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Use of Grounded Theory in Cardiovascular Research

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Abstract

While grounded theory is often cited in the qualitative literature as the methodology, there are few good examples of publications that follow the principles of grounded theory and result in an actual theory. The purpose of this paper is to demonstrate how the Corbin and Strauss (2015) method of grounded theory was used in a study looking at how patients with cardiovascular disease and diabetes develop health literacy skills that are used to manage their condition. The key principles of grounded theory include theoretical sampling, constant comparison, open, axial, and selective coding, the use of memoing, and theoretical saturation. Data collection in this study was in the form of semi-structured interviews of 16 patients with cardiovascular disease and diabetes, and 19 healthcare professionals that care for or educate these patients. Patients were recruited from a primary care medical practice, a cardiology medical practice, patient focused programs provided by the American Heart Association, and social media. Healthcare professionals were recruited from the medical practices, the American Heart Association, and social media. Each interview was recorded, transcribed, and coded. Insights from these interviews led to the development of the health literacy instructional mode, which explores the use of digital tools, instructional approaches, social support, and self-directed learning in the development of health literacy skills, and is an example of the use of grounded theory in cardiovascular research.

Keywords

Health Literacy, Grounded Theory, Cardiovascular, Diabetes, Qualitative Research

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Use of Grounded Theory in Cardiovascular Research

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While grounded theory is often cited in the qualitative literature as the methodology, there are few good examples of publications that follow the principles of grounded theory and result in an actual theory. The purpose of this paper is to demonstrate how the Corbin and Strauss (2015) method of grounded theory was used in a study looking at how patients with cardiovascular disease and diabetes develop health literacy skills that are used to manage their condition. The key principles of grounded theory include theoretical sampling, constant comparison, open, axial, and selective coding, the use of memoing, and theoretical saturation. Data collection in this study was in the form of semi-structured interviews of 16 patients with cardiovascular disease and diabetes, and 19 healthcare professionals that care for or educate these patients. Patients were recruited from a primary care medical practice, a cardiology medical practice, patient focused programs provided by the American Heart Association, and social media. Healthcare professionals were recruited from the medical practices, the American Heart Association, and social media. Each interview was recorded, transcribed, and coded. Insights from these interviews led to the development of the health literacy instructional mode, which explores the use of digital tools, instructional approaches, social support, and self-directed learning in the development of health literacy skills, and is an example of the use of grounded theory in cardiovascular research. Keywords: Health Literacy, Grounded Theory, Cardiovascular, Diabetes, Qualitative Research

Medical research is dominated by quantitative, hypothesis driven research methods. According to Krumholtz, Bradley, and Curry (2013) there is a need for more rigorous qualitative research, especially in areas where little is known, such as health literacy. Rather than relying on surveys and statistical analysis of quantitative studies, qualitative and mixed methods research can take an inductive approach to new discovery, which may lead to better hypotheses, better tools and strategies, and ultimately, better outcomes. Qualitative and mixed methods research should be used to investigate complex phenomena that are difficult to measure providing a deeper understanding and leading to better approaches, strategies, instrumentation, hypotheses, and outcomes (Curry, Nembhard, & Bradley, 2009). Qualitative methods can expand and enhance the role of quantitative research methods, especially in complex areas where little information is available, or where there is a high degree of variability in results from quantitative studies. This paper is designed to demonstrate the use of rigorous grounded theory methodology in a qualitative study of the development of health literacy skills in patients with cardiovascular disease and diabetes.

Background on the Study

The knowledge and skills necessary to manage health and prevent disease are known as health literacy (Parker & Ratzan, 2012). An estimated 90 million Americans lack the skills to understand their condition and related numbers, navigate the health system, communicate with their healthcare provider, and make good health related decisions (Kutner, Greengerg, Jin, & Paulsen, 2006). A National Action Plan was developed by U.S. Department of Health and Human Services in 2010 to create a more health literacy society, and a Health Literacy Toolkit was developed to help healthcare providers communicate more effectively with their patients (Dewalt et al., 2010). Since a national assessment of health literacy has not been conducted since 2003 (Kutner et al.), it is unclear how effective the Action Plan, Toolkit, and other strategies have been.

Just as there are many forms of quantitative methods, such as registries, clinical trials, and predictive analytics, there also are several forms of qualitative methods, including narratives, case studies, phenomenology, ethnography, and grounded theory. While grounded theory is a popular method of conducting qualitative research, many studies that claim to use grounded theory do not in fact follow the principles of grounded theory (Barbour, 2001). Also, within each of these methods difference strategies of data collection and analysis are used. The purpose of this paper is to provide an example of how grounded theory was used in a study looking at how health literacy skills are developed in patients with cardiovascular disease and diabetes.

Background on Grounded Theory

A grounded theory approach was used to gain perspective and a greater insight into the process of learning, the building of knowledge and the development of health literacy skills in patients diagnosed with a heart disease, heart failure, diabetes, high cholesterol, and high blood pressure. Grounded theory was discovered by Glaser and Strauss (1967) as a method of developing theory from empirical data, rather than simply testing hypotheses based on classical theories. While grounded theory is increasingly used in medical research there are several forms of grounded theory, based on the interpretive approach (Sbaraini, Carter, Evand, & Blinkhorn, 2011). The original grounded theory method, developed by Glaser and Strauss (1967) comes from a postpositive framework. Glaser and Strauss eventually developed their own separate methodology for grounded theory (Corbin & Strauss, 2015; Glaser, 1992). The different methods of conducting grounded theory represent different philosophical frameworks, making it necessary for the researcher to select the approach with the best methodological fit (Charmaz, 1990; Glaser & Strauss; Glaser, 1992; Strauss & Corbin, 1990). The methodology described by Glaser is a more purely inductive approach, while the methodology developed by Strauss is more structured and is both inductive and deductive (Heath & Cowley, 2004). Constructivist and postmodern approaches to grounded theory also have been developed (Charmaz, 2014; Clarke, 2005). The grounded theory approach used in this study is based on the methods described by Strauss and Corbin (1990), which emphasize an iterative approach, using theoretical sampling, constant comparison, the use of analytic memoing, and saturation (Corbin & Strauss, 2015).

While grounded theory is becoming increasingly accepted, there continues to be very few grounded theory studies in the medical literature (Watling, 2012). While grounded theory is rooted in the social sciences, many of the early pioneers came from health care backgrounds. The seminal work by Glaser and Strauss was conducted in healthcare looking at how hospitals dealt with death and dying. The second generation of grounded theorists also come from

healthcare backgrounds and have used grounded theory in their research (Charmaz, 1990; Corbin & Strauss, 2015).

Literature Review

One of the differentiating points with grounded theory methods is the use of a literature review (Heath & Cowley, 2004). While knowledge and experience frame the worldview of the researcher, it is hard to imagine rigorous research being done without an extensive review of the literature. The challenge is to keep an open mind, not an empty head.

Cardiovascular and metabolic conditions including coronary artery disease, hypertension, heart failure, lipoprotein disorders, and diabetes are complex, demanding conditions requiring skill and knowledge on the part of the patient (Artinian et al., 2010). Compared to a condition that is simple to detect and simple to treat, the management of cardiovascular disease and diabetes requires a much higher level of patient involvement (Smith et al., 2011). Health literacy skills described by Smith et al. (2011) include knowing what, when, and how to monitor key biometrics, understanding nutrition labels and medication instructions, and being able to communicate symptoms.

Despite the attention given to health literacy, research on the health impact of strategies designed to build knowledge, health literacy, and self-management skills is mixed (Sheridan, Halpern, Viera, Berkman, Donahue, & Crotty, 2011). Paasche-Orlow and Wolf (2007) have identified the causal pathway between health literacy and health outcomes. Quantitative studies have focused on self-management skills and health outcomes rather than on the improvement in knowledge and health literacy. In the quantitative studies, health literacy is represented as an ordinal value, grouped as *below basic*, *basic*, *intermediate*, and *proficient*. Lesgold and Welch-Ross (2012) pointed out that there is a large body of research in the education literature on improving literacy skills, but there is little research in adults, especially in regards to the development of health literacy skills.

Qualitative studies have focused on barriers encountered by patients with low health literacy skills and the attributes necessary to build health literacy skills, especially the communication skills of patients and their healthcare providers (Easton, Entwistle, & Williams, 2013; Edwards, Wood, Davies, & Edwards, 2012; Jordan, Buchbinder, & Osborne, 2010). Easton, Entwistle and Williams found that the stigma of low literacy can impair the patient's ability to communicate with healthcare professionals. The health literacy pathway model, described a progression of health literacy skills from knowledge to action to decision making (Edwards, Wood, Davies, & Edwards, 2012). Jordan, Buchbinder, and Osborne conceptualized health literacy as a journey including identification, navigation, communication, and resolution. Neither quantitative nor qualitative studies have addressed how health literacy skills are developed in patients with cardiovascular disease or diabetes. These qualitative studies provide important insights into the process of developing health literacy skills, and the importance of establishing baseline knowledge, but did not explore how that knowledge is initially acquired.

Selection of Grounded Theory

Grounded theory is the best methodological fit because it goes beyond the description of the phenomena to the development of a theory or model, designed to better explain the process and actions, which could lead to improved methods for becoming a more health literate culture. The postpositive interpretive framework and secondarily a constructivist approach, was used in this qualitative study. This framework is selected because it is the best methodological fit for answering the research questions, and is most aligned with the

philosophical framework of clinicians and researchers that conduct cardiovascular research. Medical researchers are more familiar with hypothesis driven research and grounding the theory the data is likely to be more accepted than more purely inductive methods.

The methodology of grounded theory involves a back and forth between data collection and data analysis and focuses on distinct steps including theoretical sampling, constant comparison, and theoretical saturation (Corbin & Strauss, 2015). The approach to grounded theory described by Strauss, and later by Corbin and Strauss, is more structured than other approaches (Heath & Cowley, 2004). While the grounded theory approaches described by Glaser (1992) and Charmaz (2014) allow the theory to emerge from the data more naturally.

The purpose of this study was to gain perspectives of patients and healthcare professionals in the development of health literacy skills in patients who have been diagnosed with cardiovascular disease and diabetes within the past 12 months. This includes how healthcare professionals assess and build health literacy skills, as well as how patients find and use health information. Healthcare professionals include not only providers of medical care but also health educators and administrators. The intent was to go beyond the description of the low health literacy groups, the challenges, or the motivational issues and instead to focus on factors related to health literacy instruction to explore the process of learning and how new resources that are now available to patients, such as digital tools, apps, wearables and websites, are used.

The central phenomenon of this grounded theory study was the process and actions from the perspectives of both patients and healthcare professionals in the development of health literacy skills. The central phenomenon of learning may be impacted by the instructional strategy and format of the healthcare professionals, and the use of technology, such as social networking sites, digital tools, web-enabled apps, and devices, including blood pressure monitors, scales, and physical activity trackers, that can be accessed directly by the patient (Beatty, Fukoaka, & Whooley, 2013). While in the past patients may have relied on the information presented to them by their doctor, they can now use search engines to learn more about their condition, track their own data using connected devices, and interact directly with other patients in a manner that was not possible even a few years ago (Beatty et al.). A better understanding of how health literacy skills are developed must go beyond the description of the phenomenon using a grounded theory approach.

Conceptual Framework

Since much of the research on literacy has been done in children and adolescents, with very little research on how health literacy skills are developed in patients with chronic conditions, there is a gap in the conceptual model. Cardiovascular disease and diabetes are complex, chronic conditions. Current conceptual models, such as the health belief model (Beckie, 2006), the transtheoretical model (Prochaska & DiClemente, 1983) and adult learning theory do not explain initial step of developing the knowledge necessary for the development of functional and critical skills. A theoretical explanation is necessary to better understand the action and processes that lead, not only to a basic understanding of the health condition, but also how that knowledge translates to self-management skills. For example, a patient with diabetes that does not learn the basic knowledge of the disease may have difficulty with functional skills such as testing blood sugar and critical decision making skills, such as adjusting insulin. The recommendations from the healthcare professional and access to digital tools both play a role in this conceptual model. How patients use medical advice and digital tools and technology in the process of knowledge building and skills development were explored in this study.

Methods

This study was approved by the Walden University IRB. The primary research question is how do individuals who have been recently diagnosed with a chronic health condition acquire knowledge and learn skills necessary to manage their condition. The data collection, including interviews of patients and healthcare professionals, the writing of analytic memos, and data analysis process, including coding were focused on answering the research questions. The primary research question was to better understand the actions and process that lead to the development of health literacy skills in patients recently diagnosed with cardiovascular disease and diabetes.

The central concepts/phenomenon in this study include the sources of information, how that information is found, accessed and validated, the format and learning style, the timeframe, and the perceived effectiveness of these sources in building health literacy skills, reaching goals, and improving outcomes. The sources of information include digital and print media from medical and non-medical sources. The information may be found, accessed, and validated from healthcare professionals or self-directed searches. Learning styles may include attending didactic lectures, reading articles, watching videos, or asking questions. Perceptions of benefits, goals, and outcomes may include improving knowledge and behaviors, such as nutrition, physical activity, and medications, achieving clinical treatment goals, such as blood pressure or cholesterol, or recurrence of symptoms.

Components of Grounded Theory

The key elements of grounded theory are summarized in table 1.

Table 1
Summary of Data Collection and Analysis Methods

Method	Description
Theoretical sampling	Identifying most likely to provide information
Constant comparison	Process of comparing data to emerging categories
Open coding	Initial process of coding data into categories
Axial coding	Process of linking codes and categories
Selective coding	Development of the theory from core phenomena
Analytic memos	Notes written by the researcher linking and explaining concepts and emerging categories
Theoretical saturation	The stage when no new information is emerging from the data

These elements included theoretical sampling, constant comparison, open, axial, and selective coding, memoing, and theoretical saturation, as described by Corbin and Strauss (2015). The data collection and analytic methods, as described by Corbin and Strauss are described in Figure 1.

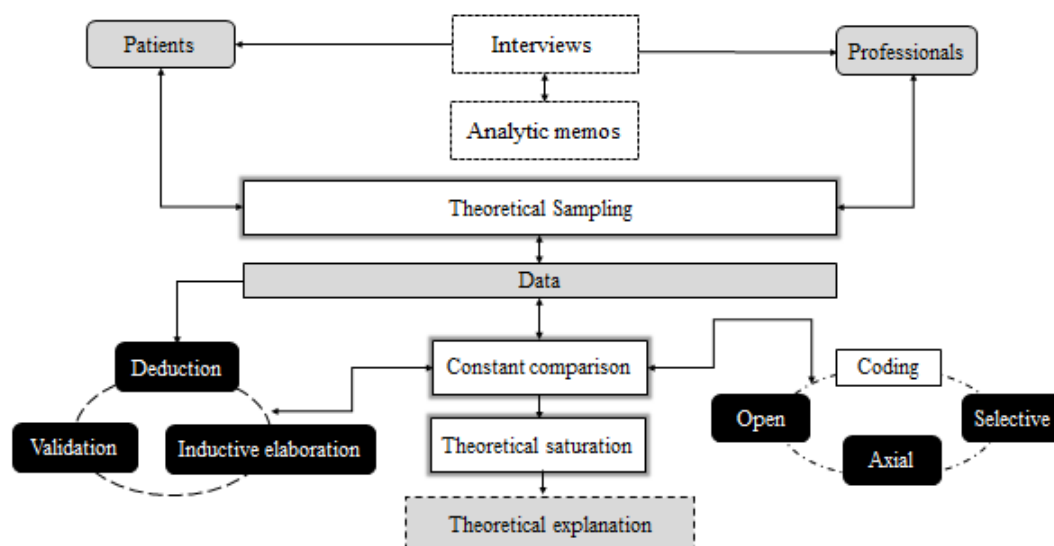


Figure 1. Data collection and analytic methods

Theoretical sampling. The sources of participants are described in Table 2 and the participant selection process is illustrated in Figure 2.

Table 2
Cooperating Sites and Sources of Study Participants

Types of site	Patient population
Primary care medical practice, based on Dallas, Texas	High blood pressure, diabetes, lipoprotein disorder
Cardiology practice, based in Grapevine, Texas	Heart attack, heart failure
Patient centered programs provided by the American Heart Association	All patient types
Social media sites	All patient types

The subjects in this qualitative study were chosen using theoretical sampling, as described by Corbin and Strauss (2015). The participants who comprise this theoretical sample were drawn from a primary care medical practice, a cardiology practice, patient centered programming offered by the American Heart Association, and social networking sites, including Facebook and Twitter, targeting patients with cardiovascular disease and diabetes. A mix of these diagnoses, as well as a mix of age, gender, ethnicity, and level of education was used to determine the selection of patients that resulted in the most information, and of which can result in greater insights in the formulation of the theory. A patient recruitment flyer was posted in the primary care and cardiology practices, and an electronic version of the recruitment flyer was posted on the American Heart Association patient centered programming and social media sites.

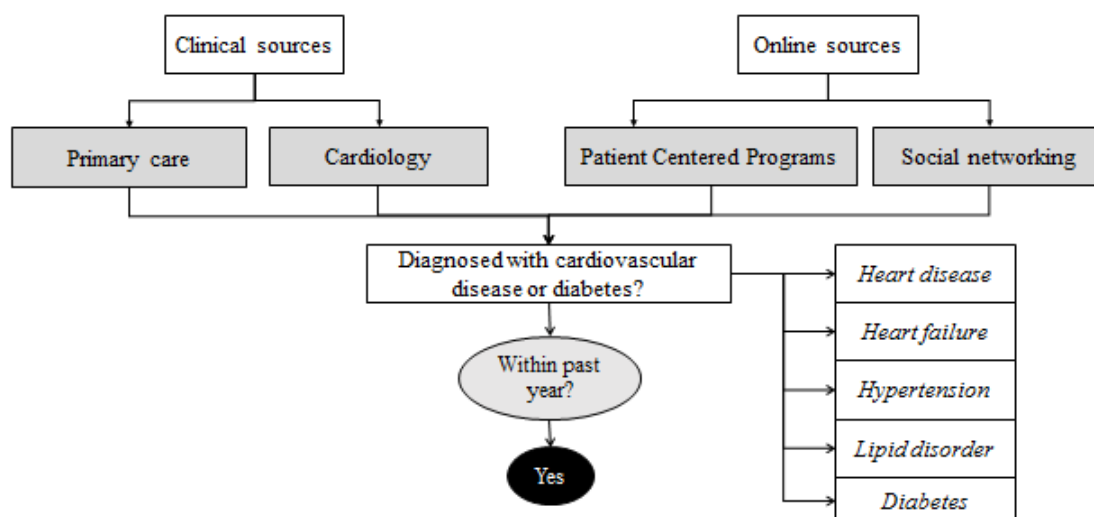


Figure 2. Participant selection process

Healthcare professionals from the primary care and cardiology practices, and the American Heart Association were recruited using theoretical sampling as described by Corbin and Strauss (2015). These three organizations include health literacy instructional practices conducted in the acute, outpatient, and community settings. Healthcare professionals, including physicians, physician assistants, nurse practitioners, nurses, dietitians, exercise physiologists, social workers, health educators, and administrators, who educate or treat patients with cardiovascular disease or diabetes, were recruited to participate in the study.

The cooperating sites were provided a one-page flyer describing the study to the patients. A recruitment flyer for patients, and a separate recruitment flyer for healthcare professionals, were posted in the waiting area of the medical clinics. Participants who were interested in participating in the study were asked to contact the lead researcher. The phone number and email address of the researcher was on the recruitment form. No patients or healthcare professionals were contacted without first contacting the researcher. With this method, adequate time and privacy was provided to all potential participants to think if they want to participate in the study and to ask any further questions by email or phone. A web link, identical to the flyer, was used to recruit patients accessing the social networking sites provided by the American Heart Association. The flyers, both patient and healthcare professional, included a brief description of the study and contact information. The patients and health care workers contacted the researcher directly if they chose to participate in the study. Each study participant received a \$10 gift card after they completed the interview. If the participant was interested in participating they were asked to complete an enrollment form, including their contact information. Consent was obtained electronically. Once they signed the consent form the interview was scheduled.

Data collection procedures. Characteristics of the patients and healthcare professionals are shown in Tables 3 and 4. A total of 16 patients and 19 healthcare professionals participated in this study. Data collection was conducted from January 19th through March 18th 2015. Data collection was in the form of interviews. Participants were given the option of an in-person interview or a phone interview. According to Sturges and Hanrahan (2004) telephone interviews can produce the same results as face to face interviews. In this study the telephone interviews allowed the American Heart Association patient program and social media to participate, a greater range of healthcare professionals, and provided more convenience and privacy. Thirty-four of the thirty-five participants chose the phone interview. Once the participants agreed to participate, the interview was scheduled. The participants were sent the

consent form in advance. The consent form was collected electronically with either a signed form that was scanned, or an email response that said “I consent.” The first part of the interview consisted of reviewing the purpose of the study and the elements of the consent form. Participants were reminded that participation was voluntary and that they could stop the interview at any time. Also, it was emphasized that their privacy would be protected and their identity would never be revealed. Participants were given an ID number and the transcripts of the interviews replaced all names with their ID number. Participants also were asked to agree to the interview being recorded.

Table 3
Interview questions for patients and healthcare professionals

Research Questions	Patients	Healthcare professionals
RQ1	Please describe how you learned to manage your condition?	Please describe the process of learning health literacy skills used by your patients?
RQ2	Do you use technology, such as apps, wearables, or other digital tools?	What resources do your patients use to manage their health?
RQ3	What role did healthcare professionals play in the process of learning to manage your health?	How do you assess the level of knowledge and literacy in your patients, and how do you build self-management skills in your patients?
RQ4	How did the strategies used by your healthcare professionals match with your learning needs?	How effective are your strategies for building knowledge, literacy, and self-management skills, and how do you know?

Table 4
Characteristics of Healthcare Professionals

Characteristic	Number of individuals
Male	5
Female	14
Average age	50.4
Age group	
Under 40	4
40-65	13
Over 65	2
Average years of experience	24.4
Profession type	
Physician	5
Nurse	5
Nurse Practitioner	1
Physician Assistant	1
Pharmacist	1
Dietitian	1
Social Worker	1
Medical Assistant	1
Health Educator/Health Coach/Designer	4

The interviews were semi-structured with open ended questions. Interview questions for patients and healthcare professionals were aligned with the research questions, as shown in Table 5. Although set questions were predetermined, the participant was encouraged to

respond in their own words and expand on their response. If the participant got off track, they were redirected. Following some initial descriptive questions, the key questions asked of the study participants are: (RQ1) Please describe your process for learning how to manage your condition? (RQ2) Are you using technology to assist you in the management of your condition? (RQ3) What is the role of your healthcare professional in learning how to manage your condition? (RQ4) How were the strategies used by your healthcare professional aligned with your process of learning?

Table 5
Characteristics of Patients

Characteristic	Number of individuals
Male	6
Female	10
Average age	55.4
Under 40	2
40-65	10
Over 65	4
High School graduate	9
College graduate	5
Master's degree	2
Patient type	
Heart attack	4
Heart failure	3
Irregular heart beat	1
High blood pressure	4
Dyslipidemia	4
Diabetes	4
Congenital heart defect	3
Care giver	2

The interviews with the healthcare professionals were used to create triangulation of the data, confirming the data generated by the interviews with the participants (Charmaz, 2014). The interview questions for the healthcare professionals included: (RQ1) Can you describe the process of learning health literacy skills used by your patients? (RQ2) What sources of information, including new technologies do your patients use? (RQ3) How do you assess the level of knowledge or literacy in your patients? (RQ4) How effective to you perceive efforts to build knowledge and literacy are? Immediately following the interview and transcript was created from the recording. The transcript was then uploaded to the MaxQDA software program, and open coding was begun, which the interview was still fresh. Following the coding of the interview the researcher composed a memo describing the interview. Using the constant comparison method and theoretical sampling data collection and data analysis occurred simultaneously. Data gathered through a deductive process was validated resulting in inductive elaboration (Corbin & Strauss, 2015). With this technique, the resulting theory is grounded in the data (Creswell, 2013). Once the interview was completed a transcript of the interview was made. The recording and the transcript were both uploaded into the MaxQDA (2014) software program. MaxQDA provided tools for coding the interview, using a line by line technique (Miles, Huberman, & Saldaña, 2014).

Constant comparison. The objective of the data analysis was to develop a theoretical explanation of how health literacy skills are developed in patients with cardiovascular disease and diabetes. Using grounded theory, data collection and analysis occurred simultaneously,

using both deduction, validation, and inductive elaboration, leading to a theoretical explanation of the actions and process of building health literacy skills (Corbin & Strauss, 2015). By creating a verbatim transcript of the interview following each interview and prior to coding, the researcher had ample time to reflect on each interview. Following each interview an analytic memo was created by the researcher. These memos were used for theoretical sampling, to create and link categories, and to describe the process, and were a source of data that was coded by the researcher (Corbin & Strauss). The memos became a key analytical tool for the researcher, including the development of categories and themes, and was a vital part of the theory creation. The memos were used to connect themes that were emerging from the patients and the healthcare providers.

A constant comparison methodology was used to generate codes and analyze the data. The coding approach included process and evaluation coding (Miles, Huberman, & Saldana, 2014). Process coding was used to identify observable and conceptual action in the developing of health literacy skills, while evaluation coding was used to evaluate the effectiveness of the sources of information. Process coding was used to focus on the actions that were occurring or being described by the participants, using the general question, “what is going on here”. The evaluation coding was used to get perspectives from the patients and healthcare professionals on the effectiveness of tools, resources, and instructional strategies.

Open Coding

The first step in the coding process used open coding to generate categories and themes, using a line by line technique. From this coding process categories emerged, based on questions of who, what, when, and how, resulting in properties or dimensions (Corbin & Strauss, 2015). The coding method consisted of three stages. The first stage was open coding and was inductive and did not use any predetermined codes. Using constant comparison methods, codes were created on the fly as new concepts emerged (Charmaz, 2014). As the coding structure began to emerge, sub codes were added to similar concepts. A total of 566 segments were coded, including 268 patient segments and 298 healthcare professional segments. A total of 70 codes were created resulting in 8 categories.

Analytic and Methodological Memos and Diagrams

Following each interview, a memo was created summarizing the interview and commenting on theoretical concepts. Methodological memos were created to clarify methods, direct theoretical sampling approaches, and define the dimensions and characteristics of the emerging codes. Analytic memos were created to expand on theoretical concepts. A weekly update memo was used to summarize the interviews, methodological, and analytic memos. This weekly update memo began the process of moving concepts from codes to themes and categories. These memos and coded segments formed the basis for the creation of a diagram designed to visualize the process, resulting in the formation of the theory.

Axial Coding

Axial coding is the process of linking codes and concepts, providing context to the data, including the variation, complexity, integration, and level of abstraction necessary to go beyond a description of the phenomenon to a theoretical explanation. This led to the development of categories and themes, and a description of the core phenomena, actions and process, including causal conditions, strategies, intervening conditions, context, and consequences. This step included using the coding segments of the interviews and the memos to determine the

dimensions, context, interactions and relationships among the codes. The linking of themes and categories is illustrated in Figure 3.

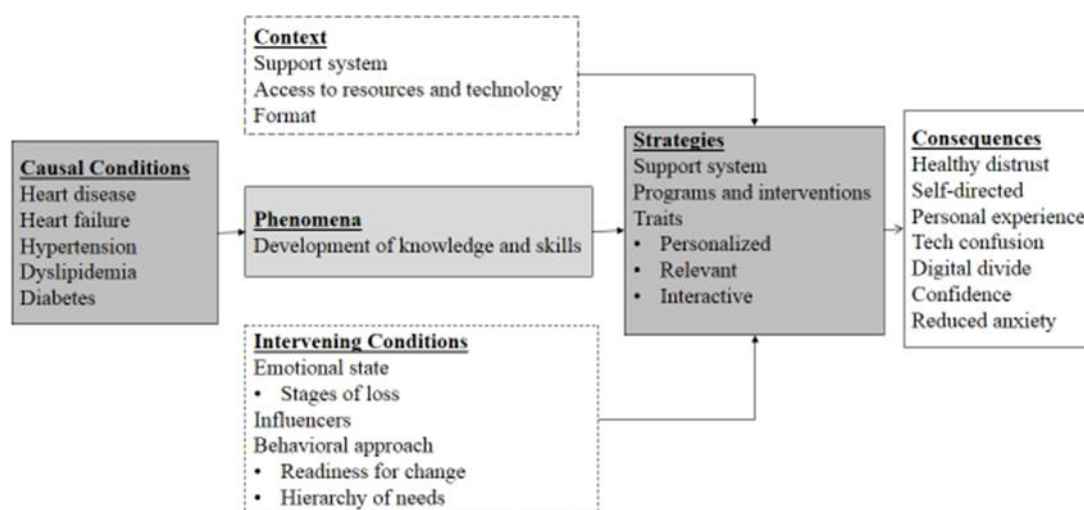


Figure 3. Linking categories

The causal conditions are the diagnosis of cardiovascular disease or diabetes. There appeared to be more emotional issues, such as anxiety in the heart attack survivors compared to patients with hypertension or dyslipidemia, but have not experienced a life-threatening event. The education and baseline level of health literacy may be important, but in this study, there did not seem to be variability based on the education level of the patient, and all of the participants had fairly good health literacy skills.

Intervening conditions include the emotional state of the patient, like anxiety or depression, their influencers, and their readiness for change. The patient has a diminished ability to process the information they were receiving if they were experiencing anxiety, depression, or denial, according to both patients and healthcare professionals. Likewise, if the patient was unmotivated or not engaged, healthcare professionals perceive educational strategies to be ineffective. Behavioral strategies addressing readiness for change and the hierarchy of needs have been used to motivate, engage, and educate the patient. In both cases finding a support system is perceived by both patients and healthcare professionals to be the key to being able to benefit from instructional strategies. While physicians have a big influence on the patient, there are many other influencers, including care givers, and non-healthcare related individuals, including friends and family, and media personalities. The context includes the support system of the patient and their access to technology. Virtually all patients and healthcare professionals mentioned, in some way, the role of social and emotional support. Patients mentioned having a difficult time processing information and focusing on their self-management and lifestyle factors until they found their support system. Once they found their support system, whatever it was, they seemed to relax and had a greater ability to focus and learn. Strategies include a support system, programs and interventions, such as a program or group, a care giver, or an online support network, and an instructional system and teaching methods that are personalized, relevant, and interactive. The consequences include self-directed learning, improved confidence or self-efficacy, reduced anxiety, and development of knowledge and skills. Consequences also included a healthy distrust for the information received from healthcare professionals. This distrust was not so healthy at times. Also, there seems to be a digital divide and confusion about the role and use of digital technology.

Selective Coding

The final phase of the data analysis process was the development of a unified theoretical explanation of the development of health literacy skills, using selective coding. Theory construction is what sets grounded theory apart from other qualitative methods by moving beyond the description of who and what to an explanation of why and how (Corbin & Strauss, 2015). Achieving a theoretical integration of the themes and categories requires a description of the properties, dimensions, density, and variation in the data. In the interviews, participants were frequently asked to go a little deeper if their answer appeared superficial. The theory formation includes a theoretical integration of the key themes and categories. Techniques used to develop the theory included the use of analytic memos and diagrams to further explain the process of health literacy skill development in patients with cardiovascular disease and diabetes. The linking of themes and categories from each research question has led to the development of the Health Literacy Instructional Model.

Software tools. Computerized software programs reduce the risk of data loss and overload. The MaxQDA (2014) program was used as the computer assisted qualitative data analysis software. The recording of each interview was transcribed into a document by the researcher. Names and other identifiable information, however, were removed from the transcript. Data from each interview, including notes, memos, and recordings were entered into the MaxQDA qualitative software program.

Issues of trustworthiness. For a qualitative study to be conducted in a healthcare setting, the meet the standards of trustworthiness, as determined by qualitative researchers, and be deemed credible by medical community. The methods for assuring the trustworthiness of the study are shown in Table 6. Credibility of the qualitative inquiry includes rigorous methods for doing fieldwork that yield high quality data, the credibility of the researcher, and the philosophical belief in the value of qualitative inquiry (Patton, 2002). Credibility was assured by following the interview guides and keeping the interview focused on the research questions (Jacob & Furgerson, 2012). Fieldwork skills, such as interviewing and observation were developed through practical experiences (Janesick, 2011). The lead researcher practiced interviewing skills, using the interview guides on colleagues and family members playing the role of both the patient and healthcare professional. The lead researcher practiced coding skills by coding and analyzing data from the American Heart Association social media sites. Credibility was also established due to the fact that the results were somewhat surprising to the researcher, demonstrating open-mindedness to the findings. This was important because a target for dissemination of the findings of this study is researchers that are more familiar with quantitative research methods.

Table 6
Strategies for building trustworthiness

Element of trustworthiness	Strategy
Credibility	Use of interview guides; open mindedness
Dependability	Triangulation of patient and healthcare profession interviews; intercoder review
Transferability	Identification of specific cases; comparison of negative cases
Confirmability	Self-awareness of the researcher

While the transferability or external validity of the study is more difficult to establish in qualitative methods, especially if viewed from the lens of the quantitative researcher, generalizations can be extrapolated to consider what is possible. Transferability was established by identifying specific cases where a strategy or concept was used to build health literacy skills, as well as identification of negative cases. Also, several patients indicated how important the cardiac rehabilitation program was in their process of learning. These examples can be used to determine what is possible in the development of health literacy skills. Ultimately, transferability will be strengthened by continued research, using both qualitative and quantitative methods, gaining even better understanding of the dimensions related to health literacy, with the goal of validating the theory.

Dependability, the qualitative counterpart to reliability, can be established through the use of multiple methods, triangulation of methods, and inter-coder agreement by having another researcher code a sample of the data (Patton, 2002). Dependability was established by interviewing both healthcare professionals and patients. Transcripts of all of the interviews, as well as codes, categories, and themes, were reviewed by another researcher for intercoder agreement. Also, coding was conducted immediately following the transcription by the researcher. The transcript was created by listening to each phrase of the audio recording and typing the word for word response to each question. Transcribing the recording verbatim allowed the researcher another pass at the exact words and phrases that were used. Confirmability is the qualitative counterpart to objectivity and will be achieved through reflexivity (Patton, 2002). Confirmability was established by becoming more self-aware of their theoretical lens, and this was confirmed through findings that were not expected.

Conclusions

This qualitative study was an example of a successful use of grounded theory in a healthcare setting, resulting in the desired end product, which is a theoretical model. Key factors that led to the successful outcome included a deep understanding of the grounded theory methodology, the selection of the method of grounded theory that had the best methodological and philosophical fit, and practice in interviewing and coding skills. The understanding of grounded theory began with reading the seminal work by Glaser and Strauss (1967) as well as second generation work.

Limitations included a small sample size, common in qualitative research. Also, as this was a qualitative study, there was no measurement of health literacy. Recruitment strategies included all patients, not just those with low literacy skills. Improvement in knowledge and skills were based on the perceptions of both patients and healthcare professionals. Finally, this was the first qualitative study conducted by the lead researcher.

Lesson learned included the proper selection of grounded theory methodology. The methodological and philosophical fit was determined by analyzing the different forms of grounded theory and the targeted audience. Since the target audience for this study are researchers that primarily do quantitative research, the post positive and most structured method was selected. These researchers primarily conduct hypothesis driven research and are more comfortable with a more structured approach by Corbin and Strauss (2015) rather than the more purely inductive approach by Glaser (1992).

Successful strategies included practicing and refining interviewing and coding skills prior to data collection using sample participants and sample data collected from the American Heart Association social media sites. Finally, this work led to the development of the health literacy instructional model, which helps to better understand how health literacy skills are developed in patients with cardiovascular disease and diabetes. Of course, this is only the first step in the validation of the theory.

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To our colleagues at the American Heart Association and Walden University, and all of the patients and healthcare professionals that participated in the study.

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