the message evaluation measure used in this research. The substantial associations between message evaluations and various behavioral antecedents (intention, attitude, subjective norm, and self-efficacy) also suggest that the motivational messages that are favorably received by consumers may have strong potential to motivate non-adherent chronically ill patients to adhere to future medication recommendations. This is consistent with previous research that shows that positive discussions with pharmacists about medications can enhance adherence [39–41]. Consumers exhibited preferences for receiving information about their medication prescriptions from health care professionals. These findings and the messages developed through this research program are currently being used to guide development and testing of large scale communication interventions to address consumer concerns about prescribed medications to combat medication non-adherence.

7.2. Limitations

A limitation to the qualitative results is that, by definition, participants in this study had to acknowledge having a chronic health condition. For this reason, patients who discounted a chronic diagnosis were not included in the study. If preliminary adherence decisions begin to occur at the moment of diagnosis, acceptance of a disease diagnosis could be enmeshed with the resulting non-adherence decision. A second study limitation, the use of a convenience sample of interviewees in phase 1, may have produced results that did not wholly represent the experiences of chronically ill patients. A more diverse sample of interviewees, cutting across a range of socio-demographic characteristics, should be utilized in future study when examining this group's concerns and barriers related to adherence.

Future research should also consider whether non-acceptance of a diagnosis influences, and is influenced by, adherence judgments among non-adherent patients. Similarly, researchers should closely examine how adherence judgments influence the adoption of adherence behaviors. Furthermore, future research should examine more fully whether consumers' concerns about

prescribed medications differ significantly based upon the kinds of health care problems they are confronting.

7.3. Practice implications

Follow-up intervention research using these motivational messages is needed to determine the level of influence of these messages on consumers' short-term and long-term decisions to adhere with medication recommendations. It will be important to develop strong exposure communication intervention strategies (including the strategic use of communication channels, sources, message repetition, and feedback) for delivering the motivational messages to patients to capture their attention, increase their understanding about the medication issues of concern to them, and to reinforce the importance of their decisions to adhere with medication recommendations. To build upon this current research, future studies should evaluate the best delivery and implementation strategies for presenting motivational messages that support the information needs of non-adherent consumers to assess the effectiveness of these intervention strategies for promoting medication adherence. Pharmacies and pharmacists have the potential to perform a central role in providing consumers with the relevant information they need to make responsible decisions that lead to increased adherence with prescription medication recommendations.

Conflict of interest

There are no conflicts of interest in this research with any of the authors since there is no reference to any specific pharmaceutical products or services in the study.

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References

- [1] Gadkari A, McHorney C. Medication non-fulfillment rates and reasons for non-fulfillment: narrative systematic review. *Clin Ther* 2010;26:683–705.
- [2] Haynes RB, McDonald HP, Garg AX. Helping patients follow prescribed treatment: clinical applications. *J Am Med Assoc* 2002;288:2880–3.
- [3] World Health Organization. Adherence to Long-Term Therapies. Geneva, Switzerland: World Health Organization; 2003.
- [4] Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med* 2005;353:487–97.
- [5] Bangsberg DR, Perry S, Charlebois ED, Clark RA, Roberston M, Zolopa AR, et al. Non-adherence to highly active antiretroviral therapy predicts progression to AIDS. *AIDS* 2001;15:1181–3.
- [6] DiMatteo MR. Variations in patients' adherence to medical recommendations: a quantitative review of 50 years of research. *Med Care* 2004;42:200–9.
- [7] Krapek K, King K, Warren SS, George KG, Caputo DA, Mihelich K, et al. Medication adherence and associated hemoglobin A1c in type 2 diabetes. *Ann Pharmacother* 2004;38:1357–62.
- [8] Blouin J, Dragomir A, Moride Y, Ste-Marie L, Fernandez J, Perreault S. Impact of noncompliance with alendronate and risedronate on the incidence of non-vertebral osteoporotic fractures in elderly women. *Br J Clin Pharmacol* 2008;66:117–27.
- [9] Breekveldt-Postma NS, Penning-van Beest FJ, Siiskonen SJ, Koerselman J, Klungel OH, Falvey H, et al. Effect of persistent use of antihypertensives on blood pressure goal attainment. *Curr Med Res Opin* 2008;24:1025–31.
- [10] Faught E, Duh MS, Weiner JR, Guerin A, Cunnington MC. Nonadherence to antiepileptic drugs and increased mortality: findings from the RANSOM Study. *Neurology* 2008;71:1572–8.
- [11] Ho PM, Magid DJ, Shetterly SM, Olson KL, Maddox TM, Peterson PN, et al. Medication nonadherence is associated with a broad range of adverse outcomes in patients with coronary artery disease. *Am Heart J* 2008;155:772–9.
- [12] Jackevicius CA, Li P, Tu JV. Prevalence, predictors, and outcomes of primary nonadherence after acute myocardial infarction. *Circulation* 2008;117:1028–36.
- [13] Hulka BS, Cassel JC, Kupper LL, Burdette JA. Communication, compliance and concordance between physicians and patients with prescribed medications. *Am J Publ Health* 1976;66:847–53.
- [14] Haynes RB, McKibbon KA, Kanani R. Systematic review of randomised trials of interventions to assist patients to follow prescriptions for medications. *Lancet* 1996;348:383–6.
- [15] Haynes RB, McDonald H, Garg AX, Montague P. Interventions for helping patients to follow prescriptions for medications. *Cochrane Database Syst Rev* 2002;CD000011.
- [16] McDonald HP, Garg AX, Haynes RB. Interventions to enhance patient adherence to medication prescriptions: scientific review. *J Am Med Assoc* 2002;288:2868–79.
- [17] Aladesanmi O. Medication adherence physician communication skills. *Arch Intern Med* 2007;167:859–60.
- [18] Horne R, Price D, Cleland J, Costa R, Covey D, Gruffydd-Jones K, et al. Can asthma control be improved by understanding the patient's perspective? *BMC Pulm Med* 2007;7:819.
- [19] Armour CL, Smith L, Krass I. Community pharmacy, disease state management, and adherence to medication: a review. *Disease Manage Health Outcomes* 2008;16:245–54.
- [20] Ngho LN. Health literacy: a barrier to pharmacist–patient communication and medication adherence. *J Am Pharm Assoc* 2009;49:e132–49.
- [21] Sluijs E, van Dulmen S, van Dijk L, de Ridder D, Heerdink R, Bensing J. Patient adherence to medical treatment: a meta review. *BMC Health Services Research* 2007;7:55. doi: 10.1186/1472-6963-7-55 [NIVEL, 2006, see: www.nivel.nl/].
- [22] Herborg H, Haugbølle LS, Rossing C, Sørensen L, Dam P. Developing a generic, individualised adherence programme for chronic medication users. *Pharm Pract* 2008;6:148–57.
- [23] Benson J, Britten N. Patients' decisions about whether or not to take antihypertensive drugs: qualitative study. *Brit Med J* 2002;325:873.
- [24] Belcher VN, Fried TR, Agostini JV, Tinetti ME. Views of older adults on patient participation in medication-related decision making. *J Gen Intern Med* 2006;21:298–303.
- [25] Gardner ME, Rulien N, McGhan WF, Mead RA. A study of patients' perceived importance of medication information provided by physicians in a health maintenance organization. *Drug Intell Clin Pharm* 1988;22:596–8.
- [26] Barber N, Parsons J, Clifford S, Darracott R, Horne R. Patients' problems with new medication for chronic conditions. *Qual Saf Health Care* 2004;13:172–5.
- [27] Weick K. *The Social Psychology of Organizing*. Reading, MA: Addison-Wesley; 1979.
- [28] Kreps GL. Applying Weick's model of organizing to health care and health promotion: highlighting the central role of health communication. *Patient Educ Couns* 2009;74:347–55.
- [29] Kreps GL. Strategic use of communication to market cancer prevention and control to vulnerable populations. *Health Mark Q* 2008;25:204–16.
- [30] Tversky A, Kahneman D. The framing of decisions and the psychology of choice. *Science* 1981;211:453–8.
- [31] McHorney C. The Adherence Estimator: a brief, proximal screener for patient propensity to adhere to prescription medications for chronic disease. *Curr Med Res Opin* 2009;25:215–38.
- [32] Glaser B, Strauss A. *The discovery of grounded theory: strategies for qualitative research*. Chicago, IL: Aldine Publishing Company; 1967.
- [33] Thomas DM, Watson RT. Q-sorting and MIS research: a primer. *Commun Assoc Inform Syst* 2001;8:141–56.
- [34] Mojtabai R, Olsson M. Medication costs, adherence, and health outcomes among Medicare beneficiaries. *Health Aff* 2003;22:220–9.
- [35] Zhao X, Strasser A, Cappella J, Lerman C, Fishbein M. A measure of perceived argument strength: reliability and validity. *Commun Methods Meas*; in press.
- [36] Fishbein M. The role of theory in HIV prevention. *AIDS Care* 2000;12:273–8.
- [37] Fishbein M, Triandis H, Kanfer F, Becker M, Middlestadt S. Factors influencing behavior and behavior change. In: Baum A, Revenson T, Singer J, editors. *Handbook of health psychology*. Mahwah, NJ: Erlbaum; 2001. p. 1–17.
- [38] O'Keefe DJ, Jensen JD. The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: a meta-analytic review. *J Health Commun* 2007;12:623–44.
- [39] Haugbølle LS, Devantier K, Frydenlund B. A user perspective on type-1 diabetes: sense of illness, search for freedom and the role of the pharmacy. *Patient Educ Couns* 2002;47:361–8.
- [40] Knudsen P, Hansen EH, Traulsen JM. Perceptions of young women using SSRI antidepressants—a reclassification of stigma. *Int J Pharm Pract* 2002;10:243–52.
- [41] Traulsen JM, Almarsdóttir AB, Björnsdóttir I. The lay user perspective on the quality of pharmaceuticals, drug therapy and pharmacy services. *Pharm World Sci* 2002;24:196–200.