Effects of Direct-to-Consumer Prescription Drug Advertising on Patients' Medication Regimen Adherence

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I still remember when I wrote my first acknowledgement in my MA thesis. I dedicated it to everyone who made the journey possible. Now five years have passed, and again, I want to dedicate this dissertation to everyone who made this journey possible.

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Chapter 1

INTRODUCTION

1.1. Research Purpose

Since its first introduction in the U.S. market in the 1980s, direct-to-consumer advertising

(DTCA) of prescription drugs has become one of the main methods of pharmaceutical

marketing. In 2010, the DTCA share of overall pharmaceutical marketing expenditure

reached 40% (Liu and Gupta 2014). With the growing prevalence of DTCA, heated

debates have been continuing about the potential positive and negative effects of DTCA.

The debates have revolved around the potential effects of DTCA on individuals and

society. DTCA supporters contend that DTCA functions as an health information source

to patients for their medication-related decision-making, leads consumers to visit their

doctors to discuss about their health conditions and medications, which increases the

chance of getting an early and appropriate diagnosis and seeking necessary medical

treatments, and leads to better adherence to medication regimens, which in turn, would

reduce the overall healthcare costs. On the other hand, DTCA opponents argue that it

provides inaccurate information to patients, leads patients to demand unnecessary

prescriptions from their doctors, which can cause their relationship with doctors to

deteriorate, and increases misuse and overuse of patients' prescription medications,

which would result in increased healthcare costs (Auton 2006; DeLorme, Huh, Reid, and

An 2011; Huh 2014).

Against the backdrop of this controversy, the vast majority of DTCA studies have

focused on examining the effects of DTCA, some from an economic perspective and

many others from a behavioral perspective. From the economic perspective, previous

studies have focused on how DTCA is associated with prescription drug sales and healthcare costs, and how it influences the pharmaceutical market. Previous studies have suggested a significant relationship between DTCA expenditure and overall prescription medication spending (Dave and Saffer 2012; Law, Soumerai, Adams, and Majumdar 2009; Rosenthal et al. 2003). In terms of its impact on the pharmaceutical market, researchers have investigated the relationship between DTCA and medication prices (e.g., Calfee 1997 as cited in Calfee 2002), sales (e.g., Calfee, Winston, and Stempski 2002; Donohue and Berndt 2004; National Institute for Health Care Management Research and Educational Foundation 2001), and market expansion (e.g., Hansen, Shaheen, and Schommer 2005; Iisuka 2004). From the behavioral perspective, the research focus has been on how DTCA affects patients' perceptions, attitudes, and behaviors related to prescription medications, with the results revealing both positive and negative effects on patients.

Previous studies have shown that, in general, many patients perceive DTCA as a useful information source (e.g., Deshpande, Menon, Perri III, & Zinkhan, 2004; Perez et al., 2011). This tendency is stronger among patients of low socioeconomic status (Chaar and Lee 2012; Liu and Gupta 2011) and among racial/ethnic minorities (DeLorme, Huh, and Reid 2010; Lee and Begley 2010). In addition, previous studies have shown that patients who have seen DTCA tend to seek more information about their condition or treatment options, including the advertised medication (e.g., U.S. Food and Drug Administration 1999; Huh and Becker 2005). However, some studies have suggested that DTCA may not be a comprehensible information source and that it can influence patients to have inaccurate perceptions about medical issues and medications. For example, one

study reported that African American adolescents did not fully understand DTCA information concerning the HPV vaccine (Leader et al. 2011). Another study demonstrated that depression patients who judged the prevalence of depression in the United States based on advertising tended to believe that it was higher than it was in reality (An 2008).

Researchers have also investigated the effects of DTCA on patients' interaction with their doctors. In particular, they have examined how patients' exposure to DTCA or DTCA expenditures are related to the frequency of patients' visits to doctors and discussions of their conditions and treatment options, requests for prescriptions for the advertised medications, and actual prescriptions. In general, previous studies have shown a positive correlation between DTCA expenditure and patients' visits to their doctors (Hosken and Wendling 2013; Izuka and Jin 2005). Previous studies have also suggested that DTCA promotes patient-doctor discussion about health conditions and advertised medications (e.g., Weissman et al. 2003). DTCA has also been found associated with an increase in diagnosis of diseases such as high cholesterol conditions (e.g., Niederdeppe et al. 2013), further treatment seeking (e.g., Donohue and Berndt 2004), requests for prescriptions of the advertised medications (e.g., An 2007; DeLorme, Huh, and Reid 2007; Mintzes et al. 2002), and actual prescriptions of the advertised medications (e.g., Donohue, Berndt, Rosenthal, Epstein, and Frank 2004; Spence, Teleki, Cheetham, Schweitzer, and Millares 2005). In terms of DTCA's association with inappropriate prescriptions or overprescription, there has been mixed results. One study found no direct relationship between DTCA and inappropriate prescription of medications (e.g., Calfee al. 2002), while another study demonstrated that DTCA was positively associated with

patients' advertised medication intake even when there were alternative medication options (e.g., Spence et al. 2005).

Compared to the large volume of research on the aforementioned issues commonly raised by supporters and opponents of DTCA, very little systematic research has been conducted about the potential effects of DTCA on patient medication adherence. The lack of research on the relationship between DTCA and patient medication adherence is somewhat surprising given that the potential positive effects of DTCA improving patients' medication adherence has been one of the most common arguments made by DTCA supporters.

As lack of information and negative perceptions about medications are among the factors that influence patients' medication non-adherence (Gellad, Grenard, and McGlynn 2009), DTCA has potential to improve patients' adherence to their prescription drug regimen by reminding them of the seriousness of their health problems and the benefits of their drugs for managing them. On the other hand, it is also possible that DTCA might have detrimental effects on medication adherence because the ads might remind patients about side effects and other risks involved in taking medications (Wosinska 2005). There are some survey results that suggest the potential for DTCA's positive influence on patient medication adherence. In a survey conducted by the U.S. Food and Drug Administration (FDA) in 2002, physicians reported that DTCA improved their patients' medication adherence (U.S. Food and Drug Administration 2003, as cited in Auton 2004). A consumer survey also showed a similar result. In a survey conducted by Prevention magazine in 1999, patients reported that DTCA influenced them to be

more likely to take their medication (20% of the respondents) and to fill their prescription regularly (33% of respondents) (Slaughter and Schumacher 2001).

Some studies have examined the relationship between DTCA spending and patient medication adherence by comparing DTCA expenditure data with patients' medication claim data from health insurance companies and medical records from hospitals. However, the findings have revealed only a weak correlation. More research is, therefore, needed to fully understand the relationship between DTCA and patient medication adherence, particularly at the individual level.

To address this paucity in the research literature, this study investigates DTCA effects on patient medication adherence at the individual level. More specifically, this study examines the effects of DTCA on patient medication adherence as a type of media priming effect—a short-term media exposure effect on the audience's thoughts, beliefs, judgments, and behaviors (Roskos-Ewoldsen, Klinger, and Roskos-Ewoldsen, 2007). According to media priming effect theory, frequent and recent exposures to certain media contents can affect individuals' behaviors and evaluations relating to the object or idea presented in the media contents for a limited time (Roskos-Ewoldsen, Klinger et al. 2007; Roskos-Ewoldsen, Roskos-Ewoldsen, and Carpentier 2009).

The predicted priming effect of DTCA on patients is not likely to be confined to exposure to advertisements for the particular drugs or brands that they use. It is more likely to be a result of general exposure to all DTC advertisements in the mass media. Due to the rather standardized nature of DTCA content, patients are likely to be presented with similar types of health information repeatedly through cumulative and constant exposure. Thus, the main research questions addressed in this study are whether higher

exposure to DTCA generates priming effects of making certain beliefs related to common DTCA content elements (e.g., the seriousness of medical conditions and the benefits and risks of the drugs) more accessible in patients' minds and whether such priming influences their medication adherence behavior. This study will investigate these questions by applying media priming effect as a theoretical framework. Empirical examination of the potential effects of DTCA on patients' medication adherence behavior is important both for advancing the literature on DTCA and for providing practical implications for addressing the medication non-adherence issues (Wosinska 2005).

1.2. Background about the Medication Non-Adherence Problem

As chronic diseases have become the primary cause of morbidity and mortality in the United States, the management of chronic diseases has become an important public health issue. According to the 2012 National Health Interview, approximately half of Americans have at least one chronic disease (Ward, Schiller and Goodman 2014). The 2011 National Vital Statistics Report also revealed that chronic diseases accounted for seven of the top ten causes of death in the United States (Hoyert and Xu 2012).

Since a long-term commitment to a drug regimen is the primary treatment option for chronic disease patients, patients' medication non-adherence has risen as an important public health problem and a great challenge for healthcare practitioners (Braithwaite, Shirkhorshidian, Jones, and Johnsrud 2013). A recent meta-analyses of 20 studies on American patients' medication non-adherence from 2002 to 2010 showed that the non-adherence rate across all drug categories was 46% (Naderi, Bestwick, and Wald 2012). Another study investigating elderly patients' medical record from 1994 to 1998, reported

that about 80% of coronary artery patients stopped taking their medications within the first three months, and about 43% of the remaining patients stopped taking theirs within six months (Jackevicius, Mamdani and Tu 2002).

Improving patients' medication adherence is an important issue both at the individual and societal levels. At the societal level, approximately $290 billion or 13% of annual total healthcare expenditures in the U.S. was related to medication non-adherence issues in 2009 (New England Healthcare Institute 2009). Osterberg and Balscheke (2005) also reported that 33% to 69% of hospital admissions per year in the U.S. are related to medication non-adherence.

At the individual level, medication non-adherence is not only correlated with deterioration of patients' health, but it also increases individual patients' healthcare spending. Patients who poorly adhere to their medication regimens have higher rates of hospitalization, higher mortality, and more frequent emergency room visits than do adherent patients across many chronic diseases, including diabetes and heart disease (Ho, Magid, Masoudi, McClure and Rumsfeld 2006; Matsui 2013). For example, myocardial infarction patients who poorly adhere to their statin regimen are found to be at a 25% higher risk of mortality than those who adhere to their regimen (Rasmussen, Chong and Alter 2007). Prior studies have specifically demonstrated that medication non-adherence increases healthcare costs for diabetic, high cholesterol and hypertensive patients (Shenolikar, Balkrishnan, Camacho, Whitmire, and Anderson 2006; Sokol, McGuigan, Verbrugge, and Epstein 2005).

Because of the critical societal and individual implications of the medication non-adherence problem, many public health researchers and health-related organizations have

examined patients' medication adherence behavior and influencing factors (e.g.,

Christensen and Johnson 2002; Gellad et al. 2009; Kronish and Ye 2013). Most of these

studies agree that medication adherence is a multifaceted, dynamic process with a host of

different influencing factors, including: 1) the healthcare system factors, 2) the

medication regimen factors, 3) the patient factors, and 4) the environmental factors.

DTCA is a part of the broader environmental factor surrounding patients, which shapes

the manner in which patients get information about their medication regimen and act on it

(Kronish and Ye 2013).

1.3. Chapters and Organization

This dissertation is organized as follows: Chapter 2 discusses the concept and

phenomenon of medication adherence and non-adherence, reviews research literature on

medication adherence and influencing factors, and discusses media priming effect as the

theoretical framework of this study. The first part of Chapter 2 presents an overview of

how patients' medication adherence and non-adherence have been conceptualized, and

discusses medication adherence as a sequence of stages based on the stages of health

behavior change models. Previous empirical studies on influencing factors of medication

adherence are also reviewed. In the second part of Chapter 2, previous research

examining the relationship between DTCA and medication adherence is reviewed. In the

third part of Chapter 2, media priming effect theory is introduced as the theoretical

framework of this study, followed by detailed discussion of characteristics of media

priming effect and a review of empirical research relevant to explaining potential effects

of frequent exposure to DTCA on patients' medication adherence. Chapter 3 presents this

study's hypotheses and research questions, which are developed based on the literature review.

Chapter 4 presents a preliminary qualitative study that was conducted prior to the main quantitative survey study. This chapter explains the purpose and main questions addressed by the preliminary study, followed by presentation of key findings and discussion of how the findings were used for the measurement development in the main study. Chapter 5 describes the method of the main survey study, including the study context and sample, measurements, and data collection procedure. Chapter 6 presents the survey data analysis results. Finally, Chapter 7 summarizes and discusses the key findings from both the preliminary and main studies, and presents theoretical and practical implications of the findings. The limitations of this study are also discussed, followed by specific suggestions for future research directions.

Chapter 2

LITERATURE REVIEW

2.1. Medication Adherence and Relevant Research

2.1.1. Conceptual definitions of medication adherence and non-adherence

Medication adherence, also known as medication compliance, is a type of health behavior in which patients follow the medication regimen prescribed or advised by their healthcare providers to control their health conditions. Commonly, it is defined as "the extent to which a person's behavior – taking medication… corresponds with agreed recommendations from a health care provider" (Sabatâe 2003, p. 3). It is a process concerning how patients evaluate their health conditions and the benefits and risks of their medications, in order to decide whether or not to follow their prescription regimen regarding the time, quantity, and frequency of taking medications. The process starts with filling a medication prescription at a pharmacy and eventually ends with the formation of a habit (Cramer et al. 2008). Previous research has used the terms "adherence" and "compliance" interchangeably, but this study uses the term adherence, because many healthcare providers prefer it (Osterberg and Blaschke 2005), and it reflects a more active role on the part of patients in the treatment process.

Conceptually, medication adherence is considered a health behavior as well as a consumer behavior. As a health behavior, medication adherence is a patient's effort to control his/her health condition that has deteriorated due to an illness. It is a continued behavior, initiated by a healthcare provider's prescription of a medication regimen, and the patient's task is to follow the instructions continuously until the healthcare provider confirms that the condition is fully controlled.

As a consumer behavior, on the other hand, medication adherence is a continuous decision-making process to stay on the prescribed drug regimen until it becomes a habitual behavior. Unlike other medical procedures performed by healthcare providers, medication adherence is a behavior performed by patients. In other words, patients have control over whether or not to take their prescribed medications and whether or not to follow their medication regimen. For patients who are not in the habit stage and still consciously appraise the value of their medication regimen, continuing the regimen requires a certain degree of self-regulation and control.

Medication adherence and non-adherence is not conceptualized as a clear-cut dichotomy. Researchers who study medication adherence have agreed that medication non-adherence takes many different forms along the continuum, with one end being complete adherence and the other end being complete non-adherence (e.g., Gellad et al. 2009; Park and Jones 1997). Previous research has identified and investigated three types of medication non-adherence behavior: 1) nonfulfillment; 2) nonpersistent adherence; and 3) nonconforming adherence (Gellad et al. 2009).

Nonfulfillment, which is known as primary non-adherence, occurs when patients do not initiate their prescribed medication regimen in the first place. Patients who do not fill their first prescription or those who filled the first prescription but never take the new drug are categorized as nonfullifiller. In the context of myocardial infraction (MI), one study reported 18% of MI patients were nonfullifillers, based on its investigation of the patient records from 1994 to 1998 (Jackevicius, Li, and Tu 2008).

Nonpersistent adherence refers to when patients stop taking their medications after initiation. This is the most common type of medication non-adherence behavior.

One study compared medication claim data from 2005 for six drug categories and found that 55% of patients taking statins (i.e., cholesterol medication) and 47% of those taking diabetic medications stopped taking their medications within six months (Yeaw et al. 2009). Another study showed that 80% of coronary artery patients stopped taking their medications within the first three months, between 1994 and 1998 (Jackevicius, Mamdani, and Tu 2002).

Lastly, nonconforming adherence is when patients take their medications but do not follow the regimen as instructed by healthcare providers (Berg, Dischler, Wagner, Raia, and Palmer-Shevlin 1993; Gellad et al. 2009). Skipping doses and taking drugs not at the prescribed time or not in the prescribed doses are examples of nonconforming adherence. Typically, two types of measures are used to determine nonconforming adherence: 1) the percentage of pills that patents take as prescribed (80% is usually used as a point of adherence); and 2) the duration of patients' medication adherence (Krosnish and Ye 2013). Nonconforming adherence is relatively less studied, but it has significant impact on patients' health. For example, taking medication incorrectly can immediately deteriorate patients' condition in certain disease types (e.g., Gellad et al., 2009).

2.1.2. Medication adherence stages

Medication adherence behavior changes over time (Park and Jones 1997) and these changes occur in a multistep process (Gellad et al. 2009). Various health behavior stage models have been employed as a theoretical framework for understanding medication adherence behavior stages and to design an effective intervention program to increase patients' medication adherence (Sabatâe 2003).

The main ideas of health behavior stage models include: (1) health behavior changes can be understood as a process involving several stages; (2) each stage requires patients to make unique decisions; and (3) a certain set time period between stages is commonly shared by individuals (e.g., Prochaska and DiClemente 1992; Rothman, Baldwin, Hertel, and Fuglestad 2011). For example, Rothman and colleagues' model of health behavior change proposed that a health behavior change begins with an initial response, such as making a decision to try a new health behavior, followed by continued response, maintenance, and habit stages (Rothman et al. 2011). Similarly, Prochaska and DiClemete (1992) identified five stages (i.e., precontemplation, contemplation, preparation, action, and maintenance) and argued that patients' health behavior changes or health behavior adoption would undergo the five stages sequentially. Regarding the time taken to move from one stage to the next, they proposed a time period of six months between each stage transition in the context of smoking cessation.

Among various health behavior stage models, this study adopts and modifies Rothman et al.'s model, because this model is conceptually better applicable to the medication adherence context than other models. It views forming a habit as the ultimate final stage of the health behavior adoption process, which is conceptually equivalent to the final desired stage of medication adherence. According to Rothman et al. (2011), changing one's behavior or adopting a new health behavior consists of four stages or phases: 1) the initial response stage is the first step where individuals decide whether or not to try a new recommended health behavior; 2) the continued response stage is the second step of this process, where individuals decide whether or not to establish the changed or newly adopted behavioral pattern; 3) the maintenance stage is the third stage

where individuals decide to continue the newly adopted behavioral pattern; and 4) the habit stage is the final stage, in which individuals no longer consciously evaluate the newly adopted behavior but automatically continue the behavior. In the habit stage, the main predictor of the behavior is individuals' past behavior.

Applying Rothman et al.'s health behavior stage model to patients' medication adherence behavior, this study proposes three stages: 1) the initiation stage, 2) the maintenance stage, and 3) the habit stage. In the initiation stage, a patient decides whether or not to fill the prescription received from his/her healthcare provider and whether or not to take the drug. If the patients fill the first prescription and begin their medication regimen, they move on to the maintenance stage. The maintenance stage is not a mere continuation of taking the prescription drug, but rather a conscious and continuous decision-making process to appraise the value of outcome from continuing the newly adopted behavior (in medication adherence context, taking the prescription medication). Patients in the maintenance stage continually assess if following the medication regimen can improve their health and decide whether or not to adhere to the regimen. When patients no longer consciously assess the value of their medication regimen but automatically take the drugs, they are considered to have arrived at the habit stage. In the habit stage, patients form a routine around the newly adopted behavioral pattern (Rothman et al. 2011) and automatically adhere to it without conscious thoughts about the behavior. Figure 1 summarizes the three stages of patients' medication regimen adherence.

Figure 1. Stages of Patient Medication Regimen Adherence

Initiation	**Maintenance**	**Habit**
• Filling the prescription • Starting the medication • Decision-making: whether or not to start	• Continuing the medication regimen • Decision-making: whether or not to stay on the regimen	• Continuing the medication regimen by habit • No conscious decision-making: automatic behavior
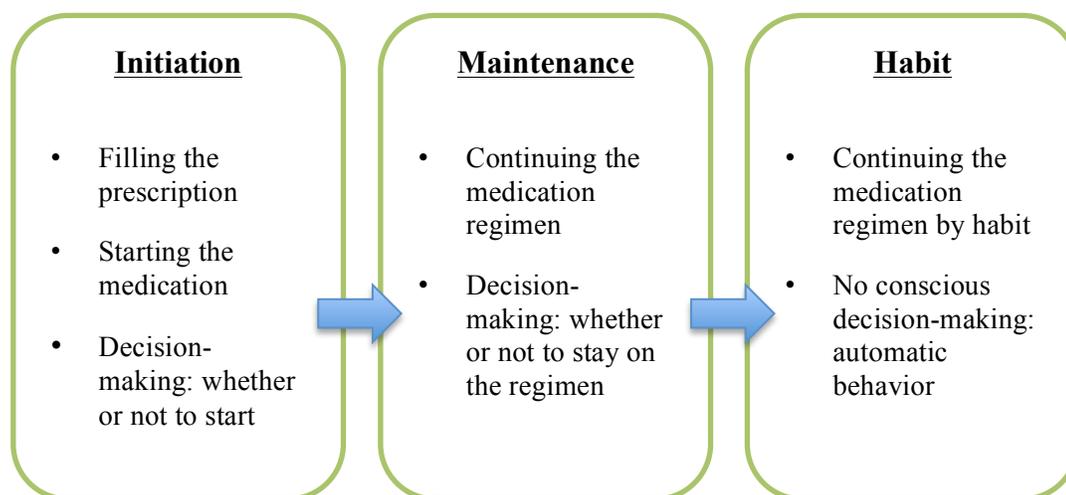
2.1.3. Factors influencing medication adherence behavior

Previous studies on medication adherence from pharmacy and public health examined various influential factors for improving patients' medication adherence (e.g., Gellad et al. 2009; Kronish and Ye 2013; Park and Jones 1997; Sabatâe 2003). The influencing factors can be classified into four broad categories: 1) the healthcare system factors (financial factors, distribution channel factor, and healthcare provider factors); 2) the medication regimen factors (medication-related factors such as the complexity of medication regimens and side effect experiences); 3) the patient factors (demographic factors, condition-related factors and beliefs about their illnesses and drugs).; and 4) the environmental factors.

Healthcare system factors

Financial factors. The financial factors, particularly about patients' cost-sharing, include medication cost and patients' health insurance status (Kronish and Ye 2013). Because patients' health insurance status and insurance coverage of prescription

medication costs are directly related to the costs of medications that patients have to cover, health insurance status has been studied frequently as a predictor of patients' medication adherence.

Previous research has consistently shown a negative association between medication cost and patient medication adherence (Balkrishnan 1998; Sabatâe 2003). For example, one study based on secondary analysis of the National Health and Nutrition Examination Surveys (NHNES) showed that having no health insurance increased the chance of patients' medication non-adherence by 88% (Baustista 2007). Other studies also found that patients were less likely to adhere to their medications when the out-of-pocket cost of medications increased (Bowman, Heilman, and Seetharaman 2004; Goldman, Joyce, and Zheng 2007).

Distribution channel factors. Compared to other healthcare system factors, medication distribution channels have been studied less. Distribution channels can influence patient medication adherence because they can consistently remind patients to refill their prescription and to take their drugs (Bowman et al., 2004). One study tested the relationship between the type of distribution channels and patients' medication adherence using an economic modeling approach, and found that direct channels, such as an online or catalog order system, were more positively related to patient medication adherence than other distribution channels such as pharmacies at the grocery stores (Bowman et al., 2004).

Healthcare provider factors. Frequency and the quality of communication between patients and their healthcare providers have been frequently examined as another important factor influencing patients' medication adherence (Baustista 2007; Gellad et al.

2009; Hyre et al. 2007; Nguyen et al. 2009; Sabatâe 2003; Schoenthaler et al. 2009;Wu, Moser, Chung, and Lennie 2008). The number of patients' visits with healthcare providers during a certain time period is commonly used as an indicator of frequency of communication with healthcare providers. One study found that patients who visited their healthcare providers at least once a year were more likely to adhere to their medication regimen than those who never visited during the same time period (Baustista 2007).

In terms of the quality of communication, the amount of information provided by healthcare providers, the degree of comfort that patients felt during the conversation with their healthcare providers, and healthcare providers' communication style have been examined in connection to patient medication adherence. A report from the World Health Organization (WHO) on patients' treatment adherence showed that patients who adhere to their medication regimen tended to be those who received more information about their medication from healthcare providers and actively participated in the prescription process (Sabatâe 2003). Another study demonstrated that patients who felt more comfortable asking questions to their physicians tended to adhere more to their medication regimen (Hyre et al. 2007). Healthcare providers' collaborative communication style has also been found positively related to patients' medication adherence. One study found that patients who reported that their healthcare provider had a friendly communication style adhered more to their medication regimen (Schoenthaler et al. 2009).

The influences of patients' satisfaction with and trust in healthcare providers on medication adherence have been also frequently studied. Generally, patients who are more satisfied with their healthcare providers and who trust in them are more likely to

adhere to their medication regimen (Gellad et al. 2009). For example, a survey of inflammatory bowel disease (IBD) patients demonstrated that patients with greater trust in their physicians adhered more to their treatment regimen (Nguyen et al. 2009). Another survey with a sample of heart failure patients also showed that patients who highly trusted their physicians were more likely to adhere to their medication regimen (Wu et al. 2008).

Medication regimen factors

Complexity of medication regimens and side effect experiences have been frequently studied as medication regimen-related factors influencing medication adherence. Complexity of medication regimen is commonly operationalized by the frequency of medication use, the number of doses, and the number of other prescription medications taken concurrently. Previous studies have shown that patients are more likely to adhere to their medication regimens when the drugs are taken less frequently (Saini, Schoenfeld, Kaulback, and Dubinsky 2009), and when a smaller number of pills are taken at once (Phatak and Thomas 2006; Wu et al. 2008).

However, the association between the number of other medications taken and medication adherence is unclear. Some studies revealed that patients who were taking more numbers of medications tended to adhere more to their regimen (Bilups, Malone, and Carter 2000; Burge et al 2005), while other studies found a negative association between the two (Bowman et al. 2004; Chapman et al. 2005; Gazmararian et al. 2006).

When it comes to the relationship between patients' side effect experience and their medication adherence, previous studies have shown a negative association between them (Sabatâe 2003). A recent survey by the National Community Pharmacist

Association revealed that patients who experienced side effects from their medications were less likely to adhere to the medication regimen (National Community Pharmacist Association 2014). Another study also found that high cholesterol patients who experienced side effects from their cholesterol medications tended to be more non-adherent to the medication regimen (Kaplan et al. 2004).

Patient factors

Patient factors are the most frequently examined factors influencing patients' medication adherence, based on the assumption that medication non-adherence is an abnormal patient behavior that should be fixed by understanding patients' individual characteristics (Berg et al., 1993). Patient factors can be categorized into patient demographic attributes, their condition-related factors and psychological factors.

Patients' demographic attributes. Demographic attributes have been studied most frequently; however the results have been inconsistent, even within the context of treatment for the same illness. For example, some studies showed that, in the context of hypertension medication regimens, older patients tended to better adhere to their medication regimen (Bautista 2008; Schoenthaler et al. 2009), while another study on the same topic found younger patients were more likely to adhere to their medication regimen (Krousel-Wood, Muntner, Islam, Morisky, and Webber 2009).

Overall, previous studies on patient demographic factors have shown no consistent evidence of significant relationships between patient medication adherence and demographic characteristics, such as age, sex, education, income, race and ethnic background (Haynes 1979; Kaplan and Simon 1990). Moreover, even when significant relationships were found between some demographic characteristics and medication

adherence, no meaningful theoretical discussions were offered about the findings. Instead, most of the previous studies simply described the demographic characteristics of medication adherers or non-adherers.

Patients' condition-related factors. Patients' health condition-related factors, such as symptom severity, have been studied as potential influences on medication adherence (Sabatâe 2003). Particularly, whether the illness is symptomatic or asymptomatic, and whether the consequences of non-adherence are severe or not severe have been studied frequently. Generally, patients who take prescription drugs for controlling asymptomatic illnesses tend to be more non-adherent to their medication regimen than those with symptomatic illnesses (Sabatâe 2003). One study revealed that high cholesterol and hypertension patients were less adherent to their medication regimen than diabetic patients, whose condition was more symptomatic and consequences of non-adherent were more severe (Bowman et al. 2005).

Patients' psychological factors. The psychological factors can be divided into individual personality factors and beliefs about medications and illnesses. Previous studies have found no significant influence of patients' personality factors on their medication adherence (Sabatâe 2003). On the other hand, patients' beliefs about their illnesses and medications have been proposed as an important factor in medication adherence, both theoretically and empirically (e.g., Christensen and Johnson 2002; McHorney et al. 2007; Park and Jones 1997).

Beliefs are a psychological representation about some objects. Commonly, individuals' thoughts or knowledge about an object are considered their beliefs about the object (Fannis and Stroebe 2010), which are the basis of attitude toward the object (Ajzen

and Fishbein 1980). According to Rokeach (1968), there are three types of beliefs: 1) descriptive beliefs, 2) prescriptive beliefs, and 3) evaluative beliefs. Descriptive beliefs are represented as factual statements in our mind and they can be determined to be accurate or inaccurate. Prescriptive beliefs about an object are the desirability of the object. Evaluative beliefs reflect one's assessment of the object, which are commonly represented as good or bad. Previous studies examining the role of beliefs on patients' medication adherence have focused on the role of the accuracy of descriptive beliefs (or knowledge) and the effects of evaluative beliefs about the medication and illness.

Patients' descriptive beliefs about their illnesses and medications. Previous studies measured descriptive beliefs by assessing how accurately patients answered a series of knowledge questions about their illnesses and medications. Therefore, many studies used the term, *knowledge*, to describe descriptive beliefs about illnesses and drugs. The research findings have generally demonstrated a positive association between accuracy of patients' knowledge about their illnesses and medication adherence (Sabatâe 2003). For example, a study of type 2 diabetes patients found that the patients who had incorrect beliefs about their disease were less likely to adhere to their medication regimens (Mann, Ponieman, Leventhal, and Halm 2009). Results from a survey of Korean American high blood pressure patients also showed that patients with inaccurate knowledge of high blood pressure were less likely to adhere to their medication regimen (Kim et al. 2007).

Regarding patients' beliefs about their medications as well, research has demonstrated generally positive relationship between accuracy of descriptive beliefs about medications and patient medication adherence. A cohort study of asthma patients

revealed that patients who had more accurate knowledge about their treatment tended to better adhere to their medication regimen (Apter et al. 2003). A survey conducted in the same disease context also showed the same relationship between accuracy of the asthma treatment knowledge and patients' medication adherence (Wells et al. 2008). Another study with glaucoma patients found that patients who had inaccurate beliefs about the consequences of glaucoma medication regimen non-adherence (i.e. reduced vision) were less likely to adhere to their medication regimen (Friedman et al. 2008).

While the previous research results have demonstrated a significant and consistent effect of patients' descriptive beliefs about their medications on medication adherence, the research has limitation in that all of the measured beliefs were beliefs about medication benefits. The effects of descriptive beliefs about medication risks have not been directly tested.

Patients' evaluative beliefs about their illness and medication. Evaluative beliefs about the illness and the drug in patients' mind have been proposed as a strong predictor of patient medication adherence (e.g., Gellad et al. 2009; Park and Jones 1997). Particularly, patients' evaluative beliefs about the severity of their illness have been frequently studied. In terms of evaluative beliefs about medications, evaluative beliefs about the drug itself, about the drug benefits and the drug risks have been studied.

Generally, most of the studies testing the effects of evaluative beliefs about the illness severity on patients' medication adherence have shown that patients who perceive their illnesses more severely tend to adhere to their medication regimen more. In the context of asthma, a couple of studies demonstrated that asthma patients adhered to their regimen better when they perceived their condition as more severe (De Smet, Erickson,

and Kirking 2006; Janson, Earnest, Wong, and Blanc 2008). Other studies with high cholesterol patients (Mann et al. 2007) and hypertension patients (Li, Stotts, and Froelicher 2007) also provided supporting evidence for the relationship between patients' disease severity beliefs and higher medication regimen adherence.

Evaluative beliefs about medications have also been found to be a consistently related to patient medication adherence. For example, a survey by Gatti and colleagues found that patients with generally negative beliefs about their medications were more likely to be medication non-adherers (Gatti, Jacobson, Gazamararian, Schmotzer, and Kripalani 2009).

Evaluative beliefs about medication risks in particular have been found to be significantly associated with medication adherence in various disease contexts, including diabetes (Aikens and Piette 2009; Chao, Nau, and Aikens 2007; Mann et al. 2009) and depression (Brown et al. 2005). The results from the previous studies showed negative associations between beliefs regarding drug risks and medication adherence. Particularly, previous studies demonstrated that patients' concerns about medication risks were one of the main barriers to medication adherence in the context of cardiovascular medication regimens (Kronish, Leventhal and Horowitz 2012; Marshall, Wolfe, and McKevitt 2012), high cholesterol patients (Mann et al. 2007), and type 2 diabetes patients (Mann et al. 2009). Additionally, a survey with patients taking medications after coronary artery bypass graft (CABG) surgery found that medication non-adherent patients had higher beliefs about medication risks (Khanderia et al. 2008).

Regarding the impact of patients' evaluative beliefs about medication benefits, previous studies suggest that positive beliefs about medications, particularly positive

beliefs about the health outcomes from following the medication regimen (drug benefits and effectiveness), facilitate better medication adherence (Aiken and Piette 2009; Apter et al. 2003; McHorney et al. 2007). A study of asthma patients showed that patients with more positive views of their medications' benefits were more likely to adhere to their medication regimen (De Smet et al. 2006). A survey of glaucoma patients also demonstrated that patients with positive beliefs about their medications' benefits (i.e., their medications help improve their glaucoma condition) were more likely to adhere to their eye drop regimen (Friedman et al. 2009).

Environmental factors

Previous studies on influencing factors of various health behaviors, including patient medication adherence, tended to focus on healthcare system factors and patient factors. However, some public health researchers have started paying attention to the importance of environmental factors. Conceptually, environmental factors are various micro and macro level physical, social, political, economic and sociocultural variables that surround individuals' daily lives (Kremers 2010). Mass media content is regarded as one of such environmental factors. Recently, the importance of environmental factors on patient medication adherence has been addressed by one study. Kronish and Ye (2013) proposed that patient surroundings, such as workplaces, community, and media as environmental factors, indirectly influence patient medication adherence.

Environmental factors can influence individuals' behavior in two ways: 1) through an indirect route by influencing individuals' cognition, such as attitudes and intentions; and 2) through a direct route by functioning as a behavioral cue (Kremers 2010). Previous theories on health behavior have primarily focused on the direct effect of

environmental factors. For example, health belief model (HBM) assumed that environmental factors, such mass media content, function as a cue-to-action, without influencing any cognitive variables (Janz and Becker, 1984). However, environmental factors can also indirectly influence patient behaviors. For example, frequent exposure to media messages, particularly medication-related messages, can influence patient beliefs and perceptions about their medications, which can lead them to adhere or not to their medication regimens. Through constant exposure to certain types of health messages in the mass media, patients would implicitly form related beliefs and use them in their decision-making.

Although the potentially important role played by environmental factors in patients' medication adherence has been proposed in the research literature, very few studies to date have empirically tested the effects of environmental factors on medication adherence. Studies examining DTCA effects on patients' medication adherence are those few studies.

2.1.4. DTCA as an environmental factor influencing medication adherence

As one of the primary media content elements that patients are frequently exposed to in their daily lives, DTCA has the potential to influence patient medication regimen adherence, and this has been recently tested in certain limited ways. Previous studies examining DTCA effects on medication adherence focused exclusively on societal-level and aggregate effects using an economic modeling approach. Specifically, four studies investigated the relationship between DTCA exposure and patient medication adherence. These studies used patients' pharmacy claim records from health insurance companies or patients' medical records as a measure of medication adherence, and correlated the data

with DTCA expenditure data. Two of the studies (Donohue et al. 2004; Hansen, Chen, Gaynes, and Maciejewski 2010) compared the effects of various pharmaceutical marketing methods, including DTCA, on patient medication regimen adherence. The other two economic modeling studies (Bowman et al. 2004; Wosinska 2005) regarded DTCA as one of various predictors of patient medication adherence.

One of the earliest studies testing on the relationship between DTCA and patient medication adherence was conducted by Donohue and colleagues (2004). The primary purpose of this study was to compare the effects of DTCA and other common pharmaceutical marketing methods—physician detailing and providing samples to physicians—on patients' initiation of and adherence to antidepressant regimens. The researchers analyzed monthly advertising spending data of six antidepressant brands promoted by DTCA for the time period of 1997 to 2000, physician detailing data, and health insurance medical and prescription claims data. The results showed that high DTCA spending at the time of the illness diagnosis was positively related to both patients' initiation of the advertised medications and the duration of antidepressant use (Donohue et al. 2004), but the positive association was weak and not brand-specific. DTCA spending of a specific brand was not only positively related to the advertised brand use, but also related to increased use of other brands in the same drug category. The authors interpreted these results as suggesting that there is a spill-over effect of DTCA and suggested that the positive association between patients' increased medication adherence and DTCA expenditure was observed for antidepressants in general, not only for the advertised medications.

The primary purpose of Bowman et al. (2004) was to estimate an economic model predicting consumers' product compliance in the context of prescription medication. DTCA expenditures for prescription drugs of four chronic diseases (arthritis, diabetes, high cholesterol, and hypertension) were included as one of the predictors of patient medication adherence. By analyzing patients' drug purchase diary data, the study found non-significant and mixed results about the relationship between the amount of DTCA expenditure and patient medication adherence. The researchers suggested that DTCA could have both positive and negative effects; it could enhance patient medication adherence by putting to ideas about the drug regimen on top of patients' mind, while they could also give false sense that patients' were already cured by presenting healthy images. Overall, compared to other predictors, such as the salience of the condition (i.e. how much the condition severity was salient in patients' mind) and the medications' perceived costs, the effects of DTCA expenditure on patient medication adherence seemed to be small and inconsistent.

Wosinska (2005) also estimated and tested a model of patient medication adherence by using DTCA of three statin brands expenditure data from Ad$pender and prescription claim data from Blue Shield of California from 1996 to 1999. Patients' medication non-adherence was operationalized by counting the number of skipping days within 60 days (i.e., between the two 30-day prescription refill cycles), and DTCA expenditures were weighted to represent the differential effects of current and previous advertising on patients. Similar to Donohue et al. (2004), this study demonstrated that an overall increase in DTCA spending for the statins was positively related to patient statin adherence, but its economic impact was very small. Again, a small but positive

relationship was found for the drug category, rather than at the brand-level. The researcher suggested that DTCA could remind patients of their illness.

A particularly interesting finding from Wosinska was a negative relationship between Lipitor ad spending and patient medication adherence – the negative effect was significant for new patients (who initiated the drug regimen when Lipitor started its TV commercials). The researcher interpreted that Lipitor TV ads, whose formats were different from other brand ads and included more drug risk information, might have possibly become a source of drug risk information for patients.

Another study that demonstrated a category-level effects of DTCA was conducted by Hansen et al. (2010). As with the study of Donohue et al. (2004), the primary purpose of Hansen et al. was to examine the effects of DTCA and physician detailing on patients' medication switching and adherence in the context of antidepressants. They divided patient medication adherence into two phases: 1) acute phase, in which patients had been taking prescription antidepressants for no more than 90 days, and 2) continuation phase, in which patients had been taking the medication for more than 90 days but less than 270 days. The researchers investigated whether the effects of DTCA and physician detailing differed by the patients' medication adherence phase. By analyzing antidepressant DTCA expenditure and insurance claim data for the time period of 2000 to 2004, the study showed that a category-level increase in DTCA expenditure was positively associated with patients' medication adherence only for the continuation-phase patients, but not for the acute-phase patients. The results suggested that DTCA was more influential on patients who had been on the medication regimen for a longer period than on those who had recently initiated the regimen. Although this study did not formally apply the stage of

health behavior model, the results can be interpreted as showing that DTCA can be more influential on maintenance stage patients.

Overall, findings from the previous four studies examining DTCA effects on patients' medication adherence can be summarized as follows: 1) there is a weak but positive association between DTCA spending and patient medication regimen adherence; 2) the positive association between DTCA spending and patient medication adherence seems to be more pronounced for patients who have been on the medication for a longer period of time; and 3) the positive association between DTCA spending and medication adherence is more likely to be a category-level effect than a brand-specific effect.

Research on DTCA effects on patient medication adherence is only recently emerging and remains very scarce. The previous studies on the relationship did not directly measure patients' individual medication adherence behaviors, and did not provide any theoretical explanations for the underlying mechanism behind the positive association between DTCA and patient medication adherence. Some studies suggested the possibility that DTCA can be regarded as an environmental factor that influences patient medication regimen adherence by influencing their beliefs about their illnesses and drugs (e.g., Bowman et al. 2004; Wosinska 2005), but the suggested idea has not been empirically tested. As a media environmental factor providing information about illnesses and medications, DTCA has the potential to influence patients' beliefs about their illnesses and medications, and such beliefs are known to be one of the most important predictors of patient medication adherence. Potential effects of DTCA on patients' medication adherence via influencing beliefs can be understood as a media priming effect.

2.2. Theoretical Framework: Media Priming Effect

2.2.1. Media priming effect theory and research

Media priming effect is defined as the effect of short-term media exposure on the audience's thoughts, beliefs, judgments, and behaviors (Roskos-Ewoldsen et al. 2007). Broadly, media priming effect has been studied in three areas—media violence priming, political priming, and stereotype priming. Media violence priming research has theorized and investigated how exposure to violent media content primes aggression-related affects and behaviors in various media contexts from movies to video games (e.g., Carnagey and Anderson 2005; Josephson 1987). Political priming studies have examined how exposure to political news and entertainment shows affects individuals' views on politicians and political issues (e.g., Iyengar and Kinder 2010; Moy, Xenos, and Hess 2005). Stereotype priming research has investigated how exposure to media content portraying racial or gender stereotypes influence individuals' evaluation of an event which is related to the racial and gender group (e.g., Monahan, Shtruilis and Brown Givens 2005; Power, Murphy and Coover 1996).

Characteristics of media priming effect

The original concept of priming effect was developed in the social psychology field and thus, media priming effects and the original priming effects from social psychology share some similarities. First, media priming effects become stronger when the priming happened more recently or frequently. Roskos-Ewoldsen et al.'s review of media priming effects showed that recency and frequency of exposure were two main characteristics of media priming effects. Second, compared to other types of media effects, priming effects only last for a short time period (Roskos-Ewoldsen, Klinger et al.

2007; Roskos-Ewoldsen, Roskos-Ewoldsen et al. 2009). Roskos-Ewoldsen, Klinger et al.

(2007) conducted a meta-analysis of media priming effect research and found that media

priming effects tended to dissipate over time. Although media priming effect studies have

shown longer lasting effects than those found in the traditional social psychological

priming studies, even the longest media priming effect lasted only for two months

(Roskos-Ewoldsen, Roskos-Ewoldsen et al. 2009).

There are also some unique aspects of media priming effects compared to

traditional priming effects in social psychology. First, the nature of priming from media

content exposure is incidental. Unlike an experimental setting in which individuals are

forced to be exposed to the priming condition, in a real media viewing environment,

individuals are typically unaware of the potential priming intent from media messages

such as news and advertising, when they are exposed to them. Therefore, priming effects

from media messages are usually caused by incidental exposure.

Second, media exposure happens ubiquitously and for a long period of time.

Roskos-Ewoldsen et al. (2009) pointed out that media's ubiquitous nature could prime

individuals' thoughts or behaviors more strongly than the manipulation done in the lab

setting (Roskos-Ewoldsen et al. 2009). Similar types of media messages are disseminated

via multiple media channels surrounding our everyday lives. For example, in the context

of advertising, Faber, Duff, and Nan (2012) argued that, as advertising messages are

disseminated through multiple media channels simultaneously, individuals are exposed to

the same advertising messages repeatedly. This ubiquitous nature of media increases the

chance of being exposed to the same message repeatedly and frequently, which is closely

related to stronger priming effects.

Theoretical assumptions of media priming

Media priming effects are conceptualized based on the assumption that concepts are stored as a network in an individual's long-term memory. Among the various networks of memory models (e.g., Anderson 1996; Higgins, Bargh and Lombardi 1985; Wyer and Srull 1980), Anderson's ACT* model (1996) has been widely used as the basis for media priming effect models. According to Anderson (1996), an individual's memory system called ACT productive system consists of the working memory (i.e., short-term memory) and the declarative memory (i.e., long-term memory). In this model, declarative representations, which are cognitive units such as constructs, knowledge, beliefs, and attitudes, are stored in the declarative memory in the form of a hierarchical network. When a cognitive unit in the declarative memory is activated, the unit becomes ready to move into the working memory, where it becomes accessible for making judgments.

Because cognitive units are located in the associative network, which is an inter-connected, hierarchical network in the declarative memory, the activation of one unit can spread to other connected units, known as the spread of activation. Priming happens when activation of one cognitive unit (e.g., belief regarding effectiveness of one's current prescription medication) affects the activation of another connected cognitive unit (e.g., beliefs about other benefits of one's current prescription medication), which in turn becomes readily accessible in the working memory (Anderson 1996). The accessible cognitive units in the working memory influence individuals' subsequent decision-making process (e.g., my current medication is good for my health) and behavior (e.g., staying on the current medication regimen).

Accessibility effects and relevant media priming research

Based on the concept of associative network of long-term memories, media priming effect studies view accessibility effects as the underlying mechanism of media priming effects. Accessibility effects refer to "the activation potential of available" knowledge, beliefs, and attitudes stored in one's memory (Higgins 1996, p.134), which means that among knowledge, beliefs, and attitudes that already exist in one's memory, certain types of knowledge, beliefs, and attitudes can become more readily accessible for making subsequent judgments. Accessibility effects can happen only among already available constructs of knowledge, beliefs, and attitudes. Belief salience is sometimes interchangeably used when referring to accessibility effects. However, Higgins (1996) points out that salience is the outcome of selective exposure, which is a different concept from accessibility. Thus, the current study uses the term, accessibility, to refer to increased possibility of memory activation.

Media priming effect research has studied how temporarily or chronically accessible cognitive units or affects influence individual audiences' subsequent behaviors or judgments of an object. Since many previous priming effect studies employed lab experimental methods, their findings have primarily demonstrated temporary accessibility effects, which only exist for a couple of minutes to a couple of days (Higgins 1996). However, to better reflect the true nature of media exposure in the real world, some of the more recent media priming effect studies, particularly political news priming studies, have focused on how media exposure enhance chronic accessibility to certain cognitive units.

Chronically accessible cognitive units are more ready to be activated (Bargh and Pratto 1986) and relatively stable to guide the subsequent information processing (Lau 1989). Chronic accessibility is associated with automatic processing (Bargh and Thien 1985) and its effects are longer lasting, ranging from a couple of weeks (Higgins, King, and Mavin 1982) to over a year (Lau 1989). One example of media priming effects on chronic accessibility is found in Lau (1989), which examined enduring effects of individuals' chronic accessibility of certain political constructs over time, influencing their attitudes toward politicians. Chronic accessibility of four political constructs—politician, issue, group, and party—was measured by coding respondents' answers to eight open-ended questions in a survey. Structural equation modeling results using data collected from 1956 to 1960 showed that heightened accessibility of the four hypothesized political constructs lasted for over four years. In follow-up studies, Lau also demonstrated that these four chronically accessible political constructs influenced respondents' attitudes toward presidential candidates (Lau 1989).

In a political news context, Price and Tewksbury (1997) developed a news priming model to explicate how exposure to political news primes individuals' political decision-making, especially when evaluating political leaders and issues. Their model is based on Anderson's ACT* model, which consists of knowledge store (i.e., long-term memory) and active thought (i.e., short-term memory). They also assumed that the associative network of cognitive units in long-term memory and salient attributes in media messages, such as political news, activate cognitive units in the long-term memory and move them to the short-term memory, where the activated cognitive units are readily used for political issue evaluation. Price and Tewksbury (1997) argued that social objects

and attributes, goals, values, motivation, and affects are stored as a form of associative network in the long-term memory.

Political news priming studies have mainly focused on how news coverage of political affairs influences the kind of information that individuals use for overall evaluation of politicians. In particular, political news coverage has been found to enhance chronic accessibility of news-covered information in individuals' minds (Roskos-Ewoldsen et al. 2009). Chronically accessible information persists over time and is used for subsequent judgments and behaviors more than temporarily accessible information (Roskos-Ewoldsen et al. 2009).

One of the earliest studies on political priming effect is Iyengar and Kinder's experimental work (2009). In a series of experiments conducted from 1980, they showed various edited evening news segments (e.g., segments about American defense preparedness in experiment 1) to participants in the treatment conditions. They found that participants placed more weight on the political issues covered in the news they saw, which affected their overall evaluation of President Carter's performance (Iyengar and Kinder 2009). Political priming effect has been studied in various contexts aside from traditional news media, on which Price and Tewksbury's model was based, including entertainment media. For example, Moy, Xenos, and Hess (2005) found that the public's evaluation of President George W. Bush' character traits was primed by his appearance on The Late Show with David Letterman.

The current study's hypothesis model, which will be presented in the next chapter, is built based on Price and Tewksbury's (1997) news priming model to investigate DTCA effects on individuals' medication regimen adherence, for the following reasons: 1) the

nature of DTCA exposure is incidental, repetitive and gradual, which is similar to the nature of news exposure; and 2) patients use the information from advertisements, but usually do so a while after their exposure to the ads, which is also similar to the news priming situation.

2.2.2. Media priming effect as the mechanism underlying the relationship between DTCA exposure and patient medication adherence

Applying media priming effect theory and findings from relevant studies to DTCA context, it is expected that patients who are frequently exposed to DTC ads are more likely to have accessible beliefs about their illnesses and medications that are consistent with the DTCA content. Due to the rather standardized nature of DTCA content, patients are likely to be exposed to similar types of health information repeatedly through cumulative and constant exposure to DTCA, which, in turn, can make certain beliefs about the illnesses and the drugs chronically more accessible in patients' minds.

The standardized nature of DTCA content

One of the unique characteristics of DTCA is that its content is regulated by the U.S. Food and Drug Administration (FDA), which requires every DTC ad to include both risk and benefit information about the advertised drug in a fair-balanced manner. Drug benefit information includes information on how the advertised drug treats certain medical symptoms, medication effectiveness, convenience, and innovation. Drug risk information includes common side effects, serious side effects, and the groups who may experience more harm than good (U.S. Food and Drug Administration 2015).

According to the FDA, three types of DTC are approved to be shown in the media: 1) product claim advertisements, 2) reminder advertisements, and 3) help-seeking advertisements. Product claim advertisements include the name of the brand, at least one benefit of the drug approved by the FDA, and risks of the drug. Reminder advertisements assume that patients already know about the use of the drug; thus, the purpose of these types of advertisements is to remind them of the drug name, but not explicitly mention its benefits or risks. Finally, help-seeking advertisements describe related illnesses, but do not mention a specific drug name or its risks and benefits (U.S. Food and Drug Administration 2012).

Previous content analysis studies of DTCA (e.g., Frosch, Krueger, Hornik, Gonbolm, and Barg 2007; Macias, Pashupati, and Lewis 2007) have revealed that all DTC ads include information about the advertised medication's benefits and risks, and the medical symptoms treated by the drug. A content analysis of TV DTC ads appearing during prime time TV shows in 2004 demonstrated that most ads were making factual (82%) claims about the drug's benefits and risks, and provided information about related medical conditions such as causes, prevalence, and risk factors (Frosch et al. 2007).

In terms of medication benefits, DTC ads emphasize the benefits of the advertised drugs for facilitating control of medical symptoms, the effectiveness and the safety of the advertised medications, and social benefits from the use of the advertised drugs. Folsom and colleagues conducted a content analysis of print DTC ads of urological drugs, and found that symptom control, effectiveness, and lifestyle enhancement were frequently presented as drug benefits (Folsom, Fesperman, Tojoula, Sultan, and Dahm 2010). Another content analysis of magazine DTC ads also showed that most DTC ads

emphasized the effectiveness and safety of the advertised drugs, as well as social benefits such as enhancement of the patient's lifestyle (Bell, Kravitz, and Wilkes 2000). A more recent study on TV DTC ads also demonstrated that social appeals such as regaining control of one's life by using the advertised drugs were frequently depicted, as well as the effectiveness and safety of drugs (Frosch et al. 2007). A content analysis of the visual cues from DTC ads showed similar results as well (Welch Cline and Young 2009).

As previous content analyses have demonstrated, information about illnesses and medications presented in DTCA tends to be standardized. Due to the standardized nature of DTCA content, patients are likely to be exposed to similar types of information about their illnesses and medications repeatedly through cumulative and constant exposure to DTCA. Thus, it is predicted that higher exposure to DTCA would likely lead to priming of certain health beliefs related to common DTCA content elements (e.g., drug benefits and risks), which, in turn, would influence subsequent medication adherence behavior. This predicted effect is explained in further detail in the following section.

Potential priming effects of standardized DTCA content

The standardized information presented in DTCA would likely influence patients' accessibility to two specific types of beliefs about their illnesses and medications: descriptive beliefs and evaluative beliefs. First, frequent exposure to DTCA can enhance the chronic accessibility to the descriptive beliefs about illnesses and medications because factual information about illnesses and medications are commonly presented in DTCA. Macias et al. (2007) showed that 74.5% of DTC ads provide general information about the advertised medications and the illnesses they treat, and Frosch et al. (2007) showed that 82% of TV DTC ads present factual information about the drug benefits and

risks. As the majority of DTC ads provide factual information about illnesses and medications, frequent exposure to DTC ads would likely make descriptive beliefs about illnesses and medications more chronically accessible in patients' minds. Specifically, patients are likely to have more accurate descriptive beliefs about their condition and its potential impact on their life, as well as more accurate descriptive beliefs about the medication benefits and risks.

Second, frequent exposure to DTCA can enhance patients' chronic accessibility to evaluative beliefs about their illness severity and medications. Frosch et al. (2007) found that the advertised medications were commonly portrayed as a method to regain control of one's health, which was lost because of an illness. This type of portrayal commonly emphasizes the negative aspects of illnesses (i.e., loss of control, severity of illness) and suggests taking the advertised medications as a solution (Frosch et al. 2007). Through frequent exposure to this type of portrayal of both illnesses and medications in DTCA, in patients' minds, negative evaluative beliefs about illnesses and positive evaluative beliefs about medications could become more chronically accessible, eventually influencing patients' decision to take their medications.

2.3. Summary

Medication adherence is patients' health behavior to control their health conditions by taking medications as their healthcare providers prescribed. It is a continuous decision-making process in which patients evaluate their health condition and the benefits and risks of their drugs, until it becomes a habit. On the continuum of medication adherence, where full adherence and non-adherence are placed at each end, three types of non-

adherence behaviors are identified. Nonfulfilment is the primary medication non-adherence, which happens when patients do not initiate their first prescription. Nonpersistent adherence is the most common type of non-adherence and happens when patients drop out of their medication regimen after the initiation. Nonconfoming adherence is failure to correctly follow given medication regimens, which is usually measured by the percentage of pills taken and the duration of medication taking.

Because medication adherence behavior changes over time, it should be considered a multi-stage concept. Applying the stage of health behavior change model to the context of medication adherence, this study defines medication adherence as a process consisting of three stages: (1) the initiation stage, (2) the maintenance stage, and (3) the habit stage. The first stage of medication adherence—the initiation stage—starts when a patient obtains a prescription from his/her doctor and begins to take the medication. If the patient fills the first prescription and starts his/her medication regimen, the patient is said to have moved on to the second stage, called the maintenance stage. In this stage, a patient consciously re-assesses the value of continuing the newly adopted medication regimen behavior. At the final stage—the habit stage—patients take their medication as a habit, which is an automatic behavior that does not require any conscious re-evaluation of the value of their medication regimen.

Among the different stages of patients' medication adherence, this study focuses on the maintenance stage for the following reasons: 1) the healthcare providers' role is more influential than patients' own cognitive efforts in the initiation stage and thus, the DTCA's influence would likely be minimal at this stage; 2) although both maintenance and habit stages can be characterized as a continuation of the medication regimen, the

habit stage requires less or no cognitive efforts compared to the maintenance stage, and thus the influence of DTCAs would likely be minimal; 3) the maintenance stage still requires making a relatively conscious decision to stay or not to stay on the medication regimen, and DTCAs can have a considerably greater influence.

Previous studies on the influencing factors of patients' medication adherence have examined various factors that can be broadly categorized to the healthcare system factors, the medication regimen factors, the patient factors, and the environmental factors. DTCA can be regarded as an environmental factor that indirectly influences patient medication adherence by increasing awareness of illnesses and affecting patients' beliefs about their illnesses and medications. However, very few studies have examined DTCA effects or any other media factor effects on medication adherence. Only a handful of studies exist about DTCA effects on patient medication adherence, and they have demonstrated a weak, positive association between DTCA spending and patient medication regimen adherence. The positive association between DTCA spending and patient medication adherence is more likely to be a category-level effect than brand-specific effect, and more applicable to patients who are already following their medication regimens (i.e., in the maintenance stage).

DTCA effects on patient medication adherence can be understood as a media priming effect. Media priming effect is a type of short-term media effects when media exposure influences audiences' subsequent thoughts and behaviors. Based on the concept of associative network of memory, priming happens when the activation of a certain concept spreads to another connected concept in the memory network. The activation is readily accessible to be used for individuals' subsequent decision-making and behavior,

which is called accessibility effects. Media priming effect research has investigated how temporarily or chronically accessible cognitive units influence the subsequent behavior or judgments of an object in the context of violent media exposure, news media, and stereotyping. Media priming effect becomes stronger when media exposure happens more frequently and recently, and lasts a relatively short period of time compared to other types of media effects.

Price and Tewksbury (1997) developed a news priming model to explicate how exposure to political news primes individuals' political decision-making, especially when evaluating political leaders and issues. They propose that salient attributes in political news activate cognitive units in individuals' long-term memory. Because the nature of DTCA exposure is similar to the nature of news exposure, which is incidental, repetitive, gradual, and, just like news priming, there is a time gap between DTCA exposure and patients' actual decision-making, this study builds its model based on Price and Tewksbury's (1997) news priming model to investigate the DTCA effects on individuals' medication regimen adherence.

Because of the FDA regulation, DTCA is required to include information about both drug benefits and risks, as well as the information about the illness treated by the advertised drug. Previous content analyses of DTCA have shown that the content of DTCA is standardized. Most DTCA includes factual claims about the illness, medication benefits, and risks. The balance between the benefits and risks of the advertised drug is fair in regard to quantity. The most commonly used message appeal in DTCA is describing the illness as a serious condition hindering one's healthy life, and suggesting the advertised medication as a method of re-gaining health.

Frequent exposure to DTCA's standardized content can increase patients' accessibility to certain types of descriptive beliefs and evaluative beliefs about their illnesses and medications. Specifically, frequent exposure to the DTCA's factual claims about illness and medication benefits and risks can increase the accuracy and accessibility of descriptive beliefs, and frequent exposure to the portrayal advertised medication as a method of re-gaining one's health can increase the accessibility to negative evaluative beliefs about illnesses severity. Overall, increased accessibility to descriptive and evaluative beliefs about illness and medication benefits and risks can affect patient medication adherence.

Chapter 3

HYPOTHESES AND RESEARCH QUESTIONS

3.1 Influencing Factors at Different Stages of Medication Adherence

Previous studies on influencing factors of medication adherence have been conducted without considering the multi-stage nature of medication regimen adherence. However, the health behavior change stage models and the medication adherence literature suggest that different influencing factors might play different roles at different stages (e.g., Gellad et al. 2009; Rothman et al. 2011).

One of the main arguments of Rothman et al.'s stage of health behavior change model is that the psychological factors influencing new health behavior initiation and those influencing the maintenance of the newly adopted behavioral pattern differ. Specifically, they argued that self-efficacy and expectation about the outcome from performing a health behavior are important determinants of health behavior adoption for individuals in the initial phase, while satisfaction with the outcome from the behavior is a more important influencing factor for individuals in the maintenance phase. For the habit phase patients, who perform the behavior automatically, previous behavior is the main predictor of health behavior (Rothman et al. 2011).

Empirical evidence supporting the notion of different influencing factors at different health behavior stages has been offered. In the context of a weight loss intervention program, one study found that self-efficacy was a strong predictor of individuals' weight loss behaviors, such as dieting and exercising, during the weight loss intervention period; however, it did not predict individuals' weight loss behavior after completing the intervention program (Linde, Rothman, Baldwin, and Jeffery 2006). In

the context of a smoking cessation intervention, another study also revealed self-efficacy as the main predictor of individuals' initiation of smoking cessation (Baldwin et al. 2006). But, after completing the program, satisfaction with the results of the smoking cessation program was the main predictor of continuation of smoking cessation.

In the patients' medication adherence context, Gellad et al. (2009) proposed that some influencing factors of medication adherence could be more effective for patients at certain medication adherence stages. Based on a review of literature on influencing factors of medication adherence, they argued that healthcare system factors, such as healthcare costs, would be the main influencing factor that motivate or inhibit patients' filling of the first prescription, which is the initial stage. However, for patients at the maintenance stage, medication-related factors, such as regimen complexity, and patients' psychological factors, such as beliefs about their illnesses and medications, would play a more important role.

Inferring from the research literature on health behavior stage models and the research on patient medication adherence reviewed in the previous section, the current study posits that DTCA's effect on patient medication adherence is likely to be more prominent in the maintenance stage. In the initiation stage, the healthcare provider factor or the healthcare system factor, such as health insurance coverage of the medication cost, would likely be more influential in motivating patients' medication-taking (Gellad et al. 2009). Thus, DTCA would likely be minimally influential in this stage. In the habit stage as well, DTCA influence would likely be minimal, because patients' cognitive processing and decision-making to or not to continue their medication regimen does not happen at this stage.

On the other hand, in the maintenance stage, medication adherence requires continuous and conscious decision-making by individual patients until it becomes a habit. Constant exposure to DTCA could enhance the accessibility of certain beliefs about medications, which would affect patients' decision to or not to stay on their medication regimen. Therefore, frequent exposure to DTC ads is likely to have more substantial influence on patients in the maintenance stage than on those in other stages. . As discussed earlier, DTCA effects on the maintenance-stage patients' medication adherence can be understood as a media priming effect.

Focusing on medication adherence behaviors among patients at the maintenance stage of medication use, this study hypothesizes that the level of DTCA exposure will be positively associated with patients' adherence to their medication regimen. Based on the theory of media priming effects and relevant empirical findings, DTCA is predicted to influence maintenance-stage patient medication adherence behaviors by increasing chronic accessibility of descriptive and evaluative beliefs about their illnesses and the medications they are taking. The following sections present specific hypotheses with justifications.

3.2. Priming Effects of DTCA Exposure on Patients' Beliefs about Their Illnesses and Medications

The FDA requires, and the previous research of DTCA content demonstrates, that factual information about the advertised drugs' benefits and risks and related illnesses is universally present in all branded (product-claim) DTC ads (Frosch et al. 2007; Marcias et al. 2007). Therefore, based on the media priming theory, repeated and cumulative

exposure to DTC ads would likely make the specific descriptive beliefs about the drugs and illnesses featured in DTC ads more accessible in patients' long-term memory (Roskos-Ewoldsen et al. 2009).

As suggested by Donohue et al. (2004) and Hansen et al. (2010), such priming effects on chronic accessibility of certain descriptive beliefs are likely to occur through overall DTCA exposure, not necessarily through exposure to ads promoting specific drugs taken by exposed patients. In other words, the hypothesized DTCA priming effects are not likely brand-specific effects. Thus, all of this study's hypotheses are posed about the effects of general DTCA exposure, not brand-specific ad exposure.

Therefore, the following hypotheses are posed:

H1. The level of patients' DTCA exposure and the accessibility of descriptive beliefs about their illness in the patients' memory will be positively related.

H2. The level of patients' DTCA exposure and the accessibility of descriptive beliefs about their drug benefits will be positively related.

H3. The level of patients' DTCA exposure and the accessibility of descriptive beliefs about their drug risks will be positively related.

In addition, previous content analysis studies have shown that many DTC ads have the tendency to present information about illnesses and medication benefits by highlighting the severity of the illness as the obstacle to living a normal and healthy life, and by showing that the medication can help remove that obstacle. Repetitive exposure to such prevalent depiction of illnesses and medications in DTC ads can influence patients' evaluative beliefs about their illnesses and medications. Repetitive exposure to an illness as a severe problem to their health and life can increase the chronic accessibility of

patients' evaluative beliefs about their illnesses being a severe problem. Therefore, the following hypothesis is posed:

> **H4.** The level of patients' DTCA exposure and the accessibility of evaluative beliefs about the severity of their illnesses in the patients' memory will be positively related.

While a significant effect of DTCA exposure on patients' evaluative beliefs about their medications is also predicted, the direction of the relationship is unclear. DTCA is required by the FDA to present both benefits and risks of the advertised drugs in a balanced manner, and previous content analysis studies have shown that both benefit and risk information types are presented equally in DTC ads, at least in terms of the quantity of information (Abel et al. 2007). Thus, frequent exposure to DTCA could lead to heightened accessibility of positive evaluative beliefs of drugs or negative evaluative beliefs, depending on which type of information had stronger impact on individual patients. Therefore, this study will pose a research question regarding the DTCA effects on patients' evaluative beliefs about their medications:

> **RQ1**. How will the level of patients' DTCA exposure and the accessibility of evaluative beliefs about their drugs be related?

3.3. Belief Accessibility Effects on Patients' Medication Adherence

The next set of hypotheses test relationships between the descriptive and evaluative beliefs about illnesses and medications primed by DTCA exposure and patient medication regimen adherence behavior. Previous studies on psychological influencing factors of medication adherence have shown that patients with more accurate descriptive beliefs about their illnesses and drugs tend to adhere better to their medication regimen (e.g., Aperter et al. 2003; Friedman et al. 2008; Kim et al. 2007; Wells et al. 2008). Based

on these empirical findings and the media priming literature (e.g., Roskos-Ewoldsen et al. 2009), it is predicted that increased accessibility of descriptive beliefs about illnesses and drug benefits caused by frequent DTCA exposure will be positively associated with medication adherence. The relationship between the descriptive beliefs about medication risks and patient medication adherence has not been directly tested. However, there are some experimental studies demonstrating negative relationships between exposure to DTCA risk information and patients' attitude toward the advertised medication and choice of the advertised medication (e.g., Lu 2007; Nikam 2003).

As discussed in the previous section, frequent exposures to factual claims about drug risks in DTCA is predicted to increase the accessibility of descriptive beliefs about the drug risks. Since attitude has been conceptualized and tested as a predictor of one's behavior (Ajzen and Fishbein 1980), it is expected that the heightened accessibility of descriptive beliefs about medication risks is likely to be negatively associated with patient medication adherence. Thus, the following hypotheses are posed:

H5. The level of accessibility of descriptive beliefs about the illness and patients' medication adherence will be positively related.

H6. The level of accessibility of descriptive beliefs about the medication benefits and patients' medication adherence will be positively related.

H7. The level of accessibility of descriptive beliefs about the medication risk and patients' medication adherence will be negatively related.

Previous studies on influencing factors of medication adherence have demonstrated that patients' perceived severity of illness, which is a type of evaluative belief about illness severity, tends to be positively related to their medication adherence. Based on the empirical findings and the media priming literature (e.g., Roskos-Ewoldsen

et al. 2009), it is predicted that increased accessibility of evaluative beliefs about the

illness severity will be positively associated with medication adherence. In addition,

previous studies on influencing factors of medication adherence have shown that patients

who perceive more benefits than risks from their medications tend to adhere better to

their medication regimen (De Smet et al. 2006; Gatti et al. 2009). Therefore, the

following hypotheses are posed:

> **H8.** The level of accessibility of evaluative beliefs about the illness severity and patients' medication adherence will be positively related.
>
> **H9**. The level of accessibility of evaluative beliefs about the drugs and patients' medication adherence will be related, and the direction of the relationship will depend on the nature of the evaluative beliefs (positive or negative).

In addition, a research question will be posed to test the overall link between

DTCA exposure and medication adherence behavior. Because some accessible beliefs are

likely to be positively related to medication adherence while other types of beliefs are

likely to be negatively related to the dependent variable, the following question is posed:

> **RQ2**: Through the hypothesized priming effects, would the level of DTCA exposure positively or negatively influence patients' medication adherence behavior?

The hypothesized associations between DTCA exposure, patients' beliefs about

their illnesses and medications, and patient medication adherence are illustrated in *Figure*

2.

Figure 2. Hypothesized Effects of DTCA Exposure on Patients' Belief Accessibility and Medication Adherence
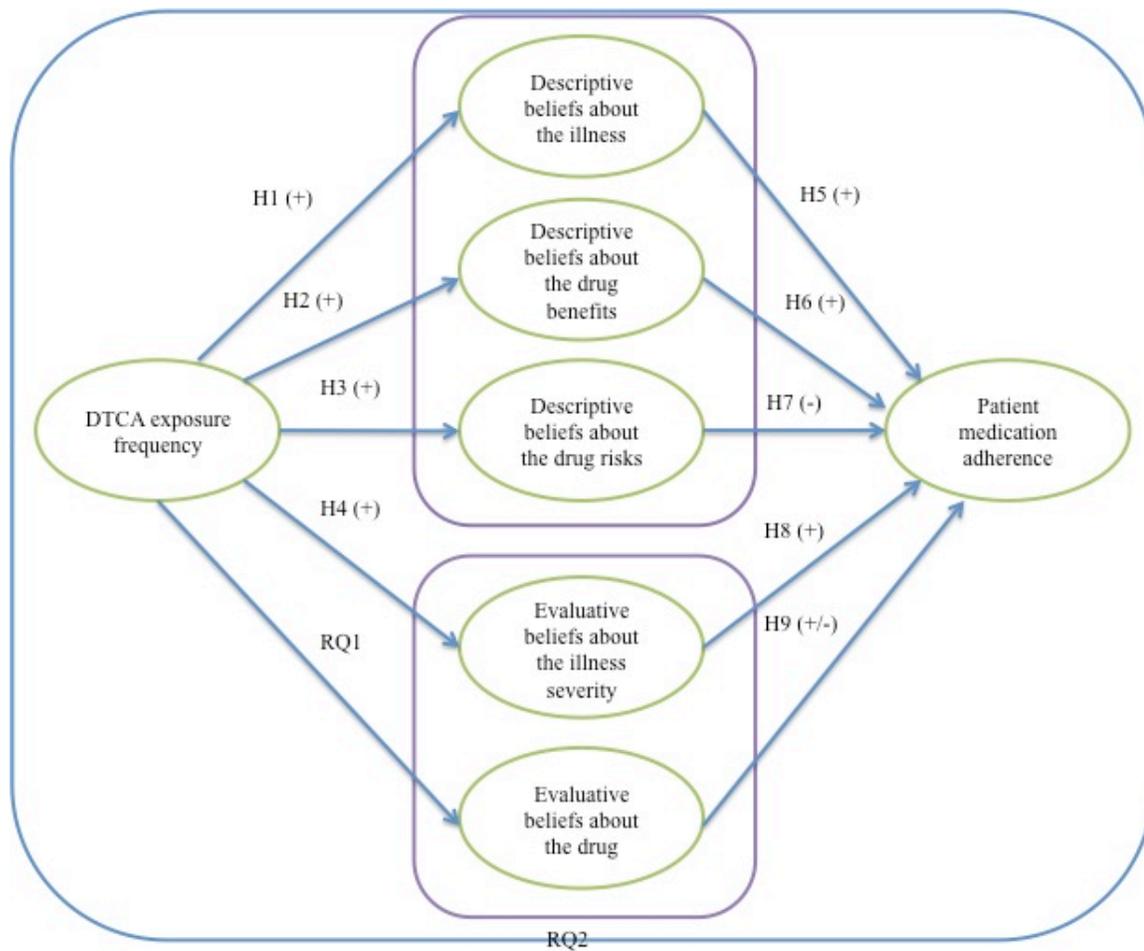
Chapter 4

PRELIMINARY QUALITATIVE STUDY

4.1. Purpose of the Preliminary Study

In order to obtain information necessary for developing the survey measurements for the main study, preliminary qualitative study was conducted using a series of in-depth interviews. Since this study focuses on medication regimen adherence at the maintenance stage, it is crucial to screen potential participants based on their medication use stage. For prescription medication users to reach the maintenance stage, it is required that they have spent a certain amount of time under the current medication regimen and made the transition from the initiation stage to the maintenance stage but not reached the habit stage yet. However, determining how to construct the screening measures is a challenging task due to a lack of clear guidelines in the existing research literature.

Previous studies on the stage of health behavior model assumed a specific time period between one stage and the next (e.g., Prochaska and DiClemente 1983; Rothman et al. 2011). For example, Prochaska and DiClemente (1983) proposed a time period of six months between each stage transition in the context of smoking cessation. Similarly, Rothman et al. (2011) used seven consecutive days as the time frame for determining transition between stages.

However, in the context of patient medication adherence, no previous research has proposed or empirically tested the amount of time needed for patients to move from the initiation to maintenance stage, and from the maintenance to habit stage. Some studies provide suggestive information that can be applied to conceptualizing a possible time frame for transition between the maintenance stage and the habit stage. For example,

Yeaw et al. (2009) studied the medication adherence pattern of six chronic disease patients using the pharmacy claims database, and reported that the number of drug claims by patients taking cholesterol-lowering medications showed drastic drops at the 30-day, 60-day, and 90-day mark after starting their medications. This finding suggests that a maintenance pattern would likely be formed within the first 30 days of taking the medication and that after 90 days most patients would likely enter the habit stage. However, this notion has not been empirically tested and there is no solid empirical data based on which medication use stages can be determined. Therefore, one of the primary purposes of the preliminary qualitative study was to develop feasible screening measures for determining maintenance-stage patients.

Another important purpose of the preliminary qualitative study was to learn patient characteristics in the maintenance and habit stages, in terms of their medication adherence behavior and their perceptions and beliefs of the medications. Specifically, interview questions were aimed at obtaining comments about patients' perceptions and beliefs about their illnesses and their drug benefits and risks, to use them for developing statements for the accessibility to the beliefs accessibility measurements about the illness and medication measurements. The in-depth interviews were approved by the University of Minnesota Institutional Review Board (IRB).

4.2. Method: In-depth Interviews

4.2.1. Study context: high cholesterol patients' medication adherence

As discussed earlier, the media priming effect of increasing chronic accessibility of certain beliefs tends to be a very short-term effect. Therefore, for testing DTC ad effects on patients' medication regimen adherence through priming, it is important to select the specific type of prescription medications that was heavily advertised within a reasonable time period surrounding the data collection period. Two months is the longest effect period that has been observed in news priming research (Roskos-Ewoldsen et al. 2009) and the longest effect period detected in psychology research is only a couple of weeks (Higgins et al. 1982). Based on these previous study findings, DTCA expenditures by medication types were checked for two months before the beginning of the preliminary qualitative study.

The cholesterol-lowering medication regimen (e.g., Lipitor and Crestor) for patients with hyperlipidemia (high cholesterol) was selected as the research context for three reasons. First, cholesterol-lowering medications were one of the most heavily advertised drugs on the market within the two-month time window before the in-depth interviews started (Kantar Media 2013). Second, high cholesterol is a chronic condition treated by prescription drugs requiring the patients' long-term commitment to the medication regimen, sometimes taken for the patients' entire lifetime. Third, non-adherence to the cholesterol-lowering medication regimen (e.g., skipping doses) does not lead to immediate negative consequences the patients can feel physically. Thus, it is relatively easier for patients to forget to take their medications and to become non-

adherent to their medication regimen in various ways, compared to other types of medications for chronic conditions.

4.2.2. In-depth interview procedure

Sixteen semi-structured interviews were conducted with cholesterol patients currently on the cholesterol medication regimen, from February 10 to April 25, 2014. Interviewees were recruited in various ways. Online recruitment advertisements were posted on Craigslist and emailed to potential interviewees through the university staff listserv. Snowball sampling was also used relying on the cooperation of participants. Fifteen interviews were conducted in-person and one interview was conducted via Skype. The time and location of in-person interviews were selected by interviewees for their convenience, which varied from the university lab to coffee shops near their homes. The online interview was scheduled by the interviewee for the interviewee's convenience. The interviews were conducted in English and each took about 30 minutes to 1 hour. All the interviews were digitally recorded with the permission of interviewees. Interviewees received a $20 gift card as a compensation for their participation.

The interview recordings were transcribed, resulting in a total of 141 pages of transcript, and analyzed by the author. The interpretative analysis approach (Lindlof and Taylor 2010) was taken for analyzing the data. The data were read carefully several times and examined line-by-line using analytic induction procedures and comparative analysis (Strauss and Corbin 1990). NVivo 10 for Mac was used for coding and investigating the emerging patterns.

4.3. Key Findings from the In-depth Interviews

4.3.1. Interviewee characteristics

In total, ten males and six females who were currently taking prescription cholesterol medications were interviewed. Fifteen interviewees were currently taking a prescription cholesterol medication, and one interviewee was taking niacin, a dietary supplement that helps control one's cholesterol level. Although niacin is not a prescription medication, the interviewee was not excluded from the analysis because the niacin was prescribed by a doctor and she had been on the medication regimen for a while; thus, it was determined that she could provide valid information about regular medication regimen adherence behavior. Her medication use behavior and perception about her illness and medication, and DTCA were not very different from others taking prescription cholesterol medications. Age of the interviewees ranged from 40 to 84. In terms of race, most of interviewees were white; only one African American and one Asian were interviewed. All interviewees were at least high school graduates. Two had some college-level education, ten interviewees received a bachelor's degree, two received a master's degree, and one received a doctoral degree. They all resided in Minnesota.

The time of initial diagnosis of their cholesterol condition ranged from 5 months to 26 years ago. The duration of their current cholesterol medication use ranged from 5 months to 10 years, which means some started taking their medications immediately following their cholesterol condition diagnosis. Nine of the interviewees started taking cholesterol medications at the time of their diagnosis, whereas others tried other alternative options such as increasing physical exercises or eating healthy before beginning their prescription drug regimens. However, eventually, all were put on the

prescription medication, because their initial attempts to manage cholesterol with physical exercises and healthy eating were not enough to reach the healthy level of cholesterol.

More than half of the interviewees had been taking the same cholesterol medications that were first prescribed to them, whereas seven reported changing their medications. The most common reasons for change in medication were cost and insurance coverage. Specifically, they had to change their medications when their health insurance stopped or changed the coverage of the previous medication costs or when the generic version of the drug was introduced to the market. In addition, some changed their medications because of side effects experiences or because their condition deteriorated. The decision to change medication regimens was made by doctors, whom seemed to have considered the patients' report of their condition changes or the patients' insurance coverage.

Most interviewees reported fully adhering to their current cholesterol-lowering medication. They never or rarely forgot to take their medications. Five interviewees reported that they sometime forgot to take their medications and the frequency of such non-adherence behaviors ranged from one to two times a week to twice a month. One interviewee reported that he once forgot to refill his medication. The demographic characteristics of interviewees and characteristics of their cholesterol medication use are summarized in Table 1.

Table 1. Characteristics of Interviewees

Interviewee number	Gender	Age	Race	Education	Duration on the current cholesterol medication
#1	Male	40s	White	BA (MA student)	2 years
#2	Female	57	White	Some college	2 years
#3	Female	56	White	High school (some AP courses)	2 years
#4	Male	84	White	BA	26 years
#5	Female	55	White	BA (completing 2nd degree at community college)	5 years
#6	Female	64	White	BA	7~8 years
#7	Male	70s	Black	Ph.D.	10 years
#8	Male	66	White	BA (MA student)	8 years
#9	Male	46	Asian	BA	6 months
#10	Male	62	White	MS	10 years
#11	Female	54	White	BA (some MA)	3 years 6 months
#12	Male	66	White	BA	6 years
#13	Male	58	White	BA (2 BA)	6 years
#14	Male	46	White	GED (BA student)	21 months
#15	Male	59	White	BA	2 years
#16	Female	54	White	MA	5 month

4.3.2. Feelings and thoughts about their cholesterol condition

Many interviewees were well aware ("I'm cognizant of it" [#10]) of the fact that

they had a health issue that they "need to address," and "pay attention to (#1)," and that

the high cholesterol issue was linked to other complications such as heart disease or

stroke. However, most interviewees did not feel the seriousness of their cholesterol

condition in their daily lives nor have any strong feeling about it: "No. I feel that I don't

think about it that much (#1)"; "Not serious…I am not anxious about it (#7)." In fact,

they did not seem to think much about their cholesterol condition, did not "worry about

it" (#1, #6, #9, and #12), were not "anxious" (#7) about it, and it did not "bother" them

(#16).

> I don't worry about it…I guess I don't worry much about it, because of the drugs I am taking (#6).

> It wasn't bothering me before I went to the doctors, and doesn't bother me after now. I know it's a big deal but I don't feel (so serious). I just take my medicine. Until the next check-up, I will be better, in the range whatever the doctor said it should be (#16).

Some interviewees even expressed positive feelings about their condition, because

their cholesterol medication or other activities to manage their cholesterol level have been

working successfully.

> I feel good about it because the medication's working, and so I feel like I'm gonna be healthier because of the medication (#3).

> My cholesterol? Oh I think it's OK. I'm OK with it. I think it's fine. (#4).

Although they did not worry about their cholesterol condition in their daily lives, they reported that they were "motivated" (#10), "determined" (#11), and "disciplined" (#2 and #16) to continue health behaviors that help control their cholesterol condition, including taking a cholesterol medication. For example, #10 reported "I think in parts, it keeps me motivated to that (diet change and exercise)," and #8 said, "I don't really think about it very much. At the same time, I would not stop taking statin."

Five interviewees reported that they considered their cholesterol condition to be serious and expressed concern or worry about their condition. They tended to have family history of cholesterol issues or heart diseases; this may have made them feel more serious or anxious about the condition.

> I think it's quite serious. In that, when I first discovered that it was high, I started looking into my family history. And I found out that I've got a lot of family history on both sides, both my parents and their siblings, and that they have heart conditions, and, you know, either died early or had heart attacks or, you know, the various heart-related ailments. So, umm, because of that, I took it fairly seriously that I need to (#2).

> I take it really seriously because cholesterol runs in my family, both sides. And so it's something that I work diligently on and takes the medicine regularly, and would like to be off in another year as completely as possible (#11).

> I am very serious about it… My father died of heart condition. (There's a) family history. And he died very young, of heart condition. It's many many years ago. But I am very determined to take care of it, not let it cause any problems from the rest of my family. When people do not have a personal connection, it's very, sort of, theoretical, philosophical, but it's not real to them. When you have a personal connection it takes on a whole new meaning as you probably know (#13).

In addition, female interviewees tended to express more concerns about their cholesterol issues, because they thought they should be healthy enough to take care of their family or to see their grandchildren grow.

(I am) disciplined because if I'm going to be around to see my grandson grow up, I'd better be doing everything I can to make that happen (#2).

But, you know, I was younger, I had a whole life, so I didn't think about it that much. Now, since I am sitting at 55, it's like, you know, I want it for long because my grandkids are little so I want to watch them, stay with them little longer. My parents both died very young (#5).

Overall, interviewees tended to be well aware of their cholesterol condition's seriousness, including its complication with other more serious illnesses such as heart disease. The awareness of the seriousness of the condition seems to be stronger among female interviewees and interviewees who had a family history of cholesterol condition or heart diseases. It seems that their awareness of the seriousness of the condition made them more motivated to manage their health condition. In addition, for some interviewees, they even used positive description about their condition, because their cholesterol condition was successfully managed by taking current cholesterol medication. Based on the interviewee comments, a series of descriptions about seriousness of the cholesterol condition were developed to form adjective pairs for the evaluative illness belief accessibility measurement in the main study (e.g., serious - not serious). The words or phrases frequently used by the participants to describe their cholesterol condition are summarized in Table 2.

Table 2. Frequently Used Descriptions for Their Cholesterol Condition

Common themes	Words or phrases
Awareness	Aware, cognizant
Seriousness	Serious, seriously, seriousness
	Worry, concerned, anxious, bother, bothering
	Not good, bad
Complications	Heart diseases (heart attack), and stroke
Family history	Hereditary, family history
Motivation	Motivated, determined, disciplined (to keep health behaviors)
Positive feeling	I will be better, feel good (because of the medication)

4.3.3. Feelings and thoughts about their cholesterol medication regimen

When it comes to overall thoughts about the medication, the most commonly used word to describe the cholesterol medication regimen was necessity. Interviewees tended to emphasize that taking their cholesterol medications was a requirement for them to control their cholesterol condition and ultimately to keep them healthy.

It's " I have to" " must." It's needed and regimented, so taking it on time, same time everyday. And I'm ….it's important (#5).

It's something you have to do or should do (#9).

No, it's a necessity. It is at least a habit. To me, it's somewhere between essential and critical (#10).

I have to take it. I need to take it (#14).

Interviewees also mentioned their feelings about the ease of their medication regimen. Many of them thought their medication regimen was easy (#2, #9,#11,#12, and #15), simple (#16), convenient (#2 and #11),and not difficult, hard, or troublesome (#9 and #11) because it just required taking one pill a day. In addition, words or phrases about the cholesterol medication cost were also frequently mentioned. Mostly,

interviewees who took generics thought it was cheap (#12), or less or not expensive (#4, #15) compared to more expensive branded medications such as Zocor or Lipitor.

Overall, interviewees reported that their cholesterol medication regimen is necessary for managing their health condition. Most of them thought their medications were an easy and cheap method to keep them healthy. The descriptions about necessity and the ease of regimen were used for developing the adjective pairs measuring the evaluative medication belief accessibility measurement in the main study. The most frequently used words or phrases to describe the cholesterol medication regimen are summarized in Table 3.

Table 3. Frequently Used Descriptions for the Cholesterol Medication Regimen

Common themes	Words or phrases
Necessity	Necessarily, necessity, essential, critical, have to, must, need, needed Option, options
Ease of regimen	Not burdened, troublesome, easy, not difficult, simple, comfortable, convenient Hard, such a pain to take it
Cost	Cheap, inexpensive, not expensive

Benefits of the medication

Many of interviewees reported that their cholesterol medication was "working" (#1–#3, #6, #11, and #16). They stated they knew the medication was working because their cholesterol numbers were in the healthy range, although there was no physical condition improvement they could feel.

> It is working, because those numbers, umm, became lower once I start taking the medication. So therefore, I believe in the medication because of the numbers (#1).

I certainly don't feel anything. So the only proof comes empirically through the follow-up with my doctor…So based on that it seems like it's working (#9).

The belief that their medication was working seemed to convince them it helped, or will help, them be alive and remain healthy. Also, they believed it enabled them to complete everyday tasks. Such a belief also seemed to make them feel good about the medication and be satisfied with it (#1 and #12).

We have, mmm, when there is a clear weather, we walk everyday General Mills research center park. Without fail, we leave in the morning,… Walking. And we do that every morning. Without fail. And in Winter, some exercises we do in the house… I do some exercises… a stationary bicycle, and I ride that for 20 minutes to half hours. Not everyday, but most days. And other than that, I mow the lawn a lot (#4).

It's something keep you alive and get you healthier, once you have. And I always keep them in my bedside (#6).
I feel good about it because the medication's working, and so I feel like I'm gonna be healthier because of the medication (#3).

Although physical condition improvements were hardly felt, many interviewees reported that they experienced some psychological benefits. The most commonly addressed psychological benefit was comforting. Interviewees reported that taking their cholesterol medications comforted them to think that their condition would be better because of the medication.

I think it gives me a peace of mind. … my general concern about my health is decrease because of the fact that I take the medication that ultimately is very effective regulating cholesterol level (#10).

Reassuring… It's just a kind of comforting. Just knowing what I'm doing, probably better for me (#15).

Feelings of pride and accomplishment were other reported psychological benefits

mentioned by one interviewee. His feeling of pride and accomplishment seemed to stem

from the fact that he was successful in taking care of his health issues.

> In terms of successfully addressing something in that is a problem…I feel it's benefit to me because I feel like I am doing something about this issue…   It gets me a sense of pride and accomplishment (#1)

Overall, experiencing the positive benefits of their medications seemed to

influence interviewees to have positive views about their cholesterol medications. Some

interviewees even reported that they were fortunate, lucky, and/or blessed to have their

medications and living in an era where such medications are available.

> So in terms of how I feel about taking it, I think I'm little bit lucky that such a thing exist. I can't imagine 50 year ago, even 20 years ago, people didn't have the choice (#9).

> I would say what comes to my mind first is that it's amazing that or able to take something that has effects. I feel lucky that I'm able to do that. I'm able to get that kind of medication, I'm able to potentially prolong my life (#10).

> I personally feel very fortunate to live in that era that we're living. Because 50 years ago, if I had this thyroid problem, my doctor (would) said, "There's nothing I can do for you." Now they do surgery and I take medication for it. It was gonna create all kinds of fix. My cholesterol, 50 years ago, nobody knows about it. A lot of people died of heart attacks (#12).

In sum, many of the interviewees reported that their medications were effective in

keeping them living a healthy life. They also expressed various psychological benefits

they felt from taking their medications, such as feelings of comfort and accomplishment

of successfully dealing with one's health issue. Some of the descriptions about

medication benefits were used for developing adjective pairs measuring the evaluative

belief accessibility about the medication in the main study (e.g., effective – ineffective;

important – unimportant; successful – unsuccessful). The most frequently used words or

phrases to describe the cholesterol medication benefits are summarized in Table 4.

Table 4. Frequently Used Descriptions for the Cholesterol Medication Benefits

Common themes	Words or phrases
It's working	Working, works, effective, successful, successfully
Keep me healthy	Helping, helps, improve, progress; decreases, lowers (cholesterol level)
	Keep (their) health, keep healthy, life, lifestyle, not falling over floor, walking, normal
Psychological benefits	Well, good, best, satisfied/satisfying
	Comforting, reassuring, giving a peace of mind, validation (number)
	Fortunately, happy, lucky, marvelous, praise, important
	Accomplishment, pride

Risks of the medication

Many of the interviewees were well aware of that side effects are risks linked to

their medications and they can happen to them. Among interviewees, 10 reported that

they had never experienced any side effects with their cholesterol medications. Among

the six interviewees who had experienced side effects from their previous or current

cholesterol medications, four interviewees answered they had experienced various side

effect symptoms from their current cholesterol medications, such as flushing (#2 and #9),

cramping (#14), and muscle pains (#14). Among the 10 interviewees who did not

experience any side effects from their cholesterol medication, three interviewees reported

they experienced side effects from other prescription medications. Since not many

interviewees experienced side effects from their current cholesterol medications, the

interview question extended its focus to cover interviewees' overall experience with any

of their previous and current prescription medications, including cholesterol medications.

When describing their experience with the risks of prescription medications in

general, the interviewees used various negative adjectives. Experiencing side effects were

complicated and frustrating (#1), troublesome (#10), and made them a little

uncomfortable (#6). Two interviewees reported that they were always very careful about

any kind of risks when they had to start a medication (#4 and #7). One interviewee, who

thought that the risk of a medication would not happen to him, described his side effect

experience from a cholesterol medication as an awakening experience (#14).

When interviewees felt they had, or might have had, side effects, most tended to

talk to their doctors about them first. The interviewees who did not report having any side

effect stated that their doctors already explained the potential side effects to them when

prescribing their medications. In addition, some interviewees reported they turned to the

medication information in the container to seek more information and to learn more about

their conditions before meeting with their doctors.

> I saw my doctor and complained about the side effects, and I worked with her to
> find, different dosage to adjust, or sometimes to change it to the different drugs
> would address to the same issues (#1).

> Maybe it could've been in my head, but I would say that within the 3 months I
> had some pain in my arm and I look back at the information from the companies.
> Muscle soreness is the potential symptom, so I went back, and because I was
> experiencing some muscle soreness in one of my arms and went back to talk to
> my physician (#11).

Among the interviewees who experienced side effects from their cholesterol medications, three did not consider cholesterol medication side effects seriously and experiencing the side effects did not influence them to stop their medications. They tended to describe their side effect experiences as a little uncomfortable (#6) but not a big issue, considering their age or comparing it to the benefits of the medication. Therefore, experiencing side effects did not seem to make them hesitant to take their medications. Many of them were already informed about the common side effects of their medications from their doctors or from their own research.

> No, you know, if I were younger, it might. You know, if I'm younger, I wouldn't want the hassle. But I know I have to so it doesn't change my view now (#5).

> The biggest thing is Advicor is a combination of niacin and statin. So the biggest and most common side effect is a flushing, because of the niacin and combination with statin…And I think I have noticed the touch of flushing. I am used to it in a week (#9).

> I was told, can cause deep muscle ache. I can't remember it was the blood pressure medication or the cholesterol medication. I would say if I experience any of that it was minimal. I move stuff around and I bump into stuff. I have aches now and then. I can't even recall quite how I acquire if I drop something on my leg or something. But in any of them, that's minimal (#15).

One interviewee reported that he was currently suffering from cholesterol medication side effects. He felt his doctor did not warn him much about the side effects of the medication when it was prescribed to him, and he did not think that it would happen to him. He stated his side effect experience made him take more prescription medications to relieve the symptoms. Although he believed he was suffering from serious cholesterol medication side effects, it did not make him quit the original prescription

medication regimen. However, it made him hesitant to add another prescription

medication to his regimen.

> I wish he would've talked more about side effects…Because I always thought
> when I read about side effects, in my mind, "That's not gonna happen to me." …
> So this has been an awakening for me, an eye opener, thinking especially for
> statin, it's very common that people have this problem…In fact I even started
> taking Celebrex because of the pain. I may not need the Celebrex (#14).

> Q: So does the side effect experience make you hesitate more to add another
> prescription medication in your regimen?
> #14: Yes. I recently gain weight after I take Celebrex. And I take Celebrex
> because of the side effects from Prevastatin. Anyhow I need to talk to my doctor
> (#14, about the influence of the side effects).

Overall, six interviewees reported that they had experienced or were experiencing

side effects from prescription medications, and four cases were experiences related to

previous or current cholesterol medications. Although it was uncomfortable and

troublesome experience to them, their experiences of the medication side effects were not

severe enough to affect their medication use. Only one interviewee, who was undergoing

serious side effects from his cholesterol medication, reported that he was very hesitant to

keep on taking the medication. The descriptions that interviewees used for their various

prescription medication risk experiences were adopted for developing the measurement

of the accessibility of evaluative beliefs about medication (e.g., makes me feel better –

does not make me feel better). The most frequently used words or phrases for describing

cholesterol medication side effects are summarized in Table 5.

Table 5. Frequently Used Descriptions for Risks of Prescription Medications (Including Cholesterol Medication Experiences)

Common themes	Words or phrases
Pains, symptoms	Example of symptoms: Muscular, back, joint, arm, leg, spine, bowel pains; cramping, diarrhea, flushing Could be happening/not happening to me Caused, causes, come/coming from (medication) Symptom(s), problem(s) Not feeling very good, bad, not good
Actions taken	Talk, tell or report to their doctor Look back to information/ learn more about side effects/read about side effects Switch, change (medication) Hesitate to take/quit (the regimen) Be/get used to it
Positive descriptions	Minimal, normal, common, feel any difference, and not affected
Negative descriptions	Worried, complicated, frustrated, awakening, careful, troublesome, and uncomfortable

4.3.4. Transition from the maintenance to habit Stage

According to Rothman et al. (2011), maintenance-stage patients consciously make a decision to continue engaging in their current health behavior, while habit-stage patients are automatically repeating their behavior. Habit is usually defined as an automatic behavioral sequence that consists of cues, rewards, and responses (Duhigg 2012). It is formed and performed to achieve certain goals (Verplanken and Aarts 1999). For example, patients' habit of taking a cholesterol medication is to achieve a goal of healthy living. Verplanken and Orbell (2003) pointed out three characteristics of habits: (1) habitual behaviors are performed frequently; (2) habit is formulated by specific frequent and successfully linked cues and behaviors; and (3) habit has an automatic nature. Based on the conceptualization by Rothman et al. (2011) and Verplanken and

Orbell (2003), three interviewees belonged to the maintenance stage and 13 belonged to the habit stage. Table 6 summarizes each interviewee's medication adherence stage.

Table 6. Interviewees' Medication Adherence Stage

Interviewee number	Medication adherence stage
#1	Habit
#2	Habit
#3	Maintenance
#4	Habit
#5	Habit/still forget sometimes
#6	Habit
#7	Habit/ but still conscious
#8	Habit/demands some efforts
#9	Maintenance
#10	Habit
#11	Habit
#12	Habit
#13	Habit
#14	Maintenance
#15	Habit/still needs to remember
#16	Habit

Characteristics of the maintenance-stage patients

Consistent with Rothman et al.'s (2011) conceptualization of maintenance behavior, the maintenance-stage interviewees were more conscious about the overall procedure of taking their medications and weighed the benefits and risks of their medication over other options (#3 and #14). Particularly, they tended to view that they were responsible for their health and their family's health decision-making (#3, #9, & #14), and actively sought health information from various sources (#9 & #14), or paid close attention to prescription drug advertisements (#3) to learn more about their medications.

Also, the maintenance-stage interviewees tended to show less strong habit characteristics than the habit-stage interviewees. First, the maintenance-stage interviewees reported that their cholesterol medication regimen still required conscious effort to remember. #9 regarded his medication regimen as burdensome, and something easy not to do. Second, they tended not to take their medications regularly as instructed by their doctors. For example, #14 said, "I didn't follow that advice because I forget to take my medication sometimes. So I take some medication twice a day and some of it one time a day."

Characteristics of habit-stage patients

Compared to the maintenance-stage interviewees, the habit-stage interviewees tended to show stronger habit characteristics. Particularly, they described their cholesterol medication regimen as a daily/nightly routine, which took place at the same time and place regularly. Also, they reported that their cholesterol medication use as an automatic behavior that did not require any conscious effort.

When the habit-stage interviewees were asked to describe their cholesterol medication intake behavior, the most frequently mentioned characteristic was "regularity." "Habit" (#2, #8, #10, and #12) and "routine" (#1, #7, #8, #12, #13,and #15) were the most commonly used nouns to describe their medication intake behavior. Some interviewees were very reluctant to use the term habit to describe their medication intake, because they felt that habit has some compulsive (#1), addictive (#15), and/or reflexive (#7) aspects. Some interviewees who chose the term "habit" emphasized it was a "routine" that did not have addictive aspects (#13). Some interviewees even regarded their medication regimen as a "ritual" (#1) or described that they were very religious about it (#12). "Consistent" (#10) was another word that interviewees chose to describe their cholesterol medication intake.

In addition, the habit-stage patients reported that they usually took the medication at the same time and the same place, which is the key characteristic of strong habit.(Duhigg, 2012; Versplanken and Orbell 2003). Doing so enabled them to connect their cholesterol medication intake behavior to certain contextual cues, such as a specific time or place or other routine behavior patterns.

> I take it every morning, at the same time approximately when I go to work, it's usually 6 in the morning. On weekends, it usually 8 or 9. It kept in the medicine cabinet. I take one tablet every morning, usually at the same time (#11)

> I take it everyday. I take at the same time everyday. I have to be honest with you, I take two medications, one fore blood pressure and one for cholesterol…It's the same routine I get up, and go through sort of early morning routine, shave, make my coffee, and take my medication same time, pretty much every morning (#13).

Because the habitual cholesterol medication intake was linked to other contextual cues and some patterns of behavior linked to the habit, when there was a situation in which their regular routine pattern was broken (e.g., traveling), some interviewees mentioned, they had hard time continuously taking their medication.

> I've not missed to take it for a long time. The times when I was most susceptible to forgetting to take it are when I was traveling, if I go on vacation. You have to almost create a new routine when you're on vacation. And since most people don't travel regularly, it's harder to form a travel routine as like a home routine (#13).

Third characteristic of habit is that it is performed automatically. As Versplanken and Orbell (2003) indicated, most habit-stage interviewees tended to think that they took their cholesterol medications without much conscious effort; they regarded it as an automatic behavior. The most common analogy they used to describe their medication intake was "tooth brushing" (#2 and #9), because it is an automatic, routine behavior.

Although their cholesterol medication intake showed all three characteristics of habits, some habit-stage interviewees still had some of the characteristics from the maintenance stage, For instance, #10 took his cholesterol medication religiously and automatically, but he still weighed the benefits and risks of taking his medication and actively sought information about the medication from various sources**.**

Transition between the maintenance and habit stages

When it comes to the exact time frame for transitioning from the maintenance to habit stage, substantial individual differences were found. The time to form a medication intake habit ranged from immediately after starting the regimen to 6 years. The interviewees could be divided into three groups in terms of how long it took for them to form a habit with their cholesterol medication regimen.

The first group formed the habit of taking their medications immediately after starting their medication regimen. They tended to use a pillbox or smartphone app as an aid and had been on other medication regimens previously. The mentioned aid devices helped them form a habit right away. Pillboxes (#4, #11, #15, and #16) helped plan medication intake and see the achievement of following the regimen. Smartphone apps (#9 and #15) helped them by sending a reminder when it was time for medication intake and showing the trend of their cholesterol number as a record of improvement. In addition, individuals who were already on a regular medication regimen tended to move immediately to the habit stage.

> I think it was immediate. And the reason it was immediate because I was already in the process of taking other drugs in the morning, so I just added it to the cocktails, so to speaking. It was another ingredient of the cocktail. That's all (#1).

The second group took longer to move to the habit stage. Typically, the cholesterol medication was their first prescription drug regimen. For example, #9 (still in the maintenance stage after taking the medication for six months), #11 (took 3 to 4 weeks to move to the habit stage), #12 (took 2 to 3 years), #13 (took a few months), and #15 (took few refill cycles) reported that the cholesterol medication was their first regular prescription medication regimen.

> It took a while, early on, to just get into the routine of when to take it (#15).

> A few months going through all of the cycles of getting to take it and taking it every morning, reordering it and so on. And then keep going through all of the different cycles of getting and taking the medications, and then it becomes a routine, and it's just a second habit for me (#13)

Some interviewees in this group reported that the transition to the habit stage took a while because it was very difficult for them to change their pre-existing lifestyle. In addition, some of them were in a situation that made forming a regular routine difficult. For example, #5 (took 5 to 6 years to move to the habit stage) was attending community college and her schedule was constantly changing. Side effect experience was another barrier for the maintenance stage patients' transition to the habit stage. #14 (still in the maintenance stage after taking the medication for 21 months) believed he was suffering from serious side effects from his cholesterol medication, which made him hesitant to stay on the regimen.

> I am having side effects. I didn't know that it was side effect. My doctor didn't really warn me or he did warn me but I didn't hear about statins that can cause muscle pains or joint pain. And because of the five broken vertebrates, I have pinch   nerves, and I have a arthritis in my spine. I am in pain a lot to be…I've always have muscle pains, but I believe there was a noticeable difference   (after start taking statins). I am thinking of doing an experiment of not taking it for 1 or 2 weeks. And then I would see during the 1 or 2 weeks if my pain gets better, then I will know for sure it's a statin (#14).

The final group was intentionally reluctant to move to the habit stage, even though they acknowledged that taking their medications was a part of their routine. Typically, they seemed to have a negative attitude toward any type of medications, particularly about the potential risks involving side effects. They were very cautious about any side effects, which was the main reason they did not want to make their medication regimen a habit.

> I just hate taking drug. So if I can get away, without taking drug, even it's Tylenol…if I had a choice between Lipitor and not doing anything, I would not do anything. Where this drug has less side effect, so I am more willing to take it. So depends on side effects… Like I said, sometimes I feel that side effects are worse than taking… not taking the drug (#3).

> Worried about it? When first taking any medication, I am careful to be aware of any side effects (#7).

Overall, the interview results reveal some distinctive characteristics that separate maintenance-stage and habit-stage patients. Compared to the maintenance-stage interviewees, the habit-stage interviewees tended to show stronger habit characteristics, such as performing their medication intake regularly at a specific time and place, without conscious efforts. Although they clearly showed all the habit characteristics, some habit-stage interviewees still consciously weighed the benefits and risks of taking their medication. Moreover, substantial individual differences were found in the between-stage transitions and some individuals showed both maintenance and habit stage characteristics.

Although this qualitative study was aimed at obtaining information to determine the specific time frame for maintenance and habit stages, the findings suggest that trying to determine patients' medication adherence stages using some kind of time frame measurements would be not only difficult but also inappropriate. Therefore, survey respondents for the main study will not be screened based on their medication regimen time period.

4.4. Summary

In-depth interviews with 16 patients who were taking a cholesterol medication were conducted to develop the measurement of the main study and to determine the ways to systematically determine different stages of medication adherence. Cholesterol medication was chosen for the study context because its characteristics were well suited for testing the media priming effects of DTC ads. Ten men and six women who were currently taking a prescription cholesterol medication were interviewed.

The results showed that interviewees were aware of that their cholesterol condition was a health problem, but most did not feel serious about the condition in their everyday lives. They only knew about their cholesterol problem when their doctors notified them of their cholesterol numbers from the lab test. Some female interviewees or interviewees with family history tended to feel more serious about the cholesterol condition in their daily life, while some had positive views about their health condition because they believed that their current cholesterol medications helped them to be healthy. The findings from the interviewees' feelings and thoughts about their cholesterol condition were used for developing the evaluative belief about the illness severity measurement in the main study.

When it came to their cholesterol medication regimen, many interviewees reported that it was something necessary and important to control their cholesterol condition. Many of them felt that taking their cholesterol medications was a simple and inexpensive way to keep them healthy. Most interviewees reported that their medication was working, although they could not physically feel the benefits. They knew it was working through the numbers received from their doctors, and some reported to believe

that the medication helped them to make it possible to live a healthy life. Most benefits of the cholesterol medication mentioned by the interviewees were psychological. Interviewees felt reassured and had a peace of mind after taking their medications and felt pride and accomplishment in that they were successfully handling their health problem. Some of the interviewees who were satisfied with their medications, said that they were lucky and fortunate to have such a treatment option. The descriptions about their medications were used for developing the evaluative belief about the drug measurement.

Only six interviewees experienced side effects from their previous or current prescription medications, including their cholesterol medications. They described their side effect experience as uncomfortable and troublesome, and most of them reported this type of experience to their doctors. Even though it was not a good experience, many of them reported that experiencing the medication side effects did not affect their medication intake; their side effect experiences were just a little discomfort and they had already been informed about the side effects from their doctors. The descriptions about the prescription medication risk experiences were used for developing the measurement of the evaluative belief about the drug measurement.

Finally, the results from the in-depth interviews identified key characteristics of maintenance- and habit-stage patients, which were in line with those identified in relevant research literature. Among 16 interviewees, three showed strong maintenance-stage characteristics and 13 demonstrated habit-stage characteristics. The most distinctive differences between the maintenance-stage and habit-stage interviewees were the different levels of habit characteristics that their medication intake behavior showed. The maintenance-stage interviewees reported that they carefully contemplated the benefits

and risks of their medication intake. On the other hand, the habit-stage interviewees tended to show all three habit characteristics suggested by Versplanken and Orbell (2003); they took their medications regularly at a specific time and place, without conscious thought or efforts. However, some habit-stage interviewees still consciously evaluated their medications, which suggests that some habit-stage patients might still have some maintenance stage characteristics.

In addition, individual differences were found in the between-stage transitions. Broadly, three types of maintenance-to-habit transition were identified from the in-depth interview results. The first type of interviewees formed the habit of taking the medication immediately. They tended to use a pillbox or smartphone app as an aid and had a pre-existing regimen. The second type of interviewees took longer to move to the habit stage. Typically, the cholesterol medication was their first prescription drug regimen. Some of them were in the situation that prevented them from taking their medications, such as having an irregular schedule or suffering from cholesterol medication side effects. The final type of interviewees was intentionally avoiding the transition to the habit stage, even though they described that taking the medication was a part of their routine. They were very aware of the negative aspects of a medication, such as its potentially addictive aspects and the risk of side effects.

Chapter 5

MAIN STUDY METHOD: ONLINE SURVEY

Based on the literature review and the preliminary in-depth interview results, an online

survey was conducted to test the hypotheses and to investigate research questions. The

sample was patients who were currently taking oral prescription blood thinners. The

online survey was approved by the University of Minnesota Institutional Review Board

(IRB).

5.1. Study Context, Target Population, and Sampling

The target population for the online survey was changed to patients who were taking

blood thinners due to the DTCA expenditure trend change at the time the main study was

conducted. According to Ad$pender data for May 2014, Eliquis, a prescription blood

thinner, was the second most heavily advertised drug, following Cialis (Kantar Media,

2014). The total expenditure for the top three prescription blood thinners (i.e., Eliquis,

Pradaxa, and Xarelto) was over $85 million between June and August 2014 while the

total expenditure for all cholesterol-lowering medications was about $15 million.

Blood thinners are medications used to reduce blood clot formation. They are

prescribed to treat various blood clot problems, including atrial fibrillation (AFib or AF),

heart attack, stroke, heart valve diseases, pulmonary embolism (PE; blood clots in the

lungs), and deep vein thrombosis (DVT; blood clots in the legs). They are also prescribed

to maintain health after heart valve surgeries, hip replacement surgery, and knee

replacement surgery. In general, blood clot problems have characteristics that are similar

to cholesterol problems, which make the drug type equivalently suitable for this study.

Skipping doses of a blood thinner medication does not have immediate consequences that patients can physically feel. Blood thinners are mainly used to prevent blood clots, which are unobservable from outside the body and do not involve immediate pain or other symptoms. However, in the long run, skipping doses can cause a patient's condition to become fatal. Generally, non-adherence to a blood thinner regimen can increase a person's chance of suffering from heart diseases or stroke.

There are two types of blood thinners: oral medications and injections. Injectable forms of blood thinners, such as heparin, are usually prescribed to patients for a shorter period of time than oral medications and healthcare providers administer the injection. On the other hand, oral blood thinners, such as warfarin and Eliquis, are prescribed for patients who need to manage their condition for a longer period of time, and the medications are taken by patients without healthcare providers' assistance. Therefore, oral blood thinners were selected as this study's context. Aspirin, one of the most popular types of blood thinners prescribed to prevent heart diseases, was excluded from this study because consumers do not need a prescription to buy most aspirin products.

The target population for this study is American patients ranging in age from 45 to 80 and who are currently taking oral prescription blood thinners. The target population was selected based on the following reasons. First, the blood thinner use rate increases with age. The Centers for Disease Control and Prevention (CDC) and the National Center for Health Statistics' report on prescription drugs showed that, from 2010 to 2012, 1.8% of Americans 18 or older were taking blood thinners; that rate dramatically increased to 18.1% for Americans 60 years of age or older (National Center for Health Statistics, 2014). In 2012, a report from the American Heart Association also showed that the

incident rate for AFib, one of the medical conditions for which blood thinners are prescribed, increased with age (Roger et al. 2011). In addition, many previous DTCA studies have focused on patients that are 45 years of age or older because of the prevalence of various chronic diseases among this demographic group. Therefore, the lower age limit for this study's sample is set at 45.

One of the issues to consider when studying the aging population is the potential memory issue that older people might have. Generally, aging is related to a decrease in both encoding and retrieval (Zacks, Hasher, and Li 2000) and to having false memories (Roediger and McDermott 2000). One study demonstrated that media exposure recognition error increased with age. In particular, after being exposed to TV news stories, adults who were 70 or older had more recognition test errors than adults under 70 (Southwell and Langteau 2008). Considering the potential memory issues associated with aging, this study set the upper limit of the participants' age to 80.

A volunteer sample of 240 participants meeting the sample inclusion criteria was purchased from the Qualtrics Panel Management service. The Qualtrics online survey panels consist of individuals who volunteer to participate in Qualtrics surveys, and they were recruited from 62 partnered sampling service companies (e.g., Survey Sampling International [SSI]). Potential participants are recruited from the Internet and respondents are compensated by Qualtrics Panel Management.

5.2. Survey Procedure

The online survey was designed using Qualtrics, available through the University of

Minnesota's institutional subscription. The link for the online survey was sent to the

individuals in the study sample via the Qualtrics Panel Management service. An informed

consent form was presented on the first page of the questionnaire and the survey began

with three screening questions based on the participant eligibility criteria and the study's

quota requirement. The eligibility criteria included: (1) age between 45 and 80 years old;

and (2) currently taking a prescription oral blood thinner. The quota requirement was

equal number of men and women, so the study sample would represent the actual gender

ratio of American patients with blood clot problems (Center for Disease Control and

Prevention 2014).

After the screening and quota questions were answered, the respondents answered

questions about the medication adherence measures and belief accessibility measures.

The belief accessibility measures were presented before the DTCA exposure frequency

measures in order to prevent a potential priming effect during the survey process.

Questions measuring the control variables were presented at the end.

5.3. Measurements

5.3.1. Medication adherence

Adherence to the blood thinner refers to a patient's compliance with the prescribed medication regimen to control his/her blood clot problem. As discussed earlier, three types of medication non-adherence behaviors have been identified and investigated in previous research: (1) nonfulfillment, (2) nonpersistent, and (3) nonconforming (Gellad et al. 2009). Because the present study focuses on the patients' nonpersistent and nonconforming medication adherence, respondents who at least started their medication by filling their first prescription were recruited. Therefore, there is no case of nonfulfillment in this study's sample.

To measure the level of medication regimen adherence, this study modified Morisky, Ang, Krousel-Wood, and Ward's (2008) 8-item measurement for medication adherence. Morisky et al.'s original 8-item measurement consists of seven yes/no questions and one 5-point scale. This measurement was validated through several steps (Morisky et al. 2008) and has been used in a number of previous studies (Ingles et al. 2015; Newman-Casey et al. 2015; Krousel-Wood, Munter, Islam, Morisky, and Webber 2012; Gatti, Jacobson, Gazmararian, Schmotzer, and Kripalani 2009). The eight original measurements consist of various types of medication non-adherence and the reasons for non-adherence. Among them, only the measurement items about the degree of medication adherence were selected and modified for the present study, because the current study mainly focus on the degree of patient medication adherence behavior. Respondents reported yes or no to the first five statements assessing whether or not respondents had taken various types of medication non-adherence behaviors (e.g., Do

you sometimes forget to take your blood thinner pills?; Have you ever forgot to refill the prescription for your blood thinner?). The 5-point scale item measured how often the respondents had difficulty remembering to take their blood thinner medication based on a scale of 0 = Never to 4 = Very Often. The measurement items are listed in Appendix A.

5.3.2. Belief accessibility

According to previous priming effect studies, belief accessibility can be operationalized in two ways: 1) correlation approach and 2) response time approach. The correlation approach has been widely used in studies on both temporary and chronic belief accessibility effects and measures accessibility to cognitive units in terms of the degree to which the primed beliefs are used in the subsequent decision-making, such as an evaluation of the primed topic (Higgins 1996). More recently, many priming effect studies have used the response time approach to measure belief accessibility. This approach is based on the assumption that more cognitively accessible units move more quickly into a person's short-term memory, which becomes more readily available for the subsequent evaluation process (Bassili 1995). The present study uses both approaches to measure descriptive and evaluative belief accessibility.

First, applying the correlation approach, survey respondents' descriptive beliefs about the illness and the drug were measured by a series of yes/no questions; 12 statements regarding the blood clot problem and the blood thinner benefits and risks (e.g., Blood clots could cause a stroke; blood thinners could cause severe bleeding; blood thinners reduce the risk of stroke) were given to respondents one at a time and they were asked to choose yes or no to each given statement. Each type of descriptive beliefs (about the illness, about the drug benefits, and about the drug risks) was measured using four

statements. The statements were developed based on the existing prescription blood thinner ads and the preliminary interview results. Descriptive belief statements about the illness and the drug benefits consisted of two correct and two incorrect statements and the statements about the drug risks consisted of three correct statements and one incorrect statement.

The statements for the descriptive beliefs about the illness included: 1) blood clots could cause a stroke; 2) blood clots could cause indigestion; 3) blood clots could cause damages to the lungs and other organs; and 4) blood clots can be treated with dietary changes. The statements for the descriptive beliefs about the drug benefits included: 1) blood thinners lower the chance of blood clot formation; 2) blood thinners could improve lung functions; 3) blood thinners reduce the risk of stroke; and 4) blood thinners could improve digestion. The statements for the descriptive beliefs about the drug risks included: 1) blood thinners could cause severe bleeding; 2) blood thinners could cause a person to bruise easily; 3) blood thinners could cause blindness; and 4) stopping blood thinners could increase the risk of stroke.

Applying the same correlation approach, evaluative beliefs about the illness severity and the drug were measured using a series of adjective pairs. For the evaluative beliefs about the illness severity, the respondents were instructed to choose one of the adjectives from each presented pair that best described their blood clot problem. Every adjective pair was presented using the statement, "My blood clot problem is…." The adjective pairs were displayed one pair at a time and a total of seven pairs were presented, including: 1) treatable – untreatable; 2) manageable – unmanageable; 3) severe

– not severe; 4) serious – not serious; 5) important – unimportant; 6) significant – insignificant; and 7) not frightening – frightening.

Evaluative beliefs about the drug were measured using the same measurement approach. The adjective pairs were presented one at a time, with the statement, "My blood thinner (is)…" The pairs included: 1) beneficial – harmful; 2) safe – unsafe; 3) effective – ineffective; 4) successful – unsuccessful; 5) important – unimportant; 6) essential – optional; and 7) makes me feel better – makes me feel worse.

Second, following the response time approach, the response time for each of the descriptive and evaluative belief accessibility questions was measured using the response latency technique. The response latency technique has been widely used to measure attitude accessibility (Mulligan, Grant, and Mockabee 2003). The assumption underlying this technique is that attitude accessibility reflects how strongly an object and its evaluation are linked in a person's memory (Fazio 1995, as cited in Mulligan et al. 2003), and the response time to the attitude object indicates the strength of the linkage. Specifically, this measurement technique is designed based on the assumption that the respondents' response time will be shorter when they encounter more accessible attitude items than when they encounter less accessible attitude items. Belief accessibility can be measured in the same way because beliefs are a component of attitude, and many response time attitude measurements consist of belief statements. Therefore, this study uses the same response latency technique used in previous attitude accessibility studies (e.g., Elliot et al. 2015; Grant, Mockabee, and Monson 2010; Mulligan et al. 2003).

The response time of each of the descriptive and evaluative belief questions was measured using a response time checking function in Qualtrics. First, the baseline

response time for each respondent was assessed using a baseline statement, "Both men and women could have blood clot problems." Then, response time to each of the 12 descriptive belief statements and 14 evaluative belief adjective pairs, by measuring the time (in millisecond) each respondent took to answer each question. The example of the response time measurement is shown in Appendix B.

5.3.3. DTCA exposure frequency

To measure the individual-level exposure to DTC ads for prescription blood thinners, two types of advertising exposure frequency measures were administered: 1) the category-level DTCA exposure frequency, and 2) the brand-level DTCA exposure frequency. The category-level DTCA exposure frequency refers to the number of respondents' exposure to overall prescription blood thinner ads from Newspaper, TV, magazine, radio and the Internet. Respondents' exposure to the blood thinner ads from the five media were measured by asking " How often have you seen ads for blood thinners in the past 3 months?" The questions provided six frequency options, ranging from 1 = Never to 6 = Almost every day. If a respondent answered "1 = Never" to all five of the media, the survey system let the respondent skip the subsequent questions measuring the brand-level DTCA exposure frequency.

The brand-level DTCA exposure frequency was measured using the same 6-point scales (1 = Never, 6 = Almost every day) for three blood thinner brands that were currently advertised during the data collection period or had been advertised within three-month time window before the data collection. The brand list included three oral prescription blood thinners, Eliquis, Pradaxa, and Xarelto that were currently advertised at the time of the data collection. The measurement items are listed in Appendix A.

5.3.4. Control variables

In addition to the key variables, various control variables were measured. Based on the in-depth interview results and a review of previous research on media priming effect and the medication adherence literature, the control variables were selected because they are likely to significantly influence media priming effects or patients' beliefs about their illnesses and medications, and their medication regimen adherence. For example, patients' relationship with their doctors has been found to be related to patient medication adherence in the previous medication adherence literature (Gellad et al., 2009; Nguyen et al., 2009; Wu et al., 2008) and the in-depth interview results. Previous medication adherence literature has shown a positive relationship between the level of patients' satisfaction and trust with their healthcare providers and their medication adherence (Gellad et al., 2009). In the in-depth interviews as well, it was found that patients tended to adhere to their medication regimen better when they trusted and were satisfied with their current doctors and they had a tendency to conform to their doctor's medical decisions.

The included control variables were demographics (age, sex, household income, education, and race), medication-related variables (health insurance status, out-of-pocket cost, duration of blood thinner intake, number of prescription medication taken, side effect experience, and the level of satisfaction with and trust in the current doctor), and media use variables (general media use, health media use, and health media attention).

Demographic variables

Age, sex, household income, education, and race were measured as demographic variables. The screening question asking, "What is your age as of today?" was used as the age measurement and the quota question asking, "What is your sex?" was used for measuring respondents' sex. Income, education, and race were measured using questions adopted from the 2010 US Census (U.S. Census Bureau, 2010). Annual household income was measured with a 9-point scale, ranged from $ 0 to $ 9,999 to $200,000 or more. Education was measure with a 10-point scale, ranged from "No schooling complete, or less than 1 year" to "Doctoral degree (PhD, EdD, etc)." Race was measured with two measurements. Respondents were first asked whether they are of Hispanic, Latino, or Spanish origin, then asked, respondents' race was by asking " What is your race?" with six categories.

Medication-related variables

Health insurance status, out-of-pocket cost, the duration of blood thinner intake, the number of prescription drugs taken, side effect experience, and the level of satisfaction with and trust in the current doctor were measured as the medication-related variables that can affect respondents' descriptive and evaluative beliefs and their medication adherence behavior.

Health insurance status was measured by a yes/no question asking whether they had health insurance including private health insurance plans. Out-of-pocket cost for purchasing the current blood thinner was measured by two questions. The first question asked "How many days of supply do you get for your current blood thinner?" Then, the second question asked "How much do you co-pay (the cost you pay in addition to the

insurance coverage) for your current blood thinner?" The respondents were asked to write down the cost per their typical days of supply answered in the previous question.

Duration of blood thinner use was measured by a single open-ended question asking "Approximately how long have you been taking your current blood thinner?" The number of prescription drugs taken was measured by first asking respondents were asked whether they were taking prescription medications other than a blood thinner. If they reported "yes," they were instructed to record how many prescription medications (including blood thinner) they were currently taking.

In addition, side effect experience was measured. Side effect experience was measured by a single yes/no question asking whether the respondents had experienced any side effects with their current blood thinners. . For trust in and satisfaction with the current healthcare provider, the respondents were asked to rate their level of satisfaction with and trust in the current doctor who checks their blood clot problems using a 5-point scale (Satisfaction: 1 = Very dissatisfied to 5 = Very satisfied; Trust: 1 = Highly distrust the doctor to 5 = Highly trust).

Media use variables

Media use variables were also included as control variables, because individuals who more frequently use media that are heavily used for the prescription blood thinner DTCA have a higher possibility of being exposed to more DTC ads than those who use such media less frequently, which could affect this study's dependent variables. The level of media use was measured in 3 ways: general media usage, health media usage, and health media attention.

General media use was measured by asking the respondents about their use of five types of media. The hours and minutes that each respondent spent on reading newspapers and magazines, watching TV, listening to the radio, and using the Internet were measured. Because media use patterns tend to be different on weekdays and weekends, the media usage time were asked separately for typical weekdays and weekends.

Second, health media use was measured by asking "About how often have you read or heard such health content from the following media in the past 3 months?" in each of the five media. Health-related media usage was included because prescription medication DTC ads are more likely to appear in health-related content. For example, Xarelto, a prescription blood thinner, is more frequently appeared in the heart health section of WebMD. The level of health-related media usage was measured with 6-point scales, ranging from 1 = Never to 6 = Almost every day.

Finally, health media attention, which was about the level of attention paid to each of the five health-related media, was measured by asking how much attention respondents paid to health or medical topics in five media (newspapers, TV, magazines, radio, and the Internet). A 5-point scale (from 1 = None to 5 = A lot) was used for measuring the attention level.

Chapter 6

DATA ANALYSIS & RESULTS

6.1 Sample Characteristic

6.1.1. Demographic characteristic

The average age of the study sample was 63.10 and half of the sample was male (50%, n = 120). The respondents' median household income fell between $35,000 and $49,999, and the median education attainment level, some college education or Bachelor's degree (BA). In terms of race, a majority of the respondents were Non-Hispanic whites (90%, n = 216). The descriptive statistics of sample's demographic characteristics are presented in Table 7.

Table 7. Demographic Characteristics of the Study Sample

Demographic variables	Descriptive statistics
Age	Mean = 63.10 (SD = 8.30)
Sex	Male = 120 (50%)
	Female = 120 (50%)
Household income	Median: 5 ($35,000–$49,999)
Education	
	Median: 5 (some college education or BA)
Race	Non-Hispanic white = 216 (90%)
	Hispanic white = 9 (3.8%)
	Black = 9 (3.8%)
	Asian = 1 (.4%)
	Native Hawaiian or Pacific Islander = 1 (.4%)
	Mixed = 4 (1.7%)

6.1.2. Medication-related characteristics

The survey respondents' medication-related characteristics were also examined.

Most of the respondents showed at least some form of medication non-adherence

behavior with their current blood thinners (63.3%, n = 151). The average duration of

blood thinner intake was 63.56 months. The average out-of-pocket cost for purchasing

the current blood thinner was $12.24 per month, and most of the respondents had a health

insurance (95%, n = 228). Most the respondents did not experience side effects from

taking their current blood thinners (82.1%, n = 197), and they tended to show a high level

of satisfaction with and trust in their current doctor (satisfaction: M = 4.43, SD = .99;

trust: M = 4.57, SD = .84). The descriptive statistics of the respondents' medication-

related characteristics are summarized in Table 8.

Table 8. Descriptive Statistics of the Respondents' Medication-related Characteristics

Medication-related variables	Descriptive statistics	Range
Medication adherence	Mean = 7.46 (SD = 1.77)	0 = full non-adherence ~ 9 = full adherence
Duration of prescription blood thinner use	Mean = 63.56 (SD = 63.06)	0 ~ 342 months
Prescription blood thinner cost per month	Mean = $ 12.24 (SD = 29.40)	$ 0 ~$ 290
Health insurance status	Had a health insurance = 228 (95%)	
Number of prescription medications used	Mean = 5.88 (SD = 3.94)	1 ~ 29
Side effect experience	Yes = 43 (17.9%)	
Satisfaction with doctor	Mean = 4.43 (SD = .99)	1 = very dissatisfied ~ 5 = very satisfied
Trust in doctor	Mean = 4.57 (SD = .84)	1 = highly distrust the doctor ~ 5 = highly trust

6.2. Characteristics and Computation of Key Variables

This study tests the relationships among three key variables: Medication adherence, DTCA exposure frequency, and belief accessibility. This section explains how each of the key variables was operationalized and computed.

6.2.1. Operationalization and computation of medication adherence

As explained in Chapter 5, patient medication adherence was operationalized as the extent to which respondents adhere to their prescription blood thinner regimen, and measured by five yes/no questions about the various types of medication non-adherence behavior, and one, 5-point scale measuring the difficulty of remembering the medication regimen. A medication adherence score was created by counting the number of "no" answers to the five yes/no questions asking about medication non-adherence behavior, and summating the score with the answer from the one 5-point scale question (reverse-coded).

6.2.2. Operationalization and computation of belief accessibility

Previous priming studies have applied the correlation approach (i.e. measuring the correlation between the primed cognitive constructs and the cognitive outcomes such as evaluations and attitudes toward an object) and the response time approach (i.e., measuring the response time to the given choices to the question). Based on the previous study approaches, the current study adopted both approaches to measure patients' belief accessibility, and operationalized the content and the response time to each descriptive and evaluative beliefs about the illness and the drug. Particularly, four different types of belief accessibility variables were computed for each of the beliefs about the illness and beliefs about the drug: (1) content of descriptive beliefs; (2) response time of descriptive

beliefs; (3) content of evaluative beliefs; and (4) response time of evaluative beliefs. Detailed information on the operationalization and computation of belief accessibility variables is presented in Table 9 and 10.

Table 9. Operationalization and Computation of Descriptive belief accessibility

Descriptive beliefs	Conceptual definition	Operationalization
About the illness	How easily an individual can access to accurate beliefs about their illnesses	Content: The accuracy of a respondent's beliefs about the blood clot problem (the higher, the more accurate) Response time: How quickly a respondent responded to each of the statements about the descriptive beliefs about the blood clot problem (the quicker, the more accessible)
About the drug benefits	How easily an individual can access to accurate beliefs about their drug benefits	Content: The accuracy of a respondent's beliefs about the blood thinner benefits (the higher, the more accurate) Response time: How quickly a respondent responded to each of the statements about the descriptive beliefs about the blood thinner benefits (the quicker, the more accessible)
About the drug risks	How easily an individual can access to accurate beliefs about their drug risks, such as side effects	Content: The accuracy of a respondent's beliefs about the blood thinner risks (the higher, the more accurate) Response time: How quickly a respondent responded to each of the statements about the descriptive beliefs about the blood thinner risks (the quicker, the more accessible)

Table 10. Operationalization and Computation of Evaluative Belief Accessibility

Evaluative beliefs	Conceptual definition	Operationalization
About the illness severity	How easily an individual can access to positive or negative beliefs about their illness severity	Content: The valence of a respondent's beliefs about his/her blood clot problem (the higher, the more severe) Response time: How quickly a respondent responded to each of the adjective pairs about the evaluative beliefs about his/her blood clot problem severity (the quicker, the more accessible)
About the drug	How easily an individual can access to positive or negative beliefs about their drugs	Content: The valence of a respondent's beliefs about his/her blood thinner (the higher, the more positive) Response time: How quickly a respondent responded to each of the adjective pairs about the evaluative beliefs about his/her blood thinner (the quicker, the more accessible)

Descriptive belief accessibility in terms of the belief content accuracy was computed by counting the number of correct answers for each belief category (0 = all incorrect, 4 = all correct). Response time of each of the descriptive belief accessibility categories was calculated as follows: First, the raw score of the response time to each descriptive belief statement was converted to seconds. The raw score of the baseline response time measure was subtracted from each converted raw score for adjustments. After the subtraction, the adjusted response time scores within each belief category were summated. As a result, response time scores were generated for descriptive beliefs about the illness, about the drug benefits, and about the drug risks.

Evaluative belief accessibility variables in terms of the belief content were computed in the following ways. For evaluative beliefs about the illness severity, each positive adjective selection was coded to -1, while each negative adjective selection was coded to 1. Then, the scores were summated to create an evaluative belief about the illness severity score in which higher numbers indicate more severe illness beliefs. The summated scores for the evaluative beliefs content about blood clot problem severity ranged from -7 = not at all severe) to 7 = very severe.

For the content of evaluative beliefs about the drug, each positive adjective selection was coded to 1 and each negative adjective selection was coded to -1; and then the scores were summated to create an evaluative beliefs about the drug score in which higher numbers indicate more positive beliefs. Among the seven adjective pairs used for measuring evaluative beliefs about the drug, one pair (makes me feel better vs. doesn't make me feel better) was dropped from the computation, because the answer to that question showed different patterns than those for the other six items. As a result, the

summated scores for the evaluative beliefs about the drug ranged from -6 = all negative to 6 = all positive.

To compute the response time variables for evaluative belief accessibility, the same method used for the response time of descriptive beliefs was applied: The baseline response time score were subtracted from each raw response time score of the evaluative adjective pairs; then, the adjusted response time scores within each belief category were summated to create response time variables of evaluative beliefs about the illness and the drug.

6.2.3. Operationalization and computation of DTCA exposure frequency

As described in Chapter 5, DTCA exposure frequency was measured by two sets of 6-point scales: (1) category-level DTCA exposure frequency (DTCA exposure frequency for newspapers, magazines, TV, radio, and the Internet) and (2) brand-level DTCA exposure frequency (DTCA exposure frequency by brands for three advertised blood thinner brands). Since prescription blood thinner ads appeared on TV, magazine, and the Internet at the time of the data collection, respondents' exposure to the blood thinner ads from TV, magazine, and the Internet were used for the data analysis. Each DTCA exposure frequency were ranged from 1 = Never to 6 = Almost everyday. Because of the weak correlation among the individual DTCA exposure frequency variable scores, they were not combined but used as individual variables for data analysis.

6.2.3. Operationalization and computation of media-related variables as control variable

General media use and health media use were measured in the average hours and minutes of using five media (newspapers, magazines, TV, radio, and the Internet) on weekdays and on weekends. All measured media usage time data were converted to minutes. Then, the general media use variable was created by averaging the minutes of all five media use on weekdays and weekends. The health media use variable was created by averaging the health media use minutes on weekdays and weekends. In addition, the health media attention variable was created by averaging the individual data indicating attention paid to health-related content in five different media.

6.3. Descriptive Statistics of Key Variables

Key variables' descriptive statistics were examined and basic statistical assumptions for later analyses were checked, including normality.

6.3.1. Medication adherence

The medication adherence scores ranged from 0 = full non-adherence to 9 = full adherence. Many of the respondents showed at least some types of medication non-adherence behavior with their current blood thinners (62.9%, n = 151). The mean medication adherence score was 7.46 (SD = 1.77; skewness = -1.55; kurtosis = 2.65). Overall, most respondents tended to be highly adherent to their blood thinner regimen. The histogram of medication adherence score distribution is presented in Figure 3.

Figure 3. Histogram of Medication Adherence Scores
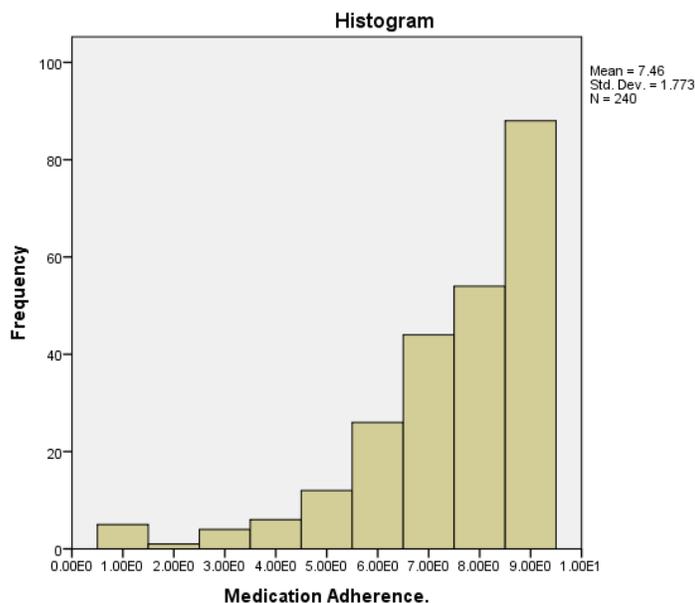
6.3.2. Belief accessibility

Content of descriptive beliefs. Scores of the three types of descriptive belief content variables ranged from 0 = completely inaccurate to 4 = completely accurate. The mean score for descriptive beliefs about the illness was 3.23 (SD = .82; skewness = -.63; kurtosis = -.74), 3.15 (SD = .81; skewness = -.29; kurtosis = -1.42) for descriptive beliefs about the drug benefits, and 3.66 (SD = .54; skewness = -1.32; kurtosis = .79) for descriptive beliefs about the drug risks. Overall, descriptive statistics showed that most respondents tended to have accurate beliefs about their blood clot problems and blood thinners. The histogram of the score distribution for each type of descriptive beliefs is presented in Figures 4 through 6.

Figure 4. Histogram of Content of Descriptive Beliefs about the Illness
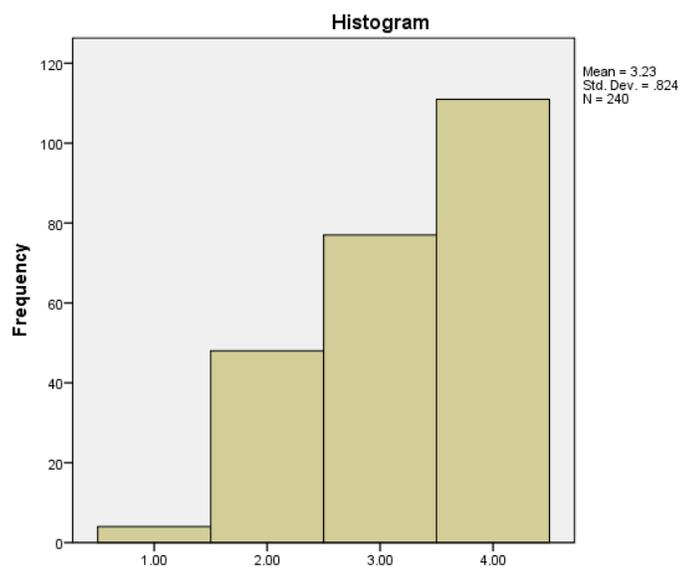
Figure 5. Histogram of Content of Descriptive Beliefs about the Drug Benefits
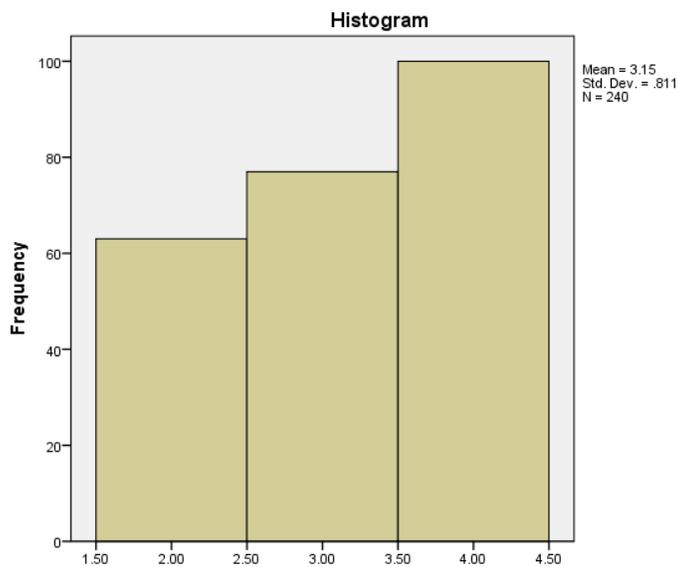
Figure 6. Histogram of Content of Descriptive Beliefs about the Drug Risks
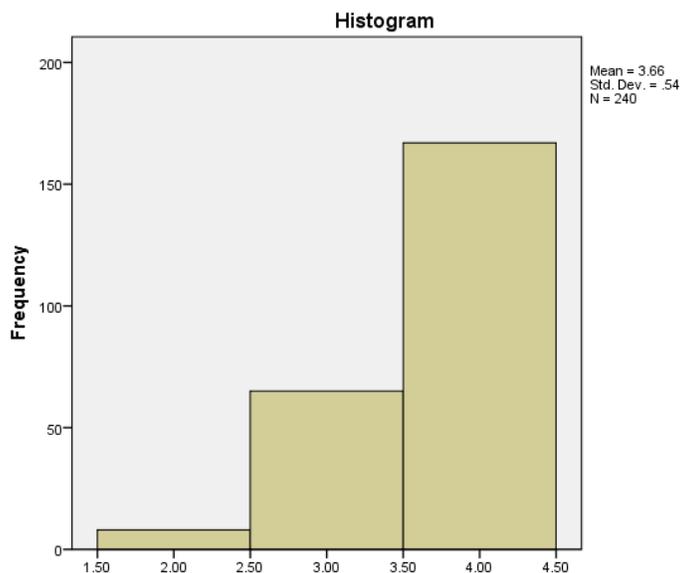
Response time of descriptive beliefs. The scores of the response time for the three types of descriptive beliefs ranged from -35.00 to 21.43. The scores include negative numbers because of the response time adjustment based on the baseline response time, as described in the earlier section. The mean score for the descriptive beliefs about the illness was .34 (SD = 6.61; skewness = -.83, kurtosis = 4.46), for the descriptive beliefs about the drug benefits it was -1.07 (SD = 6.16; skewness = -. 61; kurtosis = 2.47), and for the drug risks -2.44 (SD = 6.15; skewness = -.80, kurtosis = 5.89). The histograms of the response time scores (presented in Figures 7 through 9) suggested that each distribution of response time scores was concentrated around 0, which means that the average response time scores were not very different from the baseline response time. Compared to the baseline response time, the average response time scores for both descriptive beliefs about the drug benefits and drug risks were smaller, which means that

the two types of descriptive beliefs were relatively more accessible than the baseline. The average response time for descriptive belief about the illness was slightly larger than the baseline response time.

Figure 7. Histogram of Response Time of Descriptive Beliefs about the Illness
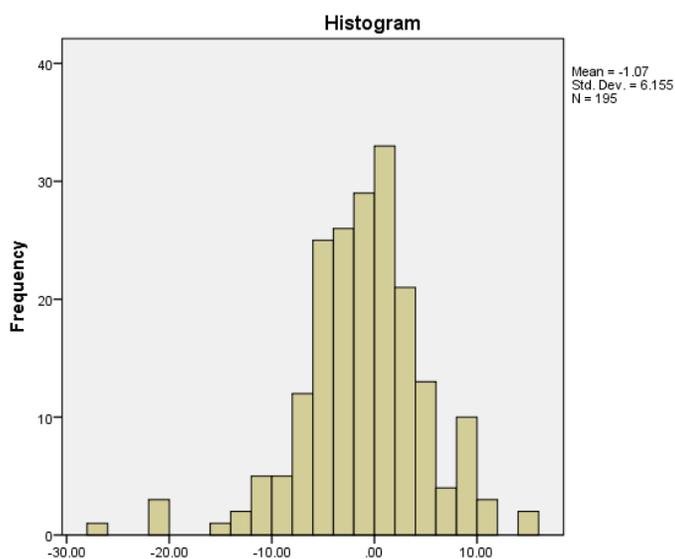
Figure 8. Histogram of Response Time of Descriptive Beliefs about the Drug Benefits
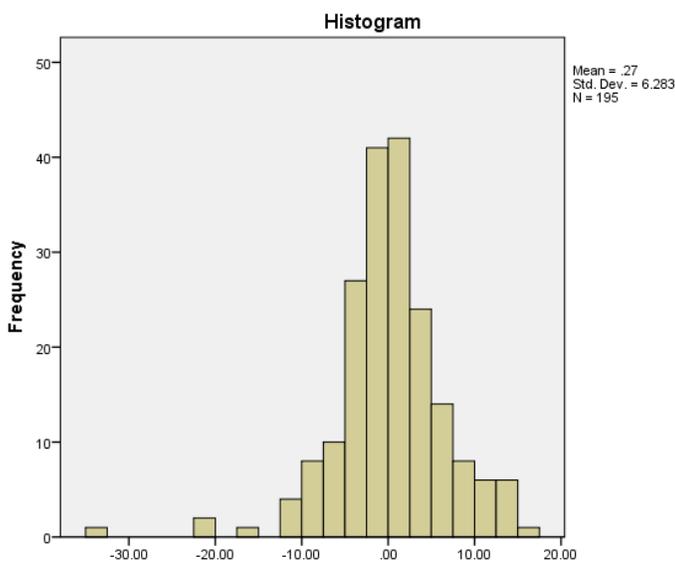
Figure 9. Histogram of Response Time of Descriptive Beliefs about the Drug Risks
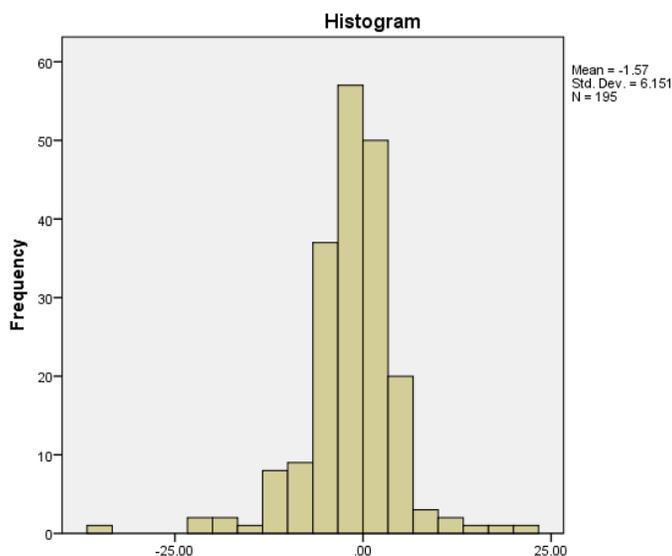
Content of evaluative beliefs. The computed scores of evaluative beliefs about the

illness severity ranged from – 7 = not severe at all to 7 = strongly severe, and the average

score was -3.42 (SD = 2.11, skewness = .02 kurtosis = -.60). The scores of evaluative

beliefs about the drug ranged from -6 = very negative to 6 = very positive, and the mean

score was 5.78 (SD = .77, skewness = -4.20, kurtosis = 20.54). Overall, the distribution of

the content of evaluative beliefs scores showed that respondents generally believed their

blood clot problems were not severe and that respondents seemed to have a very positive

view about their blood thinners. The distribution of scores for the content of evaluative

beliefs regarding the illness severity and the drug is presented in Figures 10 and 11.

Figure 10. Histogram of Content of Evaluative Beliefs about the Illness Severity
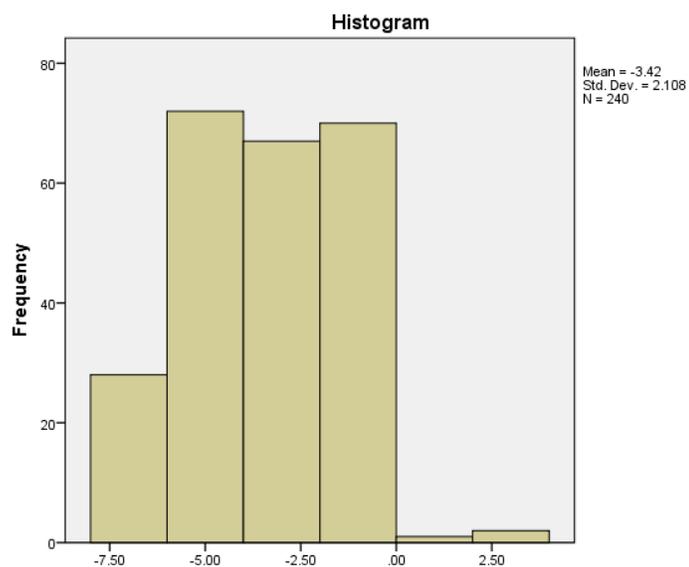
Figure 11. Histogram of Content of Evaluative Beliefs about the Drug
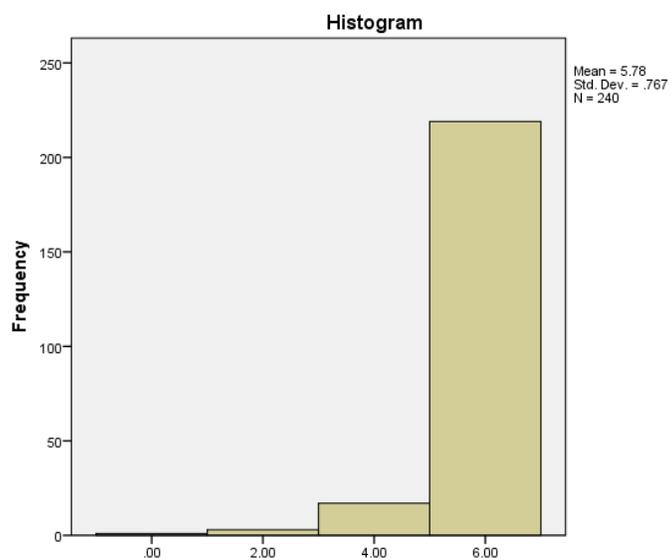
Response time of evaluative beliefs. The mean response time score for the

evaluative beliefs about the illness severity was -4.79 (SD = 10.46, skewness = -1.03,

kurtosis = 5.29), and the mean score for the evaluative beliefs about the drug was -9.87

(SD = 9.46, skewness = -.94, kurtosis = 3.25). The negative average scores for both types

of evaluative beliefs indicate that evaluative beliefs about the illness severity and about

the drug were relatively more accessible than the baseline. The distribution of the

response time scores for each type of evaluative beliefs is presented in Figures 12 and 13.

The descriptive statistics of all belief accessibility variables are summarized in Table 11.

Figure 12. Histogram of Response Time of Evaluative Beliefs about the Illness Severity
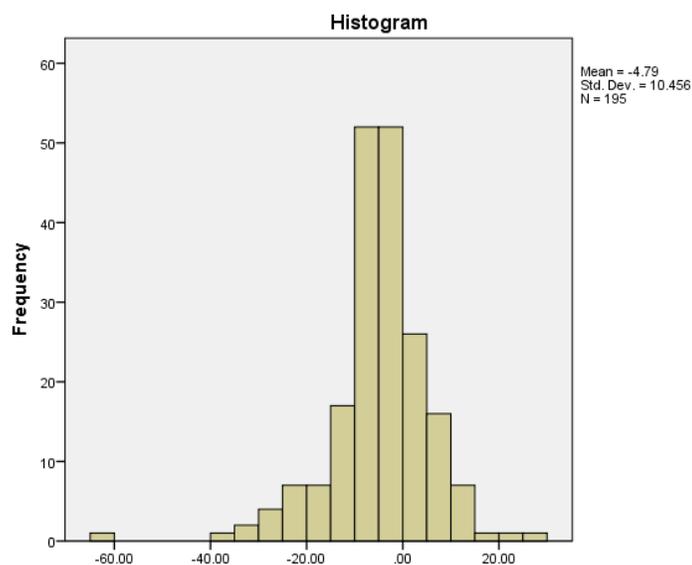
Figure 13. Histogram of Response Time of Evaluative Beliefs about the Drug
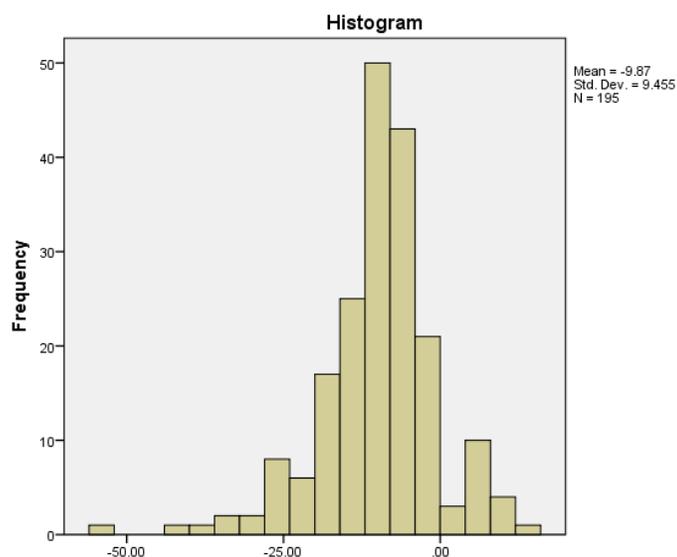
Table 11. Descriptive Statistics of Belief Accessibility Variables

		N	Mean (SD)	Range
Content of descriptive beliefs	About the illness	240	3.23 (.82)	0 ~ 4
	About the drug benefits	240	3.15 (.81)	0 ~ 4
	About the drug risks	240	3.66 (.54)	0 ~ 4
Response time of descriptive beliefs	About the illness	195	.27 (6.28)	-33.25 ~ 16.77
	About the drug benefits	195	-1.07 (6.16)	-27.18 ~ 15.51
	About the drug risks	195	-1.57 (6.15)	-35.00 ~ 21.43
Content of evaluative beliefs	About the illness severity	240	-3.42 (2.11)	-7 ~ 7
	About the drug	240	5.78 (.77)	-6 ~ 6
Response time of evaluative beliefs	About the illness severity	195	-4.79 (10.46)	-62.67 ~ 29.96
	About the drug	195	-9.87 (9.46)	-55.43 ~ 14.67

6.3.3. DTCA exposure frequency

Category-level DTCA exposure frequency. Although category-level DTCA exposure frequency was measured for five different media, given that only three media were used for prescription blood thinner DTCA around the data collection time period, all analyses for testing this study's hypotheses and research questions included category-level DTCA exposure frequency variables for only the applicable three media (TV, magazines, and the Internet). The mean score for the TV DTCA exposure frequency was 3.9 on a 6-point scale (SD = 1.73, skewness = -1.03, kurtosis = 5.29), for magazine DTCA exposure frequency 2.13 (SD = 1.36, skewness = 1.12, kurtosis = .36), and for Internet DTCA exposure frequency 2.66 (SD = 1.64, skewness = .52, kurtosis = -1.02). The descriptive statistics suggested that respondents were more frequently exposed to DTCA in TV than in the other media. The score distribution for each of the category-level DTCA exposure frequency variables is presented in Figures 14 through 16.

Figure 14. Histogram of Category-level DTCA Exposure Frequency: TV
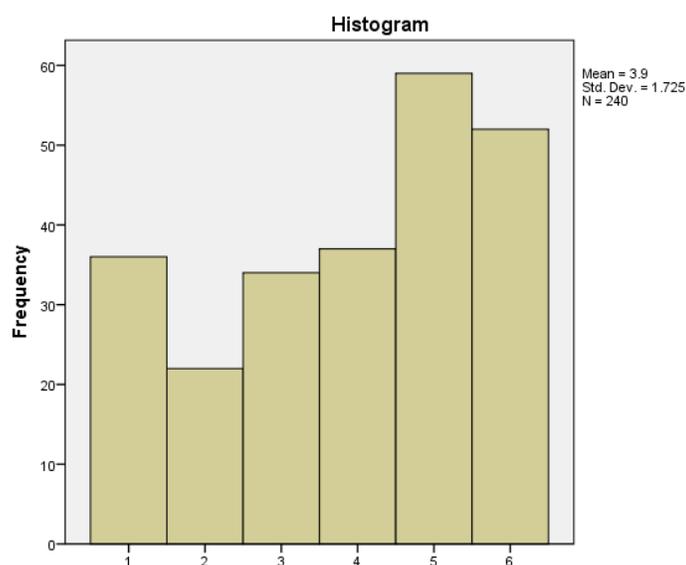
Figure 15. Histogram of Category-level DTCA Exposure Frequency: Magazine
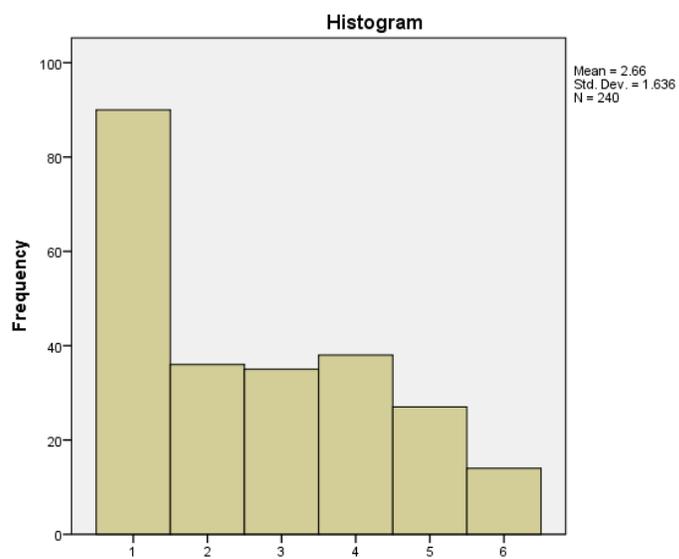
Figure 16. Histogram of Category-level DTCA Exposure Frequency: Internet
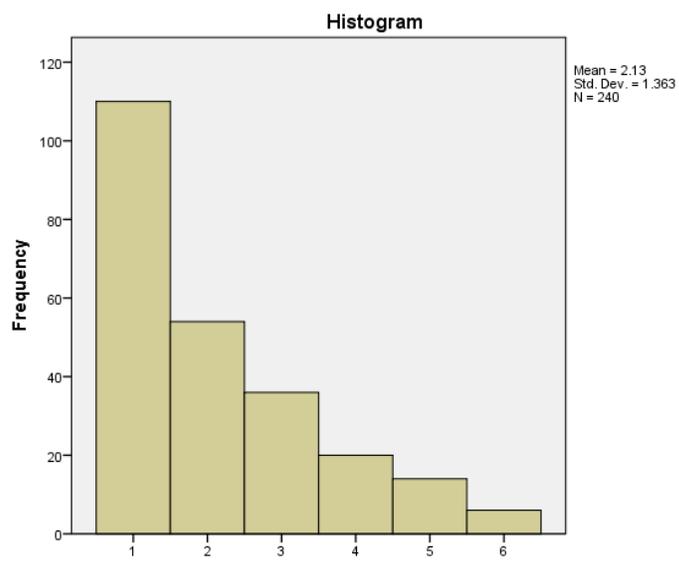
Brand-level DTCA exposure frequency. The mean score for Eliquis ad exposure frequency was 2.76 on a 6-point scale (SD = 1.71, skewness = .45, kurtosis = -1.18), for Pradaxa ad exposure frequency 2.98 (SD = 1.68, skewness = .22, kurtosis = -1.31), and for Xarelto ad exposure frequency 3.17 (SD = 1.77, skewness = .11, kurtosis = -1.35). The results showed that respondents were not very frequency exposed to the three blood thinner brands' ads. In a relative sense, ad exposure frequency was slightly higher for Xarelto ads than the other two brands. The score distributions for the three brand ads are presented in Figures 17 through 19. The overall descriptive statistics of all DTCA exposure frequency variables are summarized in Table 12.

Figure 17. Histogram of Brand-level DTCA Exposure Frequency: Eliquis
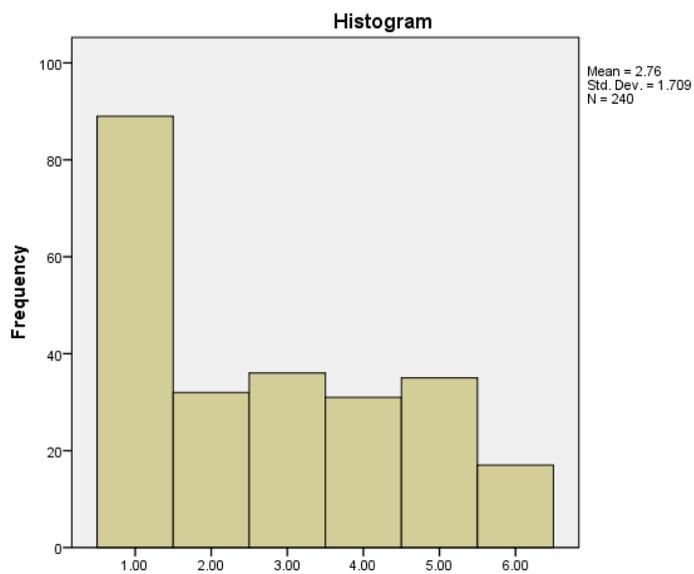
Figure 18. Histogram of Brand-level DTCA Exposure Frequency: Pradaxa
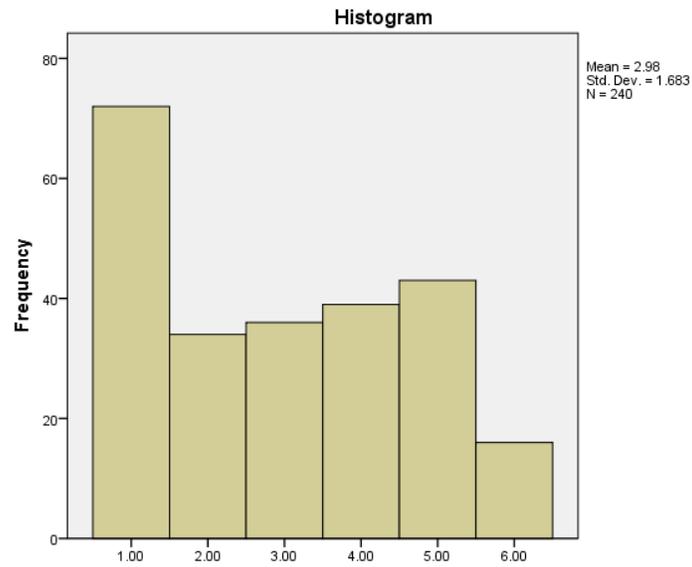
Figure 19. Histogram of Brand-level DTCA Exposure Frequency: Xarelto
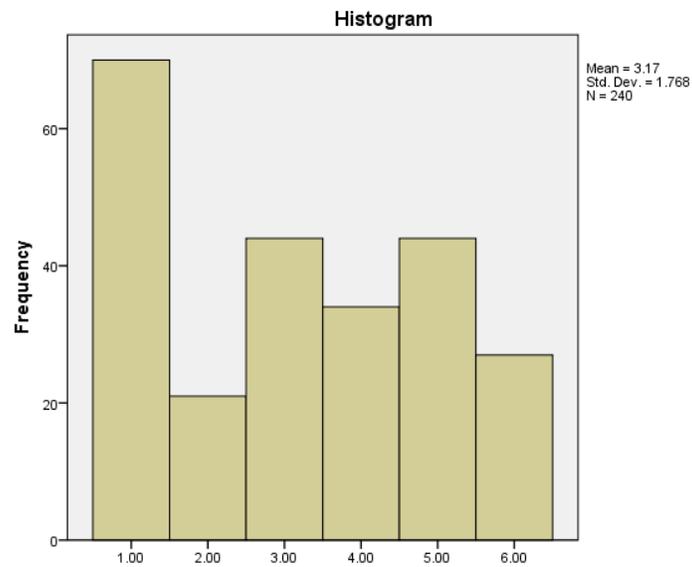
Table 12. Descriptive Statistics of DTCA Exposure Frequency Variables

		Mean (SD)
Category-level DTCA exposure frequency	TV	3.90 (1.73)
	Magazine	2.13 (1.36)
	Internet	2.66 (1.64)
Brand-level DTCA exposure frequency	Eliquis	2.76 (1.71)
	Pradaxa	2.98 (1.68)
	Xarelto	3.17 (1.77)

The descriptive statistics of the key variables and their histograms showed that none of the key variables had a normal distribution. In preparation for the hypotheses testing analyses, several normalization processes were attempted, including log-transformation and square root transformation, but the transformation process did not significantly improve the normality of the variables. Therefore, this study decided to use the original scores of the key variables for hypotheses testing. While necessary caution should be exercised in interpreting analysis results that might be affected by statistical testing assumption violations, this study's analysis approaches (multiple regression) are considered acceptable given that multiple regression analysis is relatively more flexible and robust than other parametric tests (Cohen and Cohen 1983; Hair, Black, Babin, and Anderson 2009).

6.4. Testing Priming Effects of DTCA Exposure Frequency on Patients' Belief Accessibility

H1 through RQ1 test priming effects of DTCA exposure frequency on patients' beliefs about their illnesses and the drugs. Specifically, H1 predicted a positive relationship between DTCA exposure frequency and patients' descriptive beliefs about the illness, H2 predicted a positive relationship between DTCA exposure frequency and the descriptive beliefs about the drug benefits, and H3 predicted a positive relationship between DTCA exposure frequency and the descriptive beliefs about the drug risks. H4 hypothesized a positive relationship between DTCA exposure frequency and patients' evaluative beliefs about the illness severity, and RQ1 was posed about the relationship between DTCA exposure frequency and the evaluative beliefs about the drug.

Before testing each hypothesis and addressing the research question, bivariate correlation analyses were conducted to explore the relationships among key variables. After the correlation analyses, multivariate hierarchical regression analyses were conducted.

6.4.1. Correlation analysis of the relationship between DTCA exposure frequency and belief accessibility

The first set of correlation analyses was performed to explore the relationship between DTCA exposure frequency and the content of descriptive and evaluative beliefs, and the second set of correlation analyses was conducted to explore the relationships between DTCA exposure frequency and the belief response time variables. Table 13 presents the results from correlation between DTCA exposure frequency and content of descriptive and evaluative beliefs.

Table 13. Correlations between Category-level DTCA Exposure Frequency and Content of Descriptive and Evaluative Beliefs

	TV	Magazine	Internet
Descriptive beliefs about the illness	.04	-.27**	-.28**
Descriptive beliefs about the drug benefits	.04	-.30**	-.25**
Descriptive beliefs about the drug risks	-.01	-.20**	-.18**
Evaluative beliefs about the illness severity	.14	.13*	.18**
Evaluative beliefs about the drug	-.05	-.08	-.14*

*p < .05; **p < .01

The correlation analyses between DTCA exposure frequency and the content of beliefs showed the generally negative relationship between DTCA exposure frequency and the accuracy of descriptive beliefs. All three descriptive beliefs (descriptive beliefs about the illness, the drug benefits, and the drug risks) were negatively related to DTCA exposure via magazine and the Internet. The results seem to suggest that respondents who were more frequently exposed to DTCA tended to have less accurate beliefs about their blood clot problems and blood thinners. However, for the most heavily used DTCA medium, TV, no significant correlation between the two was found.

For evaluative beliefs about the illness and the drug, only very weak and limited correlations were found between DTCA exposure frequency and evaluative beliefs (see Table 13). Weak, positive relationships were found between DTCA exposure via magazines and the Internet, and patients' evaluative beliefs about their illness severity. In other words, respondents who were more frequently exposed to DTCA tended to evaluate their blood clot problem more severely. However, the relationship was not significant for

TV DTCA. For evaluative beliefs about the drug, very weak, negative correlations were found only for the Internet DTCA exposure frequency.

The correlation analysis of the relationship between the brand-level DTCA exposure frequency and the content of beliefs showed no significant relationship. The results are summarized in Table 14.

Table 14. Correlations between Brand-level DTCA Exposure Frequencies and Content of Descriptive and Evaluative Beliefs

	Eliquis	Pradaxa	Xarelto
Descriptive beliefs about the illness	.00	-.08	-.03
Descriptive beliefs about the drug benefits	.08	.01	.03
Descriptive beliefs about the drug risks	-.01	.02	-.01
Evaluative beliefs about the illness severity	.11	.10	.11
Evaluative beliefs about the drug	.04	.04	.04

Correlation analysis results for the relationships between DTCA exposure frequency and response time of descriptive and evaluative beliefs showed no significant correlation for any of the variable pairs. The correlation results are presented in Tables 15 and 16.

Table 15. Correlations between Category-level DTCA Exposure Frequencies and Response Time of Descriptive and Evaluative Beliefs

	TV	Magazine	Internet
Descriptive beliefs about the illness	.01	-.02	.02
Descriptive beliefs about the drug benefits	-.03	.08	.00
Descriptive beliefs about the drug risks	-.12	-.00	-.02
Evaluative beliefs about the illness severity	-.04	-.03	-.02
Evaluative beliefs about the drug	-.04	.04	.03

Table 16. Correlations between Brand-level DTCA Exposure Frequencies and Response Time of Descriptive and Evaluative Beliefs

	Eliquis	Pradaxa	Xarelto
Descriptive beliefs about the illness	.00	.03	.01
Descriptive beliefs about the drug benefits	.07	.02	.04
Descriptive beliefs about the drug risks	.00	-.05	-.05
Evaluative beliefs about the illness severity	.10	.01	.05
Evaluative beliefs about the drug	.07	-.01	.03

6.4.2. Relationships between control variables and belief accessibility

Next, the relationships among various control variables and the belief accessibility were investigated. Demographic variables (age, sex, income, education, and race), media use (general media use, health media use, and health media attention), and medication-related variables (the duration of blood thinner intake, out-of-pocket cost, the number of prescription drug taken, side effect experience and health insurance status) were examined for their potential effects on belief accessibility.

First, correlation analyses between continuous, control variables and the content of descriptive and evaluative beliefs were conducted and the results are presented in Table 17. The results showed that health media use and health media attention were significantly and negatively related to the accuracy of all three types of descriptive beliefs, out-of-pocket cost was negatively related to accuracy of descriptive beliefs about the illness, and the number of prescription drugs taken was positively related to accuracy of two descriptive beliefs. The results suggest that respondents with more frequent use of and paid more attention to health content in media tended to have less accurate beliefs about their blood clot problems and blood thinners. For evaluative beliefs, only age and health media attention had weak correlation with evaluative beliefs about illness severity.

Table 17. Correlations between Control Variables and Content of Descriptive and Evaluative Beliefs

	Descriptive beliefs about the illness	Descriptive beliefs about the drug benefits	Descriptive beliefs about the drug risks	Evaluative beliefs about the illness severity	Evaluative beliefs about the drug
Age	.11	.07	.13	-.19**	-.02
Income	-.01	-.09	-.05	.04	.08
Education	-.08	-.05	-.12	-.04	.09
General media use	-.05	-.07	-.03	-.06	-.12
Health media use	-.26**	-.24**	-.24**	.12	-.02
Health media attention	-.25**	-.26**	-.22**	.18**	-.09
Duration of blood thinner intake	.07	.04	.08	-.08	.07
Out-of-pocket cost	-.13*	-.12	-.05	-.01	-.10
Number of prescription drug taken	.17*	.14*	.11	.00	.07

The relationships between categorical control variables and content of beliefs were investigated by conducting a series of t-tests. First, Table 18 presents t-test results comparing content of descriptive and evaluative beliefs between men and women.

Overall, no meaningful difference was found between men and women, with only one

belief variable, descriptive beliefs about the drug benefits, showing a significant

difference.

Table 18. T-test Results for Content of Descriptive and Evaluative Beliefs by Sex

Beliefs	Sex	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Female	120	3.32	0.82	1.65(238)
	Male	120	3.14	0.82	
Descriptive beliefs about the drug benefits	Female	120	3.74	0.48	2.29(228.13)*
	Male	120	3.58	0.59	
Descriptive beliefs about the drug risks	Female	120	3.25	0.76	1.84(238)
	Male	120	3.06	0.85	
Evaluative beliefs about the illness severity	Female	120	-3.38	2.03	.24(238)
	Male	120	-3.45	2.19	
Evaluative beliefs about the drug	Female	120	5.80	0.71	.34(238)
	Male	120	5.77	0.83	1.65(238)

*p < .05

The comparisons between non-Hispanic white respondents and others also

showed no meaningful difference between the two racial groups in terms of their

descriptive and evaluative beliefs about their blood clot problems and blood thinners. As presented in Table 19, the only significant between-group difference was found for evaluative beliefs about the drug, indicating that non-Whites tended to have slightly more positive beliefs about their blood thinners.

Table 19. T-test Results for Content of Descriptive and Evaluative Beliefs by Race

Beliefs	Race	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Non-Hispanic White	216	3.26	0.82	-1.97(238)
	Other	24	2.92	0.83	
Descriptive beliefs about the drug benefits	Non-Hispanic White	216	3.68	0.53	-1.16(238)
	Other	24	3.54	0.59	
Descriptive beliefs about the drug risks	Non-Hispanic White	216	3.18	0.80	-1.25(238)
	Other	24	2.96	0.86	
Evaluative beliefs about the illness severity	Non-Hispanic White	216	-3.41	2.09	-.20(238)
	Other	24	-3.50	2.30	
Evaluative beliefs about the drug	Non-Hispanic White	216	5.88	0.40	4.39(215.0)**
	Other	24	6.00	0.00	

**p < .01

No significant difference was found in descriptive and evaluative beliefs between those who had experienced side effects from their current blood thinners and those had not. The results are presented in Table 20.

Table 20. T-test Results for Content of Descriptive and Evaluative Beliefs by Side Effect Experience

Beliefs	Side effect	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Experience	43	3.21	0.83	.17(238)
	No experience	197	3.24	0.82	
Descriptive beliefs about the drug benefits	Experience	43	3.63	0.49	.46(238)
	No experience	197	3.67	0.55	
Descriptive beliefs about the drug risks	Experience	43	3.19	0.79	-.28(238)
	No experience	197	3.15	0.82	
Evaluative beliefs about the illness severity	Experience	43	-3.33	1.80	-.31(238)
	No experience	197	-3.44	2.17	
Evaluative beliefs about the drug	Experience	43	5.67	0.75	1.03(238)
	No experience	197	5.81	0.77	

The t-test results comparing those with health insurance and those without it showed some significant differences in their descriptive beliefs about their illness and

drugs (see Table 21). The mean scores of descriptive beliefs were significantly different between those who had health insurance and those who did not. Generally, respondents with health insurance tended to have more accurate beliefs about their blood clot problems and the blood thinners. No significant difference was found for the two evaluative belief variables.

Table 21. T-test Results for Content of Descriptive and Evaluative Beliefs by Health Insurance Status

Beliefs	Health Insurance	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Insurance	228	3.26	0.82	2.83(238)**
	No insurance	12	2.58	0.67	
Descriptive beliefs about the drug benefits	Insurance	228	3.68	0.53	2.75(238)**
	No insurance	12	3.25	0.62	
Descriptive beliefs about the drug risks	Insurance	228	3.18	0.81	2.15(238)*
	No insurance	12	2.67	0.78	
Evaluative beliefs about the illness severity	Insurance	228	-3.42	2.05	-.10(11.49)
	No insurance	12	-3.33	3.17	
Evaluative beliefs about the drug	Insurance	228	5.80	0.74	.82(11.41)
	No insurance	12	5.50	1.24	

$**p < .01; *p < .05$

Next, relationships between various control variables and response time of descriptive and evaluative beliefs were investigated using a series of correlation analyses and t-tests. The results showed no significant relationships between the control variables and the belief response time variables. The correlation analyses results and the t-test results are summarized in Tables 22 through 26.

Table 22. Correlations between Control Variables and Response Time of Descriptive and Evaluative Beliefs

	Descriptive beliefs about the illness	Descriptive beliefs about the drug benefits	Descriptive beliefs about the drug risks	Evaluative beliefs about the illness severity	Evaluative beliefs about the drug
Age	-.02	-.11	-.06	.01	-.07
Income	.05	.04	-.02	-.10	.08
Education	-.05	-.06	-.02	-.12	.02
General media use	.06	-.02	.03	.01	.06
Health media use	-.04	.04	-.01	-.07	.05
Health media attention	-.05	.07	-.03	-.07	.05
Duration of blood thinner intake	-.01	-.04	-.10	-.03	-.08
Monthly cost of blood thinner	-.01	.02	-.02	-.07	.05
Number of prescription drug taken	-.01	-.08	-.00	-.04	-.09

Table 23. T-test Results for Response Time of Descriptive and Evaluative Beliefs by Sex

Beliefs	Sex	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Female	118	0.86	6.40	1.23(227)
	Male	111	-0.21	6.82	
Descriptive beliefs about the drug benefits	Female	114	-0.99	5.45	.37(220)
	Male	108	-1.32	7.47	
Descriptive beliefs about the drug risks	Female	117	-0.82	6.98	.76(226)
	Male	111	-0.15	6.63	
Evaluative beliefs about the illness severity	Female	115	-3.97	10.70	1.75(224)
	Male	111	-6.55	11.52	
Evaluative beliefs about the drug	Female	113	-8.99	9.90	1.54(215)
	Male	104	-11.27	11.88	1.23(227)

Table 24. T-test Results for Response Time of Descriptive and Evaluative Beliefs by Race

Beliefs	Race	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Non-Hispanic White	207	0.25	6.61	.63(227)
	Other	22	1.19	6.75	
Descriptive beliefs about the drug benefits	Non-Hispanic White	201	-1.06	6.38	-.65(220)
	Other	21	-2.02	7.68	
Descriptive beliefs about the drug risks	Non-Hispanic White	208	-1.26	6.86	.73(226)
	Other	20	-0.09	6.32	
Evaluative beliefs about the illness severity	Non-Hispanic White	204	-5.13	11.32	-.44(224)
	Other	22	-6.22	9.74	
Evaluative beliefs about the drug	Non-Hispanic White	200	-10.10	10.63	.09(215)
	Other	17	-9.85	14.42	

Table 25. T-test Results for Response Time of Descriptive and Evaluative Beliefs by Side Effect Experience

Beliefs	Side effect	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Experience	42	-0.14	7.30	.52(227)
	No experience	187	0.45	6.46	
Descriptive beliefs about the drug benefits	Experience	43	-0.52	7.32	-.71(220)
	No experience	179	-1.30	6.30	
Descriptive beliefs about the drug risks	Experience	43	-0.45	7.42	-.76(226)
	No experience	185	-1.32	6.67	
Evaluative beliefs about the illness severity	Experience	42	-4.36	8.94	-.56(224)
	No experience	184	-5.43	11.62	
Evaluative beliefs about the drug	Experience	38	-9.34	9.59	-.46(215)
	No experience	179	-10.24	11.21	

Table 26. T-test Results for Response Time of Descriptive and Evaluative Beliefs by Health Insurance Status

Beliefs	Health Insurance	N	Mean	SD	t (df)
Descriptive beliefs about the illness	Insurance	218	0.29	6.58	-.57(227)
	No insurance	11	1.44	7.53	
Descriptive beliefs about the drug benefits	Insurance	214	-1.19	6.37	-.43(220)
	No insurance	8	-0.18	9.95	
Descriptive beliefs about the drug risks	Insurance	217	-1.21	6.75	-.55(226)
	No insurance	11	-0.06	8.20	
Evaluative beliefs about the illness severity	Insurance	215	-5.12	11.14	.70(224)
	No insurance	11	-7.51	11.99	
Evaluative beliefs about the drug	Insurance	206	-10.10	10.88	-.12(215)
	No insurance	11	-9.70	12.37	

6.4.3. Regression analyses for testing H1 through RQ1: Relationship between DTCA exposure frequency and content of the beliefs

The results from the preliminary bivariate correlation analyses between DTCA exposure frequency and the belief accessibility variables indicated no significant relationship between DTCA exposure frequency (both category-level and brand level) and belief accessibility measured in response time. Also, no significant relationship was found between brand-level DTCA exposure frequency and content of beliefs. Therefore, multivariate regression analyses for testing H1 through RQ1 were performed only for the relationship between category-level DTCA exposure frequency and content of descriptive and evaluative beliefs about the illness and the drug.

For each regression analysis, control variables were selected based on the preliminary bivariate analysis results. Since age, sex, health media use, health media attention, out-of-pocket cost, and the number of prescription drugs taken were found significantly related to some of the descriptive and evaluative belief content variables, they should be included as control variables. Between health media use and health media attention, a rather strong correlation was found ($r = .67$, $p < .01$), suggesting a potential multicollinearity issue. As health media attention was significantly correlated with belief accessibility variables more than health media use, it was decided to enter this variable.

A series of hierarchical regression analyses were conducted and control variables and independent variables were entered for all five hierarchical regression analyses in the following ways: In the first block, age, sex, health media attention, out-of-pocket cost, and the number of drugs taken were entered as control variables. Three category-level DTCA exposure frequency variables (TV, magazine, and the Internet) were entered in the

second block as independent variables predicting the content of descriptive and evaluative beliefs about the illness and the drug.

First, to test H1, the relationship between category-level DTCA exposure frequency and content of descriptive beliefs about the illness was examined. As presented in Table 27, the results showed a significant positive relationship between TV DTCA exposure frequency and the accuracy of descriptive beliefs about the illness (β = .22, $p < .01$). It means that respondents who were exposed more frequently to DTCA via TV tended to have more accurate beliefs about their blood clot problems, which is in line with the hypothesis. Contrary to the expectation, however, a significant negative relationship was found between Internet DTCA exposure frequency and the accuracy of descriptive beliefs about the illness (β = -.23, $p < .01$), which suggested that respondents who were more frequently exposed to DTCA on the Internet tended to have less accurate beliefs about their blood clot problems. None of the control variables were significantly related to the dependent variable. Overall, the results provide rather mixed support for H1, with TV DTCA exposure frequency having effects consistent with the hypothesis but Internet DTCA exposure frequency showing an opposite direction effect on descriptive beliefs about the illness.

Table 27. Hierarchical Regression for Testing the Relationship between Category-level DTCA Exposure Frequency and Content of Patients' Descriptive Beliefs about the Illness (N = 234)

	Predictors	*Beta*
Block 1. Control variables	Age	-.03
	Sex	-.09
	Health media attention	-.11
	Out-of-pocket cost	-.09
	Number of drugs taken	.11
Block 2. Category-level DTCA exposure frequency	TV	.22**
	Magazine	-.14
	Internet	-.23**
	$df = 8$, $MS = 3.54$, $F = 6.04$, $p < .01$; adjusted $R^2 = .15$	

**p < .01

Next, another hierarchical regression analysis tested H2, which predicted a positive relationship between DTCA exposure frequency and the accuracy of descriptive beliefs about the drug benefits. The results showed a significant positive relationship between TV DTCA exposure frequency and the accuracy of descriptive beliefs about the drug benefits ($\beta = .22$, $p < .01$), but negative relationships between magazine and Internet DTCA exposure frequency variables and the accuracy of beliefs (magazine DTCA: $\beta = -.20$, $p < .05$; Internet DTCA: $\beta = -.20$, $p < .05$). The results suggest that respondents who were exposed more frequently to TV DTCA tended to have more accurate beliefs about their blood thinner benefits, but those who were exposed to magazine and Internet DTCA more frequently tended to have less accurate beliefs. Overall, the findings offer mixed support for H2, with only TV DTCA exposure frequency showing the predicted effect on the accuracy of beliefs about the drug benefits. The results are summarized in Table 28.

Table 28. Hierarchical Regression for Testing the Relationship between Category-level DTCA Exposure Frequency and Content of Patients' Descriptive Beliefs about the Drug Benefits (N = 234)

	Predictors	*Beta*
Block 1. Control variables	Age	-.07
	Sex	-.10
	Health media attention	-.10
	Out-of-pocket cost	-.08
	Number of drugs taken	.06
Block 2. Category-level	TV	.22**
DTCA exposure frequency	Magazine	-.20*
	Internet	-.20*
	df = 8, *MS* = 3.35, *F* = 5.90, *p* < .01; adjusted R^2 = .17	

**p* < .01; **p* < .05

The third hierarchical regression analysis tested H3, which predicted a positive relationship between DTCA exposure frequency and the accuracy of descriptive beliefs about the drug risks. The results, presented in Table 29, demonstrated no significant relationships between them. Among the control variables, however, sex and health media attention were negatively related to the accuracy of descriptive beliefs about the drug risks (sex: β = -.14, *p* < .05; health media attention: β = -.16, *p* < .05). In other words, females and respondents who paid less attention to health content in various media tended to have more accurate beliefs about their blood thinner risks. Thus, H3 was not supported.

Table 29. Hierarchical Regression for Testing the Relationship between Category-level DTCA exposure frequency and Content of Patients' Descriptive Beliefs about the Drug Risks (N = 234)

	Predictors	*Beta*
Block 1. Control variables	Age	.06
	Sex	-.14*
	Health media attention	-.16*
	Out-of-pocket cost	-.01
	Number of drugs taken	.04
Block 2. Category-level DTCA exposure frequency	TV	.07
	Magazine	-.10
	Internet	-.05
	$df = 8$, $MS = .854$, $F = 3.12$, $p < .01$; adjusted $R^2 = .07$	

$**p < .01$; $*p < .05$

The fourth hierarchical regression analysis tested H4, which predicted a positive relationship between DTCA exposure frequency and the content of evaluative beliefs about the illness severity. The results, presented in Table 30, showed no significant relationship between DTCA exposure frequency and evaluative beliefs about the illness severity. Among the control variables, only sex was negatively related to the dependent variable ($\beta = -.18$, $p < .05$). In other words, females would likely evaluate their blood clot problems more severely. Thus, H4 was not supported. Another hierarchical regression analysis tested the relationship between DTCA exposure frequency and content of evaluative beliefs about the drug, addressing RQ1. As presented in Table 30, the results showed no significant relationship between DTCA exposure frequency and evaluative beliefs about the blood thinners.

Table 30. Hierarchical Regression for Testing the Relationship between Category-level DTCA Exposure Frequency and Content of Patients' Evaluative Beliefs (N = 234)

	Predictors	About the illness severity	About the drug
		Beta	*Beta*
Block 1. Control variables	Age	-.18*	-.09
	Sex	-.02	-.02
	Health media attention	.13	-.01
	Blood thinner cost	-.04	-.10
	Number of medications taken	.03	.05
Block 2. Category-level DTCA exposure frequency	TV	.10	.03
	Magazine	.01	.03
	Internet	-.01	-.18
Adjusted R^2		.04	.04
		df = 8, *MS* = 9.70, *F* = 2.31, *p* < .05	*df* = 8, *MS* = .68, *F* = 1.14, *p* = .34

**p < .01; *p < .05

Overall, the five hierarchical regression analyses testing the relationship between DTCA exposure frequency and content of descriptive and evaluative beliefs demonstrated mixed results: TV DTCA exposure were positively related to three descriptive beliefs, but magazine and Internet DTCA exposure were generally negatively related to them. The result also indicate that DTCA exposure frequency seem to have no effects on the accessibility to evaluative beliefs. The results of H1 through H4 and RQ1 testing are summarized in Table 31.

Table 31. Summary of H1 ~ H4 and RQ1 Test Results

H/RQ	Results	Other significant predictors
H1 **DV: Descriptive beliefs about the illness**	Supported for TV DTCA exposure frequency only Not supported for magazine DTCA exposure frequency Not supported for Internet DTCA exposure frequency (opposite direction) Not supported for brand-level DTCA exposure frequency	
H2 **DV: Descriptive beliefs about the drug benefits**	Supported for TV DTCA exposure frequency only Not supported for magazine DTCA exposure frequency (opposite direction) Not supported for Internet DTCA exposure frequency (opposite direction) Not supported for brand-level DTCA exposure frequency	
H3 **DV: Descriptive beliefs about the drug risks**	Not supported for category-level and brand-level exposure frequency	Sex (female > male) and health media attention (negative)
H4 **DV: Evaluative beliefs about the illness severity**	Not supported for category-level and brand-level exposure frequency	Age (negative)
RQ1 **DV: Evaluative beliefs about the drug**	No significant relationship between category- and brand-level exposure frequency and evaluative beliefs abut the drug	

6.5. Testing Belief Accessibility Effects on Patient Medication Adherence

H5 through H9 predicted the belief accessibility effects on patient medication adherence. Specifically, H5 expected a positive relationship between patients' descriptive beliefs about their illness and their medication adherence, H6 expected a positive relationship between the descriptive beliefs about the drug benefits and patient medication adherence, and H7 predicted a negative relationship between the descriptive beliefs about the drug risks and patient medication adherence. H8 and H9 predicted the positive relationships between patients' evaluative beliefs about the illness severity and the drug with patient medication adherence. Before testing the hypotheses using multivariate analysis approaches, first, a series of correlation analyses was performed to explore the relationships among the key variables.

6.5.1. Correlation analyses of the relationship between belief accessibility and patient medication adherence

The relationships between patients' descriptive and evaluative belief accessibility and their medication adherence were explored with correlation analysis. First, the content of descriptive and evaluative beliefs were correlated with medication adherence, and the results are presented in Table 32. The results showed that only the three descriptive belief variables (descriptive beliefs about the illness, the drug benefits, and the drug risks) were positively correlated with patient medication adherence. Neither of the evaluative belief content variables was significantly correlated with medication adherence. The results suggest that respondents who had more accurate beliefs about their blood clot problems and blood thinner benefits and risks tended to adhere more to their blood thinner regimen.

Another correlation analysis was performed exploring the relationships between response time of descriptive and evaluative beliefs and patient medication adherence. The analysis showed that response time of descriptive beliefs about the illness was positively related to patient medication adherence (see Table 32). It means that patients who were less accessible to the accurate beliefs about the illness tended to adhere more to their blood thinner regimen.

Table 32. Correlations between Belief Accessibility and Medication Adherence

		Content	Response time
Descriptive beliefs	About the illness	.27*	.13*
	About the drug benefits	.25**	.00
	About the drug risks	.13*	.01
Evaluative beliefs	About the illness severity	-.01	.03
	About the drug	.10	.00

$**p < .01; *p < .05$

6.5.2. Correlation analyses of the relationship between control variables and patient medication adherence

The relationship between various control variables and patient medication adherence was investigated by performing a correlation analysis and several t-tests. Demographic variables (age, sex, income, education, and race) and medication-related variables (duration of blood thinner intake, out-of-pocket cost, the number of prescription drugs taken, side effect experience, health insurance status, and satisfaction with and trust

in current doctors) were selected as control variables for testing the belief accessibility effects on patient medication adherence.

First, correlation analysis between continuous control variables and patient medication adherence was conducted. The results, as presented in Table 33, showed that age, the number of prescription drugs taken, and satisfaction with and trust in the current doctor had significantly positive relationships with patient medication adherence. That is, older respondents who took greater numbers of prescription drugs were more adherent to their blood thinner medication regimen, and those who were more satisfied with and highly trust their doctors tended to adhere to the regimen better. The results also showed a negative relationship between monthly out-of-pocket cost for blood thinners and patient medication adherence, which means that respondents who paid more for their blood thinner purchase tended to adhere less to their medication regimen.

Table 33. Correlations between Control Variables and Patient Medication Adherence

Control variables	Medication adherence
Age	.28**
Income	-.07
Education	-.03
Duration of blood thinner intake	.05
Out-of-pocket cost	-.27**
Number of prescription drug taken	.19**
Satisfaction with Doctor	.17**
Trust in Doctor	.17**

$**p < .01; *p < .05$

Relationships between categorical control variables and patient medication adherence were examined by conducting several t-tests. The results showed that the mean scores of patient medication adherence were significantly different between those with health insurance and those without (t (51.87) = 1.86, $p < .05$). That is, respondents with health insurance tended to adhere more to their blood thinner regimen. No other variables showed significant differences in medication adherence. The t-test results are summarized in Table 33.

Table 33. T-test Results for Relationships between Patient Medication Adherence and Control Variables

Control variables		N	Mean	SD	t (df)
Sex					
	Female	120	7.53	1.59	.62(238)
	Male	120	7.39	0.19	
Race	Non-Hispanic Whites	216	7.56	1.68	-1.87(25.61)
	Others	24	6.63	2.37	
Side effect experience	Experience	43	6.91	2.27	1.86(51.87)
	No experience	197	7.58	1.63	
Health insurance status	Insurance	228	7.52	1.72	2.28(238)*
	No insurance	12	6.33	2.46	

**$p < .01$; *$p < .05$

6.5.3. Regression analyses for testing the relationship between belief accessibility and patient medication adherence

The results from the preliminary correlation analyses showed that generally, there was no significant relationship between the belief response time variables and patient medication adherence, and between the content of evaluative beliefs and medication adherence. Response time of descriptive beliefs about the illness was positively related to patient medication adherence, but the correlation was not strong enough to test when including various control variables. Therefore, multivariate hierarchical regression analyses testing the hypotheses were performed only for the relationship between the content of descriptive beliefs and patient medication adherence, which are predicted by H5 through H7.

For each analysis, control variables were selected based on the preliminary bivariate analyses results. Since age, out-of-pocket cost, the number of prescription drugs taken, and satisfaction with and trust in doctors were significantly related to medication adherence, they were entered into regression as control variables. Between satisfaction with the doctor and trust in the doctor, a rather strong correlation was found (r = .67, $p < $ .01), causing multicollinearity concerns. As relevant previous research focused more on the effects of patient satisfaction with their medications rather than with their doctors (e.g., Gellad et al., 2009), trust in the current doctor was selected for this study's hypotheses testing.

To test H5 through H7, hierarchical regression analyses were conducted by entering age, out-of-pocket cost, number of drugs taken, and trust in the current doctor as control variables in the first block, and entering the three descriptive beliefs variables

(about the illness, about the drug benefits, and about the drug risks) in the second block. As presented in Table 34, the results demonstrated that the accuracy of descriptive beliefs about the illness and about the drug risks was positively related to patient medication adherence (descriptive beliefs about the illness: $\beta = .19$, $p < .01$; descriptive beliefs about the drug risks: $\beta = .16$, $p < .05$). In other words, respondents with more accurate beliefs about their blood clot problems and their blood thinner risks tended to adhere more to their medication regimen. Among the control variables, age was positively related to patient medication adherence ($\beta = .20$, $p < .01$), while out-of-pocket cost was negatively related to it ($\beta = -.20$, $p < .01$). The results suggested that older respondents with less burden of out-of-pocket cost tended to adhere more to their blood thinner regimen.

Overall, the results provide support for H5, which predicted a positive relationship between descriptive beliefs about the illness and patient medication. On the other hand, H6 (positive relationship between descriptive beliefs about the drug benefits and medication adherence) and H7 (negative relationship between descriptive beliefs about the drug risks and medication adherence) were not supported. H8 and H9, which predicted positive relationships between evaluative beliefs and patient medication adherence, were also not supported (see the preliminary correlation analysis results). The results were summarized in table 34.

**Table 34. Hierarchical Regression for Testing the Relationship between Patients'
Descriptive Beliefs and Medication Adherence (N = 234)**

	Predictors	*Beta*
Block 1.	Age	.20**
Control variables	Out-of-pocket cost	-.20**
	Number of drugs taken	.07
	Trust in doctor	.08
	Health insurance status	-.01
Block 2.	About the illness	.19**
Patients' descriptive	About the drug benefits	-.05
beliefs	About the drug risks	.16*
	$df = 8$, $MS = 20.33$, $F = 7.84$, $p < .01$; adjusted $R^2 = .19$	

$* p < .05; **p < .01$

Taken together, the results indicate that being accessible to accurate beliefs about

the illness and the drug risks were positively associated with patient medication

adherence. The hypotheses test results are summarized in Table 35.

Table 35. Summary of H5 ~ H9 Test Results

Hypotheses	Results	Other significant predictors
H5	Supported	Age (positive) and out-of-pocket
H6	Not supported	costs (negative)
H7	Not supported (Opposite direction is significant)	
H8	Not supported	
H9	Not supported	

DV: Patient medication adherence

6.6. RQ2: Mediation Effects of Belief Accessibility on the Relationship Between DTCA Exposure Frequency and Patient Medication Adherence

RQ2 examined whether DTCA exposure effects on patient medication adherence was mediated by the belief accessibility effects. Before testing the potential mediation effect, a series of correlation analyses were first conducted to explore about the relationship between DTCA exposure frequency and patient medication adherence.

6.6.1. Correlation analyses of the relationship between DTCA exposure frequency and patient medication adherence

As presented in Tables 36 and 37, the results of correlation analyses of the relationship between DTCA exposure frequency and patient medication adherence showed a negative relationship between DTCA exposure frequency and patient medication adherence. It means that patients who were more frequently exposed to DTC ads tended to be less adherent to their blood thinner regimen. The significantly negative relationship was found both at the category-level (except for TV DTCA exposure frequency) and the brand-level DTCA exposure frequency.

Table 36. Correlations between Category-level DTCA Exposure Frequencies and Patient Medication Adherence

	1	2	3	4
1.TV		.33**	.43**	-.12
2.Magazine			.57**	-.30**
3.Internet				-.21**
4.Medication Adherence				

***p < .01*

Table 37. Correlations between Brand-level DTCA Exposure Frequencies and Patient Medication Adherence

	1	2	3	4
1.Eliquis		.65**	.62**	-.15*
2.Pradaxa			.65**	-.20**
3.Xarelto				-.15*
4.Medication Adherence				

p < .05; **p* < .01

6.6.2. Mediation analyses for testing the mediation effect of descriptive beliefs on the relationship between category-level DTCA exposure frequency and patient medication adherence

Results from the earlier hypotheses testing results suggested that there could be a potential mediation effect of the content of descriptive beliefs on the relationship between the category-level DTCA exposure frequency and patient medication adherence. Hierarchical regression analyses for testing H1 through H2 showed significant relationships between the category-level DTCA exposure frequency and content of descriptive beliefs about the illness and the drug benefits, and the results from the hierarchical regression analyses for testing H5 through H7 demonstrated the positive relationship between the descriptive beliefs and medication adherence. Therefore, a series of mediation tests was conducted using a Sobel test for the effects of the content of descriptive beliefs on the relationship between category-level DTCA exposure frequency and patient medication adherence.

A series of Sobel tests was conducted by using the mediation analysis macro for SPSS developed by Preacher and Hayes (2004). The macro was developed for a formal direct test of the significance of the indirect effect of a mediator, by comparing the indirect effect to the null hypothesis that assumes the indirect effect is 0 (Preacher and Hayes, 2004). The Sobel test was conducted as follows: First, unstandardized coefficient and standard error (S.E.) of the relationships among the independent variable (IV), the mediation variable (MV), and the dependent variable (DV) were calculated by using simple OLS regression. The significance of the indirect effect (i.e., the product of the effect of IV on MV and the effect of MV on DV) was tested by comparing it to the null hypothesis.

The predicted mediation effect of the content of the descriptive beliefs about the illness on the relationship between DTCA exposure frequency and patient medication adherence was tested. Sobel test results showed that there was a significant mediation effect of descriptive beliefs about the illness on the relationship between Internet DTCA exposure frequency and patient medication adherence. The negative total effect of Internet DTCA exposure frequency becomes significantly weaker when it was mediated by the content of descriptive beliefs, which suggest that being accessible to accurate beliefs about the illness may reduce the negative effect of Internet DTCA exposure on patient medication adherence. However, the indirect effect of Internet on patient medication adherence seemed not to happen through increasing belief accessibility; Internet DTCA exposure frequency was still negatively related to descriptive beliefs about the illness in the mediation relationships. The relationship was summarized in Figure 20.

The mediation effect of descriptive belief accessibility was not found for the relationship between TV DTCA exposure frequency and medication adherence. Potential mediation effect of the content of descriptive beliefs about the drug benefits on the relationship between DTCA exposure frequency and patient medication adherence was also tested but no significant mediation effect was found. . Table 38 summarized the results of the Sobel tests. Overall, the mediation tests showed no evidence of DTCA's positive indirect effect on patient medication adherence via increasing patients' belief accessibility

Table 38. Mediation Analysis for Testing the Relationship among Category-level DTCA Exposure Frequency, Content of Patients' Descriptive Beliefs and Medication Adherence

IV: Category-level DTCA exposure frequency	MV: Content of the descriptive beliefs	Coefficient for the total effect	Coefficient for the direct effect	Indirect effect of IV on DV (SE)
TV	About the illness	-.12	-.14*	.01(.02)
Internet	About the illness	-.23**	-.16*	-.07 (.02)**
TV	About the drug benefits	-.12	-.13	.01(.01)
Magazine	About the drug benefits	-.39**	-.37**	-.02(.03)
Internet	About the drug benefits	-.23**	-.21**	-.02(.02)

DV = patient medication adherence; * $p < .05$; ** $p < .01$

Figure 20. Mediation Effect of Content of Descriptive Beliefs about the Illness on the Relationship Between Internet DTCA Exposure Frequency and Patient Medication Adherence
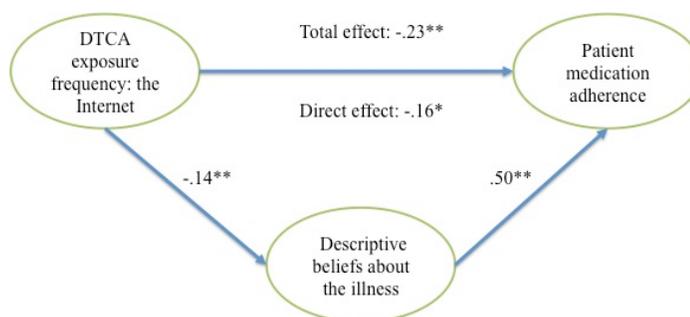
Chapter 7

SUMMARY AND DISCUSSION

DTCA of prescription drugs is one of the main pharmaceutical marketing methods, and heated debates about its potential positive and negative impacts on individuals and society have been continuing. DTCA supporters have argued for DTCA's various positive effects, such as its potential role as a patient health information source, encouraging patients to visit their doctors and to obtain timely disease diagnosis and treatment, reminding patients of their medication regimens, and reducing overall health costs. However, opponents contend that DTCA has many negative effects, such as providing inaccurate information, encouraging unnecessary prescriptions, and increasing misuse of prescription drugs, which lead to healthcare cost increase.

Although the potential effects of DTCA on patient medication adherence have been one of the main questions of the DTCA debates and patient medication non-adherence is an important issue in the pharmacy and public health fields, only a limited number of economic modeling studies exist on the potential effects of DTCA. By comparing the DTCA expenditure data and patient insurance claims data, the previous economic modeling studies have shown small but positive effects of DTCA on patient medication adherence. However, there is no empirical study on the relationship between individual-level DTCA exposure and patient medication adherence behaviors.

From a behavioral perspective, the current study examined the individual-level DTCA exposure effects on patients' medication-related beliefs and behaviors. Applying media priming effect theory, this study hypothesized that frequent DTCA exposure would influence patient medication adherence by increasing the accessibility of certain beliefs

about the relevant illnesses and drugs. Preliminary in-depth interviews and an online survey were conducted to test nine hypotheses and to address two research questions. The following section summarizes the main study findings.

7.1. Summary of Study Findings

This study hypothesized that frequent individual-level DTCA exposure would be positively related to the accessibility of patients' descriptive beliefs about their illnesses (H1) and their drugs' benefits (H2) and risks (H3), as well as evaluative beliefs about their illness severity (H4). Also, DTCA exposure frequency was predicted to have some influence on patients' evaluative beliefs about their drugs (RQ1). In turn, increased accessibility of descriptive and evaluative beliefs was expected to be related to patient medication adherence. Specifically, based on the previous research on medication adherence, patients' descriptive beliefs about their illnesses (H5) and their drugs' benefits (H6), and evaluative beliefs about the illness severity (H8) were predicted positively related to patient medication adherence. Descriptive beliefs about the drug risks were expected to be negatively related to patient medication adherence (H7). The relationship between evaluative beliefs about the drug and patient medication adherence would be dependent on the valence of the evaluative beliefs. Based on previous research, it was hypothesized that positive evaluative beliefs about their drugs would lead patients to better adhere to their medication regimen, while the opposite would occur if evaluative beliefs about their drugs were negative (H9). Lastly, this study tested the mediation effect of belief accessibility in between DTCA exposure and patient medication adherence (RQ2).

7.1.1. Priming effects of DTCA exposure on patients' beliefs about their illnesses and medications

The results of a series of hierarchical regression analyses provided only very limited support for priming effects of category-level DTCA exposure frequency on patients' descriptive beliefs about their illnesses and drugs. The priming effect hypotheses were supported only for the relationships between TV DTCA exposure frequency and the accuracy of descriptive beliefs about the illness and the drug benefits. Patients who were more frequently exposed to DTC ads on TV were likely to have more accurate descriptive beliefs about their blood clot problems and the benefits of their blood thinners. However, TV DTCA exposure frequency was not significantly related to other types of beliefs. Contrary to the hypotheses, magazine and Internet DTCA exposure had significant but negative relationships with some types of patient beliefs. Specifically, Internet DTCA exposure frequency was negatively related to patients' descriptive beliefs about their illnesses and the drug benefits, and magazine DTCA exposure frequency was negatively related to beliefs about the drug benefits.

The study findings did not provide any evidence of the brand-level effects of DTCA exposure frequency on belief accessibility. Also, DTCA exposure frequency had no significant relationship with evaluative belief accessibility or any of the response time measures of belief accessibility.

In addition to DTCA exposure frequency, sex and attention paid to health media were significantly associated with patients' descriptive beliefs about drug risks, and age was negatively related to patients' evaluative beliefs about the illness severity. In other words, female patients who paid less attention to health content in mass media were more

likely to have accurate beliefs about their drugs' risks, and older patients tended to evaluate their illness as being less severe.

7.1.2. Belief accessibility and patient medication adherence

The hypothesized effects of descriptive and evaluative belief accessibility on patient medication adherence were also tested. Hierarchical regression results generally did not support this study's hypotheses. The only result in line with the hypotheses was found for the relationship between the accuracy of descriptive beliefs about the illness and patient medication adherence. Patients who had more accessible beliefs about their blood clot problems tended to better adhere to their blood thinner regimen. Contrary to the hypothesis, the accessibility of descriptive beliefs about drug risks was positively related to patient medication adherence. The results suggested that patients who had more accessible beliefs about blood thinner risks tended to better adhere to their drug regimens. Response time measures of descriptive belief accessibility were not significantly related to medication adherence.

No significant relationship was found between evaluative beliefs (both content and response time) and patient medication adherence. Among the control variables, patient age was positively related to medication adherence, while out-of-pocket cost was negatively related to medication adherence. This means that older patients seemed to better adhere to their medication regimens, while patients who had greater financial burden in terms of drug costs were less likely to adhere to their medication regimens.

Finally, the mediating mechanism of DTCA priming effects on patient medication adherence through increasing certain types of belief accessibility was tested. Overall, correlation analysis results showed a generally negative relationship between DTCA

exposure frequency and patient medication adherence. However, a series of Sobel tests failed to provide support for the predicted mediation effect of DTCA exposure. Only one type of DTCA exposure frequency influenced patient medication adherence through one type of belief accessibility: The negative effect of Internet DTCA exposure frequency on patient medication adherence was mediated by increased accessibility of descriptive beliefs about the illness.

7.2. Discussion of Findings

7.2.1. Individual-level DTCA effects on patient medication adherence

The findings from the current study provide valuable insights into individual-level DTCA exposure's effects on patient medication adherence, an underexplored aspect of DTCA effects. Many of previous studies on the relationship between DTCA exposure and patient medication adherence tested the relationship by using DTCA expenditure data as a DTCA exposure indicator and patient insurance claims records as an indicator of medication adherence. These studies have focused on proposing and testing economic prediction models of patient medication adherence, considering DTCA as one of many predictors of medication adherence.

The current study is the first attempt to examine the relationship between DTCA exposure and patient medication adherence by directly measuring individual patients' DTCA exposure by media and by brands, and their medication-related beliefs and medication adherence behaviors. Furthermore, this study attempted to explain the potential relationship between DTCA exposure and patients' medication adherence by applying the media priming effect framework.

In contrast to previous studies, this study did not find evidence of a positive relationship between patients' individual-level DTCA exposure and their medication adherence. While previous econometric analysis studies showed a weak but positive relationship between DTCA expenditures and patients' medication adherence (e.g., Bowman et al. 2004; Donohue et al. 2004; Hansen et al. 2010; Wosinska 2005), this study's multivariate hierarchical regression results showed extremely limited support for the hypothesized relationships between individual-level DTCA exposure and medication adherence.

Particularly, the findings from this study suggest that DTCA exposure may not be directly related to patient medication adherence, but more closely related to some types of beliefs about the illness and the medication that are accessible in patients' mind. Multivariate hierarchical regression analyses results showed only limited support for the category-level DTCA exposure's relationship with patients' accessibility to specific types of descriptive beliefs about their illnesses and medications. Furthermore, the nature of the relationships between category-level DTCA exposure and descriptive belief accessibility seemed to differ by media; TV DTCA exposure showed the expected positive relationship with the accuracy of descriptive beliefs about illness and drug benefits, while magazine DTCA exposure was negatively related to descriptive beliefs about drug benefits, and Internet DTCA exposure was negatively related to descriptive beliefs about the illness and the drug.

The differences found across media channels can be explained in a couple of ways. First, the different ways in which drug benefit and risk information is presented in different types of DTC ads may explain the between-media differences found in this

study. Specifically, FDA requires all product-claim ads to disclose drug risk information by inserting brief summary of detailed information about the risks of the advertised drug in the main part of the ad. However, for broadcast ads, such as TV DTCA, the risk information disclosure requirement is differently applied: They are only required to include major risks of the drug as long as they provide alternative sources of detailed risk information (U.S. Food and Drug Administration, 2015). Typical examples are the small prints reading, "see our ads in XXXX magazine" or "visit our website at XXXX," presented in TV DTC ads. Therefore, compared to TV DTCA, magazine and Internet DTC ads tend to present more detailed drug risk information, and the detailed information could confuse or overwhelm patients, which in turn, could influence patients' descriptive beliefs about drug benefits and risks negatively.

Second, this study's sample characteristics, especially age, might explain the between-media differences in the relationship between category-level DTCA exposure frequency and descriptive belief accessibility. The sample of this study consisted of older patients, age between 45 and 80. Although there is no known study that directly tested how younger and older patients might react differently to DTC ads in different media channels, the health information seeking literature provides some relevant insights. Pervious literature on health information seeking demonstrated that older patients tended to prefer traditional media sources, such as TV and radio (Hall, Bernhardt, and Dodd 2015) and older patients were less likely to use Internet DTC ads as the prescription drug information source (DeLorme, Huh, and Reid 2011). Older patients' particular media preference and different levels of exposure to DTCA across different media might have some links to this study's findings.

Although some significant associations between category-level DTCA exposure and descriptive belief accessibility were found, the current study's findings showed that, in general, DTCA exposure frequency did not have significant indirect effect on patient medication adherence via belief accessibility. Overall, findings from this study suggest that DTCA may not be directly or indirectly related to patient medication adherence in a short period of time, but it may have some limited effects on priming patients' descriptive beliefs about their illnesses and the drugs.

7.2.2. The importance of patients' psychological characteristics as influencing factors on patient medication adherence

Previous studies from the pharmacy and public health fields have conceptualized patient medication adherence as a complex public health issue with various influencing factors, such as healthcare system factors, medication regimen factors, patient factors, and environmental factors (e.g., Gellad et al. 2009; Kronish and Ye 2013). The results from the current study also showed that demographic factors (age), healthcare system factor (out-of-pocket costs), and patients' psychological factors (descriptive beliefs about the illness and the drug benefits) were significantly associated with patient medication adherence.

Especially, this study's findings suggest the importance of patients' psychological factors, such as descriptive beliefs about their illnesses and their drugs, as significant influence on patients' medication adherence. Previous research and intervention campaigns to improve patient medication adherence tended to place more emphasis on healthcare system factors, based on the assumption that patients were mere followers of the guidance provided by healthcare providers (Sabatâe 2003). In terms of patient factors,

many previous studies based their conceptual frameworks and study designs on the

biomedical perspective, which might have caused them to focus more on patient

demographics than on psychological factors (Sabatâe 2003).

The current study's findings indicated that patients' beliefs were significantly

related to medication adherence even after controlling for patients' demographics,

healthcare provider factors, and medication-related factors. These findings suggest that a

patient's illness- and drug-related beliefs, which are psychological factors, are important

factors influencing medication adherence. Specifically, descriptive beliefs about the

illness were positively related to patient medication adherence, which is consistent with

previous study results (e.g., Kim et al. 2007; Mann et al. 2009).

In addition, this study separately tested potential effects of patients' descriptive

beliefs about drug benefits and risks on medication adherence and found some

differences between drug benefit and risk beliefs. Previous studies tended to

operationalize descriptive beliefs about drugs in general, without separating the concept

into beliefs about drug benefits and risks (e.g., Apter et al. 2003; Friedman et al. 2008;

Wells et al. 2008), and suggested a generally positive relationship between the accuracy

of the beliefs about drugs and patient medication adherence. However, this study's

findings showed that, while descriptive beliefs about drug benefits were not significantly

related to medication adherence, descriptive beliefs about drug risks were positively

related to patient medication adherence. The current study findings might be explained by

the nature of the main behavior goal of the maintenance- and habit- stage patients and its

connection to their motivation system activation. The sample of this study included

maintenance- and habit- stage patients, and the main behavioral goal for them tends to be

focused on maintaining their desirable healthy condition, which can be closely connected to the activation of behavioral inhibition motivation system (BIS). According to motivation system theory, BIS is connected to avoiding negative outcomes, such as punishments and pain (Carver and White 1994). Because the nature of the goal of maintenance- and habit-stage patients, their BIS system would likely be more activated than behavioral approach system (BAS). The activation of BIS system would, in turn, lead them to be more sensitive to drug risk information than benefit information, because drug risk information is more closely connected to the potential undesirable outcomes that they want to avoid to maintain their healthy condition.

Contrary to previous research findings, this study did not find any supporting evidence of the positive role of evaluative beliefs about illness severity and the medication. Previous medication adherence literature demonstrated that patients' evaluative beliefs about illness severity and the drug were positively related to medication adherence (e.g., Gellad et al. 2009; Park and Jones 1997), but such a relationship was not found in this study. The non-significant relationship might be due to the sample characteristics of this study. Most of the respondents of this study were highly adherent to their medication regimens, with high levels of habit strength. Prochaska and DiClemente's health behavior stage model proposed that the evaluation of risks and benefits of a certain health behavior would likely be an important factor for patients who are considering to initiate a new health behavior, which suggest that evaluative beliefs could be more influential in motivating patients in the initiation stage than those who in the maintenance or habit stage (Prochaska and DiClemente 1992).

7.3. Implications

7.3.1. Theoretical implications

Effects of media exposure on patient health behaviors

Previous research has paid limited attention to the effects of media exposure on individuals' health behaviors. The health belief model (HBM) is one of the few theoretical models that include the role of media as a predictor of patients' health behavior. However, the role of media messages in HBM is still very limited: The model proposes that individuals' perceptions about their illnesses and drugs are only influenced by demographic and psychological characteristics, which are free from other influences, such as media messages. In such a model, media messages are conceptualized as a cue-to-action that triggers individuals' heath behaviors by increasing the level of threat that individuals feel regarding their illnesses (Janz and Becker 1984).

Some researchers paid attention to the potentially important role of media messages on individuals' health behaviors. Particularly, Kremers (2010) proposed that mass media could work as an environmental factor that indirectly influence patients' behavior via patients' various psychological factors. In the context of patient medication adherence, Kronish and Ye (2009) proposed mass media as one of the environmental factors influencing patient medication adherence, and Wosinska (2005) suggested that DTCA exposure could increase the salience of certain types of beliefs about illness and drugs. However, the proposed role of media messages on patients' health-related perceptions and behaviors have not been empirically tested.

The findings of this study suggest that media messages may not directly influence individuals' health behavioral outcomes, but may play some indirect role through its

relationships with patients' psychological factors, such as beliefs. This study found that

frequent exposure to DTC ads did not seem to directly influence patient medication

adherence behavior, which is different from the HBM's assumption of media messages'

function as a cue-to-action. Instead, this study's findings demonstrated that some types of

DTC ads could increase the accessibility of patients' descriptive beliefs about their

illnesses and drugs. The findings suggest that media messages, such as DTCA, can play a

more important role in influencing patients' psychological factors than directly

influencing their behaviors. The effects of mass media, including advertising, on various

psychological factors related to patients' health behaviors should be further investigated.

Weak and limited media priming effects of advertisements

This study is one of the very few studies that empirically tested the media priming

effects of advertising. Previous media priming effect studies have focused on how

repetitive exposure to information from news media content, such as political news, can

increase audience' accessibility to cognitive constructs related to the particular media

content (Rokos-Ewoldsen et al. 2008). However, media priming effect should not be

confined to news exposure: Repetitive exposure to advertisements can also increase

chronic accessibility of the information or beliefs contained in the advertisements.

Specifically, due to the rather standardized nature of DTCA content across different

brands and drugs, frequent DTCA exposure can increase accessibility of illness- and

medication-related beliefs in patients' minds.

Despite advertising's potential to enhance consumers' chronic accessibility to

cognitive constructs from advertisements, there has been no known study about DTCA's

media priming effects on patient behavior. Although priming effect is not a new concept

to advertising researchers, previous advertising priming studies have focused on the very short-term priming effects of specific advertising content elements on subjects' immediate temporary access to beliefs and attitudes regarding the advertised product or brand (e.g., Yi 1993; Yoo 2011). The weak and mixed results found from this study suggest that advertising's media priming effect would likely be weak and limited, and call for further research.

7.3.2. Practical implications

Patient medication adherence is not only a public health issue but also closely linked to the long-term sales outcomes of pharmaceutical companies (MouKheiber 2012). The findings from this study offer some practical implications for pharmaceutical marketers.

First, the current study findings suggest that effective communication of information about seriousness of illnesses in DTC ads could have indirect impact on improving patients' medication adherence. The results showed that TV DTCA exposure was positively related to patients' accessibility to accurate beliefs about their illnesses, which was positively related to patients' medication adherence. As discussed earlier, the medication adherence behavior of the maintenance- and the habit-stage patients might be more influenced by BIS motivation activation, which is linked to the sensitivity to avoiding undesirable outcomes. Therefore, targeting this group of patients, advertising messages focusing on the seriousness of illnesses and consequences of not treating them would likely be more effective than focusing on drug benefits.

Second, this study's findings offer important insight addressing the question of possible negative effects of drug risk information in DTCA on patients' medication use

and adherence. The study results indicate no empirical evidence of the common concerns and speculations that drug risk information in DTCA might scare patients leading them to avoid taking their drugs that are necessary for treating their medical conditions. Based on the findings, pharmaceutical marketers should not be concerned about the possibility of DTCA's risk information causing patients' avoidance of drug treatment or diminished regimen adherence.

7.4. Limitations and Suggestions for Future Research

7.4.1. Limitations

This study has several limitations. First, this study was designed as a cross-sectional study. This study's methodological decision to use a cross-sectional survey method was made because patients' medication adherence behaviors are difficult to observe in an experimental setting (Park and Jones 1997), and in order to observe DTCA media priming effects in a natural setting. Due to the study method, while this study can suggest relations or associations between DTCA and presumed effects, it cannot offer a true causality test of DTCA effects. To address this limitation, future research should design a study that is more appropriate for testing the causal relationship. For example, longitudinal observational research in collaboration with the pharmacy department at healthcare facilities would be a good alternative method for testing the effects of DTCA on patients' medication adherence behaviors over time. Particularly, patient records from the pharmacy department can be used to identify patients at different stages of medication use and to track patients' medication use and refill over time. Also, qualitative methods could provide additional valuable insights on the relationship between DTCA exposure

and patient medication adherence. For example, ethnography can provide researchers a chance to holistically understand patients' experience with DTCA and their medications from patients' point of view (Lindlof and Taylor 2010).

Second, this study's sample is a non-probability sample, and thus the representativeness and generalizability of the study findings cannot be claimed. Because of the low incidence rate of chronic blood thinner users and a lack of data on the population of patients with blood clot problems, it was not possible to perform representative sampling of American patients on the blood thinner regimen. In addition, the sample tended to be homogenous in terms of the level of medication adherence and habit strength. More than 50% of the respondents were very highly adherent to their blood thinner regimens (i.e., a score of 8 or 9) and the mean habit strength of the sample was 4.34 out of 5, which indicates that a majority of the study participants were in the habit stage. This may have made it difficult to detect the hypothesized DTCA effects. The current study intended to compare DTCA's priming effects on patients in different medication adehrence stages, but due to the limitation of the sample, such comparisons could not be performed. Therefore, the findings from this study should be cautiously interpreted and future research needs to implement more careful sampling approaches to include more diverse respondents and to test the potential differences in medication adherence between maintenance-stage and habit-stage patients.

One possible way to identify the maintenance- and habit-stage patients more accurately is using patient records. Patient records can help identify patients who recently initiated a drug regimen and made transition to the early period of the maintenance stage. By tracking the pattern of medication-related behaviors of patients who first obtained

their prescription, patients' medication adherence stage can be more accurately identified. Another way to identify maintenance-stage patients is to include more relevant screening questions. For example, the results from the preliminary qualitative study suggested that habit-stage patients tended to show stronger habit characteristics than maintenance-stage patients. Therefore, the habit-strength scale developed in the prescription medication context can be used as a screening question for patients' medication use stage determination.

Third, this study relied on a self-reported medication adherence measurement. Self-reporting is one of the commonly used medication adherence measurements that can be effectively administered through a survey. However, self-reporting alone cannot accurately capture patient medication adherence. Previous studies compared other types of medication adherence measurements (e.g., biological markers and pill count) and respondents' self-reports, and found that self-reports tended to inflate the medication adherence rate (e.g., Paulson, Krause, and Iber 1977; Rand et al. 1992). Future research should employ both self-reporting and other types of medication adherence measurements.

Fourth, this study's response-time measurements were susceptible to response time differences caused by individual respondents' computer and Internet connection conditions. This study used the timing function provided by Qualtrics, which recorded the timing of respondents' first click, last click, and the page submission made within a page. The timing function is a convenient way to measure belief accessibility in an online survey, but its reliability could be affected by each respondent's Internet connection speed and device functions. Although a baseline response time measurement was

incorporated, this study could not control each respondent's survey-taking environment,
such as the computer or mobile device used for taking the survey, or the speed and
reliability of the Internet service that each respondent used. The lack of control over
respondents' survey taking devices and the Internet service may have influenced
respondents' response timing: While some respondents' Internet connections might be
consistently reliable and fast, others might have experienced slow connection speeds.
Also, the devices' processing abilities could have affected the webpage loading speed,
which might have affected the response time data. Future research should develop a more
reliable way to control each respondent's survey-taking environment and to measure
response time more accurately.

7.4.2. Future research directions

Building upon this study's findings and considering its limitations, future research
should continue investigating DTCA's role on patients' medication use and medication
regimen adherence. First, the relationship between DTCA exposure and patient
medication adherence should be examined beyond the category-level DTCA exposure
effects. Previous studies tended to investigate category- or brand-level DTCA effects on
patient medication adherence, because they usually tested the relationship in a specific
prescription medication context. For example, Wosinska (2005) investigated the
relationship in the context of statins and Hansen et al. (2010) examined the relationship in
the anti-depressant context. The results from previous studies consistently showed weak
but positive category-level DTCA effects on patients, which suggest that patients were
influenced by overall exposure to DTC ads for drugs treating the same or similar illness,
rather than influenced by ads for specific brands. Current study also suggests limited

category-level DTCA effects. Given that no research has investigated effects of general DTCA exposure across different drug categories on patients' medication use behaviors, future research is encouraged to investigate the potential relationship between general exposure to all types of DTCA and patient medication-related perceptions and behaviors.

Second, DTCA's priming effects on other cognitive constructs in patients mind need to be examined. This study examined DTCA's effects on patient medication adherence through enhancing chronic accessibility to illness- and medication-related beliefs, and showed limited priming effects of DTCA on specific types of beliefs. However, frequent exposure to DTCA could have other types of priming effects on patients by increasing the accessibility to other types of cognitive constructs. One potential cognitive construct that can be primed by DTC ads is a healthy living goal. DTCA constantly depicts healthy and active individuals involved in various healthy behaviors, such as having a physically active lifestyle, eating healthy foods, and spending quality time with friends and family. Through frequent exposure to healthy lifestyles depicted in DTCA, patients may be primed to set a goal of living a healthy life. As a cognitive construct, goals can be primed through media exposure (Price and Tewksbury 1997), but the potential goal-priming effects of media exposure have not been studied in detail. Future research should investigate the potential goal-priming effects of frequent DTCA exposure.

Third area that future research should consider is the effect of general media coverage of prescription drugs and other competing advertisements, which may influence DTCA effects on patient medication adherence. Wosinska (2005) suggested that other than DTCA exposure, there might be effects caused by news media exposure on patients'

medication adherence. During the data collection period of Wosinska's study, there was a case of the withdrawal of Baycol, which was one of prescription cholesterol medications. Wosinska speculated that heavy media coverage of the Baycol case and its role in patients' deaths might have influenced patients' drug regimen adherence. Specifically, the heavily covered negative consequences of Baycol were likely to have enhanced cholesterol patients' accessibility to beliefs about the drug risks.

In addition to the potential priming effects of media news coverage of prescription drugs, some competing advertising messages regarding prescription medications can also affect patients. For example, various law firms run advertisements seeking for potential clients to participate in their class action lawsuits against the makers of prescription medications. Such class action lawsuit advertisements tend to emphasize most serious side effects of prescription medications, which can influence patients' beliefs about medication benefits and risks. Future research should examine how competing media coverage and advertisement messages can influence DTCA effects on patients' belief accessibility and medication adherence.

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Appendix A. Online Survey Questionnaire

INFORMATION ABOUT THE RESEARCH

Consumer Perceptions of Blood Thinner Medication Advertisements

You are invited to be in a research study about consumer perceptions of advertisements for prescription blood thinners. You were selected as a possible participant because you volunteered to participate in the study.

This study is being conducted by Heewon Im (imxxx037@umn.edu), Ph.D. candidate at the University of Minnesota's School of Journalism and Mass Communication.

Procedures:

If you agree to be in this study, I would ask you to do the following things:

You will answer online survey questions about your experience and perceptions of prescription drug advertisements, beliefs about your blood clot problem and blood thinner taking behavior and the blood thinner medication you're currently taking. The study will take about 15 to 20 minutes of your time.

Confidentiality:

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relation with the University of Minnesota or Qualtrics. If you decide to participate, you can choose not to answer any questions or can withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is Heewon Im. If you have questions, **you are encouraged** to contact the researcher at the School of Journalism and Mass Communication, University of Minnesota, 330 Murphy Hall, 206 Church St. Southeast, Minneapolis, MN 55455, (612) 626-0221, imxxx037@umn.edu. You may also contact the researcher's faculty advisor Professor Jisu Huh at the School of Journalism and Mass Communication, University of Minnesota, 338 Murphy Hall, 206 Church St. Southeast, Minneapolis, MN 55455, (612) 626-5527, jhuh@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, MN 55455, (612) 625-1650.

If you want, you can request the researcher (Heewon Im, imxxx037@umn.edu) an electronic copy of this information to keep for your record.

I have read and understand the information above, and I agree to participate in this study.

Yes
No **(If "No" is selected, skip to the end of survey)**
<Page Break>

Q1. What is your age as of today? Please enter your age in the space below.

_____ years old

(If Q1 is less than 45 or is greater than 80, skip to the end of survey)

Q2. What is your sex?

Male   Female

Q3. Are you currently taking any prescription oral blood thinner medications?

Prescription blood thinners are medications prescribed to prevent blood clots from forming. Coumadin, Eliquis, Pradaxa, Xarelto and Wafarin are examples of oral prescription blood thinners. Please select "No," if you are taking aspirin (because it is not a prescription blood thinner) or receiving Heparin or other injection form of blood thinners.

Yes

No **(If "No" is selected, skip to the end of Survey)**

<Page Break>

Q4. The following statements are about your **current blood thinner regimen**. Please indicate how much you agree or disagree with each statement.

	Strongly disagree	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat agree**	**Strongly agree**
I take my blood thinner automatically.					
It makes me feel weird if I do not take my blood thinner.					
I take my blood thinner without much thought.					
Taking my blood thinner is part of my daily or nightly routine.					

<Page Break>

Q5.Please answer the following questions about your **current blood thinner regimen** by
     choosing either **"yes" or "no" for each question**.

Questions	Yes	No
Do you sometimes forget to take your blood thinner pills?		
Have you ever forgot to refill the prescription for your blood thinner?		
Over the past 2 weeks, were there any days when you did not take your blood thinner?		
Have you ever cut back or stopped taking your blood thinner without telling your doctor?		
Did you take your blood thinner yesterday?		

Q6. Below are some reasons people miss or stop taking their blood thinner. Choose any that
    have ever applied to you **(Choose all that apply)**.

    A change in routine
    Cost of the medication
    Simply forgetting
    The medication made me feel worse
    Traveling or being away from home
    It felt like my blood clot problem was under control
    It seems like a hassle to stick to the treatment plan
    None of the above/ I have never missed or stopped taking my blood thinner.

Q7. How often do you have difficulty remembering to take your blood thinner?

      Never   Rarely   Sometimes   Often   Very Often
         -------------- -------------- -------------- ---------------

<Page Break>

Instructions for Q8-1 through Q8-13: In this section, you will see a series of short statements
about blood clot problems and blood thinners. If you believe the statement is true, click "yes" or
if you believe it's untrue, click "no."

Please try to click your answer as quickly as possible without thinking too much.
<Page Break>

Q8-1.   Both men and women could have blood clot problems.

Yes   No

<Page Break>

Q8-2.   Blood clots could cause a stroke.

Yes   No

<Page Break>

Q8-3.   Blood clots could cause indigestion.

Yes   No

<Page Break>

Q8-4.   Blood clots could cause damages to the lungs and other organs.

Yes   No

<Page Break>

Q8-5.   Blood clots can be treated with dietary changes.

Yes   No

<Page Break>

Q8-6.   Blood thinners could cause severe bleeding.

Yes   No

<Page Break>

Q8-7.   Blood thinners could cause a person to bruise easily.

Yes   No

<Page Break>

Q8-8.   Blood thinners could cause blindness.

Yes   No

<Page Break>

Q8-9.   Stopping blood thinners could increase the risk of stroke.

Yes   No

<Page Break>

Q8-10.   Blood thinners lower the chance of blood clot formation.

Yes   No

<Page Break>

Q8-11.   Blood thinners could improve lung functions.

Yes   No

<Page Break>

Q8-12.   Blood thinners reduce the risk of stroke.

Yes   No

<Page Break>

Q8-13.   Blood thinners could improve digestion.

Yes   No
<Page Break>

Instructions for Q9-1 through Q9-7: In this section, you will see several pairs of adjectives that might describe your thoughts and feelings regarding your **blood clot problem**. Please click the adjective that is consistent with your thoughts or feelings.

Please try to click your answer as quickly as possible without thinking too much.
<Page Break>

Q9-1.   My blood clot problem is…

Treatable   Untreatable
<Page Break>
Q9-2.   My blood clot problem is…

Manageable   Unmanageable
<Page Break>
Q9-3.   My blood clot problem is…

Severe   Not severe
<Page Break>
Q9-4.   My blood clot problem is…

Serious   Not serious
<Page Break>
Q9-5.   My blood clot problem is…

Important   Unimportant
<Page Break>
Q9-6.   My blood clot problem is…

Significant   Insignificant
<Page Break>
Q9-7.   My blood clot problem is…

Not frightening   Frightening
<Page Break>

Instructions for Q10-1 through Q10-7: In this section, you will see several pairs of adjectives that might describe your thoughts and feelings regarding the **blood thinner you're currently taking.** For each sentence, please click the adjective that is consistent with your thoughts or feelings.

Please try to click your answer as quickly as possible without thinking too much.
<Page Break>

Q10-1.   My blood thinner is...

           Beneficial   Harmful
<Page Break>
Q10-2.   My blood thinner is...

           Safe   Unsafe
<Page Break>
Q10-3.   My blood thinner is...

           Effective   Ineffective
<Page Break>
Q10-4.   My blood thinner is...

           Successful   Unsuccessful
<Page Break>

Q10-5.   My blood thinner is...

           Important   Unimportant
<Page Break>
Q10-6.   My blood thinner is...

           Essential   Optional
<Page Break>
Q10-7.   My blood thinner...

           Makes me feel better   doesn't make me feel better
<Page Break>

The following questions ask about your typical media use.

Q11.   On **a typical weekday**, about how many hours and minutes do you spend using the following media? **Please type how many hours and minutes**.

Example:
1) If you spend less than an hour, please type "0" in the hours column and type in the minutes column.

2) If you do not use the specific medium, please type "0" in both the hours and minutes columns.
3) If you spend about 2 hours, type "2" in the hours column and type "0" in the minutes column.

	Hours	Minutes
Reading newspapers (**excluding online reading**)		
Watching television (**excluding online viewing**)		
Reading magazines (**excluding online reading**)		
Listening to the radio (**excluding online listening or podcasts**)		
Using the Internet for non-work purposes		

Q12.   On **a typical weekend**, about how many hours and minutes do you spend using the following media? **Please type how many hours and minutes.**

	Hours	Minutes
Reading newspapers (**excluding online reading**)		
Watching television (**excluding online viewing**)		
Reading magazines (**excluding online reading**)		
Listening to the radio (**excluding online listening or podcasts**)		
Using the Internet for non-work purposes		

<Page Break>

Q13.   Some media provide health content (e.g., articles about health in newspapers or magazines, health-related news on TV or the radio, health segments on TV or radio shows, and health information on the Internet). About how often have you read or heard such health content from the following media in **the past 3 months**?

	Never	Less than once a month	About once or twice a month	About once a week	Several times a week	Almost every day

In newspapers						
On television						
In magazines						
On the radio						
On the Internet						

<Page Break>

Instruction for Q14-1 through Q14-5: Please indicate how much attention you pay to health or medical topics in each of the following media sources.

Q14-1.   In newspapers

None ----------- ----------- ----------- ----------- A lot
Q14-2.   On television

None ----------- ----------- ----------- ----------- A lot
Q14-3.   In magazines

None ----------- ----------- ----------- ----------- A lot
Q14-4.   On the radio

None ----------- ----------- ----------- -----------   A lot

Q14-5.   On the Internet

None ----------- ----------- ----------- -----------   A lot

<Page Break>

The following questions ask about **<u>blood thinner advertisements (ads)</u>**.

Q15.   How often have you seen ads for **blood thinners** in the **past 3 months**?

	Never	**Less than once a month**	**About once or twice a month**	**About once a week**	**Several times a week**	**Almost every day**
In newspapers						

On television						
In magazines						
On the radio						
On the Internet						

(If you selected "Never" for all 5 types of media, skip to Q19.)

Q16.   Please try to remember **the most recent blood thinner ads** you've seen or heard**.** Please type all things you can remember from the ads (e.g., drug brand name, what happens in the ad, etc.). If you remember nothing particular, type "None."

<Page Break>
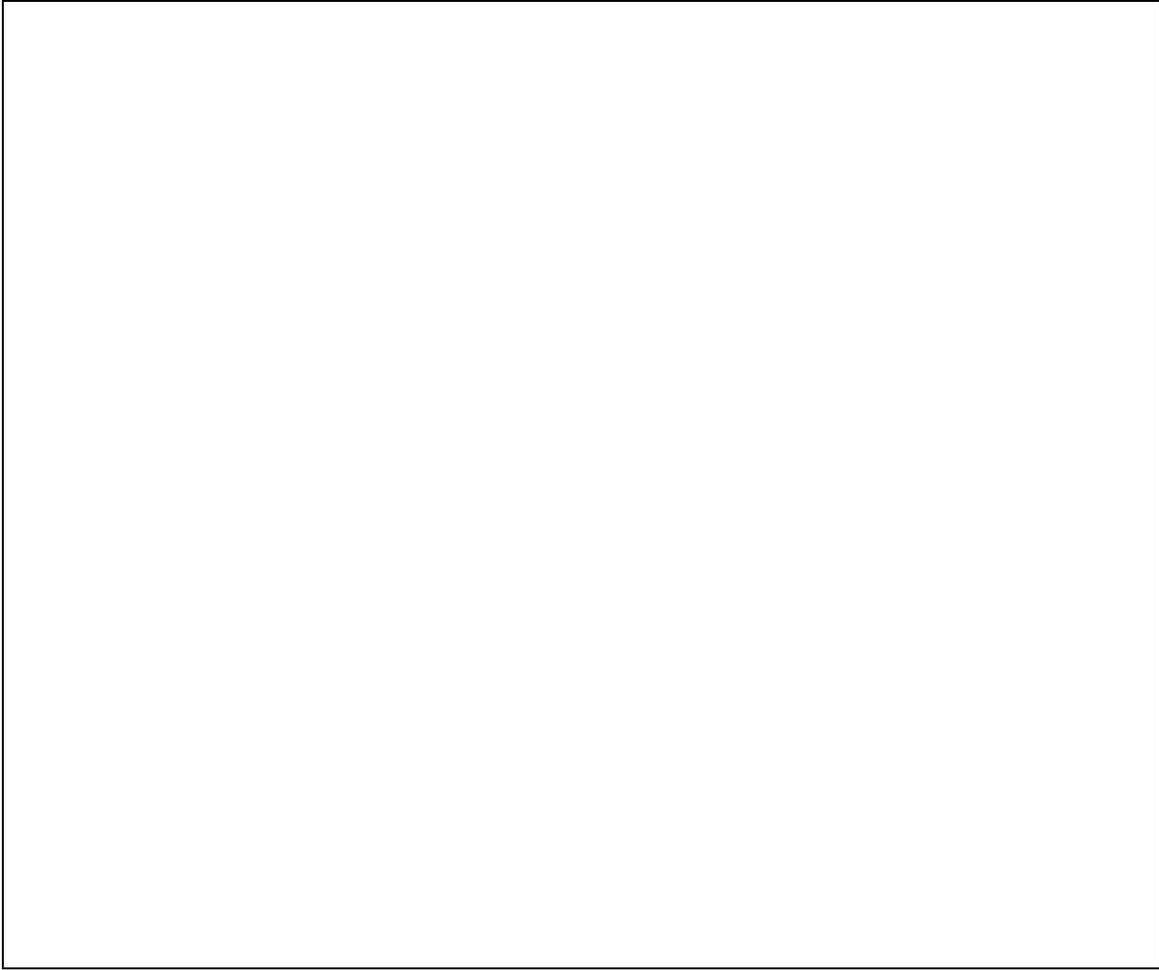
Q17.   Have you seen or heard ads for the following drug brands within **the past 3 months**? Place click the box next to the brand name **(choose all that apply).**

Aggrenox	Plavix
Brilinta	Pletal
Coumadin	Pradaxa
Effient	Ticlid
Eliquis	Warfarin
Jantoven	Xarelto
Persantine	None of the above

<Page Break>

Instruction for Q18-1 through Q18-4: In this section, you will see a series of blood thinner ads. Please click and watch each ad before answering the question, and indicate **whether or not you have seen the ad within the past 3 months.**

Q18-1.   Have you seen or heard this ad within **the past 3 months**?
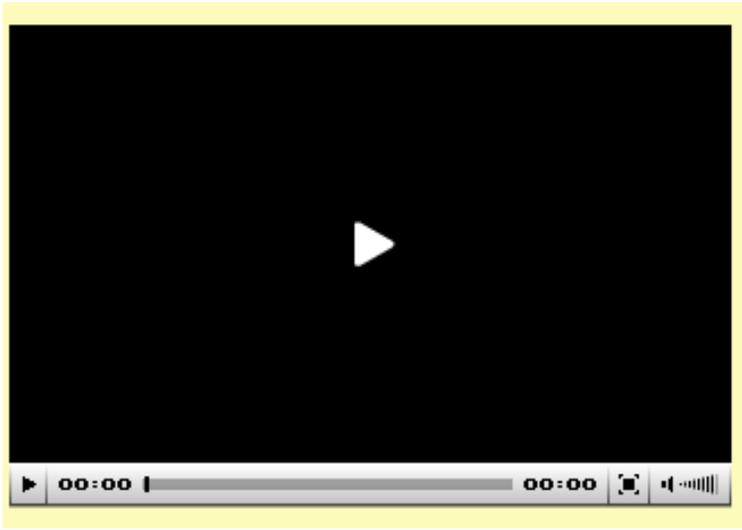
Yes, I have seen it.   No, I have not seen it.

Q18-2.   Have you seen or heard this ad within **the past 3 months**?
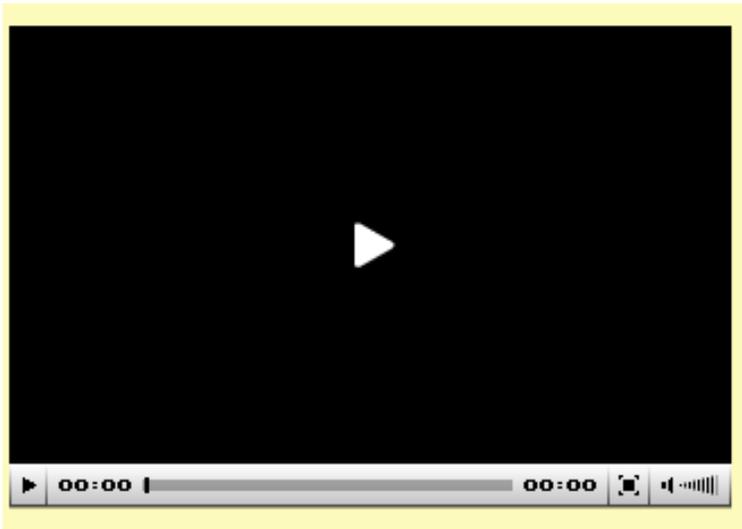

Yes, I have seen it.   No, I have not seen it.

Q18-3.   Have you seen or heard this ad within **the past 3 months**?

Yes, I have seen it.   No, I have not seen it.

Q18-4.   Have you seen or heard this ad within **the past 3 months**?
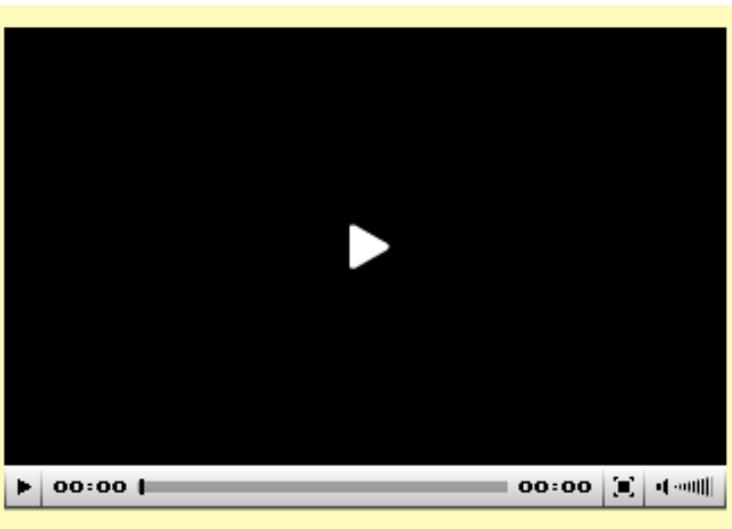
Yes, I have seen it.   No, I have not seen it.

\<Page Break\>

Q19.   How often have you seen ads for the following blood thinner brands within **the past 3 months**? If you have not seen any particular blood thinner ad, please select "Never" for that particular brand ad.

	Never	Less than once a month	About once or twice a month	About once a week	Several times a week	Almost every day
Coumadin						
Eliquis						
Pradaxa						
Xarelto						
Warfarin						

<Page Break>

Q20. What is the name of the blood thinner that you are currently taking? (Please check the label of your prescription medication container.) _____

Q21. Have you ever been prescribed other blood thinners before being put on your current blood thinner regimen?

       Yes   No

Q22. Approximately how long have you been taking your current blood thinner? Please type the duration in the boxes below. (You should fill out all the boxes to go on to the next page).

Example:
1) If you have taken the medication for about 6 months, type "6" in the month(s) box and type "0" in the year(s) box.
2) If you have taken the medication for about 2 years, type "0" in the month(s) box and type "2" in the year(s) box.

	Months(s)	**Year(s)**
I have been taking my current blood thinner for		

\<Page Break\>

Q23. Do you currently have health insurance?

Health insurance include private healthcare purchased through your current or former employer or union or purchased by you or your family members, public insurance such as Medicare and Medicaid, TRICARE or other military healthcare and VA.

       Yes   No **(If "No" is selected, skip to Q29.)**

Q24. Does your health insurance provide prescription medication coverage?

       Yes   No **(If "No" is selected, skip to Q29.)**

Q25. Do you use your prescription medication coverage provided by your health insurance?

       Yes   No **(If "No" is selected, skip to Q29.)**

Q26. Do you use your prescription medication coverage provided by your health insurance to purchase **your current blood thinner**?

       Yes   No **(If "No" is selected, skip to Q29.)**

Q27. How many days of supply do you get for your current blood thinner?

30 days   60 days   90 days   Other (Please type the number in the box)_____

Q28.   How much do you co-pay (the cost you pay in addition to the insurance coverage) for your **current blood thinner**? Please write down the cost per your typical days of supply answered in Q27.

$ _____

Q29.   On average, how much do you pay out of pocket **per month** for your blood thinner?

$ _____ per month
(If "Yes" is selected in Q26, do not show this question.)
<Page Break>

Q30.   How often do you take your blood thinner on a typical day?

Once
Twice
More than twice: Please type how many times you take on a day. ____

Q31.   Other than the blood thinner, do you take any other prescription medication(s) on a regular basis?

Yes   No **(If "No" is selected, skip to Q33.)**

Q32.   How many prescription medications are you currently taking? Please type the number of medications you take (including the blood thinner). _____

Example: If you're currently taking one blood thinner, two prescription medications for high blood pressure, and one prescription medication for diabetes, write "4."

Q33.   Which of the following medical conditions do you take your blood thinner for? **(Choose all that apply.)**

Atrial fibrillation (AF or AFib) not caused by a heart valve problem
Coronary artery disease or coronary heart disease
Deep vein thrombosis (DVT) or blood clots in legs
Pulmonary Embolism (PE) or blood clots in the lung
Family history of blood clot formation
Heart valve disease
Stroke
Hip or knee replacement surgery
☐ Heart valve surgery
Other: Please type your medical condition in the blank. _____
<Page Break>

Q34.   Have you ever experienced any **side effects** while taking your **current blood thinner**?

       Yes   No **(If "No" is selected, skip to Q35.)**

Q35.   Did you report the **side effect(s)** of your **current blood thinner** to your doctor?

       Yes   No

<Page Break>

Q36.   How many times did you visit your doctor for a regular blood monitoring (the international normalized ratio test or INR test) last month?

       Never in the last month
       Once
       Twice
       More than twice

Q37.   Overall, how satisfied are you with your current doctor who checks your blood clot problem?

       Very dissatisfied
       Somewhat dissatisfied
       Neither satisfied nor dissatisfied
       Somewhat satisfied
       Very satisfied

Q38.   Overall, how much do you trust your current doctor who checks your blood clot problem?

       Highly distrust the doctor
       Somewhat distrust
       Neither trust nor distrust
       Somewhat trust
       Highly trust

<Page Break>

Q39.   The following statements are about your typical reactions to your doctor's advice or treatment recommendations or your healthcare decision-making. Please indicate how much you agree with each statement by selecting one of the five options for each.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I almost always rely on and act upon the advice of my doctor.					
When it comes to making decisions about my health, I am more independent than conforming.					
If my doctor is very persuasive, I tend to change my opinion.					
I do not give in to my doctor easily.					
I tend to rely on my doctor when I have to make an important decision about my health.					

<Page Break>

Q40.   What is your combined **annual household income**, meaning the total pre-tax income from all sources earned in the past year?

$0 to $9,999
$10,000 to $14,999
$15,000 to $19,999
$20,000 to $34,999
$35,000 to $49,999
$50,000 to $74,999
$75,000 to $99,999
$100,000 to $199,999
$200,000 or more

Q41.   What is the highest grade of school you have completed or the highest degree you have received?
No schooling completed, or less than 1 year
Nursery, kindergarten, and elementary (Grade 1–8)
High school (Grade 9–12, no degree)
High school graduate (or equivalent)
Some college (1–4 years, no degree)
Associate degree (including occupational or academic degrees)
Bachelor's degree (BA, BS, AB, etc.)
Master's degree (MA, MS, MENG, MSW, etc.)
Professional school degree (MD, DDC, JD, etc.)
Doctoral degree (PhD, EdD, etc.)

Q42.   Which state do you currently reside in? _____

Q43.   Are you of Hispanic, Latino, or Spanish origin?
No, not of Hispanic, Latino, or Spanish origin
Yes, of Hispanic, Latino, or Spanish origin

Q44.   What is your race?
White
Black, African American
American Indian or Alaska Native
Asian
Native Hawaiian or other Pacific Islander
Other or mixed

Thank you for your participation. Have a wonderful day!

Appendix B. Belief Accessibility Measurement Example

Timing

These page timer metrics will not be displayed to the recipient.
First Click: *0 seconds.*
Last Click: *0 seconds.*
Page Submit: *0 seconds.*
Click Count: *0 clicks.*

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Q8-2. Blood clots could cause a stroke.

Yes
○

No
○