Can Messages Make a Difference? The Association Between E-Mail Messages and Health Outcomes in Diabetes Patients

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This investigation examined the impact of social support messages on patient health outcomes. Forty-one American Indian, Alaska Native, and Native Hawaiian patients received a total of 618 e-mail messages from their healthcare provider (HCP). The e-mail messages were divided into 3,565 message units and coded for instances of emotional social support. Patient glycosulated hemoglobin scores (HbA1c) showed significantly improved glycemic control and emotional social support messages were associated with significant decreases in HbA1c values. Patient involvement with the system, measured by system login frequency and the frequency of uploaded blood glucose scores to the HCP, did not predict change in HbA1c.

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Web-based monitoring and messaging systems allow healthcare providers (HCPs) to monitor closely changes in patient health, can be implemented at relatively low cost, can reduce healthcare costs, and offer both patients and HCPs convenience (Field & Grigsby, 2002; Krishna, Boren, & Balaas, 2009). These telemedicine systems employ “store and forward technologies” and have been successfully used to monitor blood pressure and hypertension (Green et al., 2008), gestational diabetes (Perez-Gerre et al., 2010), and diabetes (Levine, Turner, Robinson, Angelus, & Hu, 2009; McMahon et al., 2005; Smith et al., 2004).

Some online monitoring systems provide patients with e-mail alerts about appointments, annual exams, and/or reminders to check blood glucose levels. These simple reminder systems have been shown to work, but their effectiveness wanes over time.
time (Hanauer, Wentzell, Laffel, & Laffel, 2009; Mollon et al., 2008). Other online monitoring systems allow patients and providers to interact via e-mail. Given 96% of adult Internet users use e-mail (Purcell, 2011), it is no surprise that adults with Internet access want the opportunity to communicate with their HCPs via e-mail (Liederman, Zimmerman, Athanasoulis, & Young, 2004). Although e-mail messages are becoming a more accepted way to interact with HCPs, the impact of those e-mail messages on patient health needs closer examination.

**E-mail communication between practitioners and patients**

A growing body of research has examined the viability of e-mail as a communication vehicle (Bergmo & Wangberg, 2007; Delbanco & Sands, 2004; Patt, Houston, Sands, & Ford, 2003; Roter, Larson, Sands, Ford, & Houston, 2008; White, Moyer, Stern, & Katz, 2004) and found that e-mail can augment face-to-face interaction. Research suggests that patients find e-mail less intimidating than face-to-face interaction because it allows time to reflect and compose questions about their health or treatment regimen in advance (Borowitz & Wyatt, 1998). A study by Rosen and Kwoh (2007) suggested pediatricians spend less time answering medical questions using e-mail than they spent answering questions over the telephone. In addition, the 300 patients surveyed reported being satisfied with e-mail access to their physician and they were satisfied with the content of the e-mail sent by their pediatrician (Rosen & Kwoh, 2007).

Whereas some scholars (Baur, 2000) have cautioned that the lack of nonverbal cues available through e-mail could reduce the effectiveness of patient–HCP interaction, Roter et al. (2008) suggested e-mail mimics communication within traditional doctor and patient dialog in that it contains both task and relational content. Roter et al. contended that e-mail provides opportunities for patients to communicate their problems and worries while allowing HCPs the opportunity to provide timely patient-specific responses.

Online telemedicine systems can be used for a variety of things including serving as a portal that provides patient access to their HCP. Researchers have suggested online telemedicine systems can be used to encourage interaction and ideally enhance the patient–HCP relationship (Kassirer, 1995; Mun & Turner, 1999). Until recently, however, few studies have explored the integration of secure e-mail messaging within a system of care to manage a specific disease.

One such study by Levine et al. (2009) examined the relationship between blood glucose monitoring and online messaging with their HCP. They found that the number of times a patient transferred blood glucose readings to a web-based disease management system was correlated with the (a) number of messages sent to HCP, (b) total number of messages received from HCP, and (c) number of patient-centered messages received from HCP. This study supported the notion that interaction via web-based disease management systems should be encouraged, given the relationship between interaction and monitoring of blood glucose in patients suffering from diabetes mellitus.
In an effort to understand further the relationship between e-mail messages and patient use of online health monitoring systems, Robinson, Turner, Levine, and Tian (2011) analyzed e-mail messages sent by HCPs to their patients. These 618 messages were coded into 3,565 discrete message units, and then the message units were coded into nine message types. The categories and the percentage of messages for each category type were phatic (32.2%), informational social support (21.1%), requests for health information (13%), social integration (9.0%), emotional social support (7.2%), esteem social support (6.7%), tangible social support (6.3%), and self-disclosure (< 1.0%). The remaining 3.5% of the messages focused on technical support for the online system were omitted from this analysis.

Robinson et al. (2011) extended the work of Levine et al. (2009) by examining the relationship between patient monitoring of blood glucose, online system usage, and the types of messages they received. Specifically, they found blood glucose monitoring and online system usage was related to substantial social support messages (which included phatic messages, informational social support messages, tangible social support messages, and messages containing references to previous contact or interaction between the patient and the provider), as well as relational affect messages (which included esteem social support messages and self-disclosure). From this research, different types of messages appear to encourage or produce different levels of patient blood glucose monitoring and online health system usage.

Previous research suggests social support is related to improved patient resistance to infection and disease, longevity, patient mortality, self-efficacy, social functioning, and enhanced psychological adjustment (Berkman & Syme, 1979; Blazer, 1982; Bloom, 1982; Dimond, 1979; Hanson & Sauer, 1985; House, Robbins, & Metzner, 1982; Jemmott & Magloire, 1988; Litwak & Messeri, 1989; Major et al., 1990; Orth-Gomer & Johnson, 1987; Schoenbach, Kaplan, Freedman, & Kleinbau, 1986; Seeman et al., 1993; Welin et al., 1985). In a review of 81 social support studies, Uchino, Cacioppo, and Kiecolt-Glaser (1996) concluded that there were links between social support and beneficial effects on the cardiovascular, endocrine, and the immune systems of patients. This conclusion was reached even though 70% of these studies (57 of 81) focused on the cardiovascular system, more than half were correlational designs, and the majority used only systolic and diastolic heart rate as their physiological health outcome measure. Further these studies relied on self-report data that asked about their network of friends, coworkers, kin, and/or social activity to measure social support. None of the experimental, quasi-experimental, or prospective studies reviewed by Uchino et al. employed actual or enacted social support messages—a problem identified by Goldsmith (2004) that plagues this body of research.

In addition, only a small number of these studies reviewed by Uchino et al. (1996) are experimental, quasi-experimental, or prospective in design. These studies focused on single message effects on immediate stressor responses. Like their cross-sectional brethren, these studies said little about the impact of actual social support messages on long-term patient health and even less about the impact of messages between a patient and their HCP and poorly controlled diabetes mellitus.
Types of social support

There is no consensus among researchers about the number and types of social support but there is agreement that disaggregating the different types is difficult (Berkman, Glass, Brissette, & Seeman, 2000). For example, Cutrona and Russell (1990) suggested there are six types of social support. Sherbourne and Stewart (1991) contended that there are only four types, and Westaway, Seager, Rheeder, and Van Zyl (2005) argued for two dimensions of social support. Part of this controversy stems from the fact that the dimensions of social support are so highly correlated that they are nearly indistinguishable (Norbeck, Lindsey, & Carrieri, 1981; Robinson et al., 2011; Semmer et al., 2008; Westaway et al., 2005).

Differences in types of measures further confound the issue. Different researchers use either structural measures or functional measures of social support. Structural measures ask about the social network of the individual, only provide an indirect measure of the availability of social support functions, and are only modestly related to functional measures of social support (Cohen & Willis, 1985; Sherbourne & Stewart, 1991). Functional measures of social support rely heavily on self-report and the memory of the individual. This is problematic because individuals in a single close relationship believe they receive more social support than individuals who report having multiple superficial relationships (Cohen & Willis, 1985).

Westaway et al. (2005) pointed out that inadequate socioemotional and tangible support has been shown to be related to poorer functioning, general health, and wellbeing (Littlefield, Rodin, Murray & Craven, 1990; Pouwer et al., 2003); higher hospital admission rates (Kelly, Mahmood, Kelly, Turner, & Elliott, 1993); poorer diabetes control, increased complications, and increased mortality (Edelstein & Linn, 1985; Robinson, Lloyd, & Stevens, 1998; Schwartz, Springer, Flaherty, & Kiani, 1986; Toth & James, 1992; Wang & Fiske, 1996; Wilson et al., 1986). Because this research focuses on e-mail messages, the ability to provide tangible social support via e-mail is limited. In previous efforts to code these e-mail messages (Robinson et al., 2011), we found most of the messages contained references to tangible social support rather than actual social support. Consequently, this investigation focuses on enacted emotional social support messages (Robinson et al., 2011) and the following hypothesis is posited:

H1: Enacted emotional social support messages will be directly related to improved patient health outcomes.

Given our interest in demonstrating that enacted social support messages transmitted via e-mail are an effective tool for improving clinical outcomes, a second goal for his study was to determine the relative impact of the various types of social support on patient health outcomes. Further, we wanted to examine the impact of system usage variables on patient health outcomes. Specifically, we examined telemedicine system usage and patient blood glucose monitoring (or the uploading of blood glucose levels) and enacted social support messages on patient health. Previous research showed a relationship between blood glucose monitoring and
the reception of personal e-mail messages (Robinson et al., 2011), so the following hypothesis is forwarded:

**H2:** Enacted emotional social support messages will be a better predictor of improved patient health outcomes than patient use of an online monitoring system.

### Methods

#### Research design

A nonrandomized prospective study of 41 patients with poorly controlled diabetes was undertaken within four disparate geographical communities of American Indian/Alaska Native and Native Hawaiian patients. Patients were eligible for this study if they were over 18 years of age, diagnosed with type 1 or type 2 diabetes mellitus (T1DM or T2DM), used a standard glucose meter regularly, had an HbA1c level above 7 within 3 months prior to enrollment in the study, and were amenable to using a computer. The medical protocol was designed such that patients were enrolled in the program for 6 months and then given an exit HbA1c blood glucose test to determine the program’s effectiveness.

Patients enrolled in the program were given access to a web-based diabetes management and messaging system called the MyCareTeam® system. The MyCareTeam system contains culturally appropriate diabetes education information and a software program that helps users track their diet, exercise, and blood glucose levels. Additionally, patients were provided with a cable to connect their glucose meter to a computer or to a modem that allowed them to transmit their blood glucose readings directly to the remote secured database without a personal computer. Patients were instructed on how to transmit their blood glucose readings, how to access the blood glucose readings and other information via MyCareTeam using an Internet browser, and how to interpret the results. Patients continued checking their blood glucose as directed by their physician and uploading the readings at least once every 2 weeks or more frequently if they chose. A complete description of the design of the MyCareTeam web-based monitoring and messaging system has been reported elsewhere (Levine et al., 2009; McMahon et al., 2005; Robinson et al., 2011).

#### Healthcare provider training

HCPs from each site were trained on the system and, in turn, trained the patients on system usage. Depending on the particular clinic, a HCP could be a physician, a nurse, a physician’s assistant, study or clinic coordinator, or diabetes educator. Nearly all the e-mail contact was provided by HCPs that were not physicians. These HCPs checked for e-mail and blood glucose uploads from their patients daily. In addition, the HCPs used MyCareTeam to review their patients’ medical information, to reply to their patients’ messages, to provide encouragement, and to dispense medical advice. Additionally, although HCPs were trained in the use of the telemedicine system they were neither sensitized nor trained on the type of messages to use.
Finally, the staff members were not encouraged to send or reply to patient e-mail frequently. As a baseline study, the goal was to see what would happen without the introduction of staff motivation as an additional factor and potential confounding factor within this study.

**Participant population**
A total of 140 patients were invited to participate in this study. These patients were recruited from health clinics at three American Indian communities and two Native Hawaiian health clinics. Human subjects’ approval was received from the Indian Health Service Institutional Review Board (IRB), Native Hawaiian Health IRB, Georgetown University IRB, and the U.S. Army Office of Research Protections before patients were recruited or enrolled. Of the 140 patients invited to participate, a total of 41 patients with diabetes agreed to participate and completed the study.

The remaining patients agreed to participate in the program but did not have both baseline and follow-up HbA1c scores or were missing information on their messaging. In some cases, the data were not entered into the database by their HCP and, in other cases, the patient simply did not come in for their scheduled HbA1c test. Unfortunately, gaining HCP compliance in a complex data gathering activity is difficult and further exacerbated by patients who are under no obligation to have their follow-up HbA1c tests on time. These missing data are just that—data missing because of the exigencies associated with gaining compliance.

There was no mass exodus of patients and most of the patients sent and received e-mail up until the end of the program—even if they did not complete the final HbA1c test. A total of 25 patients (61%) were female and 33 (80%) were American Indians, Alaskan Natives, or Aleuts. Patients’, and the average, age was 53 at enrollment (Min = 30, Max = 76, SD = 11). Seventeen patients (42%) were from Idaho, 14 (34%) from Arizona, and 10 (24%) from Alabama.

**Message sample**
HCPs sent a total of 618 messages to the 41 patients between October 2005 and May of 2008. All these messages were sent to a specific patient by the HCP and divided into individual sentences. Compound sentences were divided into two sentence fragments. For example, “Glad to hear you ran 2 miles, but I still need you to upload your blood glucose scores” would be divided into two sentences—“Glad to hear you ran 2 miles” and “I still need you to upload your blood glucose.” This process yielded 3,565 message units that were initially coded into the nine message types or categories described elsewhere (Robinson et al., 2011).

Results from the post hoc two sample t-test indicated that the 41 patients that completed both the pre- and posttest HbA1c did not differ from those 80 patients that did not complete the two HbA1c tests in terms of the number of messages they received containing social support ($t = -.57$, $df = 138$, ns). In fact, 74% of the
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respondents \( (n = 80) \) missing their HbA1c posttest continued uploading their blood glucose scores throughout the 6-month period.

**Coding procedure**
The 3,565 message units were initially coded into nine categories: Emotional, esteem, integrational, informational, and tangible social support, as well as technical support, phatic communication, health information requests, self-disclosure. Three paid research assistants underwent a series of three training sessions for a total of 4 hours. Upon completion of the training session, each coder was asked to content analyze 200 messages to be coded independently. For this investigation, only emotional support messages were included in the analysis. Cohen’s \( \kappa \) indicated acceptable intercoder agreement for the emotional social support variable \( (\kappa = .846) \) (Cohen, 1960).

Any message sent by a HCP to a patient that communicated caring or concern for the patient was coded as emotional social support. This included messages such as “It is really hard for people to stay on their diet,” “You are doing great,” “I am concerned with your blood sugar readings,” “Like the weight loss!!!,” and “You are one of our best patients.” In addition, if the HCP made a general statement such as “Call if you need anything” that was also coded as emotional social support. Statements that were specific about the type of help provided were coded as tangible social support or informational social support. The key here is the HCP’s willingness to help—not the provision of specific medical information or task assistance.

**Measurement**
The dependent variable health outcome was measured using quarterly blood tests known as glycosulated hemoglobin or HbA1c. An HbA1c test measures the long-term glycemic control of individuals with diabetes. As a point of reference, an HbA1c of 6% is considered normal; a value above 6.5% may indicate a diagnosis of diabetes; and a value above 7% may mean that one’s diabetes control is not as good as it should be (NIH, 2012). For each participant, HbA1c was measured at baseline and at a 4- to 6-month follow-up interval. Changes in HbA1c were calculated as follow-up value minus baseline value \( (\text{Min} = -5.1, \text{Max} = 1.7, M = -0.77, SD = 1.8) \). Change in HbA1c has been used as an outcome measure to support improvement in a patient with diabetes (Glasgow, Boles, Kay, Feil & Barrera, 2003).

Emotional support was measured as the proportion of messages containing emotionally supportive messages sent from HCPs to a patient during a 6-month period \( (M = 0.29, SD = 0.33) \).

Patient system usage was measured by the number of times each patient logged into MyCareTeam system and by the number of blood glucose scores each patient uploaded to their HCP through MyCareTeam. These measures were recorded as 0 (no use), 1 (low use), 2 (high use for one month of login and upload activities because some patients had problems initially that led to multiple login efforts and because patients became involved in the program at different times). These discrete orderable measures better reflect actual patient system usage.
Table 1 HbA1c Results at Baseline, Follow-Up, and Change

<table>
<thead>
<tr>
<th>HbA1c</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>SE</th>
<th>95% CI for M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>41</td>
<td>8.9</td>
<td>1.6</td>
<td>0.3</td>
<td>8.4, 9.4</td>
</tr>
<tr>
<td>Follow-up</td>
<td>41</td>
<td>8.1</td>
<td>1.4</td>
<td>0.2</td>
<td>7.7, 8.6</td>
</tr>
<tr>
<td>Change</td>
<td>41</td>
<td>-0.8</td>
<td>1.8</td>
<td>0.3</td>
<td>-1.3, -0.2</td>
</tr>
</tbody>
</table>

Results

Our primary outcome variable was HbA1c measured at baseline (when the patient enrolled in the study) and at follow-up (approximately 4–6 months later). Table 1 shows the average HbA1c values at baseline, follow-up, and the change from baseline to follow-up. Patient HbA1c values at study entry ranged from 6.5 to 13.4; and follow-up values ranged from 5.4 to 11.3. The decrease in HbA1c was statistically significant ($t = −2.7, p = .009$). Figure 1 shows the margins plot of the relationship between change in HbA1c and support messages controlling for system usage. This figure shows the importance of support messages on glycemic control. Other studies have shown that people who used the MyCareTeam application the most, had better glycemic control than infrequent users (McMahon et al., 2005; Smith et al., 2004). These results indicated the general improvement of glycemic control over the study period.

Table 2 shows the results of the change in HbA1c regressed on the emotional support measure with uploads and logins as control measures. The results indicated

![Figure 1](image-url)
Table 2 Regression Results for System Usage and Emotional Support

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly logins</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>0.03</td>
</tr>
<tr>
<td>High</td>
<td>0.56</td>
</tr>
<tr>
<td>Monthly uploads</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>−1.18</td>
</tr>
<tr>
<td>High</td>
<td>−2.36</td>
</tr>
<tr>
<td>Emotional support</td>
<td>−0.03a</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Note: $R^2 = .34$

*a* $p = .0013$, statistically significant $\alpha < .01$

the importance of message content relative to MyCareTeam usage. For example, an increase in the percentage of emotionally supportive messages of one is associated with an average change in HbA1c of approximately $−.03$ ($p = .0013$). None of the system usage measures were statistically significant, although the upload measures were in the predicted direction.

H1 stated “Enacted emotional social support messages will be directly related to improved patient health outcomes” and was supported. A percentage point increase in emotionally supportive e-mail messages was associated with a change in HbA1c of $−.03$ ($p = .0013$). That is, a larger percentage of social support messages tended to be associated with greater average decreases in HbA1c controlling for system usage, a desirable outcome. Presenting our results in another way, the percentage of e-mail messages containing emotionally supportive content was 29% with an associated adjusted change in HbA1c of $−.26$. If this average were increased by 25 percentage points, the adjusted change in HbA1c would be approximately $−.92$.

Discussion

In research focusing on HCP—patient messages Smith et al. (2004) found that patient involvement with a web-based diabetes management system resulted in increased levels of interaction. Although specific messages were not analyzed in that investigation, Smith et al. found system usage predicted improved patient glycemic control. Previous research has also connected patient uploads of blood glucose readings with messages sent and received from the HCP (Smith et al., 2004) and specific message types (Robinson et al., 2011).

The current investigation is consistent with and extends this understanding of the effectiveness of online monitoring systems by demonstrating that reception of emotional social support messages is predictive of improved HbA1c levels and ultimately patient health. These findings are particularly important because other predictors such as system usage and frequency of patient uploading of BG scores were

not successful predictors of HbA1c change. This finding suggests that the messages themselves and not merely involvement with the system may play an important role in improving patient health.

Research employing short message service (SMS) technology (Hanauer et al., 2009) suggested text message and e-mail reminders are effective but only in the short term. Interaction via e-mail can be much more than a reminder. In addition to being able to monitor their patients’ health more closely, the use of e-mail affords the HCP the opportunity to interact more frequently, provide social support, and develop relationships. This investigation suggests that the provision of social support may be associated with improvements in patient health and can increase the likelihood of patient health improvement. Exactly why emotional social support predicted HbA1c improvements is not clear. It may be as Cutrona and Russell (1990) suggested that the messages represented an optimal match between patient needs and the type of social support being provided. It may also be that the interaction via e-mail represents an opportunity of relationship development. Our next line of inquiry will focus on the impact of the frequency of messages sent by patients’ and how this impact influences the process. In addition we are examining patient levels of satisfaction with their interaction.

Limitations of the present study

Although this study supports the notion that socially supportive e-mail messages contribute to improved patient health, the fact that the study employed a volunteer sample of American Indian and Native Hawaiians was a limitation to be addressed in future research. Similarly, the coding of the messages by trained coders does not necessarily mean that patients perceived the e-mail messages as being socially supportive. Determining what the patients believe they received from the e-mail messages would be an interesting project for future researchers. Similarly, the study was limited by the fact that patient message types were not examined. Some types of messages may be the result of patient inquiries or health behaviors such as uploading of blood glucose readings. Again future research needs to consider the relationship between sending messages to the HCP and patient health improvements.

Additionally, although our findings began to demonstrate the effectiveness of sending emotional social support messages within an online monitoring system to improve management of diabetes, more studies are needed to determine whether similar supportive messages can be effective in other types of web-based systems as well as within the context of doctor and patient e-mail exchange. These studies are needed for a variety of different reasons—not the least of which is one significant limitation of this investigation. The use of a volunteer sample was problematic and further exacerbated by the fact that data collection was impacted by our access to patient records. As suggested earlier, the HCPs in charge of entering patient data—in particular patient health records including HbA1c data—were not always
willing or able to enter the patient records in a timely manner. Additionally, patients
did not always return to get their HbA1c tested on time. Changes in staff further
complicated the situation as the clinicians agreeing to participate in the study
changed and, once the study was “over,” we encountered difficulty in encouraging
new staff members to go through patient records for a program that was no longer
online.

Future research needs tighter controls on data entry and respondent participation.
Additionally, we would have found it helpful to establish a control group of patients
from each site—who did not have access to the telemedicine system—that we could
use for comparative purposes. However, because of the complication of the multisite
study and the need to recruit patients into the study, we were not able to collect
these data. The clinics maintained a relatively small patient census, and we were
advised at the outset of the research that because the population was wary of research,
a randomized study would be perceived poorly by the patient population. Finally,
many variables contribute to improvement in HbA1c, including improvement in
habits related to nutrition, exercise, changes in drug therapies, or adjustments of
life stressors. We did not specifically examine these variables and therefore do not
know the extent to which they might have contributed to the improvement in
HbA1c levels.

Implications for future research and practice

This investigation has several implications for both research and practice. First, it
explored the connection between content of e-mail messages and health outcomes.
Further, it showed that the value of online monitoring systems can extend (and pos-
sibly should) beyond simple reminder systems, opportunities for patient education,
or patient accountability. Recently, researchers have focused on the use of cell phones
for educational or informational interventions to improve health outcomes. In a
recent review, Krishna et al. (2009) found that 12 of 13 studies reported significant
improvements in clinical outcomes as a result of voice or text messages sent to a cell
phone. Of the 12 studies, 9 involved effective diabetes control and management but
none examined actual messages in their efforts to better understand how they might
contribute to outcome improvement.

Unfortunately, this research into Interactive Behavior Change Technology (IBCT)
has not been particularly successful in the long-term because it focuses on the
technology and not the functions that the technology serves (Piette, 2007). In a call to
reconceptualize the way we understand healthcare access in the 21st century, Fortney,
Burgess, Bosworth, Booth, and Kaboli (2011) suggested that digital communications
between patients and their practitioners would have the ability to “drastically improve
access” (Fortney et al., 2011, p. 645).

Our findings appear to support this call and that the content of the messages
themselves can affect patient outcomes. We believe that explicit guidance regarding
the types of messages most effective with patients will be critical to developing an
effective successful online environment as the walls of the doctor’s offices expand into virtual spaces. As more online chronic conditions monitoring systems are developed, HCPs need to be guided not only in the use of the system for assessing care, but also in the role that messages can play in motivating patients to take a more active role in managing their health.

Additionally, research revealed an association between perceived social support and positive health outcomes (Barrera, Glasgow, McKay, Boles & Feil, 2002; Glasgow et al., 2003; for meta-analysis see Rains & Young, 2009; Uchino et al., 1996). However, these studies used a survey methodology to connect perceptions of social support as revealed by a self-report measure to a specific measured health outcome. The present research examined the relationship between enacted emotional social support messages and health outcomes. It is the first study to connect HbA1c and emotional support messages sent by HCPs to their patients via e-mail.

In a 2011 review of online vendor markets of diabetes applications, researchers found that the most prevalent features in the 137 applications surveyed included: insulin and medication recording, data export and communication, diet recording, and weight management. In the same study, a literature search of studies of mobile health applications found similar features (Chomutare, Fernandez-Luque, Arasand, & Hartvigsen, 2011). These applications suggested that the connection between messages and outcomes will continue to be possible as these types of technologies are adopted.

Fortney et al. (2011) argued that the paradigm for healthcare delivery is evolving with greater reliance on nonencounter-based digital communication between patients and their healthcare teams, creating new opportunities to understand and measure access to care. The changing healthcare environment provides new opportunities for access to actual messages and connecting these messages to specific healthcare outcomes. It also provides researchers the opportunities to address frameworks and theories based on a face-to-face encounter with a HCP and find out how they can be applied or adjusted to help understand digital encounters.

Similarly, social media technologies are providing new avenues for patients to engage with HCPs and for those healthcare systems to use these tools to monitor conversations and respond to patients (Thielst, 2011). Social media potentially provides an additional tool for connecting actual messages to health outcomes.

The present research took an important step by identifying a literature of social support that has indicated a connection to positive health outcomes and connecting specific messages to those outcomes. In doing so, it built on past research as well as provided an example of a new opportunity provided by digital environments that capture messages and healthcare outcome information to communication scholars.

Although this research suggested that supportive communication can enhance a doctor and patient encounter in an online setting, considering the alternative may be important. Specifically, in what settings might patients become stressed or bothered by additional input from their HCP? Research has found that advice can foster
feelings of gratitude and perceptions of caring but can also serve as a reminder of a power imbalance or be perceived as intrusive (Goldsmith & Fitch, 1997). Future research could explore the context within which patients receive e-mail messages from a HCP to better understand the reception of these messages.

For example, receiving messages in an online system where a patient must log in to communicate specifically with the HCP (similar to the system in this study) may provide more agency to the patient than receiving a message within an e-mail inbox that could interrupt the flow of other aspects of a patient’s daily life. Additionally, social support can be complicated when the patient is not ready to receive specific advice or is interested in preserving uncertainty (Brashers, Neidig, & Goldsmith, 2009). In this way, giving patients more agencies in the way they receive this support may be important.

Therefore, as HCPs and their support staff begin communicating with patients in a virtual environment, they should incorporate social support to develop relationships with their patients. Some patients will undoubtedly respond to emotional and esteem social support, whereas others may respond to other types of social support (Cutrona & Russell, 1990). HCPs need to incorporate all types of social support into their e-mail contact with patients. To do so may enhance patient adherence as well as improve patient health.

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