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Telehomecare Communication and Self-Care in Chronic Conditions: Moving Towards a Shared Understanding

Kimberly Shea, PhD, RN and

University of Arizona, College of Nursing, Tucson, AZ, USA

Breanna Chamoff, RN

Arizona State University, College of Nursing and Health Innovation, Phoenix, AZ, USA

Abstract

Background—Remote telemonitoring of patients' vital signs is a rapidly increasing practice. While methods of communication in remote electronic monitoring differ from those in traditional home health care, the understanding shared by the nurse, patient, and family members remains the same: patients' self-care behaviors affect exacerbations of chronic health conditions. The purpose of this paper is to examine the relationship between communication and information integration into the daily lives of patients with chronic illnesses and offer best practice recommendations for telehomecare nurses.

Methods—The original study utilized the Social Relations Model to examine relationships within 43 triads composed of patients with chronic conditions, home helpers and their nurse (THN) involved in telehomecare at three Veterans Health Administrations. This secondary descriptive and correlational analysis compared 43 patients' and 9 THNs' ratings of themselves and each other on communication (frequency, timeliness and understanding) and the use of patients' daily telemonitored information.

Results—There was almost no correlation between patients' perception of THNs' communication (frequency [$r = .05$], timeliness [$r = .09$] and understandability [$r = .03$]) and patients' integration of information into daily health practices. However, significant correlations were found between the THNs' perception of patients' communication frequency and timeliness, and integration, ($p = .02$), ($p < .001$) respectively.

Conclusions—This study suggests that frequent phone communication may lead the remote THN to believe patients are integrating blood pressure, weight and other information into daily self-care behaviors, when in fact the patient reports that they are not. The influence of a halo effect on the THN may cloud an accurate perception of what is actually occurring. Remote communication may require more attention to THNs educating patients about shared understandings when using telemonitoring. Best practices for THN should include explicit goals and intentions for telemonitored home care with individualized instructions about how to use the information for self-care.

After patients experience an acute exacerbation of a chronic health condition, they frequently receive transitional care from home health nurses. Increasingly, home health agencies are using technology to facilitate communication between nurses and patients. Communication is the basis of a partnership based on teaching and information transfer. Nurses provide knowledge to patients and their families on how to manage living with a chronic condition, and detect signs and symptoms of an exacerbation. Patients, in turn,

discuss challenges they encounter with managing their disease. Technology-based communication transfers information between patients and nurses so that knowledge can be integrated into self-care behaviors in the home environment. Understanding associations between communication and information integration into daily lifestyles is vital to successful management of chronic conditions at home.

The Sociotechnical Theory predicts that optimal outcomes result when there is a balance between social and technical characteristics in a system that provides services (Pasmore, Francis & Haldeman 1982). Patients will be more involved in self-management when they accept and can easily use technology for health efforts (Or, Karsch, Severtson, et al. 2011). The purpose of this paper is to examine the relationship between communication (frequency, timeliness, and understandability) and information integration into the daily lives of patients with chronic illnesses and offer caveats and recommendations for eliminating misperceptions and strengthening the shared understanding between nurses and patients when technology mediates interactions. Examining processes used in communication is crucial to creating stronger partnerships between healthcare providers, patients, and their family members in an effort to better self-manage chronic illnesses.

Background

Communication and Home Health Care

Communication is an interpersonal interaction that involves sending and receiving information in an effort to create a shared understanding between communicators. Communication requires that the sender select a mode of information delivery (e.g., face-to-face, digital technology or telephony). The mode that is chosen is a primary factor in deciding the content medium (e.g., audio, graphics or text). Sometimes more than one mode of delivery is needed (i.e., redundancy) to assure that the message is correctly understood. In today's communication-intensive environment, health information may be delivered in person or via telephone, books, or the Internet.

A shared understanding among nurses, chronically ill patients and family members is that self-care behaviors can minimize life-altering exacerbations (Bodenheimer, Lorig, Holman & Grumbach 2002). Home health nurses work diligently toward the goal of having patients integrate this shared understanding into their daily lives. However, creating a shared understanding can be challenging. In the home healthcare situation, patients and nurses take on the communication roles of both sender and receiver throughout the interaction. Each must consider the perspective of the other if the message is to be conveyed accurately. The sender may have a different perception of the communication's intent than the receiver understands. Experiences, desires and beliefs unique to each nurse or patient shape how information is sent and received. (Koppelman-White 2009)

Information Integration and Self-Care Behaviors

Information consists of raw data that are processed using the receiver's knowledge (McGonicle & Mastrian 2009). Patients engaged in telemonitoring first gather relevant data by monitoring their own body's signs and symptoms of disease. The data is processed by the patient using their knowledge that is derived from learning and experience. Once the patient has the information, they can choose to apply, note or ignore the implications for their health behaviors. Application of information for self-care behaviors requires patients to collect data, use knowledge and then act accordingly. (McGonicle & Mastrian 2009)

Nurses can and should be sources of knowledge on the nature of the chronic disease as well as how to interpret the related signs and symptoms. Self-care behaviors are actions (or intentional lack of action) that result when the information is applied to the patient's

environment (Henry, 1997). For example, patients with diabetes learn to measure their own blood sugars and adapt their diet to prevent severe hyper- or hypoglycemic complications. The process of integrating information into behaviors is complex, yet with frequent practice, the process happens quickly and can become part of a daily lifestyle.

Telemonitoring

Telemonitoring is the most common type of technology used in home health care for data collection, knowledge transfer and communication. It has been projected that by 2012 home health remote monitoring will serve over 7 million people in the United States and Europe (Park Associates 2008). In the home, a freestanding data collection hub is used to collect patients' vital signs (e.g., blood pressure, weight, pulse, glucose levels, oxygenation) and other symptoms (e.g., sleep, edema, shortness of breath, pain) daily from either attached peripheral monitoring tools or patient report. Once collected, the collection hub transmits all the data via the telephone line to a remote telehomecare nurse (THN). The THN may review data from as many as 100 patients in a single day. With the assistance of a computer program that flags out-of-range data, the THN will assess the data to determine if the patient needs to be contacted and directed to take action.

Technology-based communication in home health is becoming more prevalent because it is thought to be a feasible solution to the three major problems associated with health care: access to care, cost containment and providing quality care (Rumberger & Dansky 2006). Communication between sender and receiver that does not happen in real time is asynchronous. THNs typically review and respond to the patients' self-monitored data the morning after it was sent. Asynchronous communication is believed to be more efficient and convenient because, unlike telephone or face-to-face conversations, the sender and the receiver are not required to be physically present at the same time. Information can be sent and received at any time without the inconvenience of waiting for a prescribed time. Asynchronous communication is helpful for education because the receiver can take the time needed to process and absorb the information. (Shirani, Tafti & Alffisco 1999). The benefits have encouraged rapid growth in the use of home telemonitors; however, little research has been conducted to determine the influence of communication, using this technology, or motivating patients' to engage in self-care.

Home health agencies that use remote monitoring provide the technology as an adjunct to the traditional face-to-face visits. Due to current reimbursement restraints, only agencies such as the Veteran's Health Administration (VHA) can utilize telemonitoring as a primary source of ongoing communication for chronically ill patients. The VHA uses home telemonitoring in the typical manner described previously (Kobb, Hoffman, Lodge & Kline 2003). The VHA care coordination model has demonstrated a 40% reduction in emergency room visits, 63% reduction in hospital admissions, 60% reduction in hospital bed days of care, 64% reduction in VHA nursing home admissions, and 88% reduction in nursing home bed days of care (Meyer, Kobb & Ryan 2002). The THN makes decisions based on the data in the chart and the patient's monitored vital signs and symptoms. Communication between patient and THN about monitored signs and symptoms are thought to contribute to daily self-care behaviors that can minimize exacerbation of chronic conditions (Bodenheimer et al. 2002; Lorig 2003; Bodenheimer 2005). However, little is known about the degree to which the patient is integrating the self-monitored data into daily health efforts.

Telemonitoring and Self-care Behaviors

Research results on self-care behaviors support frequent self-monitoring and prioritization of healthcare behaviors as a strategy that keeps patients out of the hospital as effectively as the prescribed treatment itself (Jerant, Azari, Martinez & Nesbitt 2003). A patient's comfort

with self-monitoring can result in confidence in choosing the type of corrective action that must be taken and when to call his or her healthcare provider (Bodenheimer et al. 2002). Proactive behaviors develop as patients monitor vital signs and symptoms regularly (Horwitz et al. 2008). Patients who are active in self-care communicate with healthcare providers and develop partnerships as collaborators. The partnerships can promote expert patients who are living with chronic conditions and are not only consumers of healthcare but also producers of health (Holman & Lorig 2000). Home-based health interventions provide oversight that also incorporates self-care behaviors into patients' daily health care activities. Technology, such as home telemonitoring, can be a tool used by nurses to enhance the process of transforming data into self-care behaviors (Sarasohn-Kahn 2009).

Research Methods

The original study examined relationships within 43 triads (patient, THN, and home helper) involved in telehomecare at three Veteran's Health Administrations using a mathematical model that produce perceiver, target, relational and total group effect scores for each triad (Shea 2011). The Social Relations Model, often used to examine family functioning, is unique in that effect scores are derived from relationships within the group and do not include participants' perceptions of themselves (Cook & Kenny 2004). The original study displayed differences among triad characteristics that impacted outcomes.

This secondary data analysis compared communication and information integration based on the roles of patients and THNs. The study examined 43 patients and 9 THNs using a descriptive, round robin correlational research design. THNs were limited to evaluating a maximum of 5 patients. All patients interacted with their nurses using a telestation (vendor name for home-based hub) that collected and transferred information via telephone lines. Patients had at least one of the following chronic diseases: obstructive pulmonary disease, congestive heart failure or diabetes. Data were collected from participants over 2 consecutive months. To be included in the research, patient participants had to be (1) over 50 years of age, (2) enrolled in CCCS program for at least 2 weeks, (3) routinely using telemonitoring devices two or more times per week, and (4) having a caregiver who was not hired. All THNs were required to have 2 months experience as a THN in the CCCS.

All requirements for human subjects review boards were met at the three sites. Participating patients and THNs responded to similar survey questions, differing only in the subject of the question based on the role of the participant. All study surveys were administered by paper to consenting THNs and by telephone to consenting patients who met inclusion criteria.

Measures

Patient and THN surveys included demographic questions and Likert scales for seven items concerning communication and integration of telemonitored information. Questions were administered on the telephone using a round-robin design in which patients rated THNs and THNs rated patients on the same item. Round-robin data collection is most commonly used in studies that examine interpersonal relations (Bonito & Kenny 2010).

The Communication scale is a 3-item, 5-point Likert scale, with responses ranging from 1 (never) to 5 (always). The scale was adapted to this research from the studies of Gittel (2000) and Verran et al. (2003) on communication among healthcare workers. The adapted version of the Communication scale was reliable and valid for use by patients rating nurses ($\alpha = .75$, factor loadings $> .85$) and THNs rating patients ($\alpha = .82$, factor loadings $> .80$) (Shea 2011). THNs and patients were asked to rate each other on communication frequency, timeliness and understandability. The subject of the sentence changes depending on the role of the participant. Below is an example of the question format for the THN.

1. How frequently do you communicate with the PATIENT about his/her care?
(Provide number of communications since you started telemonitoring _____)
2. Does the PATIENT communicate with you in a timely way about his/her care?
3. Does the PATIENT communicate with you in an understandable way about his/her care?

The Degree of Integration was measured by 0–100 scales. First, the participants rated themselves and then the participant rated the other member of the dyad. Researchers gave study participants instructions on using the scale such as, “When choosing a number in the scale of 0–100, 0 means that the telestation information is never used to guide health efforts and 100 means that the telestation information is used to guide all healthcare efforts.” The THN was asked to assign a number to the following statements:

1. I use the home telestation information to guide my daily efforts to manage my patient’s care.
2. It is my opinion that the PATIENT uses the home telestation information to guide his/her daily efforts to manage his/her health.

Likewise, the patient was asked to rate the statements:

1. I use the home telestation information to guide my daily efforts to manage my health care.
2. It is my opinion that the TELEHEALTH NURSE uses the home telestation information to guide his/her daily efforts to manage my health..

Data Analysis

Descriptive and correlational analyses were performed using computer software, Statistical Package for the Social Sciences (SPSS) 16.0 for Windows. A Pearson’s correlation analysis was used to examine the relationship between measures of communication and integration ratings. All possible relationships between patient and THN perceptions of communication and integration were examined and considered significant at $p < .05$.

Results

Demographics

Despite efforts to recruit females, all VHA patient participants were males over 50 years of age. Diagnoses were distributed evenly among chronic cardiac, respiratory and diabetic disease. The duration of telemonitoring care in the home ranged from 2 to 24 months, with 25% using it for 1 year and 12% for 2 years. Thirty percent did not consider themselves to be experienced with electronic communication. Inclusion criteria dictated that the patient used the equipment at least two or three times per week; however, 95% used the equipment daily. Thirty-six percent of patients rated the THN as using 100% of the daily telemonitoring data for their care and 26% said that they did not know what the THN did with the data. When asked why they had telemonitoring in their homes, 70% stated that the doctor said they had to be monitored. The patient participants’ frequency of communication with the THN ranged from 0 to 50 times per month, with an average of once a month. Patients reported communication was primarily initiated by the THN. All of the patients considered phone contact only to be a source of communication, not the telemonitoring. Of the 43 patient participants, only 9 had ever had face-to-face meetings with the THN. Those meetings occurred when the THN came to the VHA clinic after telemonitored data indicated follow-up care was needed.

Eight of the nine THNs were female; six were 50 years old or older, and three were between 30 and 50 years old. Forty-four percent had a BSN, and 33% had a Master's degree in nursing as their highest degree; the balance (23%) had ADNs. Three THNs had graduated with their highest degree during the last 10 years, and all considered themselves experienced with electronic communication. All THNs had at least 1 year of experience using remote monitoring technology, but only two had prior experience in home health. Twenty-five percent of THN and 70% of patients strongly agreed with the statement, "The patient, THN and home helper have the same goals for home telemonitoring." All the THNs ranked their delivery of patient care using the monitoring technology as very enjoyable.

Communication Relationships with Integration

Means and standard deviations for THNs' and patients' perceptions of communication frequency, timeliness, understandability, and integration are displayed in Table 1. Patients perceived that THNs communicated occasionally ($\mu = 3.00$, $SD = 1.05$) and the communication was often timely ($\mu = 3.88$, $SD = 1.68$) and almost always understandable ($\mu = 4.44$, $SD = 1.28$). THNs believed that the patients' communication frequency ($\mu = 3.44$, $SD = .91$) and timeliness ($\mu = 3.63$, $SD = .87$) were more than occasional and often understandable ($\mu = 3.95$, $SD = 1.0$). The duration of telemonitoring services did not correlate significantly with patient's perception of communication frequency ($p = .705$, $r = .059$). On average, both patients and THNs believed that they integrated the monitored information more than the person they were rating.

Table 2 shows correlations between the patients' perception of communication with THN and integration scores. Table 3 shows correlations between the THN's perception of communication with patients and integration scores.

Table 2 shows that there was almost no correlations between patients' perception of THNs' communication (frequency [$r = .05$], timeliness [$r = .09$] and understandability [$r = .03$]) and patients' integration of information from the telestation into daily health practices. However, there was a significant correlation between the frequency ($p = .02$) and timeliness ($p < .01$) of patients' perception of THN communication and the degree to which the THNs' integrates the monitoring information into daily healthcare efforts to provide patient care. There was almost no correlation ($r = .07$) between the duration in the program and the patients who did not know what the THN did with the data that was sent from the telestation.

As shown in Table 3, the correlations were not statistically significant and spurious between the THNs' perception of patient communication and patient perceptions of integration. However, strong positive correlations existed between the THNs' perception of patients' communication frequency and timeliness, and integration, ($p = .02$), ($p < .001$) respectively. The THN's perception of his/her own integration did not show a significant relationship with the patient's communication.

Further investigation revealed that there was a moderate but insignificant inverse relationship between the THNs' and the patients' perception of integrating the telestation data into the patients' health practices ($p = .10$, $r = -.25$). The study showed a significant correlation between the patients' perception of communication frequency and number of phone interactions that the patient recounts ($p < .001$, $r = .52$), yet there was minimal correlation with the THNs' perception of frequency and phone interactions ($p = .50$, $r = .12$).

Discussion with Implications for Clinical Practice and Future Research

The data analysis shows that, in both THNs and patients, there is a significant relationship between frequent and timely communication and information integration, but only for the participant who is the perceiver. This may be a halo effect, whereby the perception of a one trait is influenced by the perception of another trait (Goodenough 1950). The frequency and timeliness of communication vary in the same negative or positive direction as the degree of integration for each perceiver. For example, if the THN perceives frequent and timely communication, then the THN also believes that the patient is using the monitored information daily. Similarly, if the patient perceives that the communication with the THN is frequent and timely, then the patient also believes that the THN is more likely to use the data to care for the patient. Oddly enough, 26% of patients did not even know what the THN does with the information that they sent daily.

The relationship between the variables is logical: more communication means more knowledge about what the other participant does with the telemonitoring information. However, the logic is not supported in the finding that patients' perceptions of their own degrees of integration are quite different to what the THN perceives. Patients who THNs perceive are integrating the telemonitoring information do not rate themselves as integrating information. In addition, patients' do believe that the amount of phone interaction with the THN relates to using telemonitoring information in their daily lives.

The influence of the halo effect on the THN may cloud an accurate perception of what is actually occurring. THNs may believe the increased phone interaction indicates that patients are integrating blood pressure, weight and other information from the telemonitor into their lives. Conversely, patients who do not talk to the nurse as often may rely on the telemonitored data more, but due to lack of communication, the THN does not know that the information is being used for self-care.

Best practices for THNs should include more specific and detailed explanations about the importance of the telestation as a tool for communication between nurse and patient. As stated earlier, communication is an interpersonal interaction involving sending and receiving information in an effort to create a shared understanding. The shared understanding is that self-care behaviors can minimize life altering exacerbations. Clearly, the difference between 70% of THNs and 25% of patients strongly agreeing with the statement, "The patient, THN and home helper have the same goals for home telemonitoring," is a strong indicator that goals may not be shared. Patients have large amounts of variation in their rating of how much of the telemonitored information is used for daily health efforts. Patients may consider telemonitoring as a service that enables reliance on a remote health care professional without expectations of self-care. Telestation questions that appear in addition to the monitoring are often standardized and this may contribute to the patients' belief that the information is not individualized for use in their own lives. The lack of individualization may lead the patient to believe that the information is generic and not applicable to their lives. This study supports the notion that goals and shared understandings for remote monitoring are not understood by telemonitored patients. Therefore, explicit information from the THN to the patient that the telestation is a direct communication that contains valuable data to be used for self-care is routinely needed.

Remote communication may require more attention to THNs educating patients about shared understandings. Explicit expectations for actions resulting from communication modes will help establish common goals. Open-discussions on goals will help guide the interactions toward useful integration of technology-based information. When the THN makes clear that the telestation is a tool for communication by providing more

individualized instructions about what to do with the data, the patient is more likely to realize the importance of the data to their healthcare. Perhaps the biggest concern from this study is that THNs may have misperceptions about how the telemonitor is being used. Their time and effort may be directed to patients who are already successfully using the technology, unintentionally neglecting to work with those who are not. As such, THNs will miss an opportunity to encourage use of blood pressure, weight and other monitored values for self-care.

Much can be learned from visualization of actions so that remote perceptions may not be accurate. Future studies that examine influences of explicit directions and goals on self-care behaviors using telemonitoring and human-computer interactions that motivate patients to use home telemonitored information will provide more evidence on how to implement best practice procedures for THNs.

Study Limitations

This pilot study was limited by a small homogenous sample size, which restricts analyses and limits generalizability of the study's findings. The patients were clustered within the 9 THNs and this was not accounted for in the analysis. It is difficult to control for THN bias to rate self as a high integrator of information. The questions asked for a Likert rating ranging from never to always, which may have been awkward scaling for a response to the question, "How frequently do you communicate with the PATIENT about his/her care?" Although there was strong evidence that phone contact only is considered as communication in the study, future studies should explicitly question whether telemonitoring could be considered communication.

Conclusions

Telemonitoring is a rapidly growing addition to the care of patients living with chronic conditions. When patients are visited by a nurse in traditional home health care, communication is believed to support a shared understanding that the information from the telemonitor is provided to enhance patients' self-care behaviors that will in turn minimize exacerbations of chronic health conditions. Patients monitor their own signs and symptoms and send them to the THN daily, but they do not necessarily integrate the information in order to manage their own daily health efforts. Further, the THN may misinterpret frequent and timely communication as an indicator that the patient is using the monitored information. Patients do not consider the interaction through the telestation as communication, and many do not know what the telehomecare nurse does with the information. This study indicates that an initial understanding of telemonitoring and goals should be agreed upon by the patient and THN.

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Descriptive means and standard deviations for communication and integration from patient and telehealth nurse (THN)

TABLE 1

	Patient Perception of Self		Patient Perception of THN		THN Perception of Self		THN Perception of Patient	
	μ	SD	μ	SD	μ	SD	μ	SD
Communication (range 1–5)		Not collected	3.00	1.05	Not collected		3.44	.91
	frequency							
	timeliness	Not collected	3.88	1.68	Not collected		3.63	.87
Integration of monitoring information into daily health care (range 0–100)	understandability	Not collected	4.44	1.28	Not collected		3.95	1.0
			60.44	44.82	89.33	12.25	72.98	24.79

Correlations between patients' perception of communication with telehealth (THN) and integration of integration perspectives

TABLE 2

Patient perception of communication with THN	Patient perception of own integration		Patient perception of THN integration	THN perception of own integration	THN perception of Patient integration
	r	p			
Frequency	.047		.346 *	.071	.109
	.763		.023	.653	.486
Timeliness	.088		.441 *	.027	-.010
	.576		.003	.862	.950
Understandability	.027		.220	-.268	-.159
	.865		.156	.082	.308

* significant correlation $p < .05$

TABLE 3
Correlations between telehealth nurse's (THN) perception of communication with patient and integration of integration perspectives

THN perception of communication with Patient	Patient perception of own integration		Patient perception of THN integration	THN perception of own integration		THN perception of Patient integration
	<i>r</i>	<i>p</i>				
Frequency	-.137		-.162	.201		.365 *
	.383		.298	.196		.016
Timeliness	.079		.013	.083		.499 *
	.617		.932	.598		.001
Understand	.229		.058	.019		.291
	.139		.710	.905		.058

* significant correlation $p < .05$