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Adherence and Uncertainty Management: A Test Of The Theory Of Motivated Information Management

Ryan Thiel
University of Montana, Missoula

ADHERENCE AND UNCERTAINTY MANAGEMENT: A TEST OF THE THEORY

OF MOTIVATED INFORMATION MANAGEMENT

By

RYAN DAVID THIEL

Bachelor of Arts, University of Minnesota Duluth, Duluth, MN, 2014
Associate of Arts, Anoka-Ramsey Community College, Coon Rapids, MN, 2012

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Approved by:

Scott Whittenberg, Dean of the Graduate School
Graduate School

Stephen Yoshimura
Communication Studies

Joel Iverson
Communication Studies

Jan VanRiper
Institute of Health and Humanities

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Management

Chairperson: Dr. Stephen Yoshimura

This study examined the main predictors of adherence to a health regimen by patients clinically diagnosed with a heart condition. The theory of motivated information management was used to illuminate salient variables including uncertainty, emotion(s), outcome expectancies, and efficacy assessments. A total of 76 participants completed an online survey, asking about variables related to the theory of motivated information management, adherence, and quality of communication between patient and physician. All together, 90.8% of patients reported properly adhering to their health regimen. The results further indicated that participants had overall low levels of uncertainty regarding their health regimen, and reported positive emotions as a result. Additionally, outcome expectancies and efficacy assessments had a significant effect on the decision to seek information from their physician, which had a significant effect on self-reported rates of adherence. Finally, the quality of communication was found to significantly affect adherence to a given health regimen. These results shed light on the variables that health providers must take into account in order to improve adherence and patient outcomes.

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According to the World Health Organization (WHO), only 50% of patients with chronic diseases adhere to medical recommendations (Sabat, 2003). Nonadherence can take many forms, including not following prescriptions (e.g., incorrect doses, substituting drugs, not re-filling prescriptions, failure to take medication in a timely fashion), or inconsistent adoption of recommended lifestyle changes (e.g., diet, exercise). Researchers indicate that 33% - 69% of medication-related U.S. hospital admissions were attributed to poor medication adherence (Albert, 2008, p. 56), and nonadherence is estimated to cause 125,000 deaths and at least 10% of total hospitalizations within the United States (Viswanathan et al., 2012).

Patients with a clinical diagnosis of a heart condition risk experiencing particularly negative repercussions due to nonadherence. According to the Center for Disease Control (CDC), heart disease is the leading cause of death in the United States (CDC, 2013), and approximately 610,000 people a year in the United States die as a result of this ailment, which accounts for one in every four deaths (CDC, 2013). Unfortunately, nonadherence to prescriptions or other clinical recommendations is a main correlate of factors that contribute to heart disease, such as hypertension (Sabat, 2003), and poor adherence to medical regimens accounts for substantial morbidity and mortality among patients with heart disease (Albert, 2008, p. 56).

Improvements in adherence for those with chronic conditions such as cardiovascular disease could offer substantial personal and social benefits. For example, significant cost-savings and increases in the effectiveness of health interventions are two byproducts of relatively low-cost interventions for improving adherence (Sabat, 2003, p. XIII). The costs and politico-sociological implications of heart disease account for a significant portion of total inpatient expenditure (Michalsen, Knig, & Thimme, 1998), with nonadherence costing the American health-care system between an estimated $100 billion and $289 billion a year (Brody, 2017).

The purpose of this study is to analyze the variables that affect adherence of a given health regimen, which are the set of actions a patient plans to undergo to maintain or improve health, such as diet, exercise, or treatment. To do this, the theory of motivated information management and communication between patient and physician was analyzed. The specific sample for this study are patients with a heart condition because they experience particularly serious repercussions as a result of nonadherence.

The Concept of Adherence

Adherence is "the extent to which a person's behavior - taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (Sabat, 2003, p. 3). In contrast, the Merriam-Webster dictionary defines compliance as "the act or process of complying to a desire, demand, proposal, or regimen" (Merriam Webster's Dictionary, 2017). While the terms adherence and compliance are often used interchangeably, Sabat (2003) differentiates the terms, explaining that, whereas adherence implies the patient's agreement to the recommendations, the term compliance does not necessarily do so. Thus, using the term adherence implies that patients play an active role in their health (Sabat, 2003). Compliance literature is largely unclear as to whether or not participants agreed to clinical recommendations prior to them being prescribed, and the lack of clarity has likely resulted in the two terms being used interchangeably. In this study, the term adherence instead of compliance will be used, given the patient-centered perspective that the term adherence suggests. Obviously, negligence or obstinance are not the sole or primary explanatory factors for not following prescribed health behaviors, and it would be inappropriate to imply that patients and physicians do not negotiate prescriptions around the relative net harms and benefits of following them.

The WHO (2003) identifies five variables that affect adherence: condition-related factors, patient-related factors, therapy-related factors, social/economic factors, and health-system factors. *Condition-related* factors represent particular illness-related demands experienced by the patient (Sabat*,* 2003, p. 30). Examples of condition-related factors include severity of illness and availability of effective treatments. *Patient-related* factors pivot around resources, knowledge, attitudes, and beliefs. For example, patients' perceptions regarding their health are revealed through attitudes and beliefs that "I'm not a pill person" or "I'm old fashioned - I don't take medicine for nothing" (Rosenbaum, 2015). Additionally, some patients refuse medications because they view them as "chemicals" or "unnatural" (Rosenbaum, 2015). *Therapy-related* factors include the duration and complexity of treatment. As modern medicine has evolved, regimens for managing one's health have become increasingly complex. *Social-economic* factors include socioeconomic status, poverty, or dividing resources within a family. Finally, *health-system* factors includes poorly developed health services with inadequate or non-existent reimbursement by health insurance plans or poor medication distribution (Sabat, 2003, p. 29). For example, researchers point out that adherence to medication(s) drops significantly when the co-pay for a drug reaches $50 or more (Brody, 2017). Thus, adherence is not solely based upon factors at the individual level, but instead is comprised of a combination of individual, social, and structural factors that ultimately contribute to nonadherence within the health-care setting. The complexity surrounding adherence suggests that nonadherence is not so much a patient or physician issue but instead a systems problem (Atreja, Bellam, & Levy, 2005).

Two types of adherence are important in medical treatment: clinical adherence and therapeutic adherence. *Clinical adherence* is the extent to which patients take drugs as prescribed by their health care provider (Osterberg & Blashke, 2005), whereas *therapeutic adherence*

involves lifestyle changes such as diet or exercise *along* with prescribed medication (Jin, Skylar, Oh, & Li, 2008). Concerning medication use, nonadherence is particularly prevalent within prescription drug use. Nonadherence to prescription medications is significant because "medication is the cornerstone of the treatment of heart failure patients" (Van der Wal et al., 2001, p. 6). Noncompliance/nonadherence has been observed by, for example, patients failing to recall the correct dose, taking the prescription(s) at the correct time of day, or taking the medication(s) prescribed (Cline, 1999). That is, Cline (1999) found that 75% of patients took medication that was not prescribed by a doctor. This theme was echoed by Rosenbaum (2015), who interviewed 20 patients as to why they were nonadherent to a treatment plan following a myocardial infarction, and located one participant who substituted fish oil for a statin shortly before experiencing a heart attack (Rosenbaum, 2015).

Nonadherence involves both medication use and other lifestyle changes. Within the therapeutic adherence domain, common regimens for patients who have experienced heart failure include monitoring the amount of salt in a diet and fluid restriction (Remme & Swedberg, 2001). However, adherence with a sodium restricted diet varies from 50% (Jaarsma, Abu-Saad, Dracup, & Halfens, 2001, in van der Wal et al., 2004) to 88% (Carlson, Riegel, & Moser, 2001, in van der Wal et al., 2004). Daily weighing is another common practice for the detection of worsening heart conditions, as sudden increases in weight can alert a health care provider to serious complications. Yet, adherence with daily weighing ranges from 12% (Bushnell, 1992) to 75% (Lusignan, 2001), even though the vast majority of participants have easy access to scales. Patients with heart issues are also encouraged to perform daily physical activities that do not induce symptoms. However, recommendations for daily activity are not followed by 41% - 58% of patients (Ni et al., 1999; Evangelista, Berg, & Dracup, 2001; Artinian, Magnan, Sloan, &

Lange, 2002). In fact, 30% of heart failure patients report ceasing exercise entirely following diagnosis (Carlson et al., 2001). Yet, exercise following surgery associates with a 25% decline in mortality rate within the first three years after surgery (Maddison & Prapavessis, 2004). Patients' health regimens encompass all aspects of life, from properly taking medication(s) to full-scale lifestyle changes.

Known predictors of (non)adherence

Patients living with a heart condition are typically tasked with a complex regimen of a combination of prescription drugs and lifestyle changes. Advances in health care have brought about unintended consequences as health care regimens have grown more convoluted. Patients are commonly instructed to enact lifestyle changes such as diet and exercise, and manage multiple prescriptions at the same time.

Adherence rates have been found to decline as health regimens grow more complex by way of more medications, higher doses, and lack of stability of a regimen (Michalson et al., 1998; Roe, Motheral, Teitelbaum, & Rich, 1999; Bohachick, Burke, Sereika, Murali, & Dunbar-Jacob, 2002). For example, Michalson et al. (1998) interviewed 179 patients with heart failure who were re-admitted to the hospital within a one-year period. The researchers discovered that 41.9% of patients were noncompliant with drugs or diet, and that the non-compliant patient group tended to have a greater number of prescribed drugs (4.0 vs 3.7). Michalson et al. concluded that the recurrence of chronic heart failure and readmission to hospital stemmed primarily from preventable factors and not the underlying disease (Michalson et al., 1998). To summarize, analyzing rates of adherence within patients living with heart-related conditions offers a beneficial perspective based on its complex health regimens. However, patients are not passive agents regarding their treatment and instead play an active role in the decisions they make regaring their health.

Patient Involvement. Mutual respect and negotiation are key dimensions of the physician-patient interaction, and both have been shown to impact adherence (Garrity, 1981; Blackwell, 1996; Wilson, 1995). Disagreement, or a mismatch between doctor and patient goals can decrease adherence to a treatment regimen (Blackwell, 1996; Golin, DiMatteo, & Gelberg, 1996). The role of the patient in the decision-making process regarding a treatment regimen must be negotiated between patient and physician. Reviews suggest that patients must play an active role in the decision-making process regarding one's health in order to accept responsibility as a condition for adherence (Wilson, 1995; Golin et al., 1996). Active patients ask more questions and actively participate in the decision making process (Garrity, 1981). While active patients may be more adherent, a patient can be active in obtaining information about treatment options, but still wish the physician make the penultimate decision regarding which treatment protocol to accept (Stewart et al., 1999; Golin et al., 1996). Thus, involvement is temporal and context-dependent. Mutual respect and negotiation suggest the importance of a quality relationship between patient and physician.

Other humanistic factors also affect adherence, and individuals ultimately vary their medication practice on grounds connected to managing their everyday lives (Conrad, 1985). For example, Conrad (1985) argues that, "from a patient-centered perspective the meanings of medication in people's everyday lives are more salient than doctor-patient interaction for understanding why people alter their prescribed medical regimens. The issue is more one of self-regulation than compliance" (p. 29). After conducting 80 interviews with epilepsy patients, Conrad found that 42% of the interviewees self-regulated their medications by doing at least one of the following: (1) reducing or raising the prescribed drugs for several weeks or more; (2) skipping or taking medications under certain contexts (i.e. when drinking), or (3) cease taking

the drugs completely for three consecutive days or longer. For epilepsy patients, it wasn't a matter of "adhering" to doctors' orders, it was a matter of quality of life and managing their epilepsy the best way they knew how. Through a patient-centered view, patients are seen as active agents rather than passive recipients of doctor's orders, which further details contributing factors for nonadherence that are missed when looking from a providers point of view.

Current Explanations for Adherence

At least two explanations for adherence currently exist. First, the health beliefs model (Hochbaum, 1958) postulates that the decision to engage in health behaviors are influenced by four important perceptions: (1) the perceived severity of the illness, (2) the perceived susceptibility to illness, (3) the perceived benefits associated with an uptake in health behavior(s) to address the illness, and (4) perceived barriers to engage in health behaviors. The model posits that first, an individual has a problem that is taken into account. Next comes a feeling of vulnerability due to the problem, which leads to a weighing of perceived costs and benefits. If the individual believes benefits outweigh any personal costs induced, the interaction of these assumptions fosters the appearance of healthier behavior patterns. Finally, the individual enacts health behaviors to prevent disease and avoid risky situations (Esparza - Del Villar et al., 2017). The model has successfully predicted health behaviors in a variety of contexts, including mammography screening (Aiken, West, Woodward, & Reno, 1994), child safety restraints (Arneson, Triplett, Hahnemann, & Merington, 1985), and disease modifying therapies of individuals with multiple sclerosis (Turner, Kivlahan, Sloan, & Haselkorn, 2007).

Although a multitude of studies apply the health beliefs model when analyzing adherence, the research around it raises some important questions about its efficacy. One question surrounds the applicability of "perceived severity" of illness. The health beliefs model

explicates that an individual will not enact a health behavior until the patient perceives serious health repercussions. However, research regarding health severity suggests that while low levels of perceived severity are not motivating, very high levels are inhibiting (Elling, Whittemore, & Green, 1960; Janis, 1967, Levanthal, 1965). For example, Levanthal et al. (1970) discovered that high levels of severity (1) provoked more fear, (2) rarely resulted in more behavioral change following high than low fear messages, and (3) failed to promote action when bringing one closer to the threat, such as heeding the recommendation to receive a chest x-ray (Levanthal, Singer, & Jones, 1970). Thus, both high - and low - levels of perceived severity are associated with a low likelihood of performing a health action.

Another challenge to using the health beliefs model to predict adherence is that it privileges the notion that patients make decisions based solely on health-related beliefs, while assuming that health beliefs are the most significant aspects of individuals lives. Thus, the health beliefs model maintains that adherence is a generally rational decision (Conrad, 1985). Indeed, patients often have different priorities than health professionals who might determine and evaluate regimens primarily on their medical worth. For instance, patients value "convenience, money, cultural beliefs, habits, body image, etc. Patients use their judgement when presented with a medical protocol and decide *if* to adhere to the protocol and/or which components of the protocol they will adhere to" (Langer, 2008, p. 388).

However, in a study on physicians' blind spots to patient behavior, Zola (1981) argues that disease is never solely a personal activity, but is instead a social phenomenon. To assume that an individual has the ability to make major life changes without consulting others is erroneous and makes the medical community seem unrealistic (Zola, 1981). To elucidate; physicians analyze medical charts and radiological imagery, and make recommendations based

on their best knowledge of medicine. However, patients may interpret the same data quite differently and value things such as maintaining one's lifestyle or affordability of treatment more than their physicians medical directive. An apparently irrational act of nonadherence (from the physicians view) may in fact be a completely rational decision when seen from the patient's point of view (Donovan & Blake, 1992).

These issues concerning adherence and the health beliefs model suggest the value of a different framework entirely. The Theory of Motivated Information Management (TMIM) has been tested and supported within a variety of highly-important contexts relating to one's health including family health (Hovick, 2013), family health history (Rauscher & Hesse, 2014), end of life preferences (Rafferty, 2015), and sexual health information from close friends (Chang, 2014). Thus, the theory is applied to the current study.

The Theory of Motivated Information Management

The Theory of Motivated Information Management (Afifi & Morse, 2009; Afifi & Weiner, 2004) was developed to account for active information management strategies within interpersonal contexts of high-importance. For example, patients with a heart condition receive an abundance of information and advice regarding their ailment.This information has the capability to influence the decision(s) that patients make regarding their health. Thus, patients are continually filtering and making sense of information regarding their condition/regimen and then deciding whether or not to seek information regarding their health.

The theory's propositions stem from the theory of uncertainty management (Brashers, 2001), social cognitive theory (Bandura, 1986), and problematic integration theory (Babrow, 2001). Basically, the theory predicts that information management decisions are made via a

three-step process, including interpretation, evaluation, and decision steps (Afifi & Weiner, 2006, p.36).

Interpretation Phase. The information management process begins when individuals become aware of a "discrepancy between the amount of uncertainty they desire about an important issue and the amount of uncertainty they currently have about an issue" (Afifi & Weiner, 2006, p. 36). Previous research concerning uncertainty operationalizes it as a negative experience. Researchers have found that uncertainty is positively associated with tiredness and reduced functional status among patients with chronic heart failure (Falk, Swedberg, Gaston-Johansson, & Ekman, 2007). However, the TMIM, following notions of Babrow (2001) and Brashers (2001), contends that individuals are sometimes content in an uncertain state. Babrow (2001) postulates that "From the perspective of PI (problematic integration) theory, no object of thought is inherently good or bad; all objects, including uncertainty itself, must be evaluated (Babrow, 2001, p. 562). The TMIM thus recognizes the need to "move beyond the notion of uncertainty as intrinsically negative to an ideology that recognizes cases in which individuals may purposefully seek uncertainty or be content with chronically elevated uncertainty (Afifi & Weiner, 2004, p. 169). In fact, uncertainty has been shown to lead to positive emotions such as hope within patients of serious illnesses (Babrow, 2001). For example, some individuals might feel completely comfortable with high levels of uncertainty regarding a specific health regimen or condition because it gives them a sense that they have a chance to get better. In such a case, the negative emotion resulting from a discrepancy in desired uncertainty and actual levels of uncertainty would not be triggered, and no information search would result.

The original version of TMIM (Afifi & Weiner, 2004) predicted that uncertainty discrepancy would predict anxiety, and that anxiety would affect the information-seeking

process. However, Afifi and Morse (2009) substituted emotion for anxiety, positing that uncertainty discrepancy produces a wider range of emotions than just anxiety, emotions that can be negatively or even positively valenced (Afifi & Morse, 2009). The emotion caused by uncertainty discrepancy brings about the next stage in the information seeking process.

Evaluation Phase. The evaluation phase comprises evaluations of outcome assessments and efficacy assessments. Outcome assessments assess the expected outcomes of an information search, while efficacy assessments detail the perceived ability to gain the sought-after information (Afifi & Weiner, 2006, p. 37). Outcome expectancies precede efficacy assessments and include likely rewards and costs associated with the information management process and the potential results of that process (Afifi & Morse, 2009). Perception of efficacy includes four efficacy assessments: (a) coping efficacy, (b) communication efficacy, (c) target ability, and (d) target honesty. *Coping efficacy* is "the extent to which information managers believe that they have the emotional, instrumental, and other resources to manage the outcomes they expect from the information-seeking strategy under consideration" (Afifi & Weiner, 2004, p. 178). That is, coping efficacy refers to individuals beliefs that they possess the necessary tools to deal with information they expect to receive as a result of an information search, whether it be positive (as in a complete remission of cancer) or negative (as in the diagnosis of a severe disease). *Communication efficacy* refers to individuals' perceptions that they can successfully engage in the communication or observational task required to gather the sought-after information (Afifi & Weiner, 2004). This includes patients' perceptions on whether or not they can approach a physician to ask about their beliefs concerning treatment and if they possess the knowledge necessary to discuss their health regimen. Communication efficacy is significant in that information seeking is by nature a communicative activity. *Target ability* is the belief that the

information provider is able and willing to provide the information sought by the information seeker (Afifi &Weiner, 2004, p. 179), whereas *target honesty* is the belief that the information target will sufficiently disclose information in a truthful manner. Efficacy has been found to be a significant variable within the health context, as Jayanti and Burns (1998) found that the perceived value of recommended health behaviors (response efficacy) strongly affected primary care patients' rates of compliance.

Decision Phase. The TMIM predicts that information seekers' perceptions of efficacy and outcomes will lead to three general information-seeking strategies: pursuing relevant information, avoiding relevant information, or cognitively reappraising the situation. If they choose to seek relevant information, they could use: *passive strategies*, which involve observing the person from a distance; *active strategies,* which invovle manipulating one's own environment in order to examine the target's response, or asking third parties for information; and *interactive strategies,* including communicating directly with the target person. The TMIM postulates that the final information-seeking decision will be influenced by the outcome and efficacy assessments made during the evaluation phase.

The second option is to avoid relevant information. Lerman et al. (1999) discovered that 57% of participants with a hereditary risk of colon cancer declined an offer for genetic testing. Similar findings in an investigation by Fanos (1997) led to the conclusion that "remaining unaware of their carrier status may serve significant psychological functions for individuals at risk" (p. 85).

A third option for the information seeker is cognitive reappraisal. This strategy involves engaging in psychological adjustments that alter the mechanism that activated the need for information. The cognitive reappraisal may render itself apparent in the perceived level of issue

importance, uncertainty, or the meaning of uncertainty itself (Afifi & Weiner, 2004, p. 183). For example, a patient may decide to not seek information concerning their health regimen by cognitively reappraising their situation to not be a "big deal" if she takes two pills instead of one pill a day, telling herself that after all, the difference is only one pill.

TMIM has received empirical support across a diverse array of contexts. A common theme concerning the investigations of the TMIM involves the investigation of information seeking within a wide variety of challenging topics, a feature that also characterizes conversations about one's health. Despite it being a relatively new theory, the TMIM has been applied to many different fields, including sexual health (Afifi &Weiner, 2006; Dillow & Labelle, 2014; Chang, 2014), organ donation (Afifi et al., 2006), romantic partners' relationship history (Lancaster, Dillow, Ball, Borchert, & Tyler, 2016), and posttraumatic growth in response to an adverse life experience (Tian, Schrodt, & Carr, 2016), among others. While the TMIM has not been applied directly to adherence, it has been examined within numerous health contexts that have produced supportive results.

There are several reasons the TMIM may be a good fit within the realm of adherence. First, the TMIM is a useful framework for examining adherence due to its treatment of uncertainty. While much of the research concerning adherence has treated uncertainty as negative, the TMIM explicates that there are contexts in which high amounts of uncertainty may actually be desired, particularly within the health domain, where uncertainty in conditions or treatments can lead to positive feelings such as hope and happiness (Babrow, 2001). Portraying uncertainty as a potentially positive phenomenon allows for the possibility that, in some cases, uncertainty can actually lead to greater adherence.

Second, the TMIM includes an exhaustive treatment of efficacy. While the health beliefs model also analyzes efficacy, is does so in a cursory view. In contrast, TMIM breaks down efficacy into three interrelated but separate components, including (a) coping efficacy; (b) communication efficacy; and (c) target efficacy. TMIM's treatment of efficacy is especially helpful when analyzing adherence given that the health regimens for patients with heart – related conditions have grown much more complex.

The Current Study

While the TMIM has not yet been used within the adherence context, it offers the ability to analyze the relationship between information seeking within health regimens and the impact that may or may not have on adherence with a prescribed medical regimen. It's important to investigate whether this information search will ultimately lead the patient to seek information from their doctor regarding their health regimen and if this behavior has any influence on adherence.

The TMIM allows for the following hypotheses, as illustrated in figure 1.

Figure 1. The Theory of Motivated Information Management

Interpretation   *Evaluation*   *Decision*
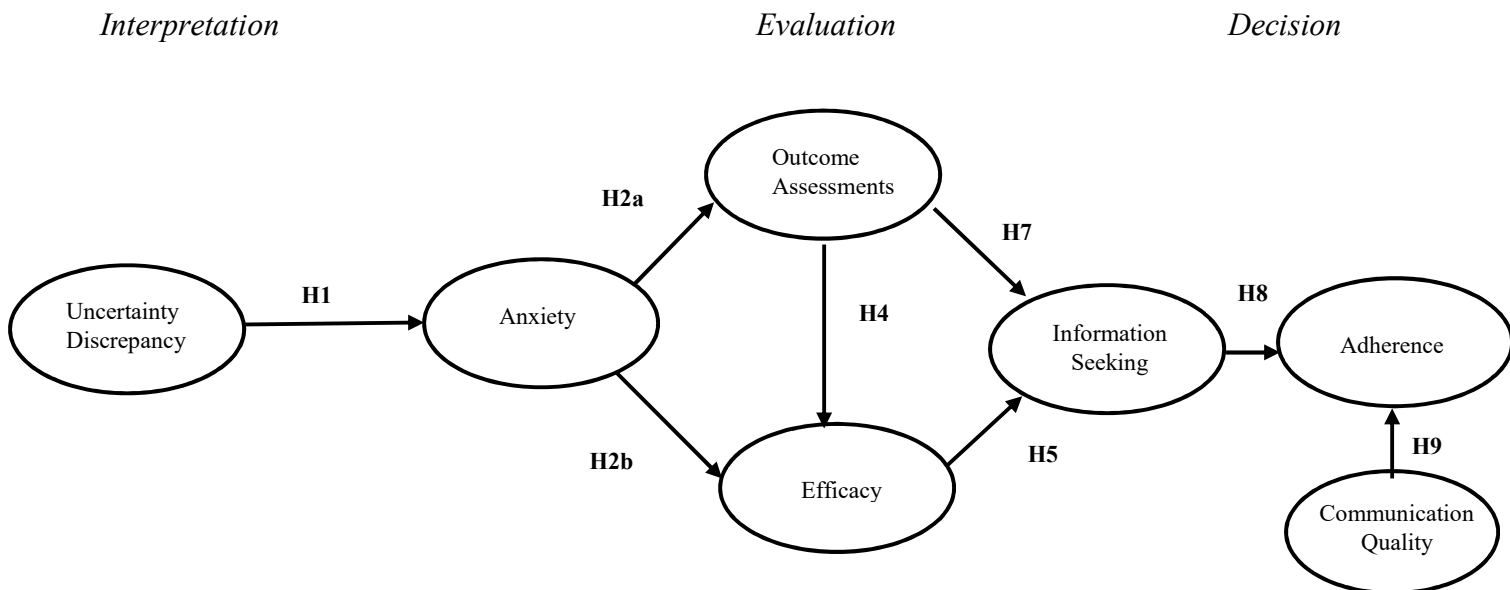
H1: *Levels of uncertainty discrepancy (UCD) about a health regimen will produce a negative emotional response.*

H2: *Negative emotions related to UCD about a health regimen will be negatively related to (a) positive outcome expectancies and (b) efficacy judgements.*

H3: *Anxiety mediates the effect of the UCD on assessments of (a) outcome expectancy and (b) efficacy*

The TMIM postulates that favorable outcome expectancies should positively correlate with efficacy judgements, which in part mediate outcome expectancies' influence on information-seeking strategies in the decision phase (Afifi & Morse, 2009; Fowler & Afifi, 2011). Ultimately, increased efficacy judgements should positively predict direct information seeking strategies and should negatively predict indirect information seeking and active avoidance.

H4: *Positive outcome expectancies are positively related to efficacy judgements.*

H5: *Positive efficacy assessments are positively related to the decision to directly seek information from a doctor.*

H6: *The impact of outcome expectancies on the information management strategy (i.e., direct or indirect information seeking) is mediated by efficacy assessments.*

H7: *Positive outcome expectancies are positively related to the decision to directly seek information from a physician regarding one's health regimen.*

While adherence has not been directly analyzed from the TMIM perspective, communication between patient and provider has been shown to have a significant impact on adherence (Hampson, McKay, & Glasgow, 1996; Vik, Maxwell, & Hogan, 2004). In fact, communication satisfaction has been identified as the most important factor in determining

patients' adherence to treatment (Hampson et al., 1996; Vik et al., 2004). Poor doctor-patient interactions have found to be a contributing factor to patient non-adherence (Svensson et al., 2000). Along the same vein, troublesome relationships with physicians have been shown to increase non-adherent behaviors (Becker & Maiman, 1983). Additionally, researchers have found an association between poor communication and malpractice claims (Beckman et al., 1994; Hickson, Clayton, Githens, & Sloan, 1994; Vincent et al., 1994). Communication problems most frequently identified include inadequate explanation of diagnosis or treatment (Beckman et al., 1994; Hickson et al., 1994), feeling ignored (Vincent et al., 1994; Hickson et al., 1992), misleading patients (Stewart et al., 1995), and feeling rushed (Hickson et al., 1994). Physician-patient communication has significant effects on adherence within common, chronic conditions such as hypertension (Friedman et al., 2008). For instance, Friedman and colleagues (2008) determined that poor adherence was in part related to the inadequacy of information communicated from doctors to patients (Friedman et al., 2008). Thus, positive communication between patient and provider should be expected to improve rates of adherence.

> H8: *Directly seeking information from a doctor concerning a health regimen will be positively related to self-reported rates of adherence.*

> H9: *Patients who self-report positive communication with their physician will have elevated rates of adherence as compared to those who report negative communication.*

In the health context, it is important to identify the focal point of emotion, as both the health regimen and health condition can produce emotion(s). Fowler and Afifi (2011) analyzed information seeking behavior within adult children's discussions of caregiving with aging parents and found general support for the TMIM framework. However, the proposed relationship between emotional response, uncertainty discrepancy, and efficacy assessments did not

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materialize. Rather, they determined that emotional responses predicted outcome expectancies, which in turn predicted efficacy judgements. This led them to determine that tests of the TMIM should scrutinize whether the cause of the emotion (e.g., uncertainty discrepancy versus the issue itself) is a critical component missing from the TMIM framework (Fowler & Afifi, 2011). Additionally, a study by Tian et al. (2016), regarding information management concerning posttraumatic events, note that people dealing with severe life experiences (such as the diagnosis of heart disease) may complicate the uncertainty management process because people are more likely to receive negative information about the traumatic event, despite the fact that an information search may lead to positive outcomes (Tian et al., 2016). These inquiries led to the following research question:

> RQ1: *Is the emotion generated by uncertainty more strongly related to the particular health regimen or the health condition?*

To glean more information regarding the relationship (if any) between directness of talk, positive communication, and adherence, the following research question was asked:

> RQ2: *Are patients who self-report as compliant more likely to seek information regarding a health regimen?*

Finally, the reason(s) in which patients were nonadherent of their health regimen were analyzed. Researchers suggest that there are instances in which patients are not capable of complying with their physicians directions and that these patients do not label themselves as nonadherent (Conrad, 1985; Rosenbaum, 2015). The following questions were asked regarding adherence:

> RQ3: *To what extent do patients perceive themselves as being noncompliant?*

> RQ4: *What reasons do people give for being noncompliant?*

Method

Voluntary participants (N = 76) who self-identified as living with a clinical diagnosis of a heart condition responded to an invitation to complete an online survey for this study. Although 128 participants began completion of the survey, a total of 52 participants were removed because they either did not complete the survey (n = 47) or failed to accurately respond to an "attention check" item included in the survey (n = 5).

Procedure

Following Institutional Review Board (IRB) approval, announcements for the survey were made in various online mediums including social media sites such as Facebook and additional nation-wide online support groups for individuals with a heart condition. Additionally, participants were recruited from a cardiac treatment and heart institute at a local hospital[1]. Cardiac nursing staff gave interested patients an announcement on a half-sheet of paper that briefly detailed the study and included the link for individuals to access the survey online. Additionally, personal contacts were notified and a snowball sample was utilized to identify additional interested individuals. All surveys were completed using Qualtrics survey software and data was analyzed using SPSS. The survey took approximately 20 minutes to complete.

Participants

The average age of the participant was 61 years (*SD=12.69*), and the vast majority of participants (90.8%) were Caucasian. Aditionally, 53.9% of respondents were male with 46.1% reporting as female. The sample population reported high levels of education, with 31.6% of participants completing "some" college, 27.6% of the sample possessing a college degree, and 26.3% of the population holding a graduate degree. As for household income, 28.9% of

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[1] IRB approval for this study was obtained from both the university and the local hospital.

participants reported earning $50,000-74,999 in the past year, with 18.4% earning between

$100,000-149,999 dollars and 10.5% making over $150,000. Participants were asked to report

the population of the city in which they resided in an attempt to gauge abundance of medical

resources in proximity to the patient. A total of 19.7% of individuals reported living in a city

with 26,000-50,000 citizens, 15.8% indicated cohabiting in a city with 51,000-100,000 people,

and 15.8% reported living in a city with 101,000-500,000 members.

A wide variety of heart conditions (over 20) were reported. Overall, the most common

conditions were myocardial infarction (20.0%), congestive heart failure (17.3%), and arterial

blockages (10.7%). Participants were also asked the amount of time (in years/months) they have

been living with the heart condition. Nearly 29 percent of the population reported living with

their heart condition for two-four years, 22.4% indicated 5-10 years since diagnosis, and 19.7%

reported one year or under. Taken together, 79.3% of the population reported living with their

heart condition for at least one year.

The vast majority of participants indicated their heart condition as severe, with 89.5% of

individuals reporting at least one hospitalization as a result of their heart condition. As a result,

the majority of participants reported being contacted about their treatment plan to ease their heart

condition at least several times. Fifty percent of participants reported being contacted by health

professionals about their treatment plan more than six times. However, a sizeable portion

(21.3%) reported no contact concerning their treatment plan. For the patients who reported being

contacted at least once, the propensity was for participants to be contacted by their cardiologist

(55.3%), primary physician (9.2%), or nurse staff (7.9%). Meanwhile, 56% of participants

reported being a member of at least one heart-related support group. The most identified support

groups were Mended Hearts (22.4%), American Heart Association (17.1%), and Ironheart (7.9%).

Instrumentation

      Issue Importance. The TMIM is based on the notion that individuals are motivated to seek information that is important to them. This variable was measured with the utilization of a seven-point Likert scale through a single question asking "It is important that I discuss my health regimen with my doctor" (1 = *strongly agree, 7 = strongly disagree*). Participants reported agreement that it was important ($M = 6.12$, $SD = 1.59$), thus the scope condition was achieved.

      Uncertainty Discrepancy Related to Treatment Regimen. To assess the degree to which individuals perceived a discrepancy between the amount of uncertainty they had regarding their health regimen and the amount of uncertainty they wished to possess, an index was created by subtracting participants' responses to the question "How certain are you that you are properly following your health regimen as stated by your doctor?" from their answer to the question "How certain do you *want to be* that you are properly following your health regimen?" (1 = *completely uncertain* to 7 = *completely certain*) (W.A Afifi & T.D. Afifi, 2009).

      Anxiety. To maintain consistency with prior tests of the TMIM, two additional items were used to measure anxiety as a result of the uncertainty discrepancy (Fowler & Affifi, 2011). The two items stated "It worries me to think about how little I know compared to how much I want to know about my health regimen" and "It makes me anxious to think about the difference between how much I know and how much I want to know about my health regimen." The items were measured using a seven-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

Emotional Reponses to Uncertainty Discrepancy. The original development of the TMIM listed anxiety as the sole emotion caused by uncertainty (Afifi &Weiner, 2004), but Fowler and Afifi (2011) listed 16 emotions experienced by individuals with an uncertainty discrepancy. However, not all of the emotions listed by Fowler and Afifi (2011) are considered true discrete emotions. Following the lead of Lancaster et al. (2016), only true discrete emotions were analyzed being that discrete emotions "…have unique appraisal patterns, motivational functions, and behavioral associations" (Nabi, Dillard, & Pfau, 2002, p. 290). The three discrete emotions chosen for analysis were happiness, anger, and fear (Lancaster et al., 2016). Anxiety was also included to maintain consistency with previous studies and respond to hypotheses. Participants were asked to consider "the size of the difference between how much you know about your health regimen and how much you want to know. To what extent (if any) does it make you feel:" happy, angry, or fearful as a byproduct of this uncertainty discrepancy (Lancaster et al., 2011). Participants were also asked to delineate their emotions in response to the health condition by asking participants to "Consider the size of the difference between how much you know about your heart condition and how much you want to know." Emotion was measured using a six-point Likert scale ranging from 1 = *not at all* to 6 = *extremely.*

Outcome Expectancies. In the TMIM, direct information seeking is based on the belief that individuals engage in perceived costs and benefits judgements when analyzing an information management strategy. Consistent with past explorations of the TMIM (W.A. Afifi & T.D. Afifi, 2009), patients were asked three questions regarding the perceived costs and benefits of an information search. Questions were asked using a seven-point Likert scale ranging from -3 (*a lot more negatives than positives*), 0 (*about as many negatives as positives*), and 3 (*a lot more positives than negatives*). The three questions consisted of "Approaching my doctor about my

health regimen would produce …;" "Asking my doctor about his/her preferences concerning my health regimen would produce …;"and "Approaching my doctor about his/her beliefs concerning my health regimen would produce…"

Communication Efficacy. The TMIM maintains that individuals are more likely to seek information when they believe they possess the necessary communication skills to do so. All subsequent measures of efficacy were measured using past measures from W.A. Afifi and T.D. Afifi (2009) using a seven-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree.* The questions were, "I am able to ask my doctor about what s/he thinks about my treatment regimen;" "I could approach my doctor to ask about his/her beliefs about my treatment regimen;" and "I am able to approach my doctor to ask about his/her beliefs about my treatment regimen."

Target Efficacy. The TMIM postulates that individuals are more likely to engage in an information search when they believe the information provider is able, willing, and honest in their disclosure (Afifi & Weiner, 2004). Participants were asked four questions measuring target efficacy, including "My doctor would be completely honest with me about my health regimen;" "My doctor would give me truthful information about my health regimen;" "My doctor would be completely forthcoming about my health regimen;" and "If approached, my doctor would be upfront about my health regimen."

Coping Efficacy. The TMIM states that individuals are more likely to perform an information search when they are confident they can adequately cope with the perceived information that will be provided as the result of an information search. The questions asked to the participants were "I feel confident that I could cope with whatever I discover regarding my health regimen;" "I couldn't deal with what I might find out about my health regimen;" "I can

handle whatever I would find out about my health regimen;" and "I would not be able to deal with what I might find related to my health regimen."

Information Seeking. To determine the extent and communication type (direct, indirect, avoidance) in which information was sought, four questions were asked of participants adopted from Afifi et al. (2007). The four items were measured using a seven-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*, and stated "If I have a talk with my doctor regarding my health regimen, I'll probably be completely upfront about my interest in their attitudes on it" and "If I have a talk with my doctor regarding my health regimen, I'll directly ask them to tell me their attitudes on the issue." The final two statements were asked to determine if individuals engaged in an information search, and stated "I would discuss my health regimen with my doctor" and "I would avoid discussion of my health regimen with my doctor."

Patient-Provider Communication Quality. Quality communication has been shown to have significant impacts on rates of compliance (Hampson et al 1996; Vik et al 2004). To assess the communication quality between patient and provider, the Questionnaire on the Quality of Physician-Patient Interaction (QQPPI) scale was utilized (Bieber, Mueller, Nicolai, Hartmann, & Eich, 2010). Despite its status as a relatively new measurement, the QQPPI displayed high internal consistency and good item characteristics (Bieber et al., 2010). The scale is measured by a five - point Likert scale ranging from 1 = *I Do Not Agree* to 5 = *I Fully Agree*. The scale is analyzed using 14-items including questions such as "The physician gave me detailed information about the available treatment options;" "The physician and I made all treatment decisions together;" "The physicians explanations were easy to understand;" and "The physician respects the fact that I may have a different opinion regarding treatment."

Compliance Instrument. To measure compliance rates of an accepted medical regimen, a modified version of the Compliance Questionnaire that was designed to measure compliance behaviors within patients with myocardial infraction was utilized (Hilbert, 1984). While the scale name is termed "compliance," I argue that the scale also accurately measures adherence given that the main difference separating the two terms is whether or not the patient agreed to an uptake in behaviors as recommended by their physician. Through the lens of communication between patient and physician, the terms "compliance" and "adherence" are both measured through factors such as genuine interest, detailed explanations, privacy, mutual decision making, and an understanding of needs and problems, all of which were measured by this scale. Following the lead of Evangelista et al. (2001), six health behaviors were identified: follow - up appointments, medications, diet, exercise, smoking cessation, and alcohol cessation (Evangelista et al., 2001). These health characteristics have been shown to be both prevalent and important in the regimen of patients with heart disease (van der Wal et al., 2001). Participants were asked to measure how important each behavior was to them through a Likert-scale ranging from 0 = *Not at All Important* to 5 = *Highly Important*. These items were appropriated to evaluate patients' perceptions on the importance of compliance to a given health behavior (Evangelista et al., 2001). Patients were then prompted to report their own levels of compliance on a five-point scale (0 = *none of the time*, 1 = *very seldom*, 2 = *about half of the time*, 3 = *most of the time*, 4 = *all of the time*). Patients were deemed compliant when selecting either *most of the time* or *all of the time* (3 or 4), which is confirmative of other studies (Evangelista et al., 2001; van der Wal et al., 2010; Nieuwenhuis, Jaarsma, van Veldhuisen, & Martje, 2012). A problem within numerous compliance self-report questionnaires is their lack of validation and content validity (van der Wal et al., 2005). However, the Compliance Questionnaire achieved content validity through a group

of four clinical nurses who had expertise in the care of patients with heart failure, making it one of the few to achieve validity (Evangelista et al., 2001). Within the present study, reliability for the compliance instrument was poor ($\alpha = .35$), thus care is advised when interpreting the results.

Results

The hypotheses for this study were tested using separate linear regression models. Although past research using the TMIM tends to use structural equation modeling to test the theoretical structure of the TMIM, the primary purpose of this study was to examine the extent to which adherence could be predicted by various aspects of the theory and other variables not part of the theory, such as satisfaction with physician communication. Although the predictive connections between the theoretical components were tested as part of this study, the primary purpose was not to test the theory itself, but rather examine the extent to which the theory could help explain adherence.

Descriptive Analyses

The means, standard deviations, and reliability indicators for all measures are presented in table one. Correlations between all variables are indicated in table two.

Table 1. *Mean, Standard Deviation, and Chronbach's Alpha per variable*

Variable	M	SD	A
UCD*	-.39*	1.23	.76
Anxiety	2.89	1.81	.98
Outcome Expectancy	5.74	1.47	.94
Comm Efficacy	6.16	1.17	.93
Coping Efficacy	5.82	1.02	.76
Target Efficacy	6.28	.93	.96
Total Efficacy	6.08	.75	.84
Information Seeking	5.96	.75	.77
Communication	3.71	1.09	.98

Note: * = Negative value equals desire for more certainty. ** = Total efficacy is a composite variable consisting of all items measuring communication efficacy, coping efficacy, and target efficacy.

Table 2. *Correlations between all variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. UCD		-.31	.25*	.03	.16	.03	.14	.39**	.33**	.53**	-.16	-.12	-.15	.28*	-.25*	-.17	-.28*
2. Anxiety			-.22	-.09	-.47**	-.10	-.36**	-.27*	-.24*	-.39**	.33**	.43**	.55**	-.23	.52**	.54**	.56**
3. Outcome Expectancies				.74**	.36**	.63**	.61**	.70**	.05	.28*	-.13	-.11	-.13	.32**	-.32**	-.08	-.10
4. Communication efficacy					.09	.70**	.59**	.60**	.01	.13	.00	.00	-.08	.22	-.20	.02	.05
5. Emotion efficacy						.11	.49**	.30**	.33**	.33**	-.28*	-.31**	-.32**	.22	-.27*	-.27*	-.26*
6. Target efficacy							.49**	.48**	-.01	.11	.00	.01	-.05	.26*	-.10	-.01	.03
7. Information seeking								.61**	.17	.47**	-.12	-.21	-.25*	.33**	-.29*	-.19	-.18
8. Phys. comm. satisfaction									.11	.28*	-.14	-.03	-.13	.24*	-.30*	-.03	-.20
9. Reported adherence										.31**	.07	-.03	-.04	.26*	-.03	-.02	-.08
10. Regimen UCD Happiness											-.12	-.21	-.13	.63**	-.21	-.19	-.16
11. Regimen UCD anger												.49**	.58**	.01	.74**	.62**	.60**
12. Regimen UCD fear													.77**	-.02	.51**	.81**	.70**
13. Regimen UCD anxiety														.00	.45**	.84**	.88**
14. Condition UCD happiness															-.11	-.04	-.04
15. Condition UCD anger																.61**	.48**
16. Condition UCD fear																	.90**
17. Condition UCD anxiety																	

Note: * = p < .05, ** = p < .01, two-tailed. UCD = Uncertainty discrepancy.

Hypothesis Tests

The results of all hypothesis tests are presented in Table 3. The first hypothesis (H1) predicted that a discrepancy in the actual and desired levels of uncertainty (UCD) would predict anxiety. Hypothesis 1 was *supported*. A simple linear regression indicated that discrepancy in desired and actual levels of uncertainty significantly predicted anxiety, β = -.31, t (74) = -2.81, p <.01, R^2 = .10. Overall, the greater the mismatch between actual and desired levels of uncertainty (represented by negative values), the more intensely participants indicated feelings of anxiety.

The second hypothesis was tested in two parts. The first part (*H2a*) predicted that anxiety would increase with outcome expectancies. Hypothesis 2a was *not supported*. A simple linear regression indicated that, for this sample, anxiety was not a significantly predictor of outcome expectancies, β = -.22, t = -1.89, p =.06, R^2 = .05. The second part (*H2b*) hypothesized that

anxiety would be negatively related to efficacy judgements. All efficacy measures (communication, coping, target) were combined to create one total efficacy measure. Hypothesis 2b was *supported*, $\beta = -.32$, $t (74) = -2.88$, p <.01, $R^2 = .10$. Anxiety significantly predicted total efficacy evaluations of patients with a heart condition.

The third hypothesis predicted that anxiety would mediate the effect of uncertainty discrepancy on assessments of outcome assessments and total efficacy. Following bootstrapped mediation tests (Preacher & Hayes, 2004), Hypothesis 3 was *not supported*. At least one criteria for mediation was not met in each of the tests. Specifically, UCD did not have an indirect effect on outcomes as a function of anxiety, $\beta = .06$, LLCI = -.01, ULCI = .21. In addition, no indirect effects were found between UCD and communication efficacy as a function of anxiety, $\beta = .03$, LLCI = -.03, ULCI = .14. For the test of outcome assessments on coping efficacy as a function of anxiety, no effect between UCD and coping efficacy was found, $\beta = .16$, LLCI = -.05, ULCI = .32. Finally, no indirect effect was found for the test of the mediated relationship between UCD and target efficacy as a function of anxiety, $\beta = -.00$, LLCI = -.03, ULCI = .11.

The fourth hypothesis predicted that efficacy assessments would have a significant effect on the decision to seek information from a doctor. This hypothesis was *partially supported.* A multiple regression model with coping efficacy, communication efficacy, and target efficacy as the independent variables indicated that coping efficacy ($\beta = .44$, $t (74) = 5.4$, $p < .00$), and communication efficacy ($\beta = .50$, $t (74) = 4.43$, $p < .00$), were significant predictors of information seeking, but that target efficacy was not ($\beta = .70$, t (74) = .63, $p = .53$.

Hypothesis 5 predicted that positive outcome expectancies would positively relate to efficacy judgements. For this hypothesis, total efficacy was measured by combining the items for the three efficacy assessments, in part because previous researchers have demonstrated difficulty

finding significant effects among individual efficacy measures (e.g., Rafferty et al., 2014). The hypothesis was testing using simple linear regression. Hypothesis 5 was *supported*, β = .79, t (74) = 10.9, p <.00, R^2 = .62. Outcome expectancies explained a significant amount of variance (62%) in total efficacy. Associations were also tested analyzing the effects of all three efficacy variables individually, and outcome expectancies (communication efficacy, β = .74, t (75) = -2.81, p < .00, coping efficacy, β = .36, t (74) = 3.33, p < .01, and target efficacy, β = .63, t (75) = 7.06, p < .00) had a significant effect on each efficacy assessment.

Hypothesis 6 predicted that the impact of outcome expectancies on information seeking is mediated by efficacy assessments. The hypothesis was tested using Preacher and Hayes' (2004) bootstrapped mediation test. The proposed mediation model was *not supported*, β = .07, t = 1.00, p = .32, LLCI = - .07, ULCI = .20. Additionally, a multiple mediated model was utilized to test the mediation effects of communication, coping, and target efficacy. While there were indirect effects for communication and coping efficacy, there was no direct effect of outcome expectancies on information seeking. Once again, the proposed mediated model was not confirmed, β = .05, t = .07, p =.45, LLCI = -.09, ULCI = .19. That is, efficacy assessments (total or coping/communication/target) were not found to mediate the relationship between outcome expectancies and information seeking.

Hypothesis 7 maintained that positive outcome expectancies would be positively related to the decision to seek information. A simple linear regression was utilized to predict information seeking as a result of outcome expectancies. The hypothesis was *supported*, β = .61, t (74) = 6.57, p <.00, R^2 = .37, Outcome expectancies explained a significant amount of variance (37%) in information seeking.

Hypothesis 8 predicted that seeking information regarding one's health condition would be positively related to self-reported rates of adherence. Hypothesis 8 was *supported*, $\beta = .34$, t (74) = 3.12, p <.01, $R^2 = .12$. That is, participants who reported increased levels of seeking information from their physician regarding their health regimen self-reported higher rates of adherence.

Hypothesis 9 posited that patients who reported quality communication with their physician would indicate higher levels of adherence as opposed to individuals who reported negative communication behaviors. Hypothesis 9 was *supported*, $\beta = .34$, t (74) = 3.06, p <.01, $R^2 = .11$. Positive communication between patient and physician was found to significantly predict self-reported rates of adherence.

Table 3. *Regression Coefficients for Univariate Tests: Supported Hypotheses*

Hypothesis	IV	DV	B	T	P	R^2
H1	UCD	Anxiety	-.31	-2.81	.01	.10
H2b	Anxiety	Efficacy	-.32	-2.88	.01	.32
H4	Outcomes	Efficacy	.79	10.90	.00	.62
H7	Outcomes	Info Seek	.61	6.57	.00	.37
H8	Info Seek	Adherence	.34	3.12	.01	.12
H9	Communication	Adherence	.34	3.06	.01	.11

Research Questions

Research question 1 inquired about the extent to which an uncertainty discrepancy about one's health regimen and condition might lead to more intense emotion(s). Mean and standard deviations were computed for four emotions: happy, angry, fearful, and anxiousness for uncertainty regarding the regimen and condition, and single-sample *t*-tests were conducted to compare the means. All means were compared to the complete absence point of the measure (see table 4a and 4b). The results indicated that all emotions were experienced to some degree, although on average, people reported more intense happiness over the uncertainty discrepancy around their regimen (*M* = 4.39, *SD* = 1.49) than their condition (*M* = 3.96, *SD* = 1.76).

Table 4a. *Emotions experienced about the health regimen, compared to scale absence point*

Emotion	*M*	*SD*	*T*
Happy	4.39	1.49	19.71**
Angry	1.71	1.08	5.56**
Fearful	2.33	1.29	8.77**
Anxious	2.48	1.43	8.87**

**= $p < .01$

Table 4b. *Emotions experienced about the health condition, compared to scale absence point.*

Emotion	*M*	*SD*	*T*
Happy	3.96	1.76	14.51**
Angry	1.71	1.17	5.15**
Fearful	2.19	1.23	8.25**
Anxious	2.44	1.41	8.69**

**= $p < .01$

As can be seen in the tables, happiness was the most intense emotion experienced resulting from an uncertainty discrepancy. The participants felt happier about the discrepancy in uncertainty regarding their regimen then they did their condition.

Research question 2 asked if information seeking would predict self-reported rates of compliance. A single linear regression was computed, which showed that seeking information from a physician significantly predicted self-reported rates of adherence, $\beta = .36$, *t* (67) = 3.14, p <.01, R^2 = .13. Patients who directly searched for information from their physician reported higher rates of adherence than those who used indirect means or did not engage in an information search.

Research question 3 asked about the extent to which patients perceived themselves as being nonadherent. Overall, the vast majority of patients reported themselves as being adherent of their health regimen ($M = 4.29$, $SD = 1.01$). In all, a total of 90.8% of individuals "definitely" or "probably" believed that they were properly following their health regimen.

To address research question 4, one survey item asked participants to write in short answer format a response detailing the instance(s) in which individuals had not been adherent of their health regimen. An iterative analysis was used in coding the data which specified alternatives between emic and emergent readings of the data based on existing models, explanations, and theories (Tracy, 2013). Open coding was used to collect, analyze, and extract themes from the data using Khandkar's (2013) method of open-coding analysis.

In all, four pages of single-spaced responses and 1,934 words were transcribed. Data were initially coded into broad themes. The goal during the initial stage was to examine the data more closely, search for relations with existing frameworks, and find similarities/dissimilarities among the participants (Khandkar, 2013). Following this initial coding, the data went through a second axial coding process which provided a more detailed and clear focus of relevant themes. Using the five dimensions of adherence (Sabate, 2003) as a descriptive framework, the analysis revealed five themes which will be subsequently discussed.

Patient factors. Patient factors manifested themselves through attitudes, beliefs, and knowledge that patients perceive to possess (Sabat, 2003). Patient *beliefs* contributed to non-adherence within patients who aspired to maintain a "natural" diet and lifestyle. One patient remarked that "*I am following a plant-based, whole foods, no added oil diet, and neither my primary care physician nor my cardiologist are supportive*" while another reported that "*I am more oriented to natural solutions. I will not take prescription remedies for cholesterol or some*

recommended pills for high blood pressure." These patients believed that natural remedies were more effective treatments than prescriptions. Rosenbaum (2015) discovered similar sentiments among participants who exclaimed things like "drug says it all, it's a substance that shouldn't be in the body" (Rosenbaum, 2015). Within the present study another participant believed that occasional nonadherence was not a major concern in saying that "*perfection isn't realistic or necessary*."

Patient *attitudes* resulted in nonadherence in that one patient remarked *"I am not as fastidious about diet as I was immediately post-heart attack. I don't wear my heart monitor when I work out. I don't take my blood pressure regularily. I don't want to feel like a cardiac patient."* Thus, this patient reported being nonadherent because they didn't want to feel like a cardiac patient in that it reminded them about their condition.

Finally, the attitudes and beliefs of the patient all served to influence perceived knowledge regarding the best way to treat their condition. Overall, several participants remarked to ostensibly owning more knowledge on a certain condition or treatment option than their physician. One participant remarked that "*My primary care physician does not believe in taking supplements. I don't argue with her about it, but I continue to take multiple supplements*." Yet another positied that "*I don't believe the medical community in general really understands the actual ramifications of cholesterol and it's reasons for building up within the vessels. Most doctors seem to be nothing more than a hotline to the pharmacy and any cure comes from a pill*." Yet another participant echoed similar sentiments explaining that incorrect information was a reason for not listening to their physicians recommendations, stating "*My physician insists that since the body requires some cholesterol to function it is important to eat enough cholesterol. As we all know the liver makes all the cholesterol required by the body*." These statements parallel

Conrad's (1985) interviews with epilepsy patients in that the issue is one of self-regulation rather than simply adhering to physician's recommendations. Individuals vary their health regimen based on grounds connected to their everyday activities and maintaining the highest possible quality of life, even if that is counterintuitive to what their physician recommends.

Therapy factors. Therapy factors include duration, complexity, and type of treatment. One theme that emerged as a factor in nonadherence was side effects to prescription drugs. One patient remarked that "*The side effects of the statins are unbearable and they keep telling me to take them and gloss over the side effects*" while another said that "*I had a severe reaction to statins, therefore, I wasn't able to take any*." This finding is consistent with prior researchers who claim that side effects are negatively related to adherence (Bloom, 2001). In fact, Rosenbaum (2015) discovered that even patients who didn't directly experience side effects themselves, but heard about them, were less likely to use the drug.

Health-system factors. Health-system factors include poorly developed health services with inadequate or non-existent reimbursement by health insurance plans, and poor medication distribution (Sabate, 2003). Examples include one participant who exclaimed "*My heart surgery put me into bankruptcy and I lived out of a car and tent for recovery. I have since lost my job and insurance and do not qualify for Obamacare. It's been 8 years since I have been to a doctor*." Two additional participants mentioned problems with insurance plans as a reason for nonadherence explaining "*Prescribed medication was not covered by insurance and was too expensive*," and "*Costs of medication and specialist/procedure co-pays*." As these participants suggest, it is difficult to comply with physician's recommendations to take prescription medication when one cannot afford the medication in the first place.

Negative Communication. Finally, negative communication was another theme as to why individuals did not follow the instructions of their physicians regarding their health regimen. One participant remarked that "*My doctor talks but does not listen. He wants to treat with a pill and I want him to be more supportive of exercise. I am on drugs for 80 year olds and being treated like an 80 year old…I want a doctor who guides me off the meds and lets me get back to races and lifting weights*." Another participant mentioned a "*lack of trust*" of their doctor while another patient talked about the "*…horrible doctor I saw because I was fainting, had fatigue and a rapid heart rate. He did not even give me an echocardiogram to look at my heart! The night before my appointment* [with a new doctor] *I suffered a sudden cardiac arrest*!" As described in detail throughout adherence literature, communication played a pivotal role in the perceived level of care and competency of physician. These perceptions and interactions had life - threatening consequences for some.

Within the theme of patient-physician communication*,* patients overall reported positive communication with their physician ($M = 3.71$, $SD = 1.08$). The two items patients were most satisfied with were "The physician seemed to be genuinely interested in my problems ($M = 4.11$ $SD = 1.01$) and "I felt I could trust the physician with my private problems" ($M = 3.95$, $SD = 1.21$). The two items patients were least satisfied with were "The physician asked about how my condition affects my everyday life" ($M = 3.16$, $SD = 1.44$) and "The physician respects the fact that I may have a different opinion regarding treatment ($M = 3.36$, $SD = 1.33$). Thus, even the lowest mean items indicated positive communication.

Adherence. A series of correlations was computed between the six health behaviors and information seeking along with adherence to the regimen in its entirety. The only health behavior found to be significantly correlated with information seeking was adherence to diet ($p < .05$).

Every health behavior but alcohol was significantly correlated with properly following one's

health regimen overall (follow-up appointments, p < .05, dose of medication, p < .05, medication

at proper time of day, p < .05, diet, p < .01, exercise, p < .01, smoking, p < .01).

As for importance, of the six health behaviors identified (follow-up appointments,

medication, diet, exercise, tobacco, alcohol) participants indicated that not smoking tobacco (*M* =

4.82, *SD* = .71) and properly taking medication (*M* = 4.73, *SD* = .63) were most important.

Limiting consumption of alcohol (*M* = 3.81, *SD* = 1.18) was deemed the least important. As for

adherence within each behavior, the two most adhered to were attending follow-up appointments

(*M* = 4.87, *SD* = .34) and properly taking medication (*M* = 4.74, *SD* = .53). Thus, the most

important and actually enacted upon behaviors were interrelated.

Table 5. *Correlations Among Health Behaviors*

Health Behavior	Information Seeking	Adherence
Follow - Up Appts	.03	.25*
Meds – Correct Dose	-.01	.27*
Meds – Correct Time	.09	.26*
Diet	.25*	.37**
Exercise	.19	.58**
Smoking	-.07	-.34**
Alcohol	.11	.13

*Correlation significant at .05 level
**Correlation significant at .01 level

To summarize, several noteworthy findings emerged from applying the TMIM to patients

with a heart condition. First, uncertainty discrepancy regarding one's health regimen produced

more intense feelings of anxiety. However, the majority of participants were content regarding

their levels of uncertainty and intense negative emotions were generally not experienced. Second, negative emotions were negatively related to efficacy assessments. Participants who felt anxious, angry, or fearful perceived less efficacy regarding their ability to seek information from their physician. Third, outcome expectancies were positively related to efficacy assessments, both when using total efficacy as a composite measure and when analyzing each efficacy measure individually. When patients perceived benefits regarding an information search, they regarded themselves as able to seek information. Finally, information seeking and communication quality were significantly related to adherence. Patients who reported seeking information from their physician *and* indicated the communication as satisfactory were more likely to adhere to their health regimen.

Discussion

This study tested the TMIM in the context of heart patients and their information seeking behaviors. The principal goal was to delineate a relationship between TMIM, adherence, and communication between patient and physician. Overall, the TMIM was generally a good fit within this sample, and TMIM and positive communication was found to significantly affect adherence.

Application of the TMIM

The TMIM proposes that an incongruence between actual and desired levels of uncertainty produces emotion. Overall, the participants in this study reported feeling small amounts of discrepancy between their current and desired levels of uncertainty about their health regimen ($M = - .34$). The relatively low discrepancy levels within this sample challenges the application of the theory in this particular case, because the discrepancy propels the information - management process. This weak "trigger," as discussed by Fowler and Affifi (2011), means that

intense negative emotional responses were less probable among this group of participants. Perhaps the relative lack of uncertainty could be attributed to the fact that 79% of patients reported living with their heart condition for at least one year, and thus had time to accustom themselves to their condition and regimen. However, the low discrepancy levels could also be interpreted as positive for patients' health, because congestive heart failure patients who do not understand their health regimen or understand the function of their prescription drugs are more likely to be non-adherent and experience negative patient outcomes (Hulka, 1976).

Although the TMIM originally predicted that only anxiety would follow uncertainty discrepancy, Afifi and Morse (2009) broadened the theory to include a wider array of emotional states. This study showed how emotions might play out for clinically diagnosed patients. Using Lancaster's (2016) approach to include only true discrete emotions of anger, happiness, and fear, the current study shows that happiness was the most intensely experienced emotion resulting from both the patients' health regimen and heart condition.

Keeping in mind that most participants reporting feeling satisfied regarding their level of uncertainty, the propensity for individuals to experience positive emotions reinforces previous researchers' findings. In particular, Fowler and Afifi (2011) found that adult children in the pursuit of caregiving information from their elderly patients experienced a range of emotions, seven out of the ten most intensely experienced emotions were positive. The current findings are also consistent with Rauscher and Hesse (2014), who determined that the two emotions fitting best into the TMIM model were interest and pride in conversations relating to family health history.

As for the connection between emotional states, outcome expectancies, and efficacy judgements, the current study shows that anger and happiness consistently predicted outcome

expectancies and efficacy judgements, whereas anxiety and fear did not. Despite minimal uncertainty discrepancy scores, the fact that uncertainty discrepancy was significantly and positively related to anxiety is consistent with past explorations of TMIM (Afifi et al., 2004; Afifi et al., 2006, Fowler et al., 2011). Thus, emotion(s) affected perceived positives/negatives and self – efficacy assessments within this particular sample of heart patients.

Outcome expectancies significantly predicted efficacy assessments and information-seeking strategies, which is consistent with the vast majority of tests surrounding the TMIM. However, an important note for this study is that significant associations were found between outcome expectancies, efficacy assessments, and information seeking, while the average score for outcome expectancies was rather high. Simply put, when patients believe they are efficacious and perceive positive outcomes, they are more likely to seek information. This finding is interesting because Afifi and colleagues (2004) suggest that the TMIM better predicts information seeking when outcome expectancies are low. In the context of this particular sample, it seems that heart-condition patients who responded to the survey seek information even when they have positive outcome expectancies.

Despite applying generally well to the current sample, neither of the mediation hypotheses outlined in the theory were supported, although other studies have also struggled to confirm such hypotheses (Affifi & Weiner, 2006; Dillow & LaBelle, 2014; Fowler & Afifi, 2011). One explanation for this non-finding is that perhaps efficacy is more influenced by emotion that what the theory currently suggests (Rafferty, 2014). In the current context, one obstacle to this analysis was the response rate (N=76), as tests for mediation are generally not advised when less than 100 (Kinney, 2016).

Additionally, the hypotheses regarding the relationship between anxiety and outcome expectancies were not supported. Affifi and Morse (2009) explain that individuals experiencing positive emotions (as in the case of this study) may not weigh efficacy assessments or outcome expectancies as heavily as those experiencing negative emotions, thereby weakening the influence of efficacy on information seeking decisions. Given that participants reported low levels of uncertainty and negative emotions, this potentially explains the lack of a significant relationship between anxiety and outcome expectancies. Once again, emotion may play a greater role in the subsequent perceptions of outcome expectancies than the theory currently suggests.

TMIM and Existing Theories

Applying TMIM to the adherence context was helpful in highlighting the important role emotion plays in the information seeking process. TMIM analyzes an abundance of emotions, both positively and negatively valenced, that subsequently impact the information decision. An analysis of the role emotion plays in the health process has been missing from previous frameworks used to analyze adherence, such as the health beliefs model. In measuring the type and intensity of emotion, it's possible to determine the role emotion plays throughout each stage and variable in the information-seeking process.

Moreover, TMIM features a detailed treatment of efficacy, that allow for efficacy variables to be measured individually as well as together as a composite variable. This results in a more complete understanding of the adherence process as opposed to the health beliefs model. TMIM explicates that individuals not only make self-efficacy assessments regarding their ability to obtain information, but they make judgements regarding the efficacy of the information provider as well. Given that communication between patient and physician is a dyadic exchange,

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this highlights the interplay and responsibility that both parties share in the exchange of information.

Adherence

The TMIM illuminated variables that affected adherence among heart-condition patients in this study. Efficacy assessments, information seeking, and communication quality all had significant effects on adherence. This finding supports researchers who have detailed the importance of efficacy within the health context (Jeng & Braun, 1996, Strecher et al., 1986). Physicians and practitioners who communicate to patients in a way that will foster self – efficacy may find more positive patient outcomes and adherence.

An important note is that the vast majority of participants in the study (90.8%) considered themselves adherent. Moreover, all health behaviors expect one (limiting alcohol use) were significantly correlated with total adherence. To clarify, "total adherence" was measured by one item that asked participants "Do you believe you are properly following your health regimen," while the compliance questionnaire analyzed adherence to six specific health behaviors. Ultimately, when heart patients reported adhering to one health behavior, they also reported adhering to their regimen as a whole.

In addition, one health behavior (diet) was significantly correlated with information seeking, and overall, the patients who sought information were more likely to be adherent. These findings could have important practical implications. Specifically, if patients are persuaded to adhere to one health behavior, they might be more likely to comply with additional clinical and therapeutic behaviors as well. If this is the case, physicians could focus time on one health behavior, ensuring that the patient understand it, as that training would subsequently influence additional behaviors.

Communication Quality

Although the TMIM does not provide guidance about the role of satisfaction with patient/physician communication in predicting adherence, among the study participants, communication quality predicted adherence. This contributes further to the growing body of knowledge that stresses the importance of communication between patient and physician (Hampson et al 1996; Vik et al 2004; Svensson et al., 2000). For patients, feelings of trust, comfortability, and privacy all factor into the quality of communication between patient and physician. Additionally, worth noting is that the presence of constructive communication is impossible if the patient does not seek information in the first place. Heart patients with positive emotions, outcome expectancies, and efficacy assessments were all more likely to seek information. Thus, it would appear that patients who feel relatively positive about their potential for health tend to be more likely to seek information, and those who sought information were more satisfied with the quality of interactions they had with their physicians.

Reasons for Nonadherence

The sample of heart patients generally reported adhering to their regimen, however when they were asked to explain their instances of nonadherence several notable findings emerged. All dimensions of adherence were identified when coding the results (Sabat, 2003). This further reinforces the idea that adherence is complex and features numerous facets, including patient, condition, and therapy related factors. Adherence is typically much more complex than simply taking a pill or exercising once a week. Most notably, several participants reported attitudes and beliefs that were antithetical to their treatment, expressing a desire for "natural" solutions. These patients were not negligent or forgetful, but instead held fundamentally divergent views as compared to their physician. Additionally, cost of medicine was a significant factor regarding

nonadherence, as numerous participants expressed a lack of insurance coverage which impacted

their ability to get the drugs in the first place. Ultimately, most patients did not report only one

factor that led to nonadherence, but instead a combination of dimensions that interrelated and

built upon each other.

Practical Implications

This thesis sheds light on the variables and challenges that heart condition patients

experience during treatment. More specifically, the results indicate that outcome expectancies

are important to the information seeking process. Simply put, patients are more likely to seek

information when they believe that a health action will impel positive benefits. In line with the

TMIM, emotion also had a significant effect on outcome expectancies, which then had a

significant effect on efficacy assessments and seeking information from a physician. In turn,

seeking information had a significant effect on self-reported rates of adherence.

Given these findings, health providers might be able to improve patient outcomes by

being accessible, receptive, and responsive to patients so as to not discourage patients from

seeking health information. Positive communication and interactions with health providers could

enable patients to experience positive emotions and outcome expectancies within their

experiences in health care, and make them more inclined to not only seek further information

about their condition and regimen, but also adhere to the recommendations that emerge.

Although the heart condition patients in this study generally reported being satisfied with

their interactions with their physicians, some items had lower mean scores, such as "The doctor

asked about how my condition affects my everyday life" ($M = 3.16$, $SD = 1.4$), and "The doctor

respects the fact that I may have a different opinion regarding treatment" ($M = 3.36$, $SD = 1.3$).

Thus, these could be areas in which physicians could orient themselves toward improving the

quality of interactions with their patients. By taking the time to discuss how an affliction impacts patients' everyday lives and by showing signs of respect for diverging opinions, patients and physicians can build stronger relationships and ultimately improve patient outcomes.

In the analysis of the qualitative data gathered to answer the research questions, the participants in this study also indicated the importance of personal values and beliefs regarding their health. In particular, several participants expressed a desire for natural remedies and solutions that were different than what their physician prescribed. Relative to the findings indicating that satisfaction with physician communication related to increased reported adherence, it seems important for health providers to become aware of these beliefs by asking patients about their pre-existing views on their health and treatment. Conversations about such beliefs and preferences could reveal pertinent information that could potentially foster a positive relationship and increase patient outcomes and adherence at the same time. In the instances where the patients' belief(s) goes against provider knowledge, the physician should probe for additional information. Ultimately, patient and physician alike should reach an understanding and strategy for treatment guided in part by the patients' pre-existing beliefs.

Future Directions

The current findings give way to several questions that could be addressed in future studies. First, researchers should continue to analyze TMIM within the adherence context. In particular, research should identify which TMIM variables are most relevant to adherence. Adherence is a complex topic that needs further research from empirically tested and validated theories such as TMIM. Through further analysis of the variables that influence adherence, health providers can improve their ability to communicate health regimens and adherence.

Future researchers should also identify and evaluate heart condition patients who have recently been diagnosed, as their uncertainty and emotion levels are plausibly more intense than individuals who have been living with the condition for several years or more. This could be the point in their regimen where they experience the greatest amounts of uncertainty and emotion which subsequently impacts the information process. Altogether, future research should attempt to locate patients who are less certain about their regimen and perceive negative outcomes.

However, heart condition patients were a difficult population to reach in this study. Researchers must find ways to obtain better access to heart condition patients, as access and response rates were a significant challenge for this study. Payment and other tangible benefits to participating would be a good place to start, as this study was unable to offer anything in the form of benefits.

Finally, research should analyze the context surrounding patients' nonadherence, and the reasons for it. Specifically, research should identify the instances where patients hold fundamentally divergent views from physicians (as noted several times in this study). Researchers should find ways in which patients and providers can "bridge the gap" to ensure that patients receive adequate care concerning their heart condition while also maintaining positive patient outcomes and integrity regarding the way they want to live.

Limitations

Because this study relied on a volunteer sample, and did not provide compensation for participating, the response rate was relatively low compared to the thousands of people who likely saw the announcement for the study. Thus, the findings are likely affected by a high amount of non-response bias. Simply put, the sample of individuals who participated in the survey are a different group than the individuals who did not access the survey, or did not finish

it completely. This particular sample is more likely to be comfortable with their health regimen and follow the recommendations given to them by their physician. Additionally, since the majority of participants belonged to a support-group, these individuals probably found it easy to talk about their condition and regimen. Overall, it's possible that individuals who maintain membership in support groups possess characteristics that could help further decode the results of this study.

Another bias on the results could be a function of social desirability effects. Generally speaking, compliance is often over-reported (George et al., 2007; Hawkshead et al., 2007), whereas noncompliance is often under-reported (Burke et al., 1995). Inaccurate reporting of compliance could be the result of recall bias, social desirability bias, and errors in self-observation (Paterson et al., 2002). Self-report instruments are advantageous due to their simplicity and inexpensiveness. They are also quick, easy to administer, and avoid the use of sophisticated methodology or equipment (Miller et al., 2000; Farmer, 1999). Although these benefits served this study well, it is true that these instruments are subject to the biases described above. Researchers involved in this topic of study should therefore consider alternative sources of data that would allow them to observe adherence in potentially less-biased ways.

Conclusion

Nonadherence is a complex problem that results in negative patient outcomes, loss of life, and significant costs in health care. Nonadherence within patients with a heart condition is particularly problematic due to its prevalence, mortality, and complex health regimens. The TMIM has been used as a predictive framework to determine information seeking within a wide variety of health topics, and was applied to this context. Overall, the TMIM illuminated variables that were particularly salient to heart condition patients that impacted reports of adherence.

Outcome expectancies, efficacy assessments, and quality communication with a physician all had a significant effect on the decision to seek information from a physician and to adhere to a health regimen. That is, patients who perceived benefits to be gained as a result of searching for information from their physician, believed they had the efficacy to make the search, and reported the communication between their physician being of quality, all were variables that led to adherence among heart patients. Through the utilization of a patient-centered approach, health providers and researchers can delineate variables that are critical in the determination of positive patient outcomes, and ultimately save lives.

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