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Beyond Initial Disclosure: The Role of Prognosis and Symptom Uncertainty in Patterns of Disclosure in Relationships

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This study is framed in Greene's (2009) health disclosure decision-making model (DD-MM) and explores the role of prognosis and symptom uncertainty in patterns of disclosure in a close relationship. Toward this end, an *uncertainty and disclosure* model is hypothesized in which prognosis and symptom uncertainty and relational quality are expected to predict perceived partner support, communication efficacy, and the depth, breadth, and frequency of disclosure to a partner about a chronic health condition. Patients with diagnosed heart-related conditions visiting a private medical office were recruited to complete anonymous surveys. Results indicated that (1) the key mechanisms identified in the DD-MM are associated with the depth, breadth, and frequency of disclosure to a partner about a health condition, and (2) uncertainty plays a prominent role in people's communication with their partner about the heart-related condition. The findings and implications of the study are discussed.

One key facet of managing health conditions is making choices about sharing information. Much research to date has explored the disclosure decision-making process in terms of sharing one particular piece of information such as a diagnosis. Such research informs scholars, for example, about the functions, reasons, and motivations for sharing personal information (see Derlega, Metts, Petronio, & Margulis, 1993; Greene, Derlega, & Mathews, 2006), private information (Petronio, 2002), and secrets (Vangelisti, Caughlin, & Timmerman, 2001). Recent models of disclosure decision making (e.g., Afifi & Steuber, 2009; Greene, 2009; Omarzu, 2000) suggest that people weigh or balance numerous factors such as the risks and benefits of revealing (or not) prior to enacting a disclosure message.

Although research on managing one piece of information continues, we know less about subsequent disclosure patterns. Disclosures do not necessarily cease after an initial revelation, or they may not be complete; that is, people continue to disclose information related to topics that are already known to the other person. In terms of sharing health-related information, Greene (2009) suggests that "people are constantly in a process where decisions have to be made about sharing updates, not simply the initial diagnosis" (p. 232). Additionally, although prior disclosure research has emphasized acute, life-threatening, and often contagious health conditions, many people are living with chronic health conditions and are making decisions about providing information to others regarding their condition on an ongoing basis. A chronic disease is defined as a noncommunicable illness that is prolonged in duration, does not resolve spontaneously, and is rarely cured completely (CDC, 2009). Chronic diseases such as cardiovascular disease (primarily heart disease and stroke) and diabetes are among the most prevalent of all health problems (CDC, 2009).

Uncertainty is a key component in illness experiences (see Babrow & Matthias, 2009; Hogan & Brashers, 2009; Mishel & Clayton, 2003). Prior studies highlight the antecedents of uncertainty in illness (e.g., Mishel, 1990), the dimensions of uncertainty (e.g., Babrow, 2007; Babrow & Matthias, 2009; Brashers, 2001), and how people manage uncertainty (e.g., Brashers, 2001; see also Hogan & Brashers, 2009). The prolonged course of illness/disability from chronic conditions such as diabetes, arthritis, and cardiovascular diseases often results in extended pain and decreased quality of life for millions of Americans (CDC, 2009). Although improved capabilities in diagnosis and treatment of such diseases may benefit patients and families, such improvement also "sets the stage for numerous sources of uncertainty" (Goldsmith, 2009, p. 209).

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Uncertainty is also an underlying feature of disclosure decisions (Greene, 2009), as people report uncertainty about whether to disclose or avoid regarding health information. A person might be uncertain about the implications of a new piece of information (e.g., results of a blood test or x-ray) and avoid sharing the information with a spouse/partner, or s/he could disclose immediately or plan to share later. People experience uncertainty variously, not simply as an uncomfortable tension demanding reduction. At times, uncertainty is a desirable state to maintain, rather than a dissonant state that requires resolution (Babrow, 2007; Brashers, 2007; see also Babrow & Matthias, 2009; Hogan & Brashers, 2009). Despite extensive theorizing and qualitative applications, relatively little is known quantitatively about how uncertainty influences disclosure decision making. Some research has shown how uncertainty influences communication in chronic illness such that people perceive the ability to talk about certain topics (e.g., treatment decisions) but may avoid discussing sensitive issues such as fears about the future (e.g., Goldsmith, 2009; Goldsmith, Miller, & Caughlin, 2007). However, more research is needed to understand how uncertainty influences people's patterns of disclosure or nondisclosure (such as to a partner) as they manage chronic health conditions. Clearly, additional research in this area would be fruitful to address these issues. Thus, the goal of this study is twofold: (a) to look beyond initial disclosure of health information (e.g., a diagnosis) by examining people's patterns of disclosure (e.g., depth, breadth, and frequency) of health information to a partner, and (b) to provide a clearer understanding of how uncertainty surrounding a chronic health condition influences disclosure decision-making patterns. The model of health disclosure decision making (DD-MM; Greene, 2009) provides a framework for this study because it identifies and operationalizes key factors influencing decisions to disclose health information and recognizes the foundational role of uncertainty.

MODEL OF HEALTH DISCLOSURE DECISION MAKING

The DD-MM (Greene, 2009) argues that health disclosure decision making is a process in which disclosures occur based on assessment of three main factors. Individuals *assess information,* such as a new health diagnosis, in terms of five aspects including preparation (e.g., expected or unexpected), prognosis (e.g., acute or chronic), relevance to others (e.g., communicable or noncommunicable), symptoms (e.g., visible or nonvisible), and stigma (e.g., HIV/AIDS diagnosis). Recent tests of the DD-MM examined sharing personal information in terms of valence (Greene et al., 2009) similar to prior disclosure studies (e.g., Afifi & Steuber, 2009; Vangelisti et al., 2001), and health information in relation to the DD-MM's five components (Greene et al., 2010). The current study focuses on symptom and prognosis uncertainty.

Uncertainty in illness is complex and stems from many sources (Brashers et al., 2003), and people experience various types of uncertainty simultaneously (Babrow, 2001; Brashers, 2001). People with chronic health conditions such as heart disease may experience uncertainties about disease prognosis or symptoms that focus on the *self* (e.g., unknown future physical limitations), *other* (e.g., a partner's concerns), and/or their *relationship* with others (e.g., whether the condition affects the relationship) (see Brashers, 2001; Greene et al., 2006). For symptom uncertainty, visibility of symptoms is only one of many types of uncertainty related to a heart condition. Others might include severity of symptoms, whether a new symptom is an indicator of a change in one's condition (versus a medication side effect), or whether a new or changing symptom requires a visit to a doctor (or emergency department). Similarly, uncertainty about one's prognosis with a heart-related condition might focus on the immediate future (e.g., "Can I play golf?") or the longer term (e.g., "Will we grow old together?"). Thus, the focus for this project is on symptom and prognosis uncertainty in relational disclosure—in DD-MM terms, uncertainty related to the health condition. The DD-MM argues that, in addition to assessing health information uncertainty, people also assess a receiver in disclosure decisions.

Assess the receiver is another component of the DD-MM that involves evaluating *relational quality* and *anticipated reaction*. In general, better relational quality is associated with more positive perceptions of anticipated reaction (Greene et al., 2009; Greene et al., in press; see Afifi & Olson, 2005; Afifi & Steuber, 2009), and this association with relational quality has received a great deal of attention in the literature. Greene et al. (2009) conceptualize anticipated reaction as anticipated *response* (e.g., provision of support) and anticipated *outcome* (e.g., relational consequences). A discloser anticipates a *response* such as an answer or reply to the disclosure communicated in words and/or action immediately following a disclosure. Additionally, a discloser anticipates an *outcome*, defined as the final product or consequence of the disclosure. As hypothesized, Greene et al. (2009) found that perceptions of anticipated response influenced perceptions of anticipated outcomes (and not the reverse). The present study focuses on partner support as a crucial anticipated response to begin study with a chronic condition.

The DD-MM also argues that an individual will assess his/her *disclosure efficacy*, a specific form of communication efficacy (Afifi & Steuber, 2009; see also Afifi & Weiner, 2004; Makoul & Roloff, 1998). Disclosure efficacy is the final component in the decision process and is defined as a person's perceived ability to share a particular piece of personal information with a specific person (Greene, 2009). Empirical evidence links perceived efficacy with willingness to reveal a secret (Afifi & Steuber,

2009), likelihood of disclosing both personal information (Greene et al., 2009) and health information (Greene et al., in press), and intentions to seek sexual health information from partners (Afifi & Weiner, 2006).

To summarize, the DD-MM explicates the key mechanisms involved in initial decisions to share health information and acknowledges that uncertainty is an underlying feature of disclosure decisions. The following sections discuss the specific role of prognosis and symptom uncertainty in people's disclosure decisions.

PREDICTING THE ROLE OF UNCERTAINTY IN PATTERNS OF DISCLOSURE

The present study explores the nature of health disclosure decision making under conditions of uncertainty about disease *prognosis* and *symptoms*. The unpredictability of disease prognosis (e.g., disease course) and ambiguous symptom patterns are two of the many sources of uncertainty for people living with HIV/AIDS (Brashers et al., 2003). Moreover, studies of chronic illness management such as congestive heart failure (Horowitz, Rein, & Leventhal, 2004) and asthma (Halm, Mora, & Leventhal, 2006) indicate that patients believe that they have a disease/condition only when they are symptomatic. Similarly, Goldsmith (2009) found that patients diagnosed with heart disease and various forms of cancer experienced illness uncertainty regarding prognosis and symptoms.

Prognosis and Symptom Uncertainty and Communication Efficacy to Partner

Uncertainty is a neutral, cognitive state that is not associated with emotions until it is evaluated. Once evaluated, the experience of uncertainty may give rise to positive (e.g., hope) or negative (e.g., fear) emotions (Mishel & Clayton, 2003). People are most likely to experience emotion when their usual patterns of behavior are interrupted (Berscheid, 1983; Mandler, 1975), and patients manage uncertainty and the emotions associated with it in various ways (Brashers, 2001). Although emotions such as anxiety in response to uncertainty (e.g., Afifi & Weiner, 2004) have unique motivational and adaptive functions designed to energize and organize thoughts and actions, intense emotions may become disruptive and disorganizing (Izard, 1991). The ability to disclose information about a health condition may not be an issue for people who wish to maintain a particular level of uncertainty. For others, however, appraisals of uncertainty may render them less confident in their ability to talk about their health condition. The experience of uncertainty in relationships, for example, undermines people's confidence in their ability to communicate with a partner (Knobloch & Satterlee, 2009). Furthermore, while illness uncertainty may prompt a desire to talk with one's partner, the changes patients are experiencing may make partners unsure about how to communicate (Goldsmith, 2009).

The DD-MM argues that disclosure efficacy plays a significant role in the disclosure decision-making process such that assessment of information and assessment of a receiver (relational quality and anticipated reaction) predict disclosure efficacy and subsequent disclosure (or nondisclosure). It may be, however, that when people experience high uncertainty about their health condition then the role of efficacy becomes less important. For example, a person who feels incapable of talking to a partner about his/her health issues and who faces impending heart surgery may uncharacteristically wish to talk about a range of topics (e.g., postoperative symptoms, medications) and/or in depth about specific health concerns such as long-term prognosis. On the other hand, for people in longer term relationships, the ability to talk about certain issues may not be a factor. It is less clear, however, whether prognosis and symptom uncertainty *directly* predict breadth, depth, and/or frequency of disclosure about a health condition (RQ1 and RQ2).

Prognosis and Symptom Uncertainty and Perceived Partner Support

Although the DD-MM was developed emphasizing anticipated or expected support related to an *initial* health disclosure (e.g., "I have breast cancer"), the present study examines people's perceptions of partner support (e.g., emotional, instrumental) related to their health condition. Significant others do influence how individuals appraise and manage illness-related uncertainty (Goldsmith, 2009; see also Brashers, Neidig, & Goldsmith, 2004). Greene (2009) argues that "attribution for responsibility of a disease is a critical facet of both disclosure and response" (p. 233). For example, a person with chronic obstructive pulmonary disease (COPD) experiencing uncertainty about increased breathing difficulty may believe that his/her partner will not provide support because the patient continues to smoke despite the partner's repeated requests to quit smoking. On the other hand, a person experiencing uncertainty about a health condition may perceive that his/her partner is not able to provide support because the person has his/her own illness-related concerns. Thus, it is expected that higher prognosis and symptom uncertainty will be negatively associated with perceptions of partner support.

Relational Quality and Perceived Partner Support

Greene (2009) argued that relational quality (e.g., closeness) and anticipated reaction (anticipated response and anticipated outcome) are likely positively correlated (see also Afifi & Olson, 2005; Afifi & Steuber, 2009). Recent studies (e.g., Greene et al., 2009; Greene et al., in press), however, found that relational quality positively predicted anticipated response (support). The present study focuses on people in

a relationship and patterns of disclosure to a partner about a health condition. Individuals disclose to people with whom they are close, whom they can trust, and who will support them (e.g., Kelly & McKillop, 1996; Petronio, 2002; Vangelisti et al., 2001). While there may be situations in which a person in a very strong and loving relationship may want to protect a loved one from worry and stress and thus choose not to disclose new information, people who report higher relational quality with their partner will likely perceive that their partner provides them with needed support (e.g., instrumental, emotional support).

Perceived Partner Support and Communication Efficacy to Partner

The DD-MM proposes that individuals also assess a target's likely reactions. Anticipated reactions may be positive (e.g., the person provides support), negative (e.g., anger, relational consequences), or neutral. In general, people must perceive a positive response in order to reveal information (Afifi & Steuber, 2009; Greene, 2009). Because the current study explores disclosure of health information beyond diagnosis, perceiving that a partner is supportive is particularly salient for predicting the ability to share subsequent information (e.g., blood test results). Therefore, it is expected that perceived partner support will positively predict communication efficacy to partner.

Communication Efficacy to Partner and Depth, Breadth, and Frequency of Disclosure

Individuals perceive the right to own and control their private information (Petronio, 2002), but confidence and skills are needed when sharing difficult information and "at times people do share with trepidation, apprehension, and considerable uncertainty" (Greene, 2009, p. 242). When people perceive they have the ability to share a piece of information to a particular person, they are likely to do so (Afifi & Steuber, 2009; Greene et al., 2009, 2010). In terms of sharing information about a health condition, however, even couples in close relationships report difficulty in talking to a partner about cancer-related or heart related issues (see Goldsmith, 2009; Goldsmith et al., 2007). The present study examines people's patterns of disclosure to a partner about a health condition in terms of understudied dimensions of depth, breadth, and frequency of disclosure.

In intimate relationships, over time individuals continue to share information such as their innermost fears, needs, values, and self-concepts. Specifically, married couples express intimacy by sharing thoughts, feelings, attitudes, and dreams (Derlega et al., 1993; see also Waring, Tillmann, Frelick, Russell, & Weisz, 1980). Although a highly empathetic person may choose not to disclose for reasons other than perceived communication efficacy or partner support (e.g., protection), it is expected that individuals managing a health condition who perceive that they have the ability to talk to their partner are likely to report intimate (i.e., in-depth) disclosures about their health condition. People in established and/or long-term relationships may communicate about a range of topics while simultaneously avoiding certain topics (see Dailey & Palomares, 2004; Goldsmith et al., 2007). However, if people perceive that they have the ability to communicate with their partner about their health condition, then they are likely to report that they disclose about a range of topics related to the condition.

For some cancer patients, frequency of interaction with significant others allows them to talk about their illness (Wortman & Dunkel-Schetter, 1979), yet other cancer patients reported little communication about their disease (e.g., Krant & Johnston, 1978). For patients diagnosed with heart disease, marital quality (including frequent "useful discussions") predicts survival (e.g., Rohrbaugh, Mehl, Shoham, Reilly, & Ewy, 2008). While frequency of talk about a health condition may be a strong predictor of better health outcomes, a person must perceive the ability to talk to a partner about his/her health condition before doing so. Thus, communication efficacy to a partner will positively predict frequency of disclosure about a health condition.

Summary

To summarize the predictions (see Figure 1), prognosis and symptom uncertainty will negatively predict communication efficacy to partner (H1a, H2a). Prognosis and symptom uncertainty will negatively predict perceived partner support (H1b, H2b). Relational quality will positively predict perceived partner support (H3), and perceived partner support will positively predict communication efficacy to partner (H4). Communication efficacy will positively predict depth, breadth, and frequency of disclosure about a chronic health condition (H5–H7). Finally, two research questions are proposed: Are prognosis (RQ1) and symptom (RQ2) uncertainty also directly related to depth, breadth, and/or frequency of disclosure?

METHOD

Participants were recruited from a private medical office in a suburban area of the northeastern United States. The 20-physician practice specializes in cardiovascular diseases with physicians board certified in both internal medicine and cardiology. Participants were age 18 years or older and had a previously diagnosed heart-related condition. This process excluded, for example, patients at initial consultation or cardiac preoperative clearance for an unrelated condition.

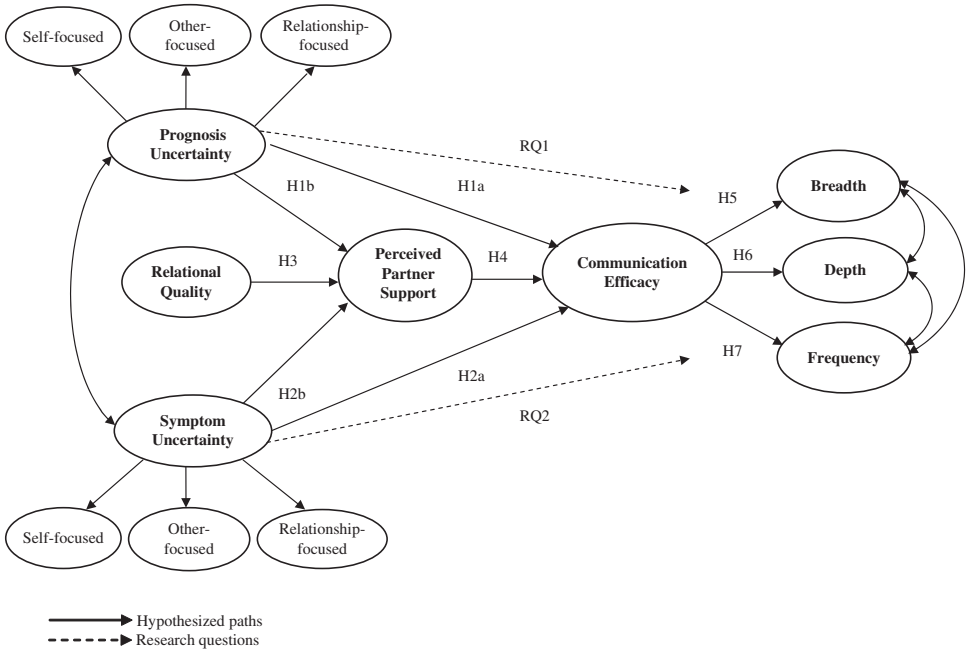

FIGURE 1 Hypothesized model.

Participants

Because this study focuses on patients sharing information about a heart-related condition with a partner, the subsample reported includes the 203 patients who completed questionnaires (~15 minutes) in relation to their partner. Of these participants, 126 (62%) were male and 76 (37%) were female (one did not report gender). Individuals ranged in age from 36 to 92 years ($M = 67.13$, $SD = 11.70$) (two did not report age). Participants were predominantly Caucasian (92%), followed by African-American (3%), and other (<3%); six people did not report race/ethnicity. Participants reported being in a relationship with their partner from 2 to 70 years ($M = 38.75$, $SD = 15.62$). Time since diagnosis ranged from <1 year to 71 years ($M = 8.98$, $SD = 9.92$).

Procedure

Two business days prior to a scheduled appointment, patients were notified via automated phone system about the opportunity to participate in a research study. On arrival at the medical office, a researcher approached the patient and asked if s/he would agree to complete an anonymous questionnaire about sharing information with a partner about a heart-related condition[1]; a second researcher was present in the waiting room for consent and to distribute/collect surveys. All participants were asked not to discuss the questionnaire with others until they had returned the survey.[2] All procedures were approved by a university institutional review board (IRB).

Measures

Variables measured included prognosis uncertainty, symptom uncertainty, relational quality, perceived partner support, communication efficacy to partner, and depth, breadth, and frequency of disclosure about a health condition. Confirmatory factor analysis (CFA) was used to evaluate the dimensionality of the measures; extensive tests of parallelism were conducted to establish discriminant validity. Additional information is available from authors. CFA requires items within factors to meet criteria of face validity, internal consistency, and external consistency (Anderson &

[1]Patients reported diagnoses such as coronary artery disease (e.g., "heart attack," "clogged arteries"), heart rhythm irregularities (e.g., atrial fibrillation, "PVCs," "SVTs"), hypertension, and hyperlipidemia. Some patients reported reasons for their visit associated with a heart-related condition such as a checkup post angioplasty or coronary artery bypass graft (CABG) surgery, for blood tests (e.g., prothrombin time or "PT"), diagnostic tests (e.g., stress test, echocardiogram), pacemaker checks, and for preoperative cardiac clearance; patients who did not report a diagnosis (e.g., in testing prior to diagnosis or left the item blank) were excluded. We relied on patient reports of diagnoses. Follow-up analyses based on reported diagnosis indicated no differences across study variables, and thus they were combined for model testing.

[2]Patients who reported that they did not have a spouse/partner were asked to complete the survey in relation to another person (e.g., child or friend) with whom they share information about their heart condition ($n = 93$). If a patient arrived with a partner or other person, that person was also invited to fill out either a partner version ($n = 15$) or other version ($n = 4$) of the survey. Only data for patients sharing information with a partner were included in this study.

Gerbing, 1988; Hunter & Gerbing, 1982). Composite scores were created by averaging responses to the individual items. Reliability was estimated by Cronbach's alpha.

Prognosis and Symptom Uncertainty

Measures of prognosis and symptom uncertainty about a health condition were created based on prior research (e.g., Brashers, 2001; see also Knobloch & Solomon, 1999, 2002). The measures employed 5-point Likert scales with responses ranging from 1 (*very uncertain*) to 5 (*very certain*).

Four items formed a unidimensional measure of *self-focused prognosis uncertainty*. A sample item included, "My health will deteriorate" (R). CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 39.46$, $p = .04$, $CFI = .97$, $RMSEA = .05$. Higher scores indicated greater uncertainty about the effect of the health condition on the person's life ($M = 2.98$, $SD = .71$; $\alpha = .50$). *Partner-focused prognosis uncertainty* also contained four items. A sample item included, "My spouse thinks that my health will deteriorate" (R). CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 45.50$, $p = .01$; $CFI = .96$, $RMSEA = .06$. Higher scores indicated greater uncertainty about whether a partner thinks the health condition affects the person's life ($M = 2.93$, $SD = .74$; $\alpha = .63$). *Relationship-focused prognosis uncertainty* contained four items. A sample item included, "My deteriorating health will affect our relationship" (R). CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 35.49$, $p = .10$, $CFI = .98$, $RMSEA = .04$. Higher scores indicated greater uncertainty about whether the health condition affects the partners' relationship ($M = 3.76$, $SD = .89$; $\alpha = .79$).

Two items were used to measure *self-focused symptom uncertainty*. A sample item included, "Symptoms of my health condition are easy to spot." Higher scores indicated greater uncertainty about whether others notice symptoms of the person's health condition ($M = 3.53$, $SD = .98$; $r = .25$, $p < .001$). *Partner-focused symptom uncertainty* contained two items. A sample item included, "My spouse thinks that symptoms of my health condition are easy to spot." Higher scores indicated greater uncertainty about whether a partner thinks that others notice symptoms of the person's health condition ($M = 3.20$, $SD = .90$; $r = .26$, $p < .001$). *Relationship-focused symptom uncertainty* contained two items. A sample item included, "Easy to spot symptoms of my health condition create challenges for our relationship." Higher scores indicated greater uncertainty about whether others noticing symptoms of the person's health condition affects the partners' relationship ($M = 3.64$, $SD = .92$; $r = .12$, $p > .05$).

Relational Quality

The quality of individuals' relationship with their partner was measured by five 5-point Likert type items adapted from Vangelisti and Caughlin (1997; Vangelisti et al., 2001; see Greene et al., 2009) and prior measures of marital quality (e.g., Norton, 1983; Spanier, 1976) with responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item was "This relationship is satisfying." CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 46.48$, $p = .01$; $CFI = .97$, $RMSEA = .07$. Higher scores indicated greater relational quality ($M = 4.33$, $SD = .62$, $\alpha = .82$).

Perceived Partner Support

Perceived partner support was operationalized with items adapted from Greene et al. (2009; see also Greene & Faulkner, 2002) using four 5-point Likert items with responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item included, "My spouse supports me emotionally." CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 51.55$, $p < .01$; $CFI = .97$, $RMSEA = .07$. Higher scores indicated greater perceived partner support ($M = 4.24$, $SD = .71$, $\alpha = .80$).

Communication Efficacy to Partner

Participants' ability to share information about the health condition with their partner was adapted from literature on revealing secrets (e.g., Afifi & Steuber, 2009; Caughlin, Afifi, Carpenter-Theune, & Miller, 2005) and disclosing a health condition (e.g., Greene, 2009) using four 5-point Likert items with responses ranging from 1 (s*trongly disagree*) to 5 (s*trongly agree*). A sample item included, "I am confident that I can share information about my health condition with my spouse when I want to." CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 44.54$, $p = .01$; $CFI = .98$, $RMSEA = .06$. Higher scores indicated greater communication efficacy to partner ($M = 4.56$, $SD = .59$, $\alpha = .84$).

Disclosure Depth

Depth of disclosure to a partner about a health condition was measured by four 5-point Likert items developed by the authors with responses ranging from 1 (s*trongly disagree*) to 5 (s*trongly agree*). A sample item included, "I have heart-to-heart talks with my spouse about my health condition." CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 48.43$, $p < .01$, $CFI = .97$, $RMSEA = .07$. Higher scores indicated greater depth of disclosure ($M = 3.82$, $SD = .82$, $\alpha = .75$).

Disclosure Breadth

Perceptions of the *breadth* or range of topics that individuals disclose to their partner about their health condition were measured by four 5-point Likert items developed by the authors, with responses ranging from a 1 (s*trongly disagree*) to 5 (s*trongly agree*). One sample item included, "I discuss

TABLE 1
Bivariate Zero-Order Correlation Matrix for All Variables

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. SProgU	1.00											
2. OProgU	.66**	1.00										
3. RProgU	.43**	.35**	1.00									
4. SSymU	.17	.18	.22**	1.00								
5. OSymU	.13	.18	.18	.58**	1.00							
6. RSymU	.22**	.22**	.45**	.31**	.34**	1.00						
7. RelQuality	−.02	−.21**	.26**	−.03	−.14	.06	1.00					
8. PartnerSupp	.18	.01	.42**	−.02	−.13	.18	.64**	1.00				
9. CommEff	.15	.09	.46**	.14	.02	.34**	.46**	.57**	1.00			
10. Depth	.15	−.01	.26**	−.01	−.07	.26**	.46**	.49**	.54**	1.00		
11. Breadth	.17	.08	.39**	.05	−.07	.27**	.42**	.43**	.56**	.72**	1.00	
12. Frequency	−.10	−.20**	−.03	−.24**	−.35**	−.04	.31**	.33**	.26**	.46**	.48**	1.00

Note: SProgU is self-focused prognosis uncertainty; OProgU is other-focused prognosis uncertainty; RProgU is relationship-focused prognosis uncertainty; SSymU is self-focused symptom uncertainty; OSymU is other-focused symptom uncertainty; RSymU is relationship-focused symptom uncertainty; RelQuality is relational quality; PartnerSupp is perceived partner support; CommEff is communication efficacy to partner; Depth is depth of disclosure; Breadth is breadth of disclosure; Frequency is frequency of disclosure.

**$p \leq .01$, two-tailed.

a wide variety of issues related to my health condition." CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 46.48$, $p < .01$, $CFI = .97$, $RMSEA = .07$. Higher scores indicated greater disclosure breadth ($M = 3.69$, $SD = .92$, $\alpha = .82$).

Disclosure Frequency

How often patients disclose to a partner about the health condition was measured by four 5-point Likert items developed by the authors, with responses ranging from 1 (*strongly disagree*) to 5 (s*trongly agree*). A sample item was "We often talk about my health condition." CFAs revealed that items loaded onto the latent construct, $\chi^2(26) = 33.43$, $p = .15$, $CFI = .99$, $RMSEA = .04$. Higher scores indicated more frequent disclosure ($M = 3.09$, $SD = .86$, $\alpha = .84$).

RESULTS

Preliminary analyses were conducted on all variables. Data were screened for normality and multivariate outliers, and no transformations were needed; 50 participants were deleted based on missing data. Table 1 presents bivariate correlations. Tests were also conducted to evaluate differences by gender,[3] age (age ≤67 and age >67), time since diagnosis (≤6 years and >6 years), and relationship length (≤42 years and >42 years) and the other study variables (using median splits). There were no systematic differences by demographic variables. Next, we tested hypotheses using maximum likelihood structural equation modeling (AMOS 18). The strategy accounts for measurement error in the data and makes it possible to assess hypothesized associations. Three goodness-of-fit indices were used to evaluate the models. χ^2/df adjusts the χ^2 statistic for sample size (Kline, 1998). *CFI* calculates the ratio of the noncentrality parameter estimate of the hypothesized model to the noncentrality parameter estimate of a baseline model (Bentler, 1990). *RMSEA* accounts for errors of approximation in the population (Browne & Cudeck, 1993). It was determined that the model fit the data if χ^2/df was less than 3, *CFI* was .90 or greater, and *RMSEA* was less than .10 (Browne & Cudeck, 1993; Kline, 1998).

Structural Equation Model Results

The first step required calculation of the error variance $(1 - \alpha)(\sigma^2)$ to account for measurement error (Bollen, 1989; Stephenson & Holbert, 2003). Initial results indicated the hypothesized model (see Figure 1) did not adequately fit the data, $\chi^2(48) = 176.76$, $p < .01$; $\chi^2/df = 3.82$, $CFI = .86$, $RMSEA = .12$. In order to improve the fit of the model, nonsignificant paths were removed one at a time. Based on that criterion, two paths were eliminated (in this order): (a) The path from prognosis uncertainty to communication efficacy to partner, and (b) the path from symptom uncertainty to perceived partner support. The fit of the model was not significantly improved, $\chi^2(50) = 178.10$, $p < .01$; $\chi^2/df = 3.46$, $CFI = .86$, $RMSEA = .11$. Next, paths were added to the model based on the magnitude of the modification indices and theory, such that suggested paths with the largest values were added first. In the present study, the modification indices identified two additional paths that were addressed by proposed RQs. The addition of paths from symptom uncertainty to frequency of disclosure (RQ2) and from prognosis uncertainty to breadth of disclosure (RQ1) resulted in a model that adequately fit the data, $\chi^2(48) = 130.02$, $p < .01$; $\chi^2/df = 2.65$, $CFI = .91$, $RMSEA = .09$.

[3]Data for males ($n = 126$) and females ($n = 76$) were examined in a multilevel model. The χ^2 difference statistic showed the model has measurement invariance across gender, $\chi^2(150) = 322.89$, $p < .01$; $CFI = .91$, $RMSEA = .05$. Thus, the combined model is presented.

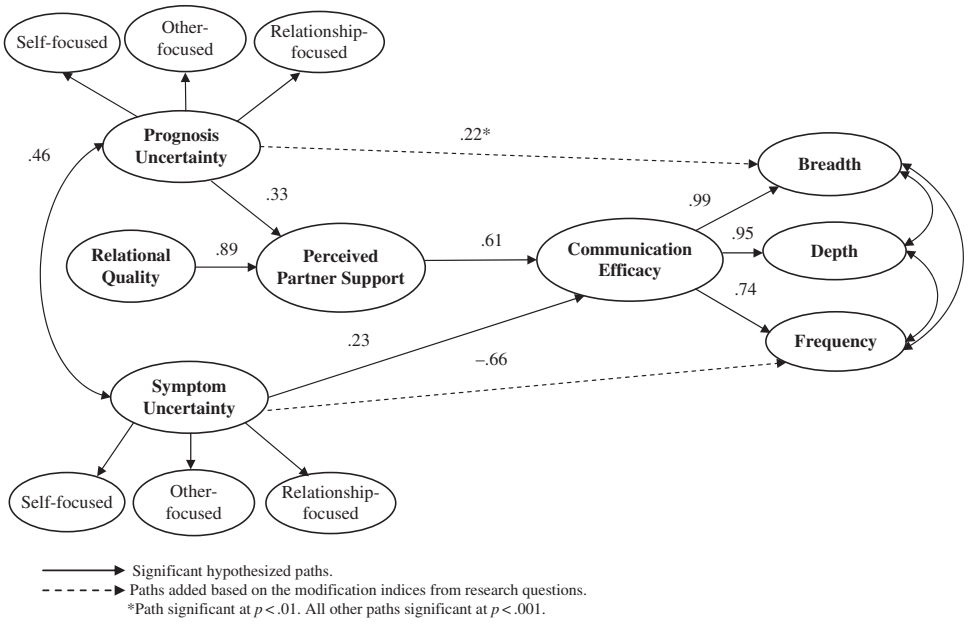

FIGURE 2 Results for uncertainty and patterns of disclosure.

The final model is presented in Figure 2. Results are consistent with some hypotheses concerning factors influencing disclosure about a heart-related condition. Prognosis uncertainty did not negatively predict communication efficacy to partner, as hypothesized in H1a. Symptom uncertainty positively, not negatively, predicted communication efficacy to partner (H2a not supported). H1b was not supported as prognosis uncertainty positively, not negatively, predicted perceived partner support. H2b was not supported, as symptom uncertainty did not predict perceived partner support. Consistent with H3, relational quality predicted perceived partner support. Perceived partner support positively predicted communication efficacy to partner (H4 supported). Communication efficacy positively predicted disclosure breadth (H5 supported), depth (H6 supported), and frequency (H7 supported). Finally, prognosis uncertainty positively predicted breadth, but not depth or frequency of disclosure (RQ1), and symptom uncertainty negatively predicted frequency, but not breadth or depth of disclosure (RQ2).

DISCUSSION

This study examined the role of prognosis and symptom uncertainty in disclosure to a partner about a health condition. The findings suggest that key mechanisms identified in the DD-MM (Greene, 2009; i.e., assessment of information and receiver, efficacy) are related to the depth, breadth, and frequency of disclosure to a partner about a heart-related condition. This study also demonstrated how uncertainty plays a prominent role in people's disclosure decisions. The following sections interpret the findings, discuss the implications of expanding the DD-MM beyond initial disclosure, highlight the strengths and weaknesses of this investigation, and propose areas for future research. The discussion begins with findings for assessing the information.

Assessing the Information

Rather than focusing on valence of information, the present study extended disclosure literature and explores prognosis and symptom uncertainty. These two facets of health information were theorized as being more crucial than valence utilized in many prior disclosure studies. The focus on uncertainty in the present study is one key contribution, and findings raise a number of questions. First, to what extent do patients report experiencing symptom and prognosis uncertainty? On our measures, patients reported greater symptom uncertainty than prognosis uncertainty (and SDs indicate variability on both measures). This does not, however, indicate that patients are necessarily striving to reduce uncertainty. It is the patterns of associations in the model (in addition to correlations) that demonstrate that health uncertainty underlies depth, breadth, and frequency of sharing information with a partner. This study is one of the first to operationalize uncertainty related to a chronic health condition, more specifically the first to operationalize uncertainty related to disease symptoms and prognosis.

Several theories speculate about the nature of managing information (or secrets, disclosure, topic avoidance) and how the dialectical foundation of the process unfolds (e.g., Petronio's CPM or Ormazu's DDM). Yet, to date, we still have few quantitative tests of how information uncertainty is managed in relationships. Although the present study does not tap all of the DD-MM's facets of information assessment, the findings provide an intriguing

base for continued research. We turn next to specific findings for prognosis and symptom uncertainty.

Uncertainty and Communication Efficacy

This study assessed uncertainty about one's prognosis and visibility of symptoms. Prognosis uncertainty did not predict communication efficacy to partner. For H2a, uncertainty *positively* predicted the ability to talk to a partner about one's heart-related condition. While the findings are not consistent with recent disclosure studies in which assessment of risk (e.g., Afifi & Steuber, 2009) and assessment of illness severity (Greene et al., in press) negatively predicted efficacy, the results are supported by theories of uncertainty in illness such that people evaluate their illness experiences (Babrow, 2007; Mishel, 1990) and manage illness uncertainty in various ways (e.g., Brashers, 2007). Although not as hypothesized, the finding for prognosis uncertainty is not surprising considering the age of participants and the number of reported years in a relationship with their partner. Intervening factors, such as a desire to protect a partner from unnecessary worry or concern, a desire to maintain a particular level of uncertainty by avoiding, or believing that if the person chooses to talk about his/her prognosis, s/he will do so regardless of perceived ability to communicate, provide alternate explanations for the results. Because this is the first study to measure these associations, findings should be replicated.

As hypothesized, symptom uncertainty predicted patients' ability to talk to a partner about their health condition, suggesting that communication efficacy is a more salient feature for uncertainty about symptoms versus uncertainty about prognosis. Symptom uncertainty was narrowly defined and measured in this study and refers to uncertainty surrounding *visibility* of symptoms. For example, patients with certain heart-related conditions may be concerned that they and their partner would recognize the warning signs of a possible cardiac event (e.g., heart attack), thus predicting communication efficacy. It may also be that some patients are concerned about whether they "look" like a heart patient. For example, a middle-aged man recovering from a recent heart attack may feel like a "marked man" but simultaneously perceive the ability to talk to his partner about his health condition. Further, the perceived ability to talk to a long-term partner (and gather/seek information) about the visibility of symptoms related to one's heart condition may be one way of managing uncertainty (e.g., Afifi & Weiner, 2004).

Prognosis and Symptom Uncertainty and Patterns of Disclosure

Prognosis uncertainty positively predicted *disclosure breadth*. People who reported uncertainty about their prognosis were more likely to report that they talk to their partner about a range of topics related to the health condition. Although some individuals experiencing illness uncertainty may have difficulty expressing their emotions and avoid communicating (e.g., Goldsmith, 2009), the findings of the present study suggest that uncertainty about the future with a heart-related condition actually *encourages* disclosure breadth. This finding is consistent with Omarzu's (2000) argument that as subjective utility of a disclosure reward increases (e.g., obtaining support from a relational partner), the sheer amount of disclosure such as the number of topics will increase. Further, uncertainty concerning the prognosis with a particular condition may motivate people to talk about numerous topics, regardless of perceived ability to talk to their partner about their health condition. Patients might also need support and have high hopes that a partner will provide it (e.g., Babrow, 2007). Disclosing about a range of topics might also facilitate catharsis, a mechanism for individuals to relieve stress associated with managing a health condition.

In contrast to prognosis uncertainty, symptom uncertainty negatively predicted *frequency* such that people who reported uncertainty about their symptoms being visible to others also reported less frequent talks with their partner about their health condition. People appraise illness uncertainty in different ways (e.g., as a danger or an opportunity; Mishel & Clayton, 2003). Uncertainty appraisals, in turn, influence how people manage uncertainty (e.g., Babrow, 2007; Brashers, 2007; Goldsmith, 2009). For example, following a myocardial infarction (heart attack), some couples engage in "protective buffering" in which they hide their concerns from their partner to avoid conflict (see Goldsmith, 2009; see also Coyne & Smith, 1994; Suls, Green, Rose, Lounsbury, & Gordon, 1997). Moreover, people experiencing uncertainty in relationships avoid discussion of sensitive subjects within cross-sex friendships (Afifi & Burgoon, 1998), dating relationships (Knobloch & Carpenter-Theune, 2004), and family relationships (Afifi & Schrodt, 2003). Whether uncertainty is about one's illness (e.g., prognosis or symptoms) or about a relationship, uncertainty is unsettling (Babrow, 2007). We turn to examination of findings for how patients assess receiver variables in disclosure decisions.

Assessing the Receiver

In addition to assessing the piece of health information, individuals assess a receiver in terms of relational quality and anticipated reaction (e.g., support, consequences for the relationship) to a disclosure. The next subsections review findings for the effect of prognosis uncertainty, symptom uncertainty, and relational quality on anticipated support.

Prognosis and symptom uncertainty and partner support. People who reported uncertainty about their

future with a heart-related condition were likely to report that their partner provided support (a positive, not negative path as predicted). One explanation is that responses to uncertainty are not always associated with negative emotions or outcomes (Goldsmith, 2009; see also Brashers, 2001; Mishel & Clayton, 2003). Negative emotional responses may occur if uncertainty is viewed as a threat or danger (e.g., anger or frustration about curtailed activities following a heart attack), while positive emotional responses may surface if uncertainty is viewed as an opportunity (e.g., increased optimism, new "lease on life" following coronary artery bypass graft surgery). However, evaluations of uncertainty can become problematic as a person encounters new or conflicting information such as perceived ambiguous response from a partner (e.g., Babrow, 2007). The uncertainties surrounding the information (and expectations of a partner's response) are likely to influence their patterns of disclosure. Symptom uncertainty did not predict perceived partner support in the present study; that is, there was no relationship between uncertainty about the visibility of symptoms of a person's heart-related condition and perceptions of partner support. It may be that partner support is more salient when people are concerned about their future with a heart-related condition than it is for uncertainty about symptom visibility. Or, it might be that partner support is less important than the ability to talk about one's health condition and/or a partner's ability to recognize visible symptoms of a person's heart condition (e.g., shortness of breath, fatigue, ashen complexion). Regardless, continued research should explore symptom uncertainty and perceived partner support because they are central in disclosure patterns.

Relational quality and perceived partner support. As predicted, individuals who are close to their partner are more likely to perceive that their partner provides them with support they need. The finding is consistent with prior disclosure literature that people disclose to those with whom they are close, whom they can trust, and who will support them (e.g., Greene et al., 2006; Petronio, 2002; Vangelisti et al., 2001). Moreover, recent tests of the DD-MM indicate that relational quality (Greene et al., 2009) and closeness (Greene at al., 2010) positively predicted anticipated response (support) to disclosure of personal information and health information. Being in a supportive relationship is one explanation for why marital partners live longer and enjoy better health than do unmarried individuals (for reviews see Burman & Margolin, 1992; Kiecolt-Glaser & Newton, 2001). Social support, for example, is particularly important for people with coronary artery disease in terms of managing depression (Bosworth et al., 2000; Shen, McCreary, & Myers, 2003), promoting healthy life choices (Franks, Wendorf, Gonzalez, & Ketterer, 2004; see also Goldsmith, Lindholm, & Bute, 2006), and other health outcomes (for a review see Littik, Jaarsma, Moser, Sanderman, & van Veldhuisen, 2005). Thus, the finding of the present study that relational quality is a strong predictor ($r = .64$) of perceptions of partner support in disclosure contributes to the body of research on the role of support in managing health conditions.

Perceived partner support and communication efficacy to partner. Participants who reported that their partner provides support were also more likely to perceive the ability to talk to their partner about their heart-related condition. The finding is not surprising considering that the average length of participants' relationships was 39 years. Moreover, there was limited variance in participants' communication efficacy with partner (e.g., $M = 4.47$, $SD = .61$). As people age, they may become more confident in their ability to share information with a long-term partner. Conversely, while people may perceive the ability to talk to a partner about a health condition they may also avoid disclosing certain topics, and these associations are worth exploring further as few disclosure studies have utilized similar samples.

Communication Efficacy to Partner and Patterns of Disclosure

Expectations or beliefs about one's ability to perform actions necessary to produce particular effects have been used to predict a variety of health-related outcomes (see Bandura, 1986; Holden, 1991; Strecher, Devillis, Becker, & Rosenstock, 1986, for reviews). In the present study, people who perceived the ability to talk with their partner about their heart-related condition reported having in-depth talks and sharing intimate issues with him/her. The results support research that length of romantic interest is positively associated with the depth of relationship talk (Knobloch, Solomon, & Theiss, 2006). Communication efficacy to partner also positively predicted that individuals would talk about a range of topics (breadth) related to a health condition, such that people who perceived the ability to talk to a partner about their heart-related condition also reported communicating about a wide variety of issues related to the condition, were likely to share even small health concerns, and were less likely to avoid discussing particular topics related to their condition. Finally, results indicated that people managing a chronic heart-related condition who perceive the ability to talk to a partner are likely to have frequent discussions about their health condition. Healthy relationships are often characterized by a balance between openness and closedness (Afifi, Caughlin, & Afifi, 2007; see also Baxter & Montgomery, 1996; Greene et al., 2006; Petronio, 2002). Although people may report communication efficacy to a partner about a variety of issues related to a health condition, patients may also engage in avoidance (see Roloff & Ifert, 2000). Continued research should examine

the kinds of information people avoid discussing and the benefits/drawbacks of these decisions for patients, partners, and relationships.

Limitations

As with any research study, there are limitations that must be considered. First, these data were collected in one state in the northeastern United States. Similarly, the data were collected in a suburban community from one cardiology office, and therefore results may not generalize to either urban or rural populations. The predominantly Caucasian sample limits its generalization to other groups. A final sample limitation is that participants in this study reported relatively long-term, high-quality relationships, limiting generalizability to other less satisfied and shorter,term relationships, yet this is an improved sample compared with many other studies.

Limiting measurement of uncertainty to prognosis and symptoms, and relatively narrow operationalization of the uncertainty variables, are additional shortcomings of the present study. For example, there are other ways to measure symptom uncertainty that may influence disclosure decision making, such as uncertainty about side effects of some medications and the meaning of specific symptoms (e.g., shortness of breath, palpitations). It would also be interesting to study people with similar heart-related conditions (e.g., CHF) and prognoses to examine the similarity of certainty surrounding their perceived prognoses.

Future research not only should expand measures in number and dimension but also should incorporate various forms of illness uncertainty (e.g., Brashers et al., 2003) and sources of uncertainty related to health disclosure. The current measures also did not specify a time period. Additionally, some measures such as relational quality and perceived partner support rely on general perceptions of the relationship. All measures share a common method and memory bias, thus likely inflating covariance. As with any study, there are also unmeasured variables that were not included and cannot be accounted for in the present data. Future research could also collect physical health data to provide additional information.

Finally, the use of individual crossectional data to examine dyadic relationship patterns (see Golish & Caughlin, 2002; Greene, 2009) is also a limitation. Because the study examined disclosure at one point in time, it is not possible to make causal inferences about the order of variables or to examine prediction. Although there are challenges, future communication research should also explore ways to recruit couples where one partner is managing a chronic health condition. An improved study would track couples across time, including specific health indicators, as well as changes in communication patterns before diagnosis, at diagnosis, after surgery (or treatment), and even longer during health condition follow up.

Implications and Future Research

Many people are managing chronic health conditions such as diabetes and heart disease and are making ongoing decisions about sharing information regarding their condition. Little research, however, has explored disclosure decision making beyond initial revelation. One goal of this research was to provide a better understanding of the factors influencing patterns of disclosure under conditions of illness uncertainty. Results of this study provide support for the key components identified in the DD-MM that predict initial decisions to disclose information. Moreover, the findings suggest that assessment of information, assessment of a receiver (relational quality and support), and efficacy predict patterns of disclosure (depth, breadth, frequency).

Another theoretical contribution of the present study is its expansion of uncertainty as an underlying feature of health disclosure decision making. Prognosis and symptom uncertainty influence key variables in disclosure decision making and directly predicted two indicators of patterns of disclosure (i.e., breadth and frequency). Additionally, the study contributes by creating initial scales to quantitatively measure uncertainty about prognosis and symptoms (albeit narrow in scope). Future research should expand measurement of forms of uncertainty experienced by people managing chronic health conditions. For people managing uncertainty regarding a heart-related condition, being in a satisfying, supportive relationship is predictive of their ability to disclose to their partner about the health condition but not always in expected directions. Additionally, increased prognosis uncertainty led to greater disclosure breadth but increased symptom uncertainty led to decreased disclosure frequency. This warrants further study.

Participants reported about the depth, breadth, and frequency of disclosure to a partner about a heart-related condition. However, we know less about the kinds of topics that people with chronic heart-related conditions avoid sharing with a partner (see Goldsmith et al., 2006). People in long-term relationships may be able to disclose in-depth about numerous topics as often as is necessary. Yet, in reality, they are likely to avoid certain discussions (e.g., sexual difficulties, fear of death). A better understanding of the function of topic avoidance in the management of chronic health conditions is needed. It may be, for example, that people in close relationships share certain information with a close friend, child, or sibling, rather than the partner. Is it healthier for people to have other close friends and/or family members in whom they can confide? Moreover, for people in long-term relationships, what is the effect on the surviving partner's disclosure patterns when the partner dies? For those who do not have a partner, it would be important to investigate other social network members (e.g., sibling, parent, or close friend) with whom individuals discuss health issues. Such research may contribute to our understanding

of not only health disclosure decision-making but also the more general role of communication in people's management of such health conditions. The area is ripe for continued research such as this study.

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