

# Cues from Doctor: Role of Media in Reinforcing Life Changing Interventions

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# Cues from the Doctor: Role of Media in Reinforcing Life Changing Interventions

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## ABSTRACT

Lack of patient motivation to change health behaviors creates a barrier to curb chronic diseases such as diabetes. This study empirically investigates the influence of perception of educational benefits and self awareness of the disease on life changing interventions, and the complementary effect of media intensity on the relationship between self awareness and life changing interventions. Using an archival survey data of 78 patients that were imparted diabetes management education programs, we find that media intensity complements the influence of self awareness on life changing modalities, along with the direct effects of perceived educational benefits and self awareness on life changing intervention and patient satisfaction. The results of this study indicate the implications that a richer media enabled by information technology can play a significant role to influence the process of chronic disease management.

## Keywords

Diabetes, chronic-care education, health action process approach, patient satisfaction, life changing interventions, information technology enabled communication.

## INTRODUCTION

An estimated 26 million people in the United States have diabetes, a disease in which blood glucose levels are above normal resulting from defects in insulin production, insulin action, or both (CDC 2011). Unfortunately, about 5 million of the individuals affected with this disease do not receive any care, and a much larger number do not follow-up with diabetes related treatment.

Diabetes can cause serious health complications such as heart attacks, strokes, high blood pressure, kidney failure, blindness and amputations of feet and legs. The burden of diabetes is estimated to cost \$174 billion annually, including \$116 billion in direct medical expenses, apart from being the seventh leading cause of death by disease.

Diabetes is a progressive disease that starts with diagnosable pre-diabetes condition in which individuals have blood glucose levels higher than normal but not high enough to be classified as diabetes. People with pre-diabetes have an increased risk of developing type-2 diabetes, heart disease, and stroke. However, studies have shown that people who lose weight and increase their physical activity can prevent or delay type 2 diabetes and in some cases return their blood glucose levels to normal (Bloomgarden 2004; Hussain et al. 2007). Clinical evidence asserts that diabetes can be curbed if patients follow life changing interventions such as physical activities, weight loss programs, diet controls; once diagnosed with the disease (Hayes and Kriska 2008; Sanz et al. 2010).

Irrespective of the positive impact of life changing interventions on diabetes cure, often individuals lack the motivation to follow such advice (Franz 1997). Since health behavior change needs a high degree of determination, individuals falter in maintaining a planned intervention process, such as a long-term diet control or exercise regime. Indeed, the burden of diabetes has propelled policy makers to implement nationwide self-management education and prevention programs, that can educate patients on interventions (Funnell et al. 2009). However, communicating these programs and motivating patients through these programs have been a concern for healthcare practitioners.

In this study, we argue that electronic media plays an important role in following up with patients to provide education and motivate them for management of diabetes. We explore how the intensity of electronic media complements the process of increasing self-awareness and communicating diabetes education to a patient. Using an archival data set constructed from survey of 78 patients, we empirically examine the direct effects of self-awareness, education perception on patient satisfaction and life changing interventions and a complementary effect of electronic media intensity on the relationship

between self awareness and life changing interventions. The results of this study indicate the implications that media intensity, specifically enabled by information technology communication medium has a significant role on patients’ life changing interventions for chronic disease management.

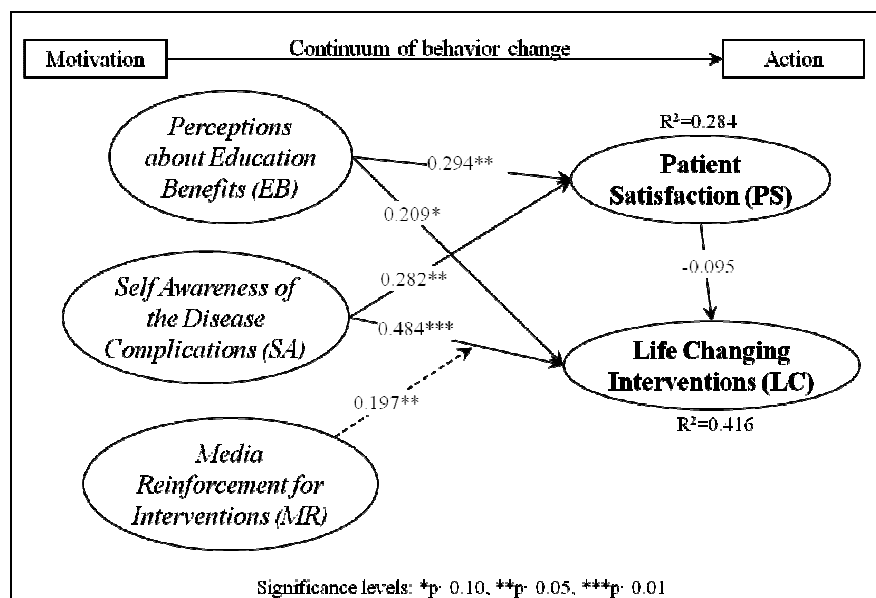
**THEORETICAL FRAMEWORK**

**Prior Literature**

A stream of literature in health management area explores how intervention helps to bridge the gap between intention and health change behavior. Prior studies suggest that motivational self-efficacy may serve as an important intervention in transforming individual intentions to health-related actions (Bandura 1998; Sutton 2008). Studies build on the self-efficacy concept to explore intervention (both digital and non-digital) as a bridge between intention and behavior in the context of health behavior changes, such as physical activities and diet or nutrition controls (for a review see Kroeze et al. 2006). Recent health management literature builds on the motivational self efficiency concept, and conceptualizes a health action process approach (HAPA) to explain the mechanisms associated with health-related behavior changes (Schwarzer 2008), arguing that individuals get motivated or set goals after shaping their intentions to achieve a certain predicted modification regarding their health behaviors. However, the process of change might be voluntary or through specifically designed motivational factors (Lippke and Ziegelmann 2008). Researchers have applied the HAPA framework to explain health behavior changes such as physical activity (Scholz et al. 2007), diet and nutrition(Renner et al. 2008), seat belt use, dental hygiene and other health interventions (see Schwarzer 2008), digital health interventions contexts such as email reminders to cardio vascular and diabetes patients (Luszczynska and Tryburcy 2008), and intervention mapping protocols for HIV patients (Mikolajczak et al. 2008). We extend this stream of research to explain how media intensity as a reinforcement mechanism can play a role for life changing interventions for diabetes patients.

**Conceptual Model**

Drawing on the concepts of health action process approach (HAPA), we present a conceptual model (see Figure 1). The model shows that perceived education benefits and self-awareness are two motivational antecedents to the behavioral shift towards life changing interventions, mediated by patient satisfaction. We argue that media reinforcement plays a complementary role on the relationship between the self-awareness and life changing interventions.



**Figure 1. Model and Results**

Individuals are at the point when their intentions are being shaped towards the management of a disease, they ‘reside’ in a phase referred to as the motivation phase. Education and self awareness shape the intentions towards the management of

disease (Sutton 2008). Once the intentions are formed, patients move on a continuum of goal pursuit towards the action, e.g., the use of life changing modalities as interventions to manage the disease. However, individuals may vary in pursuing their goals to bridge the intention and action. Prior literature suggests that inactive individuals might be slow in altering their health-related behaviors, while active persons may follow a fast transition towards their health behavior change (Weinstein et al. 1998).

Additional reinforcement mechanisms might expedite the intention to action continuum. The degree to which the intentions can be converted to actions depends on a positive or negative reinforcement, with varying degrees of effectiveness (Schwarzer 2008). For example, studies mention that planning based on constant follow-ups may intensify the action plan (when, where, how to act) and assists in the translation of intention to actual behavior or action (Schwarzer et al. 2008).

### **Hypotheses**

Managing diabetes involves several steps. First, the patient needs to know the level of disease progression. Second, the patient needs to know what is to be managed. For example, for adults with type 2 diabetes, controlling glycemic is critical towards the disease management (Norris et al. 2002). In this regard, perception of education benefit plays an important role as the patient increases the competence of decision taking abilities regarding health management (Bodenheimer et al. 2002; Warsi et al. 2004). Patients who understand benefit of an education program will attend several sessions or meet care providers to manage the critical parameters. Further, patients involved in such programs would feel ‘empowered’ with their acquired knowledge about the disease. Such patients have reduced anxiety about the ill-effects of the disease, higher health status, may make more use of preventive services. In other words, in so far as the diabetes education programs are known to improve patient’s understanding and knowledge, the perception that such programs are needed would motivate a patient to participate and learn the actions to manage the disease from these programs (Coulter and Ellins 2007). Greater understanding of the causes, outcomes, and measures to control the disease will motivate patients to follow the interventions that will facilitate managing their disease. Based on these discussions, we hypothesize:

*H1a: Higher perception about the benefits of the diabetes education will have a positive impact on patient satisfaction about self-management of disease.*

*H1b: Higher perception about the benefits of the diabetes education will have a positive impact on life changing interventions.*

Patient self awareness regarding the diseases relates to the extent of knowledge that the person has about the disease (Hernandez et al. 1999). Several prior studies mention that self-awareness or knowledge of one’s thoughts, emotions, and behaviors increases the mindfulness of a person’s actions towards a situation, with a positive impact the way a person acts to a situation or context (e.g., see Brown and Ryan 2003; Richards). Therefore, increasing self awareness about the disease complications will lead to higher self efficacy goals, since knowledgeable or mindful persons will focus on opportunities, than the obstacles in attaining challenging goals (e.g., "in my organization there is a low-fat diet group", " instead of "there are burgers given in each meeting"). Specific to diabetes, once patients know that sugar might be a critical factor in managing the disease, they may shift to the low-calorie sugars or available sweeteners; compared to the lack of knowledge that “sugar” is a concern. Furthermore, once the appropriate regime for a disease is followed, patients will also derive satisfaction from the disease, and will be keener on following the interventions needed for management of the disease. In other words, individuals with high self awareness about the disease will derive a higher satisfaction from their efforts, able to solve the challenging goals at ease (DeVellis and DeVellis 2000). Based on these discussions, we hypothesize:

*H2a: Self-awareness of the disease complications has a positive influence on patient satisfaction.*

*H2b: Self-awareness of the disease complications has a positive influence on life changing interventions.*

In a healthcare service delivery environment, the communication process is crucial to the way care is delivered from the physicians to the patients (for a review, see Rao et al. 2007). Existing literature shows the impact of media on reinforcement on certain health behaviors, such as parental reinforcement of media messages has a significant positive influence on college student’s alcohol related behaviors (Austin and Chen 2003). Similarly, researchers suggest that telemedicine can be effective to follow up with patients to adopt health behaviors (Tulu et al. 2007). Consequently, providers may be reducing their communication performance because of the communication media they use. Reduced communication performance can contribute to poor decisions or costly or negative outcomes. Therefore, it is important for providers to understand which

media to use and what kind of communication to be sent based on the need, communication task and components or processes of the task.

Communication media can hinder or help communication (e.g., see Carlson and Zmud 1999; Daft et al. 1987; Robert et al. 2008). Arguably, individuals should use multiple media for the different parts of their communication, depending on communication processes, purpose and task involved; broadly categorized into two communication processes: conveyance and convergence (e.g., proposed in media synchronicity theory by Dennis et al. 2008). Arguably, sending an individualized communication that focuses on a specific patient increases the likelihood of the patient's attention towards the disease management, than a mass postcard reminder to all to manage their diseases with some generic points of action. Thus, while the "reach" component of the communication media helps to provide access to a patient, an "intense" or "personalized" communication influences patient through individualized communication. Indeed, media synchronicity theoretical view argues that because all communication tasks are composed of two fundamental communication processes: conveyance processes (e.g., reach) and convergence processes (e.g., increasing motivation or influencing decision); asynchronous media should lead to better performance with conveyance processes, and synchronous media should lead to better performance with convergence processes (Dennis et al. 2008). Based on these discussions, we argue that using an intense media to reinforce disease management process would increase the awareness level of patients about the importance of adopting interventions that benefit managing their disease, and hypothesize:

*H2c: The positive impact of self-awareness on life change interventions is increased by using reinforcement mechanisms using high intensity and richer media.*

Prior studies show that the satisfaction of patients with the progress of their own disease management, determines their motivation to achieve further curable goals (Wiggers et al. 1990). Specific to diabetes management, studies find that a systematic approach to the intervention process, such as glycemic control using insulin or follow ups to attend managed care increase patient satisfaction and related outcomes (Clark et al. 2001; Rosenstock et al. 2004). Based on these arguments we hypothesize:

*H3: The influence of perceived educational benefits and self-awareness on life changing interventions is mediated by the patient satisfaction.*

## **METHOD**

### **Data and Variables**

We obtained the archival data for this study from a survey of diabetes patients in a southwestern US hospital during December 2009 and January 2010. A consulting firm conducted the survey, with face-to-face meetings, following a structured protocol. The consulting firm collected the data for tracking the treatment progression of diabetes patients, and therefore, the data is relevant to the purpose of the study.

The patients were followed up by the hospital through a diabetes management program for adoption of life changing interventions that are helpful for managing diabetes. The data contains response from 83 patients, out of the 201 patients followed by the hospital in the survey period. The number of usable responses was 78, leading a response rate of approximately 39%. Out of 78 patients, 32 are male, 70 were diagnosed with diabetes for at least as long as 2 years, and 30 patients had an associate's degree or higher. We obtained de-identified data from the consulting firm for this study, and coded the variables as reflective constructs from the survey items (*survey questionnaire and demographics of the respondents are available in a working paper of this study, but not attached due to space constraints*).

Table 1 includes a description of the variables as well as their corresponding items used in the study. The main dependent variable, life-changing intervention (LC), is a 4-item construct. Amongst the independent variables, self awareness of the disease complications (SA) is a 3-item construct, and the perceptions about education benefits (EB) is a 4-item construct. The mediating variable patient satisfaction (PS) is a 3-item construct, and the media reinforcement (MR) is a 4-scale single item variable. The MR variable is coded as highest with respect to personalized email (electronic and targeted), while a postcard sent to all patients is coded as lowest, as this is untargeted media. In other words, the media variable captures the intensity of media in combined electronic and targeted scales of 1 to 4. Table 2 shows the descriptive statistics, Cronbach alphas, the

average variance extracted (AVE) and the composite reliability of the constructs. All values cater to the standards mentioned in prior studies (details omitted due to space constraints).

Variable	Definition/Operationalization	Items*
Perceptions about Education Benefits (EB)	The perception of the individual on the benefits of the education on the disease management.	1. I have been told by my doctor what the tablets or insulin does to by blood sugar. (EB1) 2. I have been referred by my doctor to a diabetes education class. (EB2) 3. Diabetes education has improved my quality of life. (EB3) 4. It is important I regularly check my blood sugar. (EB4)
Self Awareness of the Disease Complications (SA)	The extent to which the individual is aware of the symptoms, complications and basic reasons of the disease.	1. I am aware of the symptoms of diabetes. (SA1) 2. I am aware of the complications with diabetes. (SA2) 3. I know that diabetes means an increase glucose level in my blood. (SA3)
Patient Satisfaction (PS)	The extent to which the patient is satisfied with the management of the disease, in his/her own terms through the interactions with doctor and healthcare providers.	1. I am satisfied with the way my diabetes is managed, in that, my condition is under control and I feel comfortable with my lifestyle. (PS1) 2. The frequency you visit your healthcare provider, or seek medical attention. (PS2) 3. The length of time spent with your doctor. (PS3)
Life Changing Interventions (LC)	The interventions that the patient feels are appropriate and actionable for managing the disease.	1. Diabetes is a serious condition that needs a change in the way I lead my life. (LC1) 2. Exercise is crucial to combat my diabetes. (LC2) 3. Managing sugar is an important way to manage diabetes. (LC3) 4. Altering my diet will improve my diabetes condition. (LC4)
Media Reinforcement (MR)	Use of effective media to provide educational material, and follow ups to the patient regarding disease management.	1. Email (electronic and targeted) (coded as 4) 2. E-announcements i.e., announcements sent through any electronic media, such as internet, blog sites, or websites (electronic and untargeted) (coded as 3) 3. Telephones (semi-electronic and targeted) (coded as 2) 4. Postcards (non-electronic and can be targeted, if received by the patient) (coded as 1)

\*Anchors used for the items for EB, SA, PS, and LC: 1=strongly disagree, 5=strongly agree

**Table 1. Variables and Items**

Variable	Obs.	Items	Scale	Mean	Std. Dev.	Cronbach Alpha	AVE	Composite Reliability
EB	78	EB1	1-5	3.83	1.47	0.65	0.50	0.79
		EB2	1-5	4.00	1.10			
		EB3	1-5	3.83	0.75			
		EB4	1-5	4.50	0.84			
SA	78	SA1	1-5	4.33	0.82	0.85	0.77	0.91
		SA2	1-5	4.50	0.84			
		SA3	1-5	4.50	0.55			
PS	78	PS1	1-5	3.5	1.05	0.81	0.76	0.89
		PS2	1-5	4.33	0.52			
		PS3	1-5	4.0	0.63			
LC	78	LC1	1-5	4.67	0.52	0.84	0.69	0.89
		LC2	1-5	4.0	1.10			
		LC3	1-5	4.33	0.82			
		LC4	1-5	4.5	0.84			
MR	78	MR	1-4	2.60	1.17			

**Table 2. Descriptive Statistics, Cronbach Alphas, AVE, and Composite Reliability**

## Analysis and Results

We conducted the empirical analysis using partial least square (PLS) technique using Smart-PLS software. PLS is an appropriate technique for this study since it can handle the small sample size secondary survey data used in this study (Rigdon 2012). In addition, PLS has capability to manage multicollinearity issues and is suitable for testing complex models, such as the one proposed in our study (Gefen et al. 2011).

Based on our empirical analysis, we find that the influence of perception about education benefits (EB) is positive and significant on patient satisfaction (PS) ( $\beta = 0.294$ ,  $p < 0.05$ ), that supports hypothesis H1a. We also found significant effect of perception of education benefits on life changing intervention ( $\beta = 0.209$ ,  $p < 0.10$ ), thereby supporting hypothesis H1b. Self-awareness (SA) significantly increases patient satisfaction ( $\beta = 0.282$ ,  $p < 0.05$ ) as well as life change interventions (LC) ( $\beta = 0.484$ ,  $p < 0.01$ ). These results support hypotheses H2a and H2b.

In regards to the complementary effect of media reinforcement on the relationship between self-awareness and life changing interventions, we find a significant and positive influence ( $\beta = 0.197$ ,  $p < 0.05$ ). This result supports hypothesis H2c, i.e., media reinforcement increases the positive impact of self-awareness on life change intervention. This was evident from the change in R-square value or explained variance in LC. The direct effect model explained 35.4% of the variance in LC respectively. When MR was included as a moderator, as expected, explained variance in LC increased to 42.9% (an increase of 7.5%). With respect to the mediating hypothesis H3, we did not find any influence of patient satisfaction on life change interventions, thereby rejecting this hypothesis.

The results remain similar after adding different controls for robustness checks; e.g., gender (male=1 and female=0), education (up to high school =1, others=0), ethnicity (dummies for Caucasian and Hispanic), and disease duration (time since diagnosed with diabetes). Only in case of disease duration, there is a reduction in the p-value (from 0.1 to 0.07) of the coefficient of EB on LC, thereby indicating that patients might accrue higher benefits from educational programs at the initial stage of diagnosis than a later stage.

## DISCUSSION

The goal of this study was to understand the antecedents of life changing interventions, and how communication media can increase the motivation of patients to manage life-changing interventions for diabetes. We find that perception regarding education benefits positively influence patient satisfaction and the action of life changing interventions. These results indicate that gaining knowledge about the disease serves as a precursor for a patient to be motivated about the management of the disease. In addition, we find that self-awareness about the disease complications positively influences patient satisfaction and life changing interventions. These findings imply that as a patient gains an understanding about the nuances associated with the disease, the motivations to manage the disease and adopt interventions increases. With respect to the complementary effect of media reinforcement, we find that as providers use an intensive media that is more targeted to the patient, the influence of self-awareness on life changing interventions increases. In other words, using targeted medium of communication motivates a patient who is aware, but lacks in the action plan towards life changing interventions. Finally, we theoretically argued for a mediation effect of patient satisfaction on self-awareness and perceived education benefits on life changing interventions. This was not empirically supported by the data.

This study contributes to health process behavior change area of research. We explore how self-awareness and perception of disease education influence the health process behavior change, in the context of effectiveness of diabetes management programs. We also contribute to information systems research in explicating the complementing influence of media reinforcement on the relationship between self-awareness about the disease and the life changing interventions.

Because of data limitations and the use of a cross-sectional design, our results are associational in nature. Second, although our sample size is small compared to the number of diabetes patients across US, it is appropriate for our study since our focus is on those individuals who are receiving follow-up treatment for their condition. Third, the empirical analysis was conducted in the context of diabetes and may limit the generalizability of the results of the study to other chronic diseases, e.g., asthma, cancer, or HIV/AIDS. Further, this study is limited to exploring the effect of uni-dimensional media reinforcement that can be extended to other dimensions; such as different levels of conveyance or convergence processes, or different tones of medium of communication emerging from Web 2.0 technologies (namely, social media such as Facebook, Twitter etc).

In terms of managerial implications, the findings of this study imply that health care providers need to pay utmost importance in explaining the detailed issues, concerns and complications associated with the disease. Further, care providers need to focus on following up with patients proactively. Indeed, with the emerging focus on the “preventive care” in healthcare, appropriate follow ups are necessary to curb the cost and increase quality of a treatment for a disease; than leaving the patient

to manage by their own. Using a targeted electronic medium of communication would increase the use of life changing interventions.

In conclusion, this study provides one of the first empirical tests to explore how two motivations factors, e.g., perception of educational benefits and self awareness about a disease increases the use of life changing interventions; and how communication media plays an important role in increasing the influence of self awareness on life changing modalities. The study contributes to the existing healthcare management and information systems literature examining the importance of media on health behavior change. Finally, this study points to the importance of targeted electronic media for communication to deal with patients for followups from providers.

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