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# The Utility of the U.S. Diabetes Conversation Map as an Intervention to Promote Diabetes Self-Management Adherence

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THE UTILITY OF THE U.S. DIABETES CONVERSATION MAP AS AN  
INTERVENTION TO PROMOTE DIABETES SELF-MANGEMENT ADHERENCE

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DISSERTATION

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A dissertation submitted in partial fulfillment of the  
requirements for the degree of Doctor of Philosophy in the  
College of Nursing at the University of Kentucky

By  
Lisa Gale Jones

Lexington, Kentucky

Director: Dr. Patricia V. Burkhart, Professor & Associate Dean

Lexington, Kentucky

2014

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## ABSTRACT OF DISSERTATION

### THE UTILITY OF THE U.S. DIABETES CONVERSATION MAP AS AN INTERVENTION TO PROMOTE DIABETES SELF-MANAGEMENT ADHERENCE

Diabetes has reached epidemic levels, to the currently estimated 29 million individuals who are living with diabetes. Those with diabetes must manage their disease through a combination of medication, physical activity recommendations, and nutritional guidelines. The consequences of non-adherence to recommendations include cardiovascular disease, kidney failure, vision loss, or ultimately, death. Despite the risks of non-adherence, individuals often do not adhere to recommended treatment. Researchers have attempted to identify strategies to promote diabetes self-management adherence, thereby decreasing complications related to the disease.

#### Specific Aims:

- 1) describe the factors that prohibit individuals from adhering from diabetes self-management behaviors as well as the factors that promote self-management adherence,
- 2) compare adherence rates of individuals participating in an enhanced diabetes education program with the adherence rates of individuals that participated in enhanced diabetes education and also attended group social support sessions,
- 3) evaluate the adherence to self-management behaviors of individuals participating in a diabetes care coordination program.

Results: A review of research articles from 2009 through 2013 identified barriers to diabetes self-management adherence as complexity of self-management, low health literacy, the financial burden of adherence, availability of resources, and lack of knowledge. Factors that promote diabetes self-management adherence include diabetes self-management education, self-efficacy, social support, and goal setting.

A retrospective chart review of participants in an employer-sponsored health program was performed to examine the effectiveness of a social support intervention administered through the health program to promote adherence to recommended diabetes treatment. Results of the study revealed that individuals who participated in the social support intervention, in addition to the employer-sponsored health program, demonstrated

increased adherence to recommended diabetes treatment from baseline to 12 months, in comparison to those who participated in only the health program ( $p = .048$ ).

Additional chart review compared participants' self-management behaviors at baseline with their self-management behaviors at 12 months after entry into the program. There was a significant improvement in adherence to self-management behaviors of receiving an influenza vaccination ( $p = .036$ ), decreased reported use of alcohol ( $p = .002$ ) and tobacco ( $p = .043$ ), and fewer reports of skipped meals ( $p = .009$ ).

Key words: diabetes, self-management, adherence, care coordination, social support

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November 5, 2014

THE UTILITY OF THE U.S. DIABETES CONVERSATION MAP AS AN  
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This work is dedicated to my husband, John, and my children, Matt, Cody, and Johnny,  
who have been tremendously supportive of me during this journey.

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## TABLE OF CONTENTS

Acknowledgements.....	iii
List of Tables .....	iv
List of Figures.....	vi
Chapter One .....	1
Overview of Chapters .....	4
Chapter Two.....	4
Chapter Three.....	4
Chapter Four .....	5
Chapter Five.....	6
Future Impact of the Study .....	7
Chapter Two: Improving Diabetes Self-Management Adherence: A Review of the Literature.....	8
Methods.....	10
Information Sources.....	10
Search Strategy .....	10
Data Collection .....	11
Results.....	11
Complexity of Self-Management.....	11
Health Literacy.....	13
Financial Impact.....	16
Self-efficacy .....	17
Diabetes Self-Management Education.....	18
Goal Setting .....	21
Social Support.....	23
Discussion .....	26
Limitations .....	28
Conclusions.....	28
Practice Implications.....	29
Chapter Three: Evaluation of a Social Support Intervention to Promote Adherence to Recommended Diabetes Treatment in an Employer-Sponsored Health Program: A Retrospective Chart Review .....	44
Recommended Diabetes Treatment .....	46
Enhanced Diabetes Education.....	46
Group Social Support.....	47
Theoretical Framework.....	48
Purpose and Specific Aim.....	49
Research Question and Hypothesis.....	49
Method .....	50
Design .....	50

Sample.....	50
Data Collection .....	50
Eligibility Criteria .....	51
Setting.....	51
Control Group: Employer-Sponsored Enhanced Diabetes Education Program.....	51
Intervention Group: Enhanced Diabetes Education and Conversations .....	54
Procedure .....	55
Measures .....	56
Demographic & Baseline Diabetes Characteristics .....	56
Adherence to Recommended Diabetes Treatment.....	57
Data Management .....	57
Data Analysis.....	58
Descriptive Analyses .....	58
Adherence to Recommended Treatment.....	58
Results.....	58
Demographic Characteristics.....	58
Baseline Diabetes Characteristics .....	59
Hypothesis Testing.....	60
Limitations .....	60
Discussion .....	61
Conclusions.....	63
Implications for Clinical Practice and Future Research .....	64

#### Chapter Four: Evaluation of Self-Management Behaviors for Patients Enrolled in an Employer-Based Diabetes Care Coordination Program: A Retrospective Chart

Review .....	71
Background.....	73
Diabetes Self-Management.....	73
Care Coordination.....	74
Group Social Support (Conversations).....	75
Theoretical Framework.....	75
Purpose and Specific Aims .....	76
Research Questions and Hypotheses .....	77
Method .....	78
Care Coordination Protocol .....	78
Group Social Support Protocol.....	81
Design .....	82
Sample.....	82
Inclusion Criteria .....	83
Exclusion Criteria .....	83
Procedure .....	84
Measures .....	84
Demographic characteristics.....	84
Clinical characteristics .....	85
Adherence to self-management behaviors .....	85

Data Management .....	86
Data Analysis .....	87
Demographic and Clinical Characteristics.....	87
Adherence to Self-Management Behaviors .....	87
Results.....	88
Baseline Demographic and Clinical Characteristics.....	88
Hypothesis testing.....	88
Discussion.....	89
Limitations .....	92
Conclusions.....	92
Implications for Practice & Future Research.....	93
Chapter Five: Conclusions and Discussion.....	99
Implications for Clinical Practice .....	101
Recommendations for Future Research .....	102
Summary .....	102
Appendices	
Appendix A: Data Collection Form.....	104
Appendix B: Standards of Care Tracking Form .....	108
Appendix C: Encounter Log .....	109
References.....	111
Vita.....	117

## LIST OF TABLES

Table 2.1. Studies Included in the Review of the Literature .....	30
Table 3.1. Protocol for Enhanced Diabetes Education (Control & Intervention Groups) .....	66
Table 3.2. Protocol for Intervention Group (Enhanced Diabetes Education + Conversations).....	67
Table 3.3. Demographic and Baseline Diabetes Characteristics of Study Participants.....	69
Table 4.1. Protocol for Diabetes Care Coordination Program.....	94
Table 4.2. Protocol for Intervention Group .....	95
Table 4.3. Demographic and Clinical Characteristics of Study Participants.....	97
Table 4.4. Comparisons between baseline and 12 months on individual self-management behaviors, controlling for type of diabetes and age (N = 96). .....	98

## LIST OF FIGURES

Figure 2.1. Flowchart for Systematic Literature Review.....	43
Figure 3.1. Plot of baseline A1C vs. 12-month A1C, by group (N=85).....	70

## CHAPTER ONE

Diabetes is described as “one of the most challenging health problems of the 21<sup>st</sup> century” (International Diabetes Federation [IDF], 2013). The global impact is astounding with nearly 400 million individuals worldwide living with diabetes and projections that nearly 600 million individuals worldwide will have diabetes by the year 2035 (IDF, 2013). In the United States, the prevalence of diabetes has more than tripled over the past thirty years, to the currently estimated 29 million individuals living with diabetes (Centers for Disease Control and Prevention [CDC], 2014). An estimated 86 million adults in the United States, considered to have pre-diabetes due to elevated glucose, are at risk for developing diabetes and its complications (CDC, 2014).

Diabetes remains the seventh leading cause of death in the United States (CDC, 2014). The consequences of diabetes are severe with one person in the world dying every six seconds from diabetes (IDF, 2013). The risks of cardiovascular disease and stroke are nearly twice that for individuals with diabetes than for those without diabetes (CDC, 2014). According to the CDC (2014), nearly half of all the new cases of kidney failure during 2011 were attributable to diabetes. Additional complications related to diabetes include vision loss and lower extremity amputation (CDC, 2014).

Beyond the physical burdens associated with diabetes are the economic costs. Recent estimates are that the average United States medical expenditures for those with diabetes were more than twice that of individuals without diabetes (CDC, 2014). This translates to annual direct medical costs of \$176 billion and indirect costs of \$69 billion (CDC, 2014).

The most effective way to effect change on both the physical and economic burden of diabetes is through individual self-management to improve glucose control and decrease the risk and severity of complications (CDC, 2014). Individuals with diabetes must manage their disease through a combination of medication, physical activity recommendations and nutritional guidelines (ADA, 2014). Effective self-management requires the individual to perform interventions based on information they have interpreted (Creer & Holroyd, 2006). This often includes making decisions based on self-monitoring of glucose and dietary carbohydrate counting (ADA, 2014). Because these self-management behaviors must be ongoing to delay or prevent the complications related to diabetes (CDC, 2014), long term adherence is often difficult for some individuals. Studies have shown that the longer an individual has diabetes, the less likely they are to adhere to self-management behaviors (World Health Organization [WHO], 2003).

In an attempt to reduce complications as well as the financial burden of diabetes, researchers have investigated various methods of promoting adherence to self-management behaviors. Patients who participate in diabetes self-management education are more likely to adhere to self-management behaviors (Atak et al., 2008; Balamurugan et al., 2006; Diedrich et al., 2010; Moriyama et al., 2009; Walker et al., 2011). Individuals who have a high confidence level to perform self-management behaviors are also more likely to be adherent (Aljasem et al., 2001; Hurley & Shae, 1992; King et al., 2010; Rustveld et al., 2009). Patients who are engaged in goal setting with their provider or educator are more likely to adhere to recommended treatments (Carbone et al., 2007; DeWalt et al., 2009; Kolbasovsky & Rich, 2010; Morrow et al., 2008; Zgibor et al.,

2007). Lastly, social support serves an important role in promoting self-management behaviors (Castro et al., 2009; King et al., 2010; Piatt et al., 2010; Rees et al., 2010; Rothman et al., 2005; Tang et al., 2010).

Self-management education and social support have been studied independently and in combination to achieve positive participant outcomes. No published studies have evaluated the effectiveness of providing these services in the workplace. In one study individuals with diabetes indicated working was a barrier to attending a self-management education program (Gucciardi et al., 2007).

The purposes of this study were to: 1) describe the factors that prohibit individuals from adhering from diabetes self-management behaviors as well as the factors that promote self-management adherence, 2) compare adherence rates of individuals participating in an enhanced diabetes education program with the adherence rates of individuals that participated in enhanced diabetes education and also attended group social support sessions, 3) evaluate the adherence to self-management behaviors of individuals participating in a diabetes care coordination program. This study was a retrospective chart review of patients enrolled in an employer-based diabetes care coordination program at a small Kentucky academic institution.

This study was guided by the constructs of the Health Belief Model (Rosenstock, Strecher & Becker, 1988). The six constructs of the Health Belief Model are *perceived susceptibility*, *perceived severity*, *perceived benefit*, *perceived barriers*, *cues to action*, and *self-efficacy* (Rosenstock, Strecher & Becker, 1988). The findings of this study particularly address the construct *cues to action*. The employer-based health program



studied provided the external triggers (*cues to action*) required to assist participants to adhere to self-management behaviors (Rosenstock, Strecher & Becker, 1988).

## **Overview of Chapters**

### **Chapter Two**

Chapter two is a review of the literature published between 2007 and 2013 related to diabetes self-management. The purpose of chapter two was to review the current knowledge regarding factors that researchers identified as barriers to adhering to self-management behaviors as well as factors that promote self-management adherence. Due to the uniqueness of individuals, interventions to promote diabetes self-management adherence and decrease the barriers must be tailored to meet the needs of individuals or groups of individuals. This chapter presents an integrative review and makes recommendations for future research.

### **Chapter Three**

Chapter three is a retrospective chart review of 85 participants in an employer-sponsored health program. The purpose of this study was to examine the effectiveness of a social support intervention administered through an employer-sponsored health program, to promote adherence to recommended diabetes treatment. The employer was a four-year-post-secondary academic institution in a rural community.

Hemoglobin A1C (A1C), the percentage of hemoglobin molecules that contain glucose, was used as a measurement of adherence to recommended diabetes treatment. The A1C correlates with the individual's average glucose over the previous three months and is used monitor adherence to recommended diabetes treatment. Decreasing A1C over time is indicative of effective adherence to self-management (ADA, 2014).

The World Health Organization's (WHO) definition of adherence was used for this study; "the extent to which a person's behavior – taking medications, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider" (WHO, 2013). Enhanced diabetes education was defined as participation in the individualized one-to-one encounters with a certified diabetes educator through the employer-sponsored health program. For the purpose of this study, social support was defined as the conversation map strategy administered through attendance at group meetings facilitated by a certified diabetes educator.

Findings of this study show that individuals who participated in the social support intervention in addition to receiving enhanced diabetes education demonstrated increased adherence to recommended diabetes treatment in comparison to those individuals who received enhanced diabetes education only. Recommendations for future studies include studies utilizing this model of employer-sponsored health program with different employer demographics, evaluation of the cost-benefit ratio for decreased lost productivity time due to increased adherence, and a randomized controlled clinical trial with scripted educational protocol.

#### **Chapter Four**

Chapter four examines the specific self-management behaviors of 96 participants in an employer-based diabetes care coordination program. The study is a comparison of participants' self-management behaviors at baseline compared with their self-management behaviors at 12 months after entry into the program. Additional comparisons were made to identify any differences in self-management behaviors between individuals who participated in the care coordination program only and those

who participated in the care coordination program and also received social support, as discussed in chapter two.

Diabetes care coordination was defined as the individualized one-to-one diabetes self-management encounters participants had with a Certified Diabetes Educator. Group social support was defined as the group meetings using the U.S. Diabetes Conversation Map as a framework to engage participants in discussion. Adherence to self-management behaviors was defined as the participant following the recommendations of their healthcare provider for medications, diet, and/or lifestyle changes (WHO, 2003).

There was a significant improvement in adherence to obtaining an influenza vaccination, reported decrease use of alcohol and tobacco, and fewer participants reported skipping meals, for those participating in care coordination. The only significant group by time interaction was for dilated eye examinations, with an increase in those receiving care coordination only, but not for those who received group social support in addition to care coordination.

Recommendations for future studies include randomized controlled clinical trials to accurately measure the impact of the group social support strategy to improve adherence, analysis of the cost effectiveness of providing this service in comparison to the decrease in employee sick days due to non-adherence, and studies using this model of care coordination with different employer populations.

## **Chapter Five**

Chapter five provides an overview of the literature review and a summary of study findings with an analysis of how these results contribute to filling the gaps in our knowledge of diabetes care. It outlines specific recommendations for future studies to

identify effective strategies to implement diabetes care coordination programs along with social support to promote diabetes self-management adherence. Finally, it describes how this project contributes to the long-term goal of evidence-based strategies to promote diabetes self-management.

### **Future Impact of the Study**

The data in this study highlight the tremendous public health issue of diabetes and the need to identify effective means for individuals to control their disease and reduce their risks for complications. The financial impact of diabetes compounded with the physical burdens underscore the urgency in determining best practice for promoting self-management behaviors in diverse populations. This study provides preliminary evidence that the model of an employer-based health program for management of diabetes discussed in this study has potential to improve individual diabetes self-management adherence. Future studies can be conducted to evaluate the effectiveness of group social support using the U.S. Diabetes Conversation Map in non-academic employment settings. Randomized controlled trials with scripted educational sessions are recommended to further evaluate the effectiveness of providing diabetes care coordination in the employment setting. Additionally, studies of the cost effectiveness of providing diabetes care coordination in the employment setting is recommended. Additional studies using this method of employer-sponsored diabetes care coordination programs in various employer settings is recommended.

## CHAPTER TWO

### Improving Diabetes Self-Management Adherence: A Review of the Literature

#### Abstract

**Aim.** The purpose of this paper is to identify barriers to and factors that promote self-management adherence for adults with type 2 diabetes.

**Background.** Worldwide prevalence of diabetes mellitus continues to increase, as does the financial burden of the disease and its associated complications. Self-management has been shown to decrease the risk of complications and the financial burden. Self-management requires consistent glycemic control, achieved through diet, physical activity and medications

**Review method.** A search of the online databases CINAHL and Medline was conducted for research studies on diabetes self-management, published between 2009 and 2013. A total of 15 qualitative studies and 32 quantitative studies are included in this review.

**Results.** Major barriers to self-management adherence include complexity of self-management, health literacy, the financial burden, availability of resources and lack of knowledge. Factors that promote diabetes self-management adherence include diabetes self-management education, self-efficacy, social support and goal setting.

**Conclusion.** Since diabetes is a chronic disease, long term self-management is necessary. Sustained adherence to recommended self-management requires ongoing education and social support. Healthcare providers can promote diabetes self-management by implementing a model of care delivery that empowers the patient by providing clear, understandable education, offering social support, and identifying available resources to support self-management behaviors.

## **Increasing Diabetes Self-Management Adherence: A Review of the Literature**

Diabetes mellitus is a chronic disease that affects more than 29 million people in the United States, including more than 11 million people over the age of 65 (Centers for Disease Control and Prevention [CDC], 2014). It is further estimated that an additional 79 million adult Americans have elevated serum glucose levels, classified as pre-diabetes, putting them at risk for developing type 2 diabetes or its complications (CDC, 2014). The World Health Organization (WHO) projects that more than 30 million people in the United States will have diabetes by the year 2030 (Wild, Roglic, Green, Sicree, & King, 2004).

Diabetes bears significant physical and financial implications. Diabetes is the seventh leading cause of death in the United States (CDC, 2014). Those individuals with diabetes have an increased risk of cardiovascular disease or stroke, two to four times that of their same age counterparts without diabetes (CDC, 2014). Additional complications related to diabetes include kidney failure, lower limb amputations and blindness (CDC, 2014). Estimated direct and indirect costs of diabetes total more than \$174 billion annually (CDC, 2014). Recommendations from the WHO for cost savings related to diabetes include moderate blood glucose control, blood pressure control and foot care (WHO, 2011).

Self-management behaviors are vital to control diabetes symptoms and prevent complications. These behaviors are often complex and may be overwhelming to some patients. National standards were developed by the American Association of Diabetes Educators (AADE) to define required components of diabetes self-management education necessary to promote individual improvement in diabetes related outcomes

(AADE, 2009; Mensing, et al., 2002). These standards, AADE 7®, are based on scientific evidence and can be implemented in diverse settings. The seven self-care behaviors include “healthy eating, being active, monitoring [glucose], taking medication, problem solving, reducing risks and healthy coping” (AADE, 2008). Despite care provider recommendations and the realistic possibility of complications, adults with diabetes often do not adhere to self-management behaviors.

The purpose of this literature review is to identify barriers to diabetes self-management adherence and the factors that facilitate or support adherence. Implications for practice and recommendations for future research will be discussed.

## **Methods**

### **Information Sources**

Relevant literature for the time period of 2007-2013 was searched using the computerized databases CINAHL and Medline. Inclusion criteria were original research articles published in English in peer-reviewed journals and studies limited to participants age 18 and older with type 2 diabetes. Literature reviews and systematic reviews were excluded. As the treatment regimen and adherence motivating factors could be quite different, studies involving children, those with type 1 diabetes or gestational diabetes were excluded.

### **Search Strategy**

Search terms included diabetes, self-management, self-care, adherence, compliance, and barriers. These terms were entered in different combinations, with all combinations including the keyword diabetes.

## **Data Collection**

A total of 1,648 articles were found. After removing duplications and applying inclusion and exclusion criteria, forty-six studies were included in this review. Research methods included 19 qualitative design studies and 27 quantitative studies, including 13 randomized controlled studies. In total more than 11,000 participants were recruited for these studies. Figure 2.1 is an illustration of the selection process.

## **Results**

It is noteworthy that only ten of the studies incorporated a theoretical framework; only one used the Health Belief Model as a framework. The outcome variable in 17 of the studies was the serum glycohemoglobin A1C [A1C].

## **Complexity of Self-Management**

Self-management requires the individual to interpret information and perform interventions based on those interpretations (Creer & Holroyd, 2006). Diabetes self-management is often complex, requiring frequent sampling and interpretation of fingerstick glucose levels, engaging in a strict diet and exercise program, and administering oral diabetic agents or injectable insulin. Lifestyle modifications must be maintained on a long-term basis. If patients do not maintain appropriate self-management behaviors, their glycemic control may be jeopardized (Menard et al., 2005; Rothman & Elasy, 2005). Patients may initially have the motivation to perform self-management activities but over time may encounter barriers to sustaining them.

One multidisciplinary panel identified multiple barriers to diabetes self-management adherence, including the complicated and often overwhelming nature of required self-management behaviors (Kent et al., 2010). The expert panel was convened



to discuss the AADE7® with an emphasis on healthy coping. The panel identified good control of blood glucose as a positive influence on quality of life. An additional finding was that diabetes-related complications negatively affected quality of life. Self-management behaviors are required to maintain good control of blood glucose (Kent et al., 2010).

Often the complicated regimen, along with the realization of life altering complications, impedes self-management actions. A qualitative study of 34 Hispanic males suggested that a fatalistic view of diabetes actually inhibited patients from engaging in self-management behaviors (Rustveld et al., 2009). Study participants were frequently knowledgeable regarding appropriate interventions to control their blood glucose; however they often indicated that they were not motivated to participate in self-management behaviors, as they believed that complications were inevitable (Rustveld et al., 2009). This study further supports the need for interventions beyond education to promote self-management, as education alone does not produce sustained behavior change.

A qualitative study of 73 African Americans with diabetes identified the complexity of managing the disease as a barrier to self-management (Utz et al., 2006). Consistent with the previous study (Rustveld et al., 2009) participants in this study were often overcome with the enormity of the requirements for adequate self-management (Utz et al., 2006). This frequently left participants feeling helpless or in some instances hopeless.

Researchers in a quantitative study of 80 adults in Appalachia found similar results (Carpenter, 2012). Participants completed the Cognitive Appraisal of Health

Scale. Based on these results, participants found diabetes self-management more of a challenge rather than the disease a threat (Carpenter, 2012).

### **Health Literacy**

Health literacy, defined as a patients' ability to access, comprehend and apply health information in making appropriate health related decisions, is vital for successful diabetes self-management (Ishikawa, Takeuchi, & Yano, 2008). Several studies identified low health literacy as a barrier to diabetes self-management (Rustveld et al., 2009; Utz et al., 2006; Bayless, Ellis, & Steiner, 2007; Lerman, et al., 2009).

Low health literacy not only influences diabetes self-management behaviors, but negatively affects the patient psychosocially as well. Furthermore, health literacy impacts quality of life. For example, low health literacy was identified as a barrier to healthy coping (Kent et al., 2010). In a study of 352 seniors with multiple morbidities, patients with diabetes and at least one additional comorbidity reported lower perceived health status (Bayless et al., 2007). Results indicated that the greater the perceived disease burden, the lower the self-reported health status. Low health literacy was identified as a barrier to self-management; however, it was not associated with perceived lower health status in this study (Bayless et al., 2007).

Three focus groups of low income individuals ( $n = 35$ ) described individual barriers, educational barriers and system barriers to self-management (Gazmararian, Zeimer, & Barnes, 2009). A common theme for individual barriers was the emotional impact of the disease and required self-management. Educational barriers were related to decision making involved in interpreting glucose results as well as understanding the consequences of the disease. Multiple system barriers were identified, related to ongoing

education and support as well as availability of alternative teaching methods and extended times for education (Gazmararian et al., 2009). Lack of access to resources for diabetes education has also been identified as a barrier for self-management adherence (Kent et al., 2010).

Results of qualitative studies with focus groups identified lack of knowledge and low health literacy as contributors to self-management non-adherence. A small study of 29 low income patients suggested that individuals who received instruction from a diabetes educator increased their self-management adherence (Mensing et al., 2002). The study supported diabetes education classes as an important intervention to increase patient knowledge and self-management adherence (Mensing et al., 2002). An additional finding in a previously discussed study was that patients identified lack of knowledge as another barrier to self-management (Utz et al., 2006). The participants reiterated the importance of patient education to increase patient knowledge as an important intervention to assist with disease self-management (Utz et al., 2006).

Participants ( $n=83$ ) were asked to complete the Revised summary of Diabetes Self-Care Activities Scale and the Chronic Disease Self-Efficacy Scale (Beard et al., 2010). Those participants scoring higher on these scales had lower A1C values. Researchers found a positive correlation between understanding of A1C results and diabetes self-management behaviors (Beard et al., 2010). The results of this study imply that increasing understanding of clinical markers, such as A1C, promotes self-management.

One researcher surveyed a group of patients ( $n= 45$ ) who were prescribed oral hypoglycemic agents as their medication regimen (Gupta, 2011). One primary reason

participants reported not adhering to oral medication was they did not understand the medications and how they worked to control their blood glucose levels (Gupta, 2011).

In a randomized controlled study, researchers found that high regimen stress was associated with higher A1C (Hessler et al., 2013). Participants ( $n=392$ ) were asked to complete the Diabetes Distress Scale to indicate the amount of distress experienced related to the disease and the prescribed regimen. Researchers found that decreasing the perceived complexity of the prescribed regimen resulted in improved glycemic control over time (Hessler et al., 2013).

Focus group participants with diabetes ( $n = 24$ ) identified lack of knowledge as a barrier to self-management adherence (Nagelkerk, Reick, & Meengs, 2006). Participants indicated that they did not feel adequately instructed on diet or medications to successfully control their disease. A therapeutic relationship between the client and education provider is an effective intervention to support self-management. Collaboration with a provider empowers patients to engage in self-management behaviors (Nagelkerk et al., 2006).

The relationship between health literacy and diabetes outcomes was examined using the Test of Functional Health Literacy in Adults (TOFHLA) as the measurement tool and A1C as the outcome variable for 408 patients with type 2 diabetes (Schillinger et al., 2002). Higher TOFHLA scores indicate greater health literacy. The researchers found that as the scores on the TOFHLA decreased, the A1C increased, indicating less glucose control (Schillinger et al., 2002).

## **Financial Impact**

Overall health is worse in patients with lower socioeconomic status and education levels; those who are wealthier and more educated tend to be the healthiest (Braveman et al., 2010). Health care costs are more than double for those diagnosed with diabetes than those without the disease (Dall et al., 2008). The annual individual expenditures for persons with diabetes exceed \$11,000, of which more than half is attributable to diabetes as compared to \$2,660 for those without diabetes (Dall et al., 2008). As a result, socioeconomic status contributes to disparities in health care in persons with diabetes. Unsurprisingly, diabetes self-management is affected by financial barriers.

Researchers identified monetary restrictions as a barrier to adherence to individual recommended self-management behaviors. The cost of medicines and diabetes supplies is a barrier to adherence to self-management (Utz et al., 2006). When responding to surveys of barriers to dietary regimen for glucose control, patients ( $n = 197$ ) reported dietary restrictions were a large burden in self-management practices (Vijan et al., 2004). The most common barrier to adherence of the recommended dietary regimen was cost (Vijan et al., 2004).

Financial restrictions also inhibit adequate availability of diabetes self-management education (DSME) programs to provide individuals the education required to practice self-management behaviors. A study of 51 Diabetes Control Program Coordinators (DCPC), representing all regions in the United States, identified limited funding as one barrier to providing DSME (Powell et al., 2005). Every state has a diabetes control program (DCP) responsible for educating the public about diabetes. Medicare reimbursement is only available to DCPs that are accredited by the American

Diabetes Association (ADA). Limited availability of resources to obtain ADA recognition and inadequate Medicare reimbursement for services were identified as barriers to providing DSME (Powell et al., 2005). If patients do not have the financial resources to access diabetes education, their ability to successfully perform self-management behaviors is hindered.

### **Self-Efficacy**

Although education or knowledge sharing is required for patients to participate in self-management behaviors, patients must also have the ability to interpret and act upon symptoms or glucose readings. Self-efficacy is the confidence to successfully engage in one's own self-care (Bandura, 1977).

A study of 309 patients with diabetes found that individuals who faced barriers to self-care behaviors had poor dietary and exercise practices (Aljaseem et al., 2001). Those with greater self-efficacy were more likely to engage in self-management behaviors such as glucose testing and adherence to medication and dietary recommendations (Aljaseem et al., 2001).

Bilingual focus groups with English and Spanish speaking Hispanic men ( $n = 34$ ) revealed the importance of self-efficacy in diabetes self-management (Rustveld et al., 2009). Participants were categorized as either intentionally non-adherent (aware of recommendations but make no effort to follow recommendations) or unintentionally non-adherent (trying to self-manage but without the skills to do so successfully). Low self-efficacy was a significant factor in the participants' ability to achieve self-care goals, regardless of whether the participant was intentionally or unintentionally non-adherent (Rustveld et al., 2009).

Patients with diabetes and at least one additional cardiovascular disease risk factor ( $n = 463$ ) were recruited from metropolitan primary care clinics to participate in a self-management program. Self-efficacy was found to be independently associated with self-management behaviors, specifically healthy eating and physical activity (King et al., 2010).

One study applied the social cognitive theory to evaluate the relationship between self-efficacy and self-management (Hurley & Shea, 1992). Adults with inadequate glucose control ( $n = 142$ ) were admitted for intensive inpatient care for approximately 5 days. Immediately prior to discharge and three weeks post discharge the patients completed self-efficacy questionnaires. Self-efficacy scores prior to discharge were predictive of self-management behaviors one month later. The strongest relationship to self-efficacy was found with dietary adherence and insulin self-administration (Hurley & Shea, 1992)

### **Diabetes Self-Management Education**

Just as lack of knowledge and low health literacy are identified as barriers to self-management adherence, research supports diabetes self-management education as an intervention to increase self-efficacy and promote self-management. A randomized single-blind controlled study of 80 patients in Turkey using a pre-test and post-test design was conducted to evaluate self-efficacy (Atak, Gurkan, & Kose, 2008). There was significant improvement in the self-management behaviors of dietary adherence, physical activity and glucose control after participants received DSME. Performance, not just knowledge, was promoted by self-efficacy. The greatest impact was on self-efficacy scores in the intervention group, as compared with the control group. The self-efficacy

score reflected how confident patients felt about their ability to perform self-management skills. An increase in self-efficacy scores for the intervention group who received DSME was statistically significant (Atak et al., 2008).

Telephone surveys of 3,841 insured residents of an Appalachian area were done to identify self-management practices and inquire about the type and amount of education each participant received regarding diabetes self-management (Raffle et al., 2012). Researchers found that attendance in a diabetes self-management education class was a significant predictor of daily self-monitoring of glucose (Raffle et al., 2012).

To evaluate the influence of a physical activity program on diabetes indicators, 53 patients with type 2 diabetes were randomly assigned to an intervention or control group (Diedrich, Munroe, & Romano, 2010). The intervention consisted of the usual self-management education program of the AADE 7<sup>®</sup>, as well as a physical activity book with instructions, and a pedometer. The control group received the self-management education only. All study participants had an increase in their physical activity, decreased A1C and decreased weight. The intervention group demonstrated improvement in body fat and diastolic blood pressure compared with the control group (Diedrich et al., 2010). Although the intervention had a positive impact on the outcomes of the intervention group, all participants in the study benefited from the education.

One group of researchers assessed the benefits of DSME provided in the community setting to improve self-management adherence (Al Hayek, 2013). Participants ( $n=104$ ) attended monthly structured diabetes educational programs over a period of six months. Following the educational program, participants reported improvement of self-management behaviors of dietary adherence, physical activity, self-



monitored blood glucose, and medication adherence. There was also a significant decrease in A1C at the end of six months (Al Hayek et al., 2013).

A study of 12 DSME programs in Arkansas was conducted to examine their impact on self-management behaviors (Balamurugan et al., 2006). Participation in the DSME programs more than doubled during the one year period studied. Results of the study suggested that self-care behaviors of glucose monitoring and foot inspections increased throughout the one year study. Additionally, individual A1C levels decreased an average of 0.5 units with program completion (Balamurugan et al., 2006).

Results were similar in a randomized controlled study of 75 Japanese patients over the course of a one year period to evaluate the effectiveness of a DSME program (Moriyama et al., 2009). The intervention group received DSME and biweekly follow-up with a nurse educator for the year. The control group received a textbook which described diabetes and self-management information. At the conclusion of the study, the intervention group had improved body weight management and serum glucose levels compared with the control group. This study however, did not identify an improvement in lipid profile or systolic blood pressure (Moriyama et al., 2009).

Despite the effectiveness of DSME, patients often do not continue with the program. A retrospective medical chart review of 536 patients who attended DSME over a one year period found that nearly 50% did not complete the program (Gucciardi et al., 2007). Factors that contributed to non-continuation of participation included age greater than 65 years and employment full or part time. This study suggests that to promote DSME participation, programs need to offer various times to meet the needs of those

working and also to provide additional support to the older population (Gucciardi et al., 2007).

Telephonic DSME could be an alternative to on-site DSME to increase accessibility for those either in remote areas or with conflicting schedules. In a randomized controlled study of 526 patients with an  $A1C \geq 7.5$  and receiving at least one oral agent, all patients received printed DSME materials (Walker et al., 2011). Additionally, the intervention group ( $n = 262$ ) received up to ten tailored phone calls from a health educator during a one-year period. The primary focus of the follow up was diet and physical activity. At the end of the study period, the mean A1C for the intervention group decreased, while those only receiving print materials experienced an A1C mean increase (Walker et al., 2011).

### **Goal Setting**

Research findings suggest that goal setting is another strategy to promote diabetes self-management adherence. Older patients with diabetes participated in self-management behaviors most often when the behaviors were congruent with their life goals (Morrow et al., 2008). Twenty-four older adults recruited from the Houston area related their self-management behaviors to their life goals and identified health care providers as facilitators to achieve these goals (Morrow et al., 2008). Similarly, to evaluate the effectiveness of goal setting in combination with diabetes self-management instruction, a quasi-experimental study was conducted. Participants ( $n = 229$ ) received one educational session and two “coaching” telephone calls over a three to four month period. Participants frequently chose diet or exercise goals. Less than 10% did not

achieve any of their goals during the study, while more than 70% sustained two or more goals (Carbone et al., 2007).

Mutual goal setting between the provider and the patient is an important factor for promoting self-management behaviors. Focus groups of 37 patients and 15 health care providers described barriers to self-management common in the Latino community (Carbone et al., 2007). One disconnect between the providers and the patients was goal setting. Providers often identified long term goals for the patients, such as preventing or reducing complications from diabetes. Patients identified short term goals to control the disease (Carbone et al., 2007). Although this study was specific to the Latino community, it does suggest that mutual goal setting promotes self-management behaviors.

A structured program that included goal setting as well as problem-solving and coping skills instruction resulted in significant improvement in A1C (Kolbasovsky & Rich, 2010). Participants were recruited from membership in a health care plan. Barriers to self-management were identified by 92 adults with type 2 diabetes at the beginning of the program. Patients were matched for age, gender and insurance coverage for the comparison group. The intervention group received educational materials but did not receive specific information regarding diabetes self-management; rather they received instruction of how to communicate with their provider. Additionally, participants were provided with strategies for overcoming identified self-management barriers and development of individual goals. At the end of the program, the intervention group averaged more than a 10% decrease in A1C results. The comparison group had an initial 1.69% increase in A1C results followed by a .39% decrease at the end of the study.

Although the study participants did not receive specific self-management instructions, they received educational materials and support that resulted in improved A1C (Kolbasovsky & Rich, 2010).

To determine the relationship between patient goals and educator goals, a study of 954 patients with diabetes was conducted (Zgibor et al., 2007). Most patients established goals for diet and physical activity. These goals were also the most common behavior change goals identified by the diabetes educators. Healthy coping was identified least by both groups. Results indicate that mutually identified goals are valuable in patients' attaining self-management behaviors (Zgibor et al., 2007). Each of these studies further supports the development of programs around patients' goals to promote self-management adherence.

### **Social Support**

Social support has been identified as a positive influence on diabetes self-management, however the specific level of support or the type of social support have not been defined (Gucciardi et al., 2007; Rees, Karter, & Young, 2010; Castro et al., 2009). The influence of social support on diabetes self-management varies according to demographics as to the self-management behavior (Rees et al., 2010). Researchers analyzed the National Health and Nutrition Examination Survey (NHANES) dataset of 450 subjects with diabetes who completed a social support questionnaire. Researchers found that increased social support in blacks resulted in an increase in weight control, exercise and dietary control. Social support in whites resulted in lower low-density lipoprotein (LDL) (Rees et al., 2010).

A holistic approach to diabetes self-management education was found to support adherence to self-management. Urban American Indians ( $n = 255$ ) were enrolled in a program that consisted of exercise classes, nutritional education, and multiple options for support (Castro et al., 2009). Patients were encouraged to participate in all activities and services, including education and support. Ninety-eight percent of those enrolled in the program participated in at least one self-management activity, with more than 60% participating in two or more. Following the program more than 50% reported testing their glucose level at least once daily. More than 70% of participants reported taking their medication as recommended either most of the time or always, and 65% reported participating in physical activity (Castro et al., 2009). Results of a correlational study also suggested social support as a factor to promote self-management behaviors (King et al., 2010). The study did not identify a relationship with medication adherence; however dietary adherence and physical activity were positively correlated with social support (King et al., 2010).

Three methods of care provider social support were compared to determine their effectiveness with self-management behaviors (Piatt et al., 2010). One intervention in this 4-phased study focused on the method of delivery of diabetes instruction to patients. Primary practice offices were randomized into 3 different groups. One group had a single, organized problem-based learning class for the providers along with provider access to a diabetes educator for a six-month period ( $n = 30$ ). Patients in this group received all diabetes related information from their providers. Another group of providers received mailings from the American Diabetes Association for one year ( $n = 51$ ). This group of providers and patients had no access to diabetes educators for support

during the study period. The providers in the intervention group received the problem-based learning classes. Additionally, problem-based intervention group patients received six educational sessions and ongoing monthly support for one year ( $n = 30$ ). After one year all groups had improvement in the outcome variables of A1C, blood pressure and glucose monitoring; however at the end of a 3-year follow up, only the intervention group had sustained the self-management behaviors (Piatt et al., 2010). The results of this study indicate sustained self-management requires ongoing social support.

African American adults with type 2 diabetes ( $n = 77$ ) received weekly newsletters with diabetes information (Tang et al., 2010). After one year, participants attended DSME classes as frequently as needed. The DSME sessions were directed by participants' questions and concerns. During both periods, the participants had significant improvements in diastolic blood pressure, cholesterol, and self-care behaviors of diet and glucose monitoring. There were also significant improvements in A1C, weight and body mass index (Tang et al., 2010).

As part of a clinical trial of 61 adults with type 2 diabetes over a period of 12 months the control group was provided with diabetes-related information following every three month laboratory visit, while the intervention group received monthly individualized education and twice weekly telephone calls for support (Menard et al., 2005). After 12 months the intervention group had reached the goal of  $< 7\%$  A1C, had lower readings for diastolic blood pressure, low-density lipoprotein and triglyceride levels when compared to the control group. Although the outcomes were better for the intervention group, these positive outcomes were not sustained. Six months following the end of the interventions, there was essentially no difference between the groups for

the previously stated outcomes (Menard et al., 2005). This study supports ongoing education and reinforcement for individuals with diabetes to improve long term self-management adherence.

## **Discussion**

Original research studies using qualitative and quantitative methods were reviewed in this paper and are briefly summarized in Table 2.1. The majority of the studies used quantitative design. Several studies relied on self-report to measure adherence, which can be an unreliable method due to inaccuracies in participant recall. The most frequently identified barriers to diabetes self-management included the complexity of self-management, low health literacy, lack of knowledge, and the economic impact of adhering to the recommended regimen. Factors that supported successful self-management include DSME, self-efficacy, goal setting and social support.

DSME is the critical intervention to decrease barriers and promote self-management adherence. Effective DSME directly addresses the complexity of self-management, lack of knowledge, and low health literacy. Education must be individualized in an easy to understand and implement method. DSME programs should provide repeated opportunities for the individual to master learned interventions and support self-efficacy while providing consultation and social support. Interventions should be focused on providing patients with appropriate information to empower them to participate in self-management behaviors.

Adherence to diabetes self-management behaviors is a vital factor in addressing the financial burden of the disease. Once the barriers are removed, and self-management adherence is sustained, glycemic control improves, reducing some of the financial

barriers to self-management adherence. Effective self-management further reduces the financial burden since complications of the disease are mitigated. Those in lower socioeconomic demographics often have limited access to appropriate DSME. Providers should assist the individuals with obtaining reliable DSME and decreasing financial obstacles.

Another important aspect of DSME is goal setting. Patients are responsible for applying the information they received in DSME to their everyday lives to gain control of their glucose. Successful self-management requires the individual to take an active role in planning their care. DSME is more effective when the provider goals and patient goals are congruent. Patients who actively participate in goal setting are more likely to adhere to self-management behaviors. Providers should encourage the individuals to identify health care goals based upon their priorities to maximize glycemic control.

Although education was shown to have a positive impact on patient self-management, sustainability of those behaviors is often an issue. The complications of diabetes occur over time and glucose control must be an ongoing process. DSME programs should be organized to provide long term support and follow up, recognizing that attrition is an issue.

The positive impact of social support on self-management behaviors is well documented. The variables are the amount of social support as well as the type of social support. The reviewed studies utilized personal contacts, mailings and telephonic communication as effective methods of social support. Each method resulted in improved diabetes self-management. Regardless of the type of social-support received, those with diabetes were more likely to adhere to self-management behaviors with the



implementation of social support. Due to limited financial resources, telephonic support may be a more cost effective method of providing social support.

### **Limitations**

Several limitations to this review exist. Only one author performed the database search and selected relevant studies to be included in the review. Use of the above search terms may not have identified some relevant studies. The exclusion of patients with type 1 diabetes may have limited identification of additional factors influencing self-management behaviors common to all patients with diabetes.

### **Conclusions**

DSME is shown to improve self-management adherence, most frequently the behaviors of diet and physical activity. There is limited research evaluating the long-term efficacy of interventions for sustained diabetes self-management. Only one study reviewed evaluated patient outcomes at three years following the intervention (Piatt et al., 2010). As diabetes is a chronic disease requiring long term self-management, additional longitudinal studies are needed to determine the effectiveness of interventions to improve self-management adherence. Further, due to the financial implications of providing services, additional research is needed to determine whether telephone social support is as effective as face-to-face encounters to promote diabetes self-management. The increasing availability of technology such as Skype or Facetime are additional options for providing social support through virtual face-to-face encounters. No studies have been conducted to evaluate the frequency and duration of social support necessary to ensure diabetes self-management activities are maintained. Further research is needed to

determine the most effective method of providing social support as well as the frequency and duration to ensure patients remain adherent in self-management practices.

### **Practice Implications**

The results of this review support DSME as an essential component of successful diabetes self-management adherence. Barriers to diabetes self-management must be addressed by the patient as well as the health care system. The burden of diabetes is beyond individual patients. Although DSME programs may be available, they are not always accessible. Effective DSME must be available and accessible to all patients with diabetes to eliminate barriers and promote sustained self-management.

Although a single approach to providing DSME is not practical, the continuous evolution of the health care system, compounded by reimbursement issues, essentially demands that DSME programs be continually evaluated and revised to best meet the needs of patients. Ongoing research is needed to identify appropriate, cost-effective behavioral interventions to support long-term adherence to diabetes self-management behaviors and decrease the burden of diabetes.

Table 2.1. Studies Included in the Review of Literature

<b>Reference (first author only)</b>	<b>Aims</b>	<b>Design</b>	<b>Theoretical Framework</b>	<b>Sample Size (<i>n</i>)</b>	<b>Measure</b>	<b>Findings</b>	<b>Effect on A1C</b>
Al Hayek (2013)	To assess the benefits of DSME on self-management adherence	Prospective quantitative	-----	104	Hospital anxiety & depression scale; self-report	Participating in a six month educational program was associated with adherence to diet, physical activity, self-monitored glucose, medication, & improvement in A1C & depression	↓
Aljasem (2001)	To examine barriers to diabetes self-management	Cross-sectional survey	Health Belief Model	309	Self-report questionnaires	Self-efficacy positively correlated with glucose testing, medication and dietary adherence	----- -

Table 2.1 Continued

Atak (2008)	To evaluate the relationship of education on knowledge, self-management and self-efficacy	Randomized controlled study	-----	80	Self-report questionnaires	Education had significant effect on patients' self-management behaviors	----- -
Bayliss (2007)	To identify barriers to self-management in seniors with diabetes	Cross-sectional survey	-----	352	Self-report questionnaires	Low self-efficacy and low health literacy were barriers to self-management	----- -
Carbone (2007)	To describe self-management behaviors	Qualitative	-----	52	Focus groups	Goals differ between patients and providers; mutual goal setting provided improved patient outcomes	----- -

Table 2.1 Continued

Carpenter (2012)	To examine the relationship of perceived threat of diabetes and self-management adherence	Descriptive	Stress and Coping Framework	80	Cognitive Appraisal of Health Scale; Summary of Diabetes Self-care Activities Measure	Participants indicated diabetes was a challenge more than a threat; Participants more likely to take medicines than follow dietary and exercise recommendations	----- -
Castro (2009)	To evaluate the effectiveness of a DSME program tailored to urban American Indians	Descriptive	-----	249	Self-management program	Those participating in the program had improvement in diabetes management knowledge	----- -
DeWalt (2009)	To examine a diabetes self-management program and counseling intervention for patient goals	Quasi-experimental	-----	229	Pre-test/post-test	Goal setting intervention assisted patients in achieving healthy behavior goals	----- -

Table 2.1 Continued

Gazmararian (2009)	To investigate barriers to diabetes self-management	Qualitative	-----	35	Focus groups	Barriers included stress and denial, lack of understanding of consequences, and availability of resources	----- -
Gucciardi (2007)	To examine usage of DSME	Quantitative	-----	536	Retrospective chart review	Less than 25% attended group education; only half completed the DSME program; employment and age were barriers to attendance	----- -
Gupta (2011)	To determine reasons for non-adherence of taking oral hypoglycemic agents	Prospective observational study	-----	45	Self-report; physiologic measurements	Reasons for non-adherence with medications: forgetful, financial, did not understand	----- -

Table 2.1 Continued

Hessler (2013)	To explore the relationship between regimen distress and self-management	Randomized controlled study	-----	392	Diabetes Distress Scale, Community Healthy Activities Model Program; NCI Percent Energy from Fat Screener; physiological measurements	High regimen distress associated with higher A1C	----- -
Hurley (1992)	To determine if self-efficacy influences diabetes self-care	Quantitative	Social Cognitive Theory	143	Self-report questionnaires	Self-efficacy and self-care scores were positively correlated with general management, diet, and insulin adherence	----- -
Kent (2010)	To evaluate clinicians' perception of healthy coping in diabetes	Descriptive	-----	?	Focus group	Barriers included low health literacy, limited access, knowledge, & stigma of diabetes	----- -

Table 2.1 Continued

35	King (2010)	To examine the association between psychosocial & social-environmental variables and diabetes self-management	Randomized trial	-----	463	Questionnaires, blood pressure, BMI, & A1C measurements	Self-efficacy strongly correlated with self-management behaviors	↓
	Kolbasovsky (2009)	To evaluate the influence of group-based DSME on glucose control	Descriptive correlational design	-----	367	Anthropometric measurements	Significant improvements in A1C; Control had increase in A1C	↓



Table 2.1 Continued

Kroese (2013)	To compare obese and non-obese patients preparation for self-management following self-management intervention	Quantitative	-----	64	Utrecht Proactive Coping Competencies Questionnaire; Brief Self-Control scale; Diabetes Self-Care Activities; Medication Adherence Report Scale; Physical Activity Scale for the Elderly; physiological measurements	Improvement in physical activity and dietary adherence in total sample with significant difference between obese and non-obese participants	----- -
Lerman (2008)	To examine psychosocial barriers to adherence	Quantitative	-----	29	Questionnaires	Low education level and low diabetes knowledge were barriers to adherence; diabetes nurse educators' support increased adherence	----- -

Table 2.1 Continued

Menard (2005)	To evaluate the effectiveness of one year intensive program on goal attainment	Randomized controlled trial	-----	72	Physiological measurements & Quality of Life Questionnaire	Individualized education and weekly phone calls for support resulted in diabetes-related goal achievement	↓
Misoon (2010)	To identify barriers to and facilitators of self-management behaviors in older Korean adults with type 2 diabetes	Qualitative	-----	24	Focus groups	Barriers identified were age-related changes, cultural restrictions, & lack of understanding. Facilitators were family support & health literacy	----- -
Moriyama (2009)	To evaluate the efficacy of a 12-month DSME program	Randomized controlled trial	Cognitive Behavioral Theory	65	Physiological measurements, Quality of Life Questionnaire, & Self-Efficacy Questionnaire	Structured DSME and biweekly telephone calls resulted in significant improvement in anthropometric measurements	↓

Table 2.1 Continued

Morrow (2008)	To examine factors that affect diabetes self-management	Qualitative	-----	24	Interviews	Self-management behaviors are practiced when they are congruent with patients' life goals	----- -
Nagelkirk (2006)	To identify barriers to self-management and strategies to promote self-management	Qualitative	Theory of Integration	24	Physiological measurements & Questionnaire	Barriers included lack of knowledge and understanding; strategies included collaboration with the provider	----- -
Piatt (2010)	To ascertain if outcomes at 12 months were sustained at 3 years	Randomized controlled trial	Chronic Care Model	119	Focus groups	Participants in DSME maintained glycemic control at 12 months and at 3 years	↓

Table 2.1 Continued

Powell (2005)	To examine barriers faced by practitioners to provide DMSE to Medicare patients	Qualitative	-----	51	Focus groups	Costs associated with DSME often prohibit ability to provide frequency of DSME	----- -
Raffle (2012)	To determine factors contributing to diabetes self-management in Appalachia	Quantitative	-----	3,841	Telephone survey	Attendance in diabetes education class was predictor of successful daily blood glucose monitoring	----- -
Rees (2010)	To evaluate the relationship of social support and ethnicity related to diabetes self-care	Qualitative	-----	450	National Health and Nutrition Examination Survey (NHANES)	Social support in African Americans resulted in increased weight control, exercise, and dietary control. Social support in Caucasians resulted in lower LDL	----- -

Table 2.1 Continued

Rusteld (2009)	To examine attitudes & self-efficacy related to diabetes self-care in Hispanic men	Qualitative	-----	34	Questionnaire & physiological measurements	Low health literacy was a significant barrier to self-management	----- -
Schillinger (2002)	To evaluate the association between health literacy and diabetes outcomes	Cross-sectional survey	-----	408	Questionnaire & Physiological Measurements	Lower health literacy scores were correlated with A1C levels	↑
Tang (2009)	To evaluate empowerment based self-management support on self-care and quality of life	Control-intervention	-----	77	Focus groups	Participants in DSME had improvement in blood pressure, A1C, weight, and self-management adherence	↓
Utz (2006)	To describe self-management and identify barriers and facilitators to self-management	Qualitative	-----	73	Physiological measurements & insurance claims data	Barriers included cost, complexity of self-management, & lack of access	----- -

Table 2.1 Continued

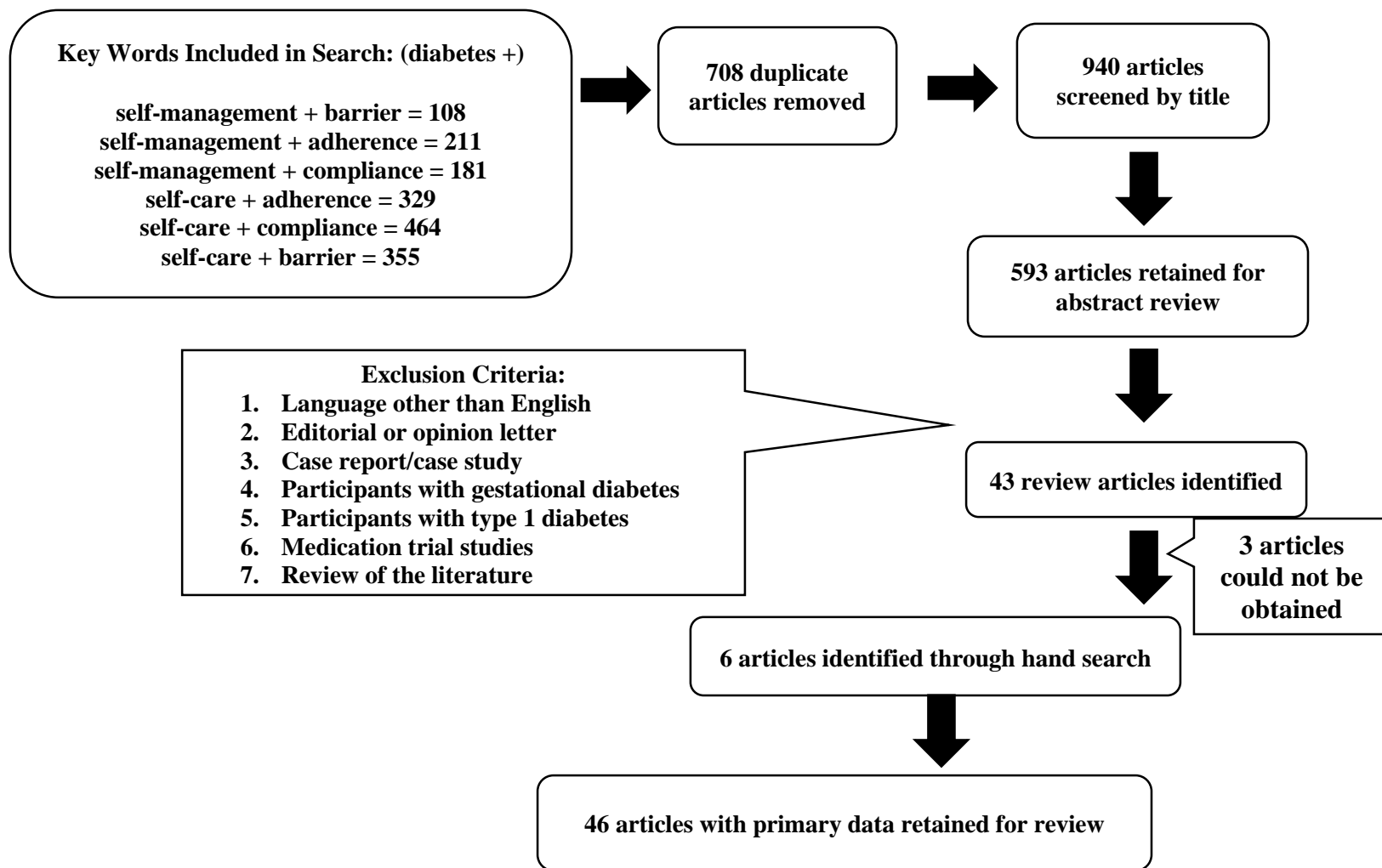
Valinsky (2013)	To examine effectiveness of diabetes groups to reduce resistance to treatment and improve management	Quantitative	-----	419	Pre-test/post-test Questionnaire; physiological measurements	All who participated in group education had reduction in A1C at end of study and one year follow-up; A1C, Systolic blood pressure, diastolic blood pressure reduced; those who were most resistant to adherence had greater improvement of scores	↓
Vijan (2004)	To evaluate barriers to following dietary recommendations	Qualitative	-----	197	Focus groups	Cost and complicated scheduling were identified as barriers	----- -

Table 2.1 Continued

Walker (2011)	To analyze the effectiveness of telephone compared with print intervention to improve diabetes self-management	Randomized control	-----	526	A1C, pharmacy claims, self-report	Participants receiving tailored telephone contacts by health educators had improved A1C results	↓
Zgibor (2007)	To identify patient and educator behavior change goals	Quantitative	-----	954	Self-report questionnaire	Dietary & physical activity goals were most common in both groups; mutually identified goals are most valuable in patients' successful self-management	----- -

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**Figure 2.1. Flowchart for Systematic Literature Review**





## CHAPTER THREE

### Evaluation of a Social Support Intervention to Promote Adherence to Recommended Diabetes Treatment in an Employer-Sponsored Health Program: A Retrospective Chart Review

#### Abstract

**Aim.** The purpose of this study was to examine the effectiveness of a social support intervention [U.S. Diabetes Conversation Map], administered through an employer-sponsored health program, to promote adherence to recommended diabetes treatment. The specific aim was to compare the change in A1C from baseline to 12 months as a measure of adherence in patients with type 1 or type 2 diabetes who received enhanced diabetes education (control group) with those program participants who attended group social support sessions in addition to receiving the enhanced diabetes education (intervention group).

**Background.** Worldwide prevalence of diabetes mellitus [diabetes] continues to increase, as does the financial burden of the disease and its associated complications. Glycemic control, achieved through effective adherence to recommended treatment has been shown to decrease the risk of complications and the financial burden. Patients are frequently unable to maintain the required glycemic control due to poor adherence to recommended treatment. Researchers have recognized the value of social support to promote adherence to recommended diabetes treatment.

**Methods.** A retrospective review of medical records of 85 participants in an employer-sponsored health program in a small rural area of a southern state was conducted. The control group received enhanced standard care that included quarterly one-to-one individualized educational sessions with a Certified Diabetes Educator. The intervention

group received enhanced standard care plus monthly group social support sessions [conversations] using the U.S. Diabetes Conversation Map as a framework. Adherence to recommended treatment was measured using participant A1C lab values. The hypothesis was that controlling for age and diabetes type, at one year the intervention group would have a greater decrease in A1C level from baseline to 12 months as compared to those in the control group.

**Results.** Controlling for age and diabetes type, there was a statistically significant change in A1C from baseline to 12 months among participants in the intervention group ( $t_{(81)} = 2.01, p = .048$ ).

**Conclusions.** A social support strategy, such as the diabetes conversation map used in this study, in addition to enhanced diabetes education shows promise in promoting adherence to diabetes treatment for patients with type 2 diabetes.

**Evaluation of a Social Support Intervention to Promote Adherence to  
Recommended Diabetes Treatment in an Employer Sponsored Health Program: A  
Retrospective Chart Review**

Diabetes mellitus is a serious public health problem affecting more than 29 million people in the United States and is the seventh leading cause of death in the United States (Centers for Disease Control and Prevention [CDC], 2014). Those with diabetes have a two to four times greater risk of developing cardiovascular disease or stroke when compared to those of the same age without diabetes (CDC, 2011a). In addition to the physical implications, the economic burden is also great. Estimated direct and indirect costs of diabetes total more than \$245 billion annually (CDC, 2013).

**Recommended Diabetes Treatment**

Diabetes treatment often includes a combination of medications, physical activity recommendations and nutritional guidelines (ADA, 2014a). Self-management requires the individual to interpret information and perform interventions based on those interpretations (Creer & Holroyd, 2006). Through adherence to these recommended behavior and lifestyle modifications, individuals with diabetes are able to decrease diabetes complications and their associated costs (CDC, 2011a).

**Enhanced Diabetes Education**

Despite care provider recommendations and the realistic possibility of complications, patients with diabetes frequently do not adhere to recommended diabetes treatment. Studies have identified the importance of providing individuals with education regarding diabetes, its complications, and recommended treatment to ensure adequate knowledge and promote adherence to the recommended treatment (Nagelkerk, Reick, and

Meengs, 2006). Multiple studies have demonstrated improvement of diabetes outcome measures following participation in diabetes self-management education (Atak, Gurkan, and Kose, 2008; Diedrich, Munroe, and Romano, 2010; Balamurugan, Rivera, Jack, Allen, and Morris, 2006; Moriyama et al., 2009; Walker et al., 2011). National standards developed by the American Association of Diabetes Educators (AADE) define the required components of diabetes self-management education necessary to promote individual improvement in diabetes related outcomes (Mensing, et al., 2002). The seven self-management behaviors [AADE-7<sup>TM</sup>] include ‘healthy eating, being active, monitoring [blood sugar levels], taking medication, problem solving, reducing risks and healthy coping’ (AADE, 2008).

Diabetes care coordination is a process whereby all of a patient’s diabetes care needs are coordinated to ensure appropriate care is received, while ensuring services are not duplicated. Care coordination is defined by the Agency for Healthcare Research and Quality (2010) as “the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient’s care to facilitate the appropriate delivery of health care services”. Participants in this study received enhanced diabetes education through individualized one-to-one encounters with a certified diabetes educator while participating in an employer sponsored diabetes care coordination program.

### **Group Social Support**

Although evidence exists that support education to promote adherence to recommended treatment, the addition of social support along with education has also demonstrated positive outcomes (Castro, O’Toole, Brownson, Plessel, and Schauben,

2009; Piatt et al., 2010). In studies with patients receiving individualized educational offerings in addition to group social support, patients demonstrated improvement in self-management behaviors including glucose testing, medication regimen adherence, and participation in physical activity (Castro et al., 2009; Piatt et al., 2010). Researchers have identified social support as a vital intervention to promote adherence to diabetes treatment; however, a definitive method of providing social support has not been established. Various modalities of providing social support have elicited positive results. Researchers have operationalized social support as emotional and financial support (Rees, Karter, & Young, 2010), informal group support (Castro et al., 2009), structured group educational sessions (Piatt et al., 2010), patient-directed educational sessions (Tang, Funnell, Brown, & Kurlander, 2009), educational mailings (Piatt et al., 2010; Rothman & Elasy, 2005; Tang et al., 2009), or routine telephone calls (Menard, et al., 2005). In this study social support was operationalized as participation in diabetes group meetings entitled “conversations”, which used the U.S. Diabetes Conversation Map as a framework.

### **Theoretical Framework**

This study was guided by the Health Belief Model (HBM). There are six constructs of the HBM, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Rosenstock, Strecher & Becker, 1988). These constructs can be applied during development of individualized patient education to address diabetes related behavior change.

The combination of individualized diabetes education and social support are potential strategies to address these constructs and promote behavior change. Diabetes

education provides an opportunity to address each of these constructs. While social support may also address all of the constructs of the HBM, this study more specifically addresses the construct of *perceived barriers*. *Perceived barriers* are the patient's beliefs about what will prohibit them from following treatment recommendations. Through this health program, participants received individualized, tailored education and had the opportunity to participate in group social support sessions; both with the goal of improving adherence to recommended treatment.

### **Purpose and Specific Aim**

The purpose of this study was to examine the effectiveness of a social support intervention [U.S. Diabetes Conversation Map], administered through an employer health program, to promote adherence to recommended diabetes treatment. The specific aim was to compare the change in A1C from baseline to 12 months as a measure of adherence in patients with type 1 or type 2 diabetes who participated in an employer sponsored health program and received enhanced diabetes education (standard care [control group]) with those program participants who attended group social support sessions [conversations] in addition to receiving the enhanced diabetes education (intervention group).

### **Research Question and Hypothesis**

This study attempted to answer the research question: Is there a difference in adherence to recommended diabetes treatment between participants receiving group social support and enhanced diabetes education with those who receive only enhanced diabetes education, when controlling for age and diabetes type? It is hypothesized that controlling for age and diabetes type, at one year participants in the intervention group

will have a greater decrease in A1C results from baseline to 12 months as compared to those in the control group.

## **Method**

### **Design**

This secondary data analysis was a retrospective chart review of 96 participants in an employer sponsored health program from June 2009 through June 2013. The health program was a benefit offered by a rural Kentucky post-secondary academic institution in partnership with a local Diabetes Center of Excellence (DCOE).

### **Sample**

The study sample was benefit-eligible employees of a rural Kentucky post-secondary academic institution and their benefitted dependents who participated in the employer sponsored health program at any time from June 2009 through June 2013. The employer has approximately 6,000 employees, of which approximately 2,100 receive insurance benefits. No records were available regarding total number of benefitted dependents or the number of insured with a diagnosis of diabetes.

### **Data Collection**

Patient medical records were accessed by the investigator through the electronic medical recording system, DiaWeb. A list of all active and inactive patients enrolled in the program from June, 2009 through June, 2013 was generated. This ensured that the study would include currently enrolled patients as well as all patients who completed or were discharged from the program, and met inclusion criteria.

## **Eligibility criteria**

Eligible participants had a diagnosis of type 1 or type 2 diabetes, an A1C of  $\geq 5.7$  upon entry to the program, were adults age 18 or older, and were physically able to perform self-management interventions. Residents of a group home or extended care facility were excluded from the study because of dependence on others for their diabetes management. Those with gestational diabetes or were less than one year post-partum were also excluded due to self-management needs different than the general population.

After applying inclusion and exclusion criteria, 85 patients were included in the study. Power analysis was not conducted for sample size since the estimated sample size was not known *a priori*. Given that the sample size was already fixed and the data already recorded, power analysis would not be statistically valid (Hoenig & Heisey, 2001).

## **Setting**

The setting was a central Kentucky post-secondary academic institution. All enhanced education encounters were held in the private office of the health program coordinator, located in a central location on the employer's main campus. The group social support sessions, conversations, were held in the library centrally located on the main campus.

## **Control Group: Employer-Sponsored Enhanced Diabetes Education Program**

All participants in this study were enrolled in the employer-sponsored enhanced diabetes education program. The primary objective of the employer-sponsored health program was to provide participants education about diabetes, complications of diabetes, and ensure standards of care were met [diabetes care coordination]. Inclusion of self-



management practices has been shown to reduce the incidence and progression of diabetes-related complications (CDC, 2013).

The health program was coordinated by a registered nurse certified through the National Certification Board for Diabetes Educators as a Certified Diabetes Educator (CDE). Participation in the program was free and voluntary. Paid release time was provided for the time period required for employees to attend health program meetings. As an added benefit, participants in the health program received their diabetes medications and testing supplies free of charge while actively participating.

Participants in the health program were recruited during the employer's annual benefits fair and through program information sent via periodic emails to all employees. The health program coordinator was present and distributed brochures during each annual employee benefits fair describing the health program and encouraging anyone with diabetes to enroll in the program. Prior to each group social support session, emails were sent to all employees and program participants notifying them of the date and time of the upcoming sessions. Throughout the study period a link was available on the employer's human resources website with information about the health program and contact information for the program coordinator. Interested eligible employees or benefitted dependents contacted the coordinator of the health program by telephone or email anytime during the year to schedule their first meeting.

Once enrolled in the program, each patient provided written consent for the program coordinator to request personal medical records from the patient's providers while the patient was participating in the program. Patients could opt out of the program at any time and no additional medical information was obtained. Any medical records

obtained and documentation of all interactions with the CDE were entered by the CDE into the confidential electronic medical recording system used by the Kentucky Cabinet for Health and Family Services, DiaWeb. The employer had no access to any of these records.

During the initial enhanced diabetes education one-to-one meeting, a clinical assessment was performed which included medical history, medical management of diabetes, glycemic control and self-assessment of diabetes knowledge and confidence in self-management. A plan of care was formulated based upon the patient's self-identified behavior change goals and mutually agreed upon learning goals. The foci of the individualized education encounters were based upon each participant's assessment and self-identified learning and behavior goals.

Following the initial enrollment meeting, each patient scheduled a second one-to-one meeting with the CDE. During the second one-to-one meeting with the CDE, patient learning and behavior goals were discussed and updated as appropriate. The CDE provided individualized self-management education based on the patient's self-reported self-management practices as well as the AADE-7<sup>TM</sup>. Summaries of all educational topics discussed and any revisions to learning or behavior goals were entered into the patient's electronic medical record by the CDE following each meeting.

As a requirement to remain in the enhanced diabetes education program, patients met with the CDE on a quarterly basis, additional meetings were scheduled as needed at the request of the patient or the CDE. During the quarterly one-to-one meetings with the CDE, patients discussed their adherence to self-management practices and provided results of their self-monitored glucose readings since the prior meeting. The CDE

provided individualized self-management instruction based on the patient's needs and progress toward the patient's learning and behavior goals. Following each quarterly meeting, the CDE requested the results of any medical encounters or laboratory results from the patient's providers and entered them in the electronic medical record as appropriate.

An updated assessment was conducted annually with each patient enrolled in the health program. Additionally, patient self-care behavior and learning goals were evaluated and updated annually. Once patients successfully met all self-care behavior goals and learning goals, and no longer required enhanced diabetes education services, they were discharged from the program. Patients were also discharged from the program once the benefit-eligible employee was no longer employed. Table 3.1 provides a summary of the protocol for the standard of care for the enhanced diabetes education program. All patients in this study received the standard of care protocol.

### **Intervention Group: Enhanced Diabetes Education and Conversations**

The intervention group received enhanced diabetes education, consistent with the control group, noted in the description and in Table 3.1. In addition, intervention group participants attended at least one monthly group meeting, entitled "conversations" during the 12-month study period. These group meetings were structured around the U.S. Diabetes Conversation Map educational program which focuses on diabetes and diabetes self-management. The U.S. Diabetes Conversation Map is an educational program developed through joint efforts of the American Diabetes Association and Merck pharmaceutical company. The Conversation Map was developed with multiple

theoretical considerations including the Health Belief Model (Reaney, Eichorst, & Gorman, 2012).

Discussion in the “conversations” was led by participants and facilitated by a CDE to ensure the standardized learning objectives were met during each session. Each month the same “conversation” topic was presented two different days and times for convenience purposes. Participants chose which “conversation” sessions they attended. There are five conversation maps covering ten educational topics related to diabetes and adherence to recommended treatment. This health program only used four of the conversation maps; the fifth map related to gestational diabetes was not used. Table 3.2 provides a summary of the learning objectives for each of the “conversation” sessions.

### **Procedure**

Approval for the study was obtained from the Kentucky Cabinet for Health and Family Services (CHFS) Institutional Review Board (IRB) and the Madison County Health Department. Documentation was submitted to the University of Kentucky (UK) Institutional Review Board however, as ownership of the medical records rests with the Kentucky Cabinet for Health and Family Services, the UK IRB deferred the IRB of record to the Kentucky CHFS.

Working from the generated list of patients, study participants were de-identified and coded as either Control Group: Enhanced Diabetes Education or Intervention Group: Enhanced Diabetes Education and Conversations. Patients in the control group were coded if they only engaged in the enhanced diabetes education with the CDE throughout their participation in the health program. Patients were considered in the intervention group and coded as Enhanced Diabetes Education + Conversations if they attended at

least one group conversation session in addition to the one-to-one sessions with the CDE. Each participant was then assigned a three digit number within the respective group (e.g. 001, 002, etc.). Data were extracted from the electronic medical record and recorded on data collection forms by the investigator (Appendix A). Once all patient records were reviewed and data extracted, records from ten randomly selected patients from each group were verified with the data collection instruments to validate accuracy. All data extraction and verification were performed by the investigator. Participant anonymity was ensured and maintained through the de-identification process. Confidentiality of the participant information was maintained throughout the study as the investigator maintained sole custody of all data collected from the electronic medical record.

## **Measures**

**Demographic and Baseline Diabetes Characteristics.** Demographic and baseline diabetes data were collected on the 85 participants for whom data could be extracted from chart reviews over the previous four years from 2009 to 2013.

*Demographic Characteristics.* Date of birth was used to calculate age at time of enrollment in the health program. The date of the initial health program assessment was entered and utilized as baseline. Additional demographic variables including race, gender, marital status, educational level, and employment status were coded (Appendix A). Income data were not collected at any time, therefore were not available in the medical record.

*Baseline Diabetes Characteristics.* Standard items were used to assess type of diabetes, weight, blood pressure, and laboratory values (Appendix B). Body mass index was calculated using the CDC formula of  $[\text{weight (pounds)}] / [\text{height (inches)}]^2 \times 703$

(CDC, 2011b). For the purpose of the study baseline laboratory values were considered the most recent value in the 12 months preceding enrollment in the health program.

**Adherence to recommended diabetes treatment (A1C).** Participants' A1C was used to measure adherence, as it provides information about the patient's average blood glucose over the previous 2-3 months (ADA, 2013). A decrease in A1C indicates lower average estimated blood glucose over the previous three months as a result of adherence to recommended treatment (ADA, 2014b; WHO 2011). For this study the A1C value immediately prior to joining the program was considered the baseline value. Subsequent A1C values were recorded as follow-up values, using a three-month window; the A1C measure closest to the 3-month mark was used for that time interval.

### **Data Management**

Data collected from chart reviews were entered onto paper tracking sheets (Appendices A, B, and C) by the investigator. The chart review process occurred over a 12-week period of time. Collecting data on the 85 patients required more than 240 hours.

All data were double entered by the investigator into version 21 of the Statistical Packages for the Social Sciences (SPSS 21.0). An electronic comparison of the two data sets was conducted and any discrepancies were verified with the data collection instruments and appropriate corrections made.

Missing data on the main variable of adherence was handled with the last observation carried forward approach. Analyses were conducted for participants with a baseline A1C and at least one additional A1C between baseline and 12 months. If the 12-month A1C was missing, the last A1C value closest to 12 months was used for analyses. Participants with missing demographic or diabetes characteristics were not included in

the analysis, however were included in other analyses with available data. A conservative intention-to-treat convention was used, whereby those in the intervention group were kept in that group throughout the analysis, whether they completed the elements of the intervention or not.

## **Data Analysis**

All statistical analyses were conducted by computer using SPSS 21.0. An alpha value of .05 was used throughout.

**Descriptive Analyses.** Descriptive analyses of the demographic and baseline diabetes characteristics and A1C values at baseline and 12 months were completed using frequency distributions or means and standard deviations, as appropriate. Comparisons between the treatment and control groups were made using chi-square or t-tests.

**Adherence to Recommended Treatment.** Analysis of variance (ANOVA) was used to compare A1C values over time (baseline and 12-months) and between groups (intervention vs. control [standard care]). The interaction between time and group were included in the model as a test of whether the two groups had the same profiles in A1C values over time.

## **Results**

**Demographic Characteristics.** The majority of patients in the sample ( $N = 85$ ) were Caucasian (85.9%,  $n = 73$ ) and female (63.5%,  $n = 54$ ). More than eighty-seven percent ( $n = 74$ ) of the study population had type 2 diabetes. This is consistent with the national average of 90% - 95% of all diagnosed cases of diabetes in the United States being type 2 (ADA, 2014a; CDC, 2011a). More than half were college graduates (53.6%,  $n = 45$ ) and nearly all the participants were employed full time (92.9%,  $n = 79$ ).

More than sixty-seven percent ( $n = 57$ ) were married. Participants in the study ( $n = 85$ ) received enhanced diabetes education through a mean of 4.9 encounters ( $SD = 3.3$ ) during the one year period. Those in the intervention group ( $n = 41$ ) attended a mean of 2.8 monthly group meetings ( $SD = 2.2$ ), entitled “conversations” during the twelve month period.

**Baseline Diabetes Characteristics.** The mean age of participants was 49.8 years ( $SD = 9.9$ ). The mean duration of diabetes was 6.9 years ( $SD = 8.6$ ). The mean A1C at baseline was 7.7% ( $SD = 1.9$ ). Based on the CDC (2011b) classifications, the majority of the study population was overweight or obese (70.6%,  $n = 60$ ), with a mean body mass index (BMI) of 35.4% ( $SD = 7.3$ ). This is slightly below but corresponds with national statistics if 84.7% of adults in the United States with diabetes who are overweight or obese (CDC, 2013). There were no statistically significant differences in demographic or baseline diabetes characteristics for those participating in the control versus the intervention group (Table 3.3). Group sizes were comparable and are summarized in Table 3.3 (Control group  $n = 44$ ; Intervention group  $n = 41$ ). There was however, a statistically significant difference in years with diabetes between type 1 ( $M = 22.9$ ,  $SD = 9.0$ ) and type 2 ( $M = 4.5$ ,  $SD = 5.3$ ).

The purpose of this study was to examine the effectiveness of a social support intervention [U.S. Diabetes Conversation Map], administered through an employer-sponsored health program, to promote adherence to recommended diabetes treatment. The specific aim was to compare the change in A1C from baseline to 12 months as a measure of adherence in patients with type 1 or type 2 diabetes who participated in an employer sponsored health program and received enhanced diabetes education (standard



care [control group]) with those program participants who attended group social support sessions [conversations] in addition to receiving the enhanced diabetes education (intervention group).

### **Hypothesis Testing**

The hypothesis was that controlling for age and diabetes type, at one year participants in the intervention group will have a greater decrease in A1C results from baseline to 12 months as compared to those in the control group. The hypothesis was supported; controlling for age and diabetes type, there was a significant interaction between program type (control versus intervention) and time. The change in A1C was greater for those in the intervention group compared with those in the control group, ( $t_{(81)} = 2.01, p = .048$ ).

There was a significant association between a decrease in A1C from baseline to 12 months and group. Of the 41 participants in the intervention group, 29 (71%) demonstrated an improvement in A1C; of the 44 participants in the control group, 18 (41%) showed an improvement from baseline to 12 months ( $\chi^2 = 7.6, p = .006$ ). The average change in A1C for those in the intervention group was a decrease of 0.57, compared to an average decrease of 0.009 for those in the control group who received enhanced standard care only ( $p = .048$ ). Figure 3.1 illustrates the change in A1C for participants in the control group and the intervention group.

### **Limitations**

In addition to a small sample size, there were additional limitations to this secondary data analysis. There was a potential for selection bias due to the convenience sample. There was no randomization as the voluntary participants determined the

number of enhanced educational encounters they had with the certified diabetes educator as well as whether to attend any conversations. Those choosing to participate in the health program may have been more adherent without any intervention. This was mitigated as there were no baseline differences in demographics between groups. There were extraneous variables such as medication type and medication adherence which were unable to be controlled.

### **Discussion**

The results of this secondary data analysis indicate that the use of the U.S. Diabetes Conversation Map as a social support strategy in addition to diabetes education shows promise in promoting adherence to recommended diabetes treatment for patients with type 2 diabetes. These results are similar to previous studies that found that social support in combination with individualized education improved adherence to diabetes treatment recommendations (Castro et al., 2009; Piatt et al., 2010).

The effects of the intervention indicating a difference between the control and intervention groups was apparent only after controlling for diabetes type. This could be explained through the length of time study participants with type 1 diabetes had been diagnosed. In the current study there was a statistically significant difference in the length of time individuals had diabetes between those with type 1 and those with type 2. On average, those with type 1 had been diagnosed with diabetes much longer than those with type 2. Previous research found that adherence rates decrease with the length of time an individual has diabetes (WHO, 2003). The adherence for those with type 1 could have affected the results for both groups and only after controlling for diabetes type, were the effects of the intervention revealed. The small number of patients with type 1

diabetes as well as the enhanced diabetes education that all participants received could have limited the power to denote an effect.

These results indicate that a program that combines enhanced diabetes education and group social support can promote adherence to recommended treatment for patients with type 2 diabetes. Although the intervention tool, U.S. Diabetes Conversation Map was different, these findings are quite similar to the study by Piatt et al. (2010) who reported a decrease in A1C results in a population that received social support in a group setting as well as one-to-one educational classes.

This model of providing enhanced diabetes education and group social support in an academic employer setting is somewhat unique and not found in the literature. The structure of this particular health program provided financial incentives for adherence to recommended treatment through waiving the costs of diabetes medications and testing supplies to participants while actively participating in the program. Prior studies identified cost as a barrier to adherence to recommended treatment (Braveman et al., 2010).

The convenience of permitting employees to attend enhanced diabetes education encounters or conversations group meetings during working hours eliminated one additional barrier to participation. Lack of convenient meeting times was identified as a barrier to participation in education in one previous study, particularly with those who were employed (Gucciardi et al., 2007). Replication of this study may be prohibitive in a non-academic setting, as other employment settings may not lend themselves to employees leaving their workstation for the necessary length of time.

Another positive finding in this study was that no participants were hospitalized with diabetes as a primary or secondary diagnosis during the period from baseline to 12-months. It is unclear whether this is a change from baseline as no hospitalization records were available on the study population for baseline comparison.

The results of this study align with the construct of *perceived barriers* of the Health Belief Model. This method of providing enhanced diabetes education and group social support through the employer-sponsored health program decreased barriers that may have otherwise prevented participants from adhering to recommended diabetes treatment. Identified barriers to adherence include the financial cost of adherence and lack of diabetes knowledge. Each of these barriers was addressed through participation in this employer-sponsored health program. The cost of adherence was reduced through provision of diabetes medication and diabetes testing supplies without charge while participating in the program. Through increasing the access to diabetes medications by eliminating the co-payment, adherence to medications was likely increased, contributing to the decrease in A1C. Diabetes knowledge was increased through the one-to-one enhanced educational encounters as well as the Conversation Map group support intervention.

### **Conclusions**

The increasing prevalence of diabetes at excessive rates underscores the need for effective strategies to promote adherence to recommended treatment. Effective diabetes management is crucial for controlling the physical burden associated with the disease and decreasing the financial expenditures associated with this chronic condition. The results of this study indicate that the use of the U.S. Diabetes Conversation Map shows promise

as an intervention to provide group social support and improve adherence to recommended diabetes treatment for patients with type 2 diabetes.

Of particular concern was the finding that patients with type 1 diabetes were less responsive to the intervention. As type 1 diabetes requires insulin for survival (ADA, 2014b), one would surmise that individuals with type 1 diabetes would be more adherent to recommended treatment, particularly medication adherence. It was beyond the scope of this study to evaluate adherence to specific self-management behaviors to differentiate the adherence of individuals with type 1 and type 2 diabetes.

This model of employer sponsored health program may not be feasible in other employment areas. Not all employment positions lend themselves to employees leaving during working hours to attend a non-work related meeting. Additionally, the cost of administering such a program may be prohibitive for smaller employers.

### **Implications for Clinical Practice and Future Research**

The results of this study support the combination of enhanced diabetes education and group social support for patients with type 2 diabetes. Employer on-site opportunities for group social support and education could be achieved through offerings at the beginning of the shift or immediately following the shift, eliminating the need for participants to leave their work station. Collaboration between an employer's pharmaceutical insurance provider and the employer to offer reduced cost or free diabetes medications and testing supplies while participating in the program could decrease overall healthcare costs through decreasing diabetes related complications as a result of improved adherence to recommended treatment.

A randomized controlled clinical trial with scripted protocol for the individualized educational topics would provide results that could be replicated in future studies. In addition to the conversation map, other social support strategies need to be tested to predict the most effective interventions for particular populations (e.g. patients with type 1 versus type 2 diabetes). Additional research is needed to determine strategies for improving adherence to specific treatment recommendations, i.e. medication adherence, nutritional recommendations, physical activity.

Cost analysis would be valuable to determine the cost-benefit ratio of administering this model of health program and answer the question: Is there a cost savings related to the decreased number of employee sick days as a result of adherence to recommended treatment?

Additional studies using this model of employer sponsored group social support and enhanced diabetes education with various demographics are recommended. The academic setting may have allowed more ease for attending educational encounters and conversation sessions. Factory or hospitality settings may reveal different results due more restrictive production time.

**Table 3.1. Protocol for Enhanced Diabetes Education (Control & Intervention Groups)**

Session	Enhanced Diabetes Education (Standard Care)
1	<ul style="list-style-type: none"> <li>• Obtain demographic data and medical history.</li> <li>• Obtain baseline data on medical management and glycemic control.</li> <li>• Obtain self-assessment.</li> <li>• Provide self-management education based on patient’s self-identified needs</li> </ul>
2	<ul style="list-style-type: none"> <li>• Obtain patient self-care behaviors</li> <li>• Obtain patient learning goals</li> <li>• Obtain patient behavior goals</li> <li>• Provide individualized self-management education based on patient assessment and the AADE-7<sup>TM</sup></li> </ul>
3 Quarterly	<ul style="list-style-type: none"> <li>• Evaluation of patient self-management and glucose readings</li> <li>• Provide individualized self-management education based on the AADE-7<sup>TM</sup> and patient’s progress towards learning goals and behavior goals</li> </ul>
4 Quarterly	<ul style="list-style-type: none"> <li>• Evaluation of patient self-management and glucose readings</li> <li>• Provide individualized self-management education based on the AADE-7<sup>TM</sup> and patient’s progress towards learning goals and behavior goals</li> </ul>
5 Quarterly	<ul style="list-style-type: none"> <li>• Evaluation of patient self-management and glucose readings</li> <li>• Provide individualized self-management education based on the AADE-7<sup>TM</sup> and patient’s progress towards learning goals and behavior goals</li> </ul>
6	<ul style="list-style-type: none"> <li>• Once learning goals and behavior goals are met, patient is discharged from Care Coordination.</li> </ul>

**Table 3.2. Protocol for Intervention Group (Enhanced Diabetes Education + Conversations)**

<b>Conversation Focus</b>	<b>Patient Learning Objectives</b>
Diabetes Overview	<ol style="list-style-type: none"> <li>1. Define diabetes in simple terms.</li> <li>2. Identify own type of diabetes.</li> <li>3. State diabetes is treated by meal plan, exercise, medication, monitoring, and education.</li> </ol>
Monitoring	<ol style="list-style-type: none"> <li>1. Name three tests or exams that should be performed annually.</li> <li>2. Name three advantages of performing home blood glucose monitoring.</li> <li>3. State target blood glucose and A1c goals.</li> <li>4. Describe safe needle disposal.</li> </ol>
Physical Activity	<ol style="list-style-type: none"> <li>1. Identify how exercise affects diabetes control.</li> <li>2. Describe benefits and risks of exercise and how to keep exercise safe.</li> <li>3. Identify strategies to help maintain a regular exercise routine.</li> </ol>
Behavior/Lifestyle Changes & Goal Setting	<ol style="list-style-type: none"> <li>1. Define goal setting.</li> <li>2. Write a personal short-term goal.</li> </ol>
Acute Complications	<ol style="list-style-type: none"> <li>1. Identify what hypoglycemia is and list the signs/symptoms, causes, treatment, and prevention of it, including medical ID.</li> <li>2. Identify what hyperglycemia is and list the signs/symptoms, causes, treatment, and prevention of it.</li> <li>3. Identify sick day guidelines and when to call the health care provider.</li> </ol>
Chronic Complications	<ol style="list-style-type: none"> <li>1. State the relationship between blood glucose control and the development/prevention of long-term complications.</li> <li>2. State the relationship between blood pressure control and the development/prevention of long-term complications</li> </ol>
Medications	<ol style="list-style-type: none"> <li>1. Describe different types of oral agents used to treat diabetes, how they work, who should use them, side effects, and special considerations for taking them.</li> <li>2. Describe types of insulin, when and how to take it, guidelines for care of insulin, site selection and rotation, side effects, special considerations when taking insulin, and sharps disposal.</li> </ol>
Foot, Skin & Dental Care	<ol style="list-style-type: none"> <li>1. Discuss why skin, dental, and foot care are important and the importance of preventive care.</li> <li>2. Demonstrate a self-foot exam.</li> </ol>



Table 3.2 Continued

Psychosocial Coping & Stress	<ol style="list-style-type: none"><li>1. Discuss the effect of stress on diabetes.</li><li>2. Verbalize at least four strategies for coping with stress</li></ol>
Nutritional Management	<ol style="list-style-type: none"><li>1. Describe the effect of carbohydrates on glucose levels and identify foods which contain carbohydrates.</li><li>2. Plan a one-day meal plan using basic nutrition guidelines for diabetes.</li><li>3. Identify information on food labels.</li></ol>

**Table 3.3. Demographic and Baseline Diabetes Characteristics of Study Participants**

	<b>Control CC</b>	<b>Intervention CCC</b>	<b><i>N</i> = 85 <i>X</i><sup>2</sup> (<i>p</i>)</b>
	<b><i>n</i> (%)</b>	<b><i>n</i> (%)</b>	
<b>Diabetes type</b>			0.59 (.44)
<b>Type 1</b>	4 (9.1)	7 (17.1)	
<b>Type 2</b>	40 (90.9)	34 (82.9)	
<b>Race</b>			2.03 (.15)
<b>Caucasian</b>	35 (79.5)	38 (92.7)	
<b>Other</b>	9 (20.5)	3 (7.3)	
<b>Gender</b>			1.22 (.26)
<b>Female</b>	25 (56.8)	29 (70.7)	
<b>Male</b>	19 (43.2)	12 (29.3)	
<b>Marital status</b>			0.21 (.64)
<b>Married</b>	28 (63.6)	29 (70.7)	
<b>Other</b>	16 (36.4)	12 (29.3)	
<b>Educational Status</b>			1.29 (.52)
<b>High school or less</b>	9 (20.9)	12 (29.3)	
<b>Some college</b>	11 (25.6)	7 (17.1)	
<b>Bachelor's degree or &gt;</b>	23 (53.5)	22 (53.7)	
<b>Employment status</b>			0.11 (.73)
<b>Full time</b>	40 (90.9)	39 (95.1)	
<b>&lt; full time</b>	4 (9.1)	2 (4.9)	
<b>Baseline BMI</b>			2.68 (.10)
<b>Normal or underweight</b>	9 (20.5)	16 (39.0)	
<b>Overweight or obese</b>	35 (79.5)	25 (61.0)	

Figure 3.1. Plot of baseline A1C vs. 12-month A1C, by group (N = 85)

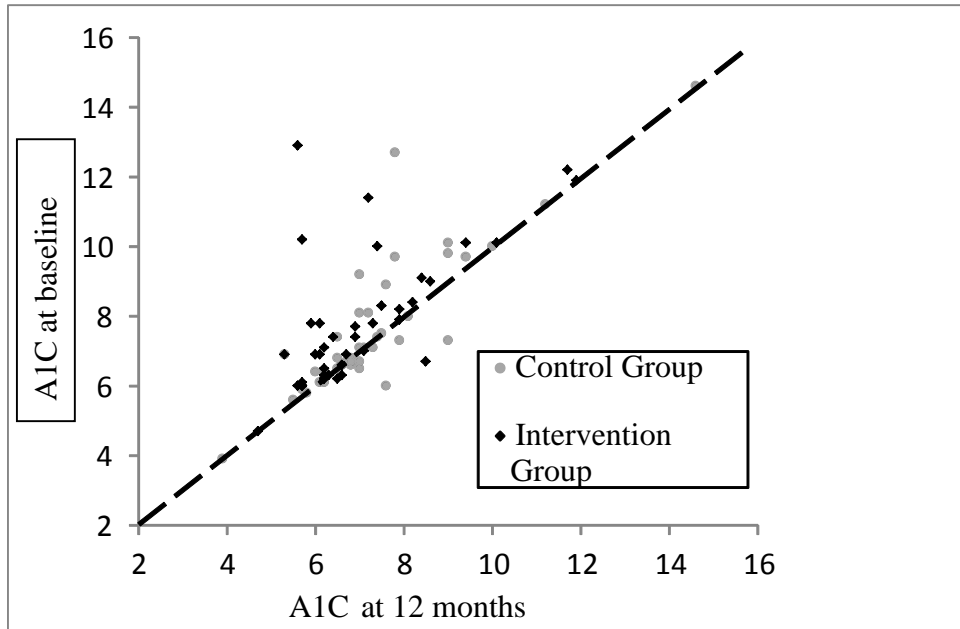


Figure 1. Points above the line represent a decrease in A1C over time. Points below the line illustrate participants whose A1C increased from baseline to 12 months.

## CHAPTER FOUR

### Evaluation of Self-Management Behaviors for Patients Enrolled in an Employer-Based Diabetes Care Coordination Program: A Retrospective Chart Review

#### **Abstract**

**Aim.** The purpose of this study was to examine the effectiveness of an employer-based diabetes care coordination program to improve adherence to recommended self-management behaviors of participants. There were two specific aims: the primary specific aim was to compare the participants' adherence rates to recommended self-management behaviors at baseline and 12 months following entry into the diabetes care coordination program. The secondary specific aim was to compare the change in adherence rates of diabetes care coordination patients (control group) with the change in adherence rates of diabetes care coordination patients who also attended monthly group social support sessions (intervention group).

**Background.** Diabetes and its complications are leading causes of disabilities and death in the United States. The health care expenditures associated with diabetes and its complications continue to increase. Performance of self-management interventions may delay or prevent the onset of complications, decreasing the financial and physical burdens associated with this chronic disease.

**Methods.** A retrospective review of medical records for a total of 96 patients participating in an employer-based diabetes care coordination program was conducted. Participants in the diabetes care coordination program met at least quarterly with a Certified Diabetes Educator for individualized diabetes self-management education (control group). In addition to the quarterly individualized diabetes self-management

education, some participants also attended monthly group social support sessions that used the U.S. Diabetes Conversation Map as a framework (intervention group). Self-management behaviors were evaluated at baseline and at 12 months after entry into the diabetes care coordination program using repeated measures analysis of variance (ANOVA).

**Results.** Controlling for age and diabetes type, there was significant improvement in adherence to receiving influenza vaccination from baseline to 12-months for the total sample, with no difference between the control group and intervention group.

Participants also demonstrated significant decreases in alcohol consumption, nicotine use, and skipping meals, with no difference between groups. The self-management behavior of obtaining a dilated eye examination had a significant time by group interaction, demonstrating an increase for the control group only.

**Conclusions.** Participating in an employer-based diabetes care coordination program shows promise for the future as an effective method to increase adherence to diabetes specific self-management behaviors, thereby decreasing the personal and economic burdens of this chronic disease.

## **Evaluation of Self-Management Behaviors for Patients Enrolled in an Employer-Based Diabetes Care Coordination Program: A Retrospective Chart Review**

The worldwide epidemic of adults with diabetes has nearly doubled over the past 30 years, resulting in an estimated 347 million individuals currently living with diabetes (Danaei et al., 2011). During the same time period, the incidence of diabetes more than tripled in the United States from 5.5 million in 1980 to 20.8 million in 2011 (Centers for Disease Control and Prevention [CDC], 2011). This number continues to grow at an excessive rate, as the most recent figures indicate that currently more than 29 million individuals in the United States are living with diabetes (CDC, 2014). Previous projections were that by the year 2030 more than 30 million people in the United States will have diabetes (Wild, Roglic, Green, Sicree, & King, 2004). Based upon the current trends, the United States will exceed that projection long before 2030. The economic implications of providing care for individuals with diabetes is also astounding, totaling more than \$245 billion annually (CDC, 2014). This figure includes approximately \$69 billion of indirect costs due to disability, lost work hours and premature death (CDC, 2014). Adherence to recommended diabetes self-management results in improved glucose control, decreasing the risk for complications that contribute to the financial burden of this chronic condition (CDC, 2014).

### **Background**

#### **Diabetes Self-Management**

Diabetes is managed through adherence to a combination of nutritional therapy, physical activity, and medications to reduce glucose levels and decrease long-term complications (ADA, 2014; CDC, 2014). Self-management requires the individual to

interpret information and perform interventions based on those interpretations (Creer & Holroyd, 2006). The American Association of Diabetes Educators (AADE) identified seven self-management behaviors that are important to improve diabetes related outcomes. These self-management behaviors [AADE-7<sup>TM</sup>] are ‘healthy eating, being active, monitoring, taking medications, problem solving, reducing risks and healthy coping’ (AADE, 2008). Physical complications of diabetes can be delayed or even prevented through effective self-management. (ADA, 2014; CDC, 2014).

### **Care Coordination**

Care coordination is defined by the Agency for Healthcare Research and Quality (2010) as “the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient’s care to facilitate the appropriate delivery of health care services”. The Institute of Medicine [IOM] (2003) identified care coordination for chronic conditions as a priority area for national action. The IOM further recognized diabetes as one of the illnesses that holds promise for care coordination to affect the most change through preventing complications to reduce the economic burden of this chronic disease (IOM, 2003). Researchers found that care coordination is an effective intervention to improve diabetes outcomes (Sutherland & Hayter, 2009). Diabetes care coordination has been implemented successfully in hospitals, primary care settings and with insurance providers to improve self-management behaviors, resulting in decreased health-care costs (Chouinard et al., 2013; Taliani, Bricker, Adelman, Cronholm, & Gabbay, 2013; Versnel, Welschen, Baan, Nijpels, & Schellevis, 2011; Wolber & Ward, 2010).

## **Group Social Support (Conversations)**

The U.S. Diabetes Conversation Map program consists of five colorful maps covering various diabetes topics. Only four of the conversation maps were used in the care coordination program; the fifth map, related to gestational diabetes, was not used. Each of the maps may be used for multiple topics.

An overview of diabetes was the main focus of Map 1. This map was used to promote participants' discussions of their feelings about having diabetes. Map 2 broadly covered the relationship between nutrition and diabetes, leading to discussions regarding healthy eating and nutritional strategies. The focus of Map 3 was glucose monitoring to facilitate discussion about how individuals interpret their results to manage their disease. Map 4 focused on the course of diabetes, including long term complications.

The five maps provided broad topics as stimulus for the ten structured educational topics with specific learning objectives to guide the conversations. The conversation topics include "Diabetes Overview", "Monitoring", "Physical Activity", "Behavior/Lifestyle Changes and Goal Setting", "Acute Complications", "Chronic Complications", "Medications", "Foot, Skin, and Dental Care", "Psychosocial Coping and Stress", and "Nutritional Management". Table 2 provides a summary of the learning objectives for each of the conversations.

## **Theoretical Framework**

This study was guided by the constructs of the Health Belief Model (HBM). The constructs of the HBM assist with understanding individual's adherence to self-management behaviors (Rosenstock, Strecher & Becker, 1988). These six constructs include *perceived susceptibility*, which is the individual's perception of developing



complications related to diabetes. *Perceived severity* is the person's feelings about the consequences of non-adherence to self-management behaviors and whether non-adherence will actually result in complications. *Perceived benefits* are the perceptions the individual has regarding whether adhering to self-management behaviors would decrease the risk or severity of complications. *Cues to action* are the internal or external triggers that stimulate the individual to engage in self-management behaviors (Rosenstock, Strecher & Becker, 1988). The final construct, *self-efficacy* is the confidence to successfully engage in one's own self-care (Bandura, 1977).

Care coordination provides a mechanism for addressing each of the constructs of the HBM. Through diabetes care coordination participants are provided with individualized diabetes self-management education enabling them to make more informed decisions regarding their own self-management adherence. The key construct addressed through this study was *cues to action*. Interactions during the care coordination meetings served as external triggers to promote adherence to self-management behaviors.

### **Purpose and Specific Aims**

The purpose of this study was to examine the effectiveness of an employer-based diabetes care coordination program to improve recommended self-management behaviors of participants. The primary specific aim was to compare the participants' adherence rates to recommended self-management behaviors at baseline and 12 months following entry into the diabetes care coordination program. The secondary specific aim was to compare the change in adherence rates of diabetes care coordination participants (control

group) with the change in adherence rates of diabetes care coordination participants who also attended monthly group social support sessions (intervention group).

Diabetes care coordination was defined as the employer-based program whereby participants received individualized one-to-one diabetes self-management education with a Certified Diabetes Educator (CDE). Group social support was defined as the group meetings that used the U.S. Diabetes Conversation Map as a framework for stimulating discussion among participants.

### **Research Questions and Hypotheses:**

The research questions posed in this study were the following:

1. Does participation in an employer-based diabetes care coordination program improve adherence to recommended self-management behaviors, when comparing baseline to one year?
2. Does participation in group social support, using conversation maps, in addition to diabetes care coordination, increase adherence to recommended self-management behaviors from baseline to one year compared with participating in diabetes care coordination only?

The following hypotheses were tested:

**H<sub>1</sub>:** Participants in the employer-based diabetes care coordination program will demonstrate improvement in self-management behaviors at 12 months when compared with their baseline adherence to self-management behaviors.

**H<sub>2</sub>:** Participants engaging in group social support in addition to the employer-based diabetes care coordination will demonstrate increased adherence to self-

management behaviors at one year compared with the adherence rates of individuals participating in the diabetes care coordination program only.

## **Method**

### **Care Coordination Protocol**

The diabetes care coordination program in this study was coordinated by a registered nurse certified as a Certified Diabetes Educator (CDE) through the National Certification Board for Diabetes Educators. Enrollment in the diabetes care coordination program was free and voluntary. Employees participating in the diabetes care coordination program were permitted to attend meetings with the CDE during their scheduled working hours. Those actively participating in the care coordination program received their diabetes medications and diabetes testing supplies free of charge while in the program.

All benefit-eligible employees with diabetes were actively recruited to participate in the program. Information was provided to employees during the employer's annual benefits fair and through program information sent periodically through email to all employees. During the annual benefits fair the care coordination program CDE was present to answer questions and distribute informational materials describing the program. A link was available on the employer's human resources website throughout the study period with information about the diabetes care coordination program and contact information for the program coordinator. Any interested eligible employee or benefitted-dependent contacted the program coordinator by telephone or email at any time during the year to schedule their initial meeting.

Upon enrollment in the care coordination program, participants provided written consent for the program coordinator to request their personal medical records from their providers while participating in the program. Participants could withdraw from the care coordination program at any time and no additional medical information was obtained. All medical records obtained from the providers and documentation of any care coordination sessions were entered into the confidential electronic medical recording system used by the Kentucky Cabinet for Health and Family Services, DiaWeb, by the CDE. The employer never had access to these records at any time.

Table 4.1 describes the protocol for the diabetes care coordination program. All study participants (control group and intervention group) received the diabetes care coordination protocol. A clinical assessment was performed by the CDE during the initial care coordination meeting. This included the participant's medical history and medical management of diabetes, their self-report of glycemic control, and self-assessment of diabetes knowledge and confidence in self-management. The participant also identified behavior change goals they wished to address and, in collaboration with the CDE, determined individual learning goals. An individualized plan of care was developed based upon these goals and guided the educational topics that were discussed during each care coordination session. While participating in the care coordination program participants were monitored for emergency department visits or hospitalizations with diabetes as a primary or secondary diagnosis, indicating poor adherence to self-management.

At the completion of the initial enrollment meeting, a second one-to-one meeting was scheduled between the participant and the CDE. During this meeting the participant

learning and behavior goals were discussed and any necessary modifications made. The CDE provided tailored self-management education based on the participant's self-reported self-management practices and the AADE-7<sup>TM</sup>. A summary of the educational session, which included all self-management topics discussed and any revisions made to the learning or behavior goals was entered into the participant's electronic medical record by the CDE immediately following each encounter.

Participants were required to meet with the CDE a minimum of once per quarter to remain in the care coordination program. Additional meetings could be scheduled at the request of the participant or the CDE. During the quarterly care coordination meetings, participants discussed their adherence to self-management behaviors and provided records of their self-monitored glucose readings since the previous meeting. Individualized self-management education was provided by the CDE based on the participant's needs and progress toward the participant's learning and behavior goals. Also during the care coordination meetings, participants were reminded when it was time to obtain recommended medical screenings or treatments. Following each quarterly meeting, the CDE contacted the participant's providers to request copies of any laboratory results or medical encounters during the preceding three month period. Once those records were received by the CDE, the results were entered into the participant's electronic medical record.

Participants in the care coordination program received an updated clinical assessment annually with the CDE. This update also included evaluation of progress and updates to the participant's self-care behavior and learning goals. Once all self-care behavior goals and learning goals were met and the participant no longer required care

coordination, they were discharged from the program. Participants were also discharged from the program once the benefit-eligible employee was no longer employed.

### **Group Social Support Protocol (Conversations)**

All benefit-eligible employees with diabetes and all diabetes care coordination participants were invited to attend monthly group social support sessions structured around the U.S. Diabetes Conversation Map. This optional group social support program focused on diabetes and diabetes management education. Nearly half ( $n = 45$ ) of all study participants attended at least one conversation group social support session and were considered in the intervention group. Participants led each conversation, with the CDE facilitating to ensure the standardized learning objectives for each conversation were met. The same conversation topic was presented twice each month on different days and different times to provide convenient opportunities for more participants to attend. These group social support sessions were held in the library centrally located on the main campus of the academic employer. Participants chose which conversations they attended. Each conversation session lasted one hour. Participants were also permitted to attend any conversation sessions during their normally scheduled work hours. The learning objectives for each of the conversation sessions is illustrated in Table 4.2.

Participants were not required to participate in the diabetes care coordination program to attend the conversation sessions, however attendance at these group social support sessions alone did not qualify individuals for the free diabetes medications and diabetes testing supplies. There were no study participants that only participated in the conversations group social support.

## **Design**

This analysis of secondary data was a retrospective chart review of 96 participants in an employer-based diabetes care coordination program. A rural Kentucky post-secondary academic institution offered the diabetes care coordination program to its employees in partnership with a local health department. The study used a pre-test/post-test design whereby individual behaviors were measured prior to entering into the program and again at one year from entry into the care coordination program.

## **Sample**

The study sample was benefit eligible employees of a rural Kentucky post-secondary academic institution and their benefitted dependents who participated in the diabetes care coordination program at any time during the four-year period beginning June 2009 and ending June 2013. The academic institution employs about 6,000 individuals, of which approximately 2,100 receive insurance benefits. The total number of insured or benefitted dependents with diabetes was unavailable for the study.

Participant medical records were accessed through the electronic medical recording system, DiaWeb, by the investigator. A list of all active and inactive participants enrolled in the diabetes care coordination program from June, 2009 through June, 2013 was generated. This ensured all currently enrolled participants as well as any former participants meeting the inclusion criteria were included in the study.

All participants in the study ( $n = 96$ ) were enrolled in the employer-based diabetes care coordination program. The primary objective of the care coordination program was to provide participants with individualized diabetes self-management education and ensure the ADA Standards of Medical Care were met. Fifty-three percent ( $n = 51$ ) of the

study participants attended care coordination meetings only and were considered the control group. The remaining forty-seven percent ( $n = 45$ ) attended care coordination meetings and participated in the group social support sessions and were considered the intervention group.

The setting was a post-secondary academic institution located in a small central Kentucky town. All diabetes care coordination meetings were held in a private office centrally located on the employer's campus. The conversation group social support sessions were held in the library located on the main campus.

**Inclusion criteria.** Participants were eligible for the study if they were adults age 18 or older and physically able to perform self-management interventions. Eligible participants had a diagnosis of type 1 or type 2 diabetes, with their most recent A1C result of  $\geq 5.7$  prior to enrollment in the care coordination program. An A1C of  $\geq 5.7$  is associated with increased risk for diabetes related complications, including cardiovascular disease (ADA, 2014).

**Exclusion criteria.** Care coordination participants were excluded from the study if they were residents of a group home or extended care facility as they were not independent with their diabetes management. Those with gestational diabetes or less than one year post-partum were excluded from the study as their self-management requirements could differ from the general population.

Ninety-six participants in the diabetes care coordination program were included in the study; these included all eligible participants who met inclusion/exclusion criteria. Power analysis was not conducted for sample size. As this was a secondary data analysis, the sample size was already determined by the participants available. Post-hoc



power analysis was not conducted as this is not statistically valid (Hoenig & Heisey, 2001).

## **Procedure**

Approval for the study was obtained from the Madison County Health Department and the Institutional Review Board (IRB) of the Kentucky Cabinet for Health and Family Services (CHFS). IRB documentation was submitted to the University of Kentucky IRB, who deferred the IRB of record to the Kentucky CHFS IRB.

Using the generated list, study participants were de-identified and grouped according to whether they participated in diabetes care coordination only (control group) or if they participated in diabetes care coordination and also attended at least one group social support session (intervention group).

Data were extracted from the electronic medical record, DiaWeb, and recorded on data collection forms by the investigator (Appendix A). Any entries that were unclear were verified with the program CDE to ensure accuracy. Following review of the medical records and extraction of the data, twenty randomly selected medical records were verified with the data collection instruments to validate accuracy. Data extraction and verification were performed by the investigator.

## **Measures**

**Demographic characteristics.** Demographic characteristics were collected on the 96 study participants for the four year period from 2009 through 2013. The date of the initial diabetes care coordination assessment was entered and utilized as baseline for each participant. Participant's date of birth was used to calculate age at the time of enrollment in the care coordination program. Additional variables including race, gender,

marital status, educational level, and employment status were collected and coded (Appendix A). Income data were not available as they are not collected in the care coordination program.

**Clinical characteristics.** Data collected from the medical record included dates of hospitalizations or emergency room visits, blood pressure, laboratory values and dates of most recent vision, dental, foot, and physical examinations. Type of diabetes, height and weight were also noted as baseline clinical data.

**Adherence to self-management behaviors.** Adherence to self-management behaviors was measured by self-report noted in the participants' medical records. A verbal questionnaire related to self-management behaviors was administered by the CDE during the initial diabetes care coordination. The results of the initial verbal questionnaire were considered baseline. Adherence to specific self-management behaviors was updated quarterly when applicable through verbal questionnaire with the CDE. The entire self-management questionnaire was updated annually through verbal questionnaire with the CDE. The following self-management behaviors were recorded at baseline and 12 months: alcohol, nicotine and drug use, carrying diabetes identification, missing medication doses, performing daily self-foot exams, engaging in physical activity daily, counting carbohydrate intake, and skipping meals.

Adherence to additional self-management behaviors was obtained through review of medical records received from the participant's health care providers. These included hospital admissions, emergency department visits, annual physical, foot, dental and eye examinations and annual receipt of influenza vaccination.

## **Data Management**

All data were collected from chart reviews by the investigator and entered onto paper tracking forms (Appendices A, B, and C). The chart review process occurred over a three month period of time with data collection on the 96 participants requiring in excess of 240 hours.

Anonymity of the study participants was ensured and maintained through the de-identification process. Confidentiality of all study participants was maintained throughout the study as the investigator maintained sole custody of all data collected from the electronic medical record. The master list of study participants was kept in a locked cabinet only accessible to the investigator. The de-identified data extraction documents were kept in a separate locked cabinet only accessible to the investigator. Both locked cabinets were housed in the private office of the investigator, which remained locked unless occupied by the investigator. Data were entered by the investigator into the private password protected computer of the investigator.

All data were double entered by the investigator into version 21 of the Statistical Packages for the Social Sciences (SPSS 21.0). An electronic comparison of the two data sets was conducted and any discrepancies verified with the data collection instruments and any necessary corrections made.

Analyses were conducted for participants with documentation of adherence at baseline and at least one additional documentation of adherence to self-management behaviors during the 12 month study period. Missing data for adherence to self-management behaviors were handled with the last observation carried forward approach.

If the participant did not have a response for 12 months, the last quarterly response prior to 12 months was used.

Analyses for hospital admissions and emergency department visits as well as adherence to annual physical, foot, dental and eye examinations and receipt of influenza vaccinations for all participants were based upon recorded data from the health care provider. The 12 month period began with the initial date of care coordination assessment and ended 365 days after entry into the program. If the participant received a service 366 days after initial care coordination, it was not considered within the 12 month study period.

### **Data Analysis**

All statistical analyses were conducted by computer using SPSS 21.0. An alpha value of less than .05 was used throughout.

**Demographic and clinical characteristics.** Descriptive analyses of the demographic and baseline clinical characteristics were completed using frequency distributions, means and standard deviations, as appropriate. Group comparisons of the control group and intervention group were made using chi-square or t-tests.

**Adherence to self-management behaviors.** A total score was calculated for total number of self-care behaviors based on participants' response to each self-care behavior. Participants were scored one point for each yes response to a positive self-care behavior (i.e. physical examination, dental examination, exercise, dilated eye examination, medical foot examination, daily self-foot examination, influenza vaccination, carries diabetic identification card, counts carbohydrate intake). Participants received no points for each yes response to a negative self-care behavior (i.e. nicotine

use, alcohol use, skipping meals, and skipping medications). The maximum total number of self-care behaviors achievable was nine. Repeated measures analysis of variance (ANOVA) was used to compare the individual participant's total number of self-care behaviors at baseline and at 12 months. Repeated measures ANOVA was also used to compare the total number of self-care behaviors between participants in the control group and participants in the intervention group at baseline and 12 months.

## **Results**

**Baseline demographic and clinical characteristics.** The mean age of the total sample was 49.8 years (SD = 10). Participants were primarily female (64.6%,  $n = 62$ ) and Caucasian (83.3%,  $n = 80$ ). Most were married (52.1%,  $n = 50$ ), college graduates (52.1%,  $n = 50$ ), and employed full time (90.6%,  $n = 87$ ). A large proportion of the study participants had type 2 diabetes (87.2%,  $n = 84$ ). The mean duration of diabetes was 6.6 years (SD = 8.2) with a mean baseline A1C of 7.7% (SD = 1.9). There was a statistically significant difference in years with diabetes between type 1 ( $M = 22.9$ , SD = 9.0) and type 2 ( $M = 4.5$ , SD = 5.3). Applying the CDC (2011) classifications for body mass index (BMI), the majority of the study participants were overweight or obese (64.6%,  $n = 62$ ) with a mean BMI of 35.3% (SD = 7.3). The control group ( $n = 51$ ) and intervention group ( $n = 45$ ) were comparable in size and demographics (see Table 4.3).

## **Hypotheses Testing**

The following hypotheses were tested:

**H<sub>1</sub>:** Participants in the employer-based diabetes care coordination program will demonstrate improvement in self-management behaviors at 12 months when compared with their baseline adherence to self-management behaviors. This hypothesis was

supported. The average total number of self-care at baseline was 5.7 compared with 6.4 at 12 months ( $p = .0006$ ). Controlling for diabetes type and participant age, all participants in the diabetes care coordination program (including control and intervention groups) demonstrated improved adherence to receiving an annual influenza vaccination (see Table 4.4). Those participating in either group in the diabetes care coordination program also demonstrated a decrease in use of alcohol, use of nicotine and skipping meals, when comparing baseline to 12 months.

**H<sub>2</sub>:** Participants engaging in group social support in addition to the employer-based diabetes care coordination (intervention group) will demonstrate increased adherence to self-management behaviors at one year compared with the adherence rates of individuals participating in the diabetes care coordination program only (control group). This hypothesis was not supported. The only significant group by time interaction was for dilated eye exam, and for this outcome, there was an increase in the prevalence of this type of exam from baseline to 12 months for the control group, but not for the intervention group. There were no other statistically significant group by time interactions in self-management behaviors between groups.

## **Discussion**

The results of this secondary data analysis indicate that employer-based diabetes care coordination is a promising option for promoting adherence to certain self-management behaviors. Previous studies of diabetes care coordination programs elicited positive results; these programs were administered through a primary care provider, hospital or insurance provider (Chouinard et al., 2013; Collinsworth, Vulimiri, Schmidt, & Snead, 2013; McEwen et al., 2009; Taliani, et al., 2013; Versnel et al., 2011; Wolber &

Ward, 2010). The results of this current study were similar to these other published studies examining the effectiveness of diabetes care coordination to improve self-management adherence.

Table 4.4 illustrates the comparisons between baseline and 12 months on individual self-care behaviors, controlling for participants' age and type of diabetes. Overall, participation in the diabetes care coordination program resulted in an increase in receiving an influenza vaccination from baseline to 12 months. These results are similar to the results elicited in the study by McEwen et al. (2009). Influenza is a preventable infectious disease associated with high mortality and morbidity in those with chronic diseases, such as diabetes (ADA, 2014; CDC, 2013). The CDC (2013) recommends all individuals with diabetes receive an influenza vaccine. One study found that diabetes-related hospital admissions were reduced by nearly 80% during influenza epidemics as a result of influenza vaccination (Colquhoun, Nicholson, Botha, & Raymond, 1997).

Participants also demonstrated improvement in self-care through decreased use of alcohol and nicotine as well as fewer participants reported skipping meals during the one year study period. The decreased use of nicotine is an important step in controlling diabetes and its complications. The current ADA (2014) recommendations are that individuals who smoke should be counselled to quit due to the increased risk of cardiovascular disease microvascular complications or death related to smoking and diabetes. Additionally, those individuals with diabetes who smoke have more difficulty controlling their disease (U.S. Department of Health and Human Services, 2014).

Results of this study elicited several positive results however, some recommended and important self-management behaviors actually decreased during the study period.

Fewer participants in the program received an annual physical examination. This result may be misleading and could be related to the strict parameters for measurement or a delay in receipt of care provider results. As baseline was the date of initial care coordination assessment, and the end point for 12 months was exactly 12 months from the baseline date, receiving a physical examination even one day beyond the 12 month point would not have been captured for data analysis. The use of approximate dates for data collection, such as the last observation carried forward approach for missing data, could have affected the timing of examinations. The ADA (2014) recommends individuals with diabetes maintain an established medical home to ensure continuity of care and evaluation of goals.

The same explanation is possible for dilated eye exams as well. The rate of receiving dilated eye examinations actually decreased in the intervention group but increased in the control group. Again, this could be related to the timing of the care coordination visit relative to the provider follow-up visit. The ADA recommends that adults with diabetes have an annual dilated comprehensive eye exam to identify diabetic retinopathy or macular edema which could lead to vision loss (ADA, 2014).

An unforeseen result was there was no change in medication adherence during the study period. Many diabetes medications are costly; a barrier often contributing to poor adherence. This barrier was reduced through participation in the program, as participants received diabetes medications without charge. Considering more than half the participants were adherent to medications upon entry to the program, any significant change may have been limited by the small sample size.



The results of this study demonstrate the relationship between the Health Belief Model construct of *cues to action* and diabetes care coordination. The external triggers provided through interactions with the CDE during the course of the program resulted in improved adherence to specific self-management behaviors. Participants were more adherent to behaviors that were immediately within their control (i.e. alcohol use, nicotine use, skipping meals) indicating the interactions with the CDE successfully provided the external triggers participants needed to support adherence to those self-management behaviors.

### **Limitations**

The small sample size was a limitation to this secondary data analysis. The convenience sample could have resulted in selection bias. There was no randomization, as those participating in the study chose whether to attend conversation group social support sessions or only participate in the diabetes care coordination only. Some analyses relied on participant self-report, which may have been inaccurate. This concern was lessened overall as some of the measured self-management behaviors were documented from care provider reports that were entered into the electronic medical record. Measurement of adherence to some self-management behaviors was reliant upon care providers forwarding copies of medical records in a timely fashion, if at all. A very small number of providers did not forward medical records on the first request, which could have affected the documented adherence rates at 12 months.

### **Conclusions**

Individuals retain the responsibility for their own outcomes through their self-management adherence patterns. As described earlier, adherence to recommended self-

management behaviors can delay or prevent complications. Adhering to multiple self-management behaviors only further decreases the complications and associated costs.

Diabetes care coordination programs have demonstrated improvement in diabetes outcomes when administered through hospitals, care providers and insurance providers (Chouinard et al., 2013; Collinsworth et al., 2013; Taliani, et al., 2013; Versnel et al., 2011; Wolber & Ward, 2010). Employer-based diabetes care coordination shows promise as an effective method to promote certain self-management behaviors (i.e. receiving dilated eye examination, receiving influenza vaccination, decreased reported use of alcohol and tobacco and decreased report of skipping meals), thereby reducing complications and decreasing the costs associated with diabetes.

### **Implications for Clinical Practice and Recommendations for Future Research**

Despite the positive findings in this study, additional research is needed to determine the best method of providing diabetes care coordination to promote adherence to additional self-management behaviors. This model may be cost prohibitive in certain employer settings, particularly those with fewer employees. Analysis of the cost of offering this type of program is recommended to determine whether care coordination through an employer is more economically beneficial than care coordination through a health care or insurance provider. Additionally, cost analysis to determine the cost savings related to decreased sick days due to improved adherence to self-management behaviors is recommended.

**Table 4.1. Protocol for Diabetes Care Coordination Program**

Session	Diabetes Care Coordination (Control Group & Intervention Group)
1	<ul style="list-style-type: none"><li>• Obtain demographic data and medical history.</li><li>• Obtain baseline data on medical management and glycemic control.</li><li>• Obtain self-assessment.</li><li>• Provide self-management education based on patient's self-identified needs</li></ul>
2	<ul style="list-style-type: none"><li>• Obtain patient self-care behaviors</li><li>• Obtain patient learning goals</li><li>• Obtain patient behavior goals</li><li>• Provide individualized self-management education based on patient assessment and the AADE-7<sup>TM</sup></li></ul>
3 Quarterly	<ul style="list-style-type: none"><li>• Evaluation of patient self-management and glucose readings</li><li>• Provide individualized self-management education based on the AADE-7<sup>TM</sup> and patient's progress towards learning goals and behavior goals</li></ul>
4 Quarterly	<ul style="list-style-type: none"><li>• Evaluation of patient self-management and glucose readings</li><li>• Provide individualized self-management education based on the AADE-7<sup>TM</sup> and patient's progress towards learning goals and behavior goals</li></ul>
5 Quarterly	<ul style="list-style-type: none"><li>• Evaluation of patient self-management and glucose readings</li><li>• Provide individualized self-management education based on the AADE-7<sup>TM</sup> and patient's progress towards learning goals and behavior goals</li></ul>
6	<ul style="list-style-type: none"><li>• Once learning goals and behavior goals are met, patient is discharged from Care Coordination.</li></ul>

**Table 4.2. Protocol for Intervention Group**

<b>Conversation Focus</b>	<b>Patient Learning Objectives</b>
Diabetes Overview	<ol style="list-style-type: none"> <li>1. Define diabetes in simple terms.</li> <li>2. Identify own type of diabetes.</li> <li>3. State diabetes is treated by meal plan, exercise, medication, monitoring, and education.</li> </ol>
Monitoring	<ol style="list-style-type: none"> <li>1. Name three tests or exams that should be performed annually.</li> <li>2. Name three advantages of performing home blood glucose monitoring.</li> <li>3. State target blood glucose and A1c goals.</li> <li>4. Describe safe needle disposal.</li> </ol>
Physical Activity	<ol style="list-style-type: none"> <li>1. Identify how exercise affects diabetes control.</li> <li>2. Describe benefits and risks of exercise and how to keep exercise safe.</li> <li>3. Identify strategies to help maintain a regular exercise routine.</li> </ol>
Behavior/Lifestyle Changes & Goal Setting	<ol style="list-style-type: none"> <li>1. Define goal setting.</li> <li>2. Write a personal short-term goal.</li> </ol>
Acute Complications	<ol style="list-style-type: none"> <li>1. Identify what hypoglycemia is and list the signs/symptoms, causes, treatment, and prevention of it, including medical ID.</li> <li>2. Identify what hyperglycemia is and list the signs/symptoms, causes, treatment, and prevention of it.</li> <li>3. Identify sick day guidelines and when to call the health care provider.</li> </ol>
Chronic Complications	<ol style="list-style-type: none"> <li>1. State the relationship between blood glucose control and the development/prevention of long-term complications.</li> <li>2. State the relationship between blood pressure control and the development/prevention of long-term complications</li> </ol>
Medications	<ol style="list-style-type: none"> <li>1. Describe different types of oral agents used to treat diabetes, how they work, who should use them, side effects, and special considerations for taking them.</li> <li>2. Describe types of insulin, when and how to take it, guidelines for care of insulin, site selection and rotation, side effects, special considerations when taking insulin, and sharps disposal.</li> </ol>
Foot, Skin & Dental Care	<ol style="list-style-type: none"> <li>1. Discuss why skin, dental, and foot care are important and the importance of preventive care.</li> <li>2. Demonstrate a self-foot exam.</li> </ol>

Table 4.2 Continued

Psychosocial Coping & Stress	<ol style="list-style-type: none"><li>1. Discuss the effect of stress on diabetes.</li><li>2. Verbalize at least four strategies for coping with stress</li></ol>
Nutritional Management	<ol style="list-style-type: none"><li>1. Describe the effect of carbohydrates on glucose levels and identify foods which contain carbohydrates.</li><li>2. Plan a one-day meal plan using basic nutrition guidelines for diabetes.</li><li>3. Identify information on food labels.</li></ol>

**Table 4.3. Demographic and Clinical Characteristics of Study Participants**

	<b>Control<sup>a</sup></b>	<b>Intervention<sup>b</sup></b>	<b><i>n</i> = 96 <i>X</i><sup>2</sup> (<i>p</i>)</b>
	<b><i>n</i> (%)</b>	<b><i>n</i> (%)</b>	
<b>Diabetes type</b>			0.00 (> .99)
<b>Type 1</b>	6 (11.8)	6 (13.3)	
<b>Type 2</b>	45 (88.2)	39 (86.7)	
<b>Race</b>			2.71 (.10)
<b>Caucasian</b>	39 (76.5)	41 (91.1)	
<b>Other</b>	12 (23.5)	4 (8.9)	
<b>Gender</b>			1.09 (.29)
<b>Female</b>	30 (58.8)	32 (71.1)	
<b>Male</b>	21 (41.2)	13 (28.9)	
<b>Marital status</b>			0.04 (.85)
<b>Married</b>	32 (62.7)	30 (66.7)	
<b>Other</b>	19 (37.3)	15 (33.3)	
<b>Educational Status</b>			0.17 (.92)
<b>High school or less</b>	13 (25.5)	12 (26.7)	
<b>Some college</b>	12 (23.5)	9 (20.0)	
<b>Bachelor's degree or &gt;</b>	26 (51.0)	24 (53.3)	
<b>Employment status</b>			1.45 (.23)
<b>Full time</b>	44 (86.3)	43 (95.6)	
<b>&lt; full time</b>	7 (13.7)	2 (4.4)	
<b>Baseline BMI</b>			1.20 (.27)
<b>Normal or underweight</b>	15 (29.4)	19 (42.2)	
<b>Overweight or obese</b>	36 (70.6)	26 (57.8)	

<sup>a</sup>Diabetes care coordination only (control group). <sup>b</sup>Diabetes care coordination and conversations (intervention group).

**Table 4.4. Comparisons between baseline and 12 months\* on individual self-management behaviors, controlling for type of diabetes and age (N = 96).**

Self-Management Behavior	Baseline	12 Months	<i>p</i>
	% yes	% yes	
Had a physical exam	31.3	8.3	.006
Had a dental exam	34.4	58.3	.10
Had a dilated eye exam			.005*
Control ( <i>n</i> = 51)	43.1	60.8	
Intervention ( <i>n</i> = 45)	73.3	55.6	
Had a medical foot exam	33.3	31.3	.32
Conducts daily self-foot exams	33.3	42.7	.10
Had an influenza vaccination	50.0	67.7	.036
Carries diabetes medical ID card	17.7	18.8	>.99
Exercises > 150 minutes/week	13.5	20.8	.092
Counts carbohydrate intake	17.7	25.0	.084
Uses alcohol	34.4	21.9	.002
Uses nicotine	14.6	7.3	.043
Skips meals	37.5	21.9	.009
Skips medication	42.7	47.9	.65

\* *p* pertaining to significance of time by group interaction; in all other models, this interaction was not significant.

## CHAPTER FIVE

### Conclusions and Discussion

The purposes of this dissertation were to: 1) describe the factors that prohibit individuals from adhering from diabetes self-management behaviors as well as the factors that promote self-management adherence, 2) determine the effectiveness of a social support intervention to promote diabetes self-management adherence, 3) identify adherence rates to specific self-management behaviors that changed over a twelve-month period, 4) compare the change in self-management behaviors over a twelve-month period between individuals enrolled in a diabetes care coordination program who participated in a social support intervention (U.S. Diabetes Conversation Map) to program participants who did not participate in the social support intervention. This study was a retrospective chart review of patients enrolled in an employer-based diabetes care coordination program at a small Kentucky post-secondary academic institution.

The constructs of the Health Belief Model were used to guide this dissertation (Rosenstock, Strecher, & Becker, 1988). The Health Belief Model consists of six constructs, *perceived susceptibility*, *perceived severity*, *perceived benefit*, *perceived barriers*, *cues to action* and *self-efficacy*. The findings of this study particularly address the construct of *cues to action*. This was achieved through the employer-sponsored health program studied, which created the external triggers necessary for participants to engage in self-management behaviors (Rosenstock, Strecher & Becker, 1988).

In this dissertation, three papers are presented. In the first paper, through an extensive review of the literature, the barriers to diabetes self-management adherence and the factors that promote diabetes self-management adherence were identified. The most



prevalent barriers identified were the financial implications of diabetes self-management adherence (i.e. dietary restrictions, medications, testing supplies), the complexity of adhering to recommended treatment (i.e. dietary recommendations, self-glucose monitoring, medication adjustments, and low health literacy [an individual's ability to access, comprehend, and apply health information to make appropriate health related decisions]). Those factors identified that promote diabetes self-management included diabetes self-management education, social support, self-efficacy, and goal setting.

Diabetes self-management is imperative for individuals living with diabetes. Due to the dynamic nature of individuals as well as the multitude of self-management treatment options, addressing the issue of non-adherence must be undertaken. Identifying effective interventions to support self-management adherence is essential.

The second paper presents the results of secondary data analysis to compare diabetes self-management adherence of 85 participants in an employer-sponsored health program, who received enhanced diabetes education, with self-management adherence of those participating in the health program and also attending a social support intervention (U.S. Diabetes Conversation Map). There was a significant association between a decrease in A1C from baseline to 12 months and group. Seventy-one percent (29) of the 41 individuals participating in the social support intervention (U.S. Diabetes Conversation Map) in addition to the health program demonstrated an improvement in A1C from baseline to twelve months. Forty-one percent (18) of the 44 individuals participating in only the health program demonstrated an improvement in A1C over the twelve month period.

The third paper discusses results of a retrospective chart review which the change in self-management behaviors of 96 individuals enrolled in an employer-sponsored diabetes care coordination program over a twelve month period was evaluated. Through comparison of self-management behavior adherence rates at baseline to self-management behavior adherence rates at twelve months, the findings were that participants in the employer-sponsored diabetes care coordination program demonstrated improvement in receiving an annual influenza vaccination. Additionally, fewer participants in the care coordination program reported alcohol consumption, nicotine use, and skipping meals from baseline to twelve months. Despite participants receiving diabetes medications at no cost while in the program, there was no change in adherence to medications.

Additional analyses were done to determine if those participating in the diabetes care coordination program and also attending a group social support intervention (U.S. Diabetes Conversation Map) demonstrated increased adherence to self-management behaviors when compared to the adherence of those who participated in the care coordination program only. Obtaining a dilated eye examination had a significant time by group interaction, demonstrating an increase for those participating in only the care coordination program. There were no other differences between groups over time.

### **Implications for Clinical Practice**

Self-management adherence remains the key to decreasing the physical and economic burdens of diabetes. Effective methods of promoting diabetes self-management must address the barriers to adherence and feature the components that facilitate self-management adherence. Through this retrospective chart review, this model of providing diabetes care coordination in the workplace setting was validated.

The addition of the social support strategy using the U.S. Diabetes Conversation Map as a framework offers a valuable option to further promote diabetes self-management adherence.

### **Recommendations for Future Research**

Factors outside the scope of this study require further inquiry. No correlations were made regarding participants' use of injectable versus oral medications, and self-management adherence while participating in the employer-sponsored program. Additional research is recommended to determine the best setting for providing health programs to promote adherence to self-management behaviors. As small employers may find this health program model cost prohibitive, cost analysis to determine the economic impact of employer-sponsored care coordination programs is recommended. The use of technology such as Skype or Facetime offers additional opportunities for providing social support in a virtual setting. These modalities may provide a more economically feasible method of providing social support. As participants in this study self-selected their group, randomization by group could provide different results. A randomized controlled study is recommended to further evaluate the impact of the social support intervention using the U.S. Diabetes Conversation Map in different employer settings and in a virtual setting. Additional studies evaluating the sustainability of diabetes self-management using the U.S. Diabetes Conversation Map for group social support are recommended.

### **Summary**

The most effective method to affect change on the national and international economic burden of diabetes is through the individual reduction of consequences of diabetes through effective self-management (CDC, 2014). The results of these studies

are similar to previous studies that found that social support in combination with individualized education improved adherence to diabetes treatment recommendations (Castro et al., 2009; Piatt et al., 2010).

There is no indication that the prevalence of diabetes will decrease in the future. This continued increase will further impact the physical well-being of individuals, as well as intensify the economic burden to the country. These must be addressed through diabetes self-management adherence. The best method of ensuring diabetes self-management adherence has yet to be identified. Effective self-management programs must address the similar needs of individuals with diabetes, while recognizing the diversity of those individuals. The use of the U.S. Diabetes Conversation Map as a group social support strategy is one option to help fill the gaps in our knowledge and our understanding of diabetes self-management adherence. This study of the U.S. Diabetes Conversation Map is only a beginning, a foundation to guide future evidence-based strategies to promote diabetes self-management adherence.

## Appendix A

### Diabetes Self-Management Adherence Demographic & Baseline Characteristics

Date of Assessment: \_\_\_\_\_ Birthday \_\_\_\_\_ CCO \_\_\_\_\_

(DM01) Diabetes (01) Type 1 (02) Type 2 CON \_\_\_\_\_

(DM02) Years of diabetes \_\_\_\_\_ (DM03) Gender (01) Male (02) Female

(DM04) Race (01) White (03) Asian (05) Other \_\_\_\_\_  
(02) African-American (04) Native American

(DM05) Marital Status (01) Single (03) Divorced (05) Widowed  
(02) Married (04) Separated (06) Other \_\_\_\_\_

(DM06) Education (01) Less than 12<sup>th</sup> grade (04) College graduate  
(02) High school diploma/GED (05) Vocational/trade school  
(03) Some college (06) Other \_\_\_\_\_

(DM07) Employment (01) Part-time (04) Retired  
(02) Full-time (05) Disabled  
(03) Unemployed (06) Other \_\_\_\_\_

(DM08) Primary support person (01) Spouse/sign other (04) Other family  
(02) Parent (05) Friend  
(03) Child (06) None

(DM09) Primary care taker (01) Spouse/sign other (04) Other family  
(02) Parent (05) Friend  
(03) Child (06) Self

(DM10) Barriers (01) None (09) No support  
(02) Vision (10) Competing activities  
(03) Hearing (11) Food issues  
(04) Language (12) Eating disorder

- |                      |                         |
|----------------------|-------------------------|
| (05) Reading/low lit | (13) Grief              |
| (06) Memory loss     | (14) Financial concerns |
| (07) Denial          | (15) Transportation     |
| (08) Work schedule   | (16) Other              |

**HEALTH CARE MANAGEMENT**

- |  |  |
|--|--|
| (HC01) Height (inches) _____                               | (HC02) Weight _____(lb) _____(oz)          |
| (HC03) Systolic blood pressure _____                       | (HC04) Diastolic blood pressure _____      |
| (HC05) Baseline Hgb A1C _____                              | (HC06) Date of baseline Hgb A1C _____      |
| (HC07) Baseline cholesterol _____                          | (HC08) Date of baseline cholesterol _____  |
| (HC09) Baseline HDL _____                                  | (HC10) Date of baseline HDL _____          |
| (HC11) Baseline LDL _____                                  | (HC12) Date of baseline LDL _____          |
| (HC13) Baseline microalbumin _____                         | (HC14) Date of baseline microalbumin _____ |
| (HC15) Baseline creatinine _____                           | (HC16) Date of baseline creatinine _____   |
| (HC17) Date of last diabetes-related ED visit _____        |  |
| (HC18) Date of last diabetes-related hospitalization _____ |  |
| (HC19) Date of last dilated eye exam _____                 |  |
| (HC20) Last physical _____                                 |  |
| (HC21) Flu vaccine this year                               | (01) yes (02) no                           |
| (HC22) Pneumonia vaccine past 5 years                      | (01) yes (02) no                           |

**CO-MORBIDITIES & DATES OF ONSET**

- |                       |                  |                            |
|-----------------------|------------------|----------------------------|
| (CM01) Cardiovascular | (01) yes (02) no | (CM02) Date of onset _____ |
| (CM03) Dental/oral    | (01) yes (02) no | (CM04) Date of onset _____ |
| (CM05) Feet/legs      | (01) yes (02) no | (CM06) Date of onset _____ |
| (CM07) Liver          | (01) yes (02) no | (CM08) Date of onset _____ |
| (CM09) Metabolism     | (01) yes (02) no | (CM10) Date of onset _____ |
| (CM11) Kidneys        | (01) yes (02) no | (CM12) Date of onset _____ |
| (CM13) Neuropathy     | (01) yes (02) no | (CM14) Date of onset _____ |
| (CM15) Eye            | (01) yes (02) no | (CM16) Date of onset _____ |
| (CM17) Other          | (01) yes (02) no | (CM18) Date of onset _____ |

**SELF-ASSESSMENT**

- (SA01) Current DM knowledge (01) good (02) fair (03) poor
- (SA02) Feelings about having DM (01) denial (05) depressed  
(02) anger (06) fear  
(03) guilt (07) overwhelmed  
(04) adaption (08) acceptance
- (SA03) General health (01) good (02) fair (03) poor
- (SA04) Importance of health (01) extremely (03) somewhat  
(02) only when ill (04) not
- (SA05) Current stress level (01) high (02) medium (03) low
- (SA06) Interfere with life (01) nothing (05) family/social  
(02) work/school (06) sexual relations  
(03) travel (07) sports/exercise  
(04) finances

**SELF CARE BEHAVIORS**

- (SC01) ETOH use (01) yes (02) no
- (SC02) Rec drugs (01) yes (02) no
- (SC03) Nicotine use (01)yes (02) no
- (SC04) Carry DM ID (01) yes (02) no
- (SC05) # times/wk miss meals \_\_\_\_\_
- (SC06) Self-foot exams (01) yes (02) no (SC07) # per month \_\_\_\_\_
- (SC08) Exercise (01) yes (02) no (SC09) # minutes per week \_\_\_\_\_
- (SC10) Diet (01) regular  
(02) count carbohydrates  
(03) low fat
- (SC11) Skip meals (01) yes (02) no
- (SC12) Who cooks (01) self (02) other
- (SC13) Who shops (01) self (02) other

**LEARNING GOALS**

(LG01) Prevent/delay complications	(01) yes	(02) no
(LG02) What is DM	(01) yes	(02) no
(LG03) Gestational	(01) yes	(02) no
(LG04) Pumps	(01) yes	(02) no
(LG05) How meds work	(01) yes	(02) no
(LG06) Monitoring	(01) yes	(02) no
(LG07) Healthy eating	(01) yes	(02) no
(LG08) Physical activity	(01) yes	(02) no
(LG09) Care before pregnancy	(01) yes	(02) no
(LG10) Care during pregnancy	(01) yes	(02) no
(LG11) Problem solving	(01) yes	(02) no
(LG12) Stress & coping	(01) yes	(02) no

**BEHAVIOR GOALS**

(BG01) Physical activity	(01) yes	(02) no
(BG02) Healthy coping	(01) yes	(02) no
(BG03) Healthy eating	(01) yes	(02) no
(BG04) Monitoring	(01) yes	(02) no
(BG05) Problem solving	(01) yes	(02) no
(BG06) Reducing risks	(01) yes	(02) no
(BG07) Taking medications	(01) yes	(02) no
(BG08) Other	(01) yes	(02) no (03) _____



Appendix B

Diabetes Self-Management Adherence

Standards of Care Tracking Form

CCO \_\_\_\_\_

CON \_\_\_\_\_

<b>Standards of Care &amp; Frequency</b>	<b>Baseline</b>	<b>3 months</b>	<b>6 months</b>	<b>9 months</b>	<b>12 months</b>	<b>18 months</b>
<b>Hgb A1C (2-4x/year)</b>						
<b>SBP (each visit)</b>						
<b>DBP (each visit)</b>						
<b>Weight (each visit)</b>						
<b>Foot Exam (1x/yr)</b>						
<b>Cholesterol (1x/yr)</b>						
<b>LDL (1x/yr)</b>						
<b>HDL (1x/yr)</b>						
<b>Microalbumin (1x/yr)</b>						
<b>Serum Creatinine (1x/yr)</b>						
<b>Dilated Eye Exam (1x/yr)</b>						
<b>Influenza vaccine (1x/yr)</b>						
<b>Dental Exam (2x/yr)</b>						

Appendix C

Diabetes Self-Management Adherence  
Encounter Log

CCO \_\_\_\_\_ CON \_\_\_\_\_

Care Coordination Education Dates																				
(01) Diabetes Overview																				
(02) Monitoring																				
(03) Physical Activity																				
(04) Behavior/Lifestyle Changes & Goal Setting																				
(05) Acute Complications																				
(06) Chronic Complications																				
(07) Medications																				
(08) Foot, Skin & Dental Care																				
(09) Psychosocial Coping & Stress																				
(10) Nutritional Management																				
(11) Problem Solving																				
(12) Reducing Risks																				
(13) Barrier Identification																				

Diabetes Self-Management Adherence  
Encounter Log

CCO \_\_\_\_\_ CON \_\_\_\_\_

<b>Conversation Focus Dates</b>																					
(01) Diabetes Overview																					
(02) Monitoring																					
(03) Physical Activity																					
(04) Behavior/Lifestyle Changes & Goal Setting																					
(05) Acute Complications																					
(06) Chronic Complications																					
(07) Medications																					
(08) Foot, Skin & Dental Care																					
(09) Psychosocial Coping & Stress																					
(10) Nutritional Management																					
(11) Problem Solving																					
(12) Reducing Risks																					
(13) Barrier Identification																					

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**VITA**  
**Lisa Gale Jones, MSN, RN, CCRN**

**Education:**

<b>Institution</b>	<b>Dates</b>	<b>Degree</b>	<b>Field of Study</b>
Eastern Kentucky University Richmond, KY	2004	MSN Education	Nursing
Eastern Kentucky University Richmond, KY	2002	BSN	Nursing
Eastern Kentucky University Richmond, KY	1992	ASN	Nursing

**Certifications and Licensure**

Critical Care Nurse Certification Kentucky Board of Nursing	2006, June RN License # 1072399
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**Professional Experience:**

<b>Dates</b>	<b>Institution and Location</b>	<b>Academic Position</b>
2004 – Present	Eastern Kentucky University, Department of Baccalaureate & Graduate Nursing Richmond, Kentucky	BSN Coordinator & Assistant Professor  (Clinical Faculty 2004-2011)
2002 – 2004	Eastern Kentucky University, Laboratory Instructor Department of Baccalaureate & Graduate Nursing Richmond, Kentucky	
1994 – Present	Baptist Health Lexington Lexington, Kentucky	Staff Nurse 4ICU North
2002 – 2004	Madison County Health Department Richmond, Kentucky	Community Nurse Intern
1997 – 1998	Baptist Health Lexington Lexington, Kentucky	Staff Nurse Home Health

2000 – 2001	Baptist Health Lexington Lexington, Kentucky	Staff Nurse Pre-Op
1996 – 1997	Cumberland Valley Cardiac Rehabilitation London, Kentucky	Staff Nurse
1995 – 1996	Marymount Medical Center London, Kentucky	Staff Nurse Emergency Dept.
1992 – 1994	Baptist Regional Medical Center Corbin, Kentucky	Staff Nurse ICU/CCU

**Awards and Honors:**

- 2003 Good Samaritan Foundation Scholarship/Internship for Graduate studies in Community Health Nursing, Eastern Kentucky University  
Richmond, Kentucky
- 2002 Good Samaritan Foundation Scholarship/Internship for Graduate studies in Community Health Nursing, Eastern Kentucky University  
Richmond, Kentucky
- 2002 Clinical Excellence Award  
Department of Baccalaureate & Graduate Nursing  
Eastern Kentucky University  
Richmond, Kentucky
- 2002 Faculty Recognition Award, Department of Baccalaureate & Graduate Nursing  
Eastern Kentucky University  
Richmond, Kentucky

**Professional Development:**

- 2014 ACHNE Annual Institute
- 2014 University of Kentucky College of Nursing 10<sup>th</sup> Annual Faculty Development Workshop
- 2013 AACN Baccalaureate Education Conference
- 2013 Clinical Education Evaluation and Testing
- 2012 University of Kentucky College of Nursing 8<sup>th</sup> Annual Faculty Development Workshop
- 2011 Effective Teaching Strategies

- 2011 EKU Faculty Consultation Program
- 2010 Facilitating Active Learning in Large Classes
- 2010 Developing Multiple Choice Tests
- 2008 Critical Thinking and Test Item Writing
- 2007 Dimensions of Clinical Education: Diversity, Litigation and Documentation
- 2007 University of Kentucky Lunch & Learn Series on Teaching Strategies and Student Engagement

**Professional Presentations:**

- 2014 Community Partnerships and Public Health Nursing Education. Oral presentation at Bluegrass Chapter of Kentucky Nurses' Association, Lexington, KY.
- 2014 CSEPP and Community System Vulnerabilities: A PHN Clinical Simulation Exercise. Poster presented at Association of Community Health Nurse Educators 2014 Institute.
- 2014 Alcohol Withdrawal and Delirium Tremens in the ICU. Oral presentation at Baptist Health Lexington, Lexington, KY.
- 2014 Acute Renal Failure in the ICU. Oral presentation at Baptist Health Lexington, Lexington, KY.
- 2014 Takotsubu Cardiomyopathy: Broken Heart Syndrome. Oral presentation at Baptist Health Lexington, 4ICU.
- 2014 Lewy Body Dementia. Oral presentation at Baptist Health Lexington, Lexington, KY, 4ICU
- 2014 Chronic Obstructive Pulmonary Disease: Multidisciplinary Case Presentation. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2013 Multi Organ Dysfunction Syndrome: Multidisciplinary Case Presentation. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2013 Chronic Renal Failure in the ICU. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2013 Collaborative Partnerships in Public Health, Oral presentation at Richmond Kiwanis Club, Richmond, KY

- 2012 Diabetes Self-Management Adherence: A Review of the Literature. Poster presented at the Kentucky Nurses' Association convention.
- 2012 Diabetic Ketoacidosis in the ICU. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2012 Gastrointestinal Bleed in the ICU. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2012 Respiratory Failure: Care Planning Presentation. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2011 MRSA in the ICU: Multidisciplinary Case Presentation. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2011 Ventilatory Dependency Care Planning Case Conference. Oral presentation at Baptist Health Lexington, Lexington, KY
- 2011 Drug Resistant Organisms Care Planning Case Conference, Baptist Health Lexington, Lexington, KY
- 2010 Alcohol Misuse in Long-Haul Truck Drivers: Psychometric Assessment of the M-CAGE. Poster presented at the Kentucky Nurses' Association convention.

**Publications:**

York, N.L., Rayens, M.K., Zhang, M., **Jones, L.G.**, Casey, B., & Hahn, E.J. (2010). Strength of tobacco control in rural communities. *The Journal of Rural Health*, 26, 120 – 128.

**Grants:**

- 2013 Health Education Grant; Richmond Kiwanis Club; \$300
- 2013 Research Grant; The Utility of the U.S. Conversation Map to Promote Diabetes Self-Management Adherence; Theta Nu Chapter of Sigma Theta Tau; \$500
- 2014 Health Education Grant; Richmond Kiwanis Club; \$300

**Professional Membership:**

Association of Community Health Nursing Educators  
Sigma Theta Tau, Theta Nu (Chapter Secretary)

**Committee Membership:**

2013 – present Bluegrass Planning Consortium

2013 – present DBGN Program Evaluation Committee

2012 – present DBGN Faculty Search Committee

2012 – 2013 CHS Alumni Affairs Committee

2011 - 2013 CHS Continuing Education Committee

2011 – 2013 DBGN United Way Representative

2011 – present DBGN Baccalaureate Curriculum Committee (Chair 2013 – present)

2010 – present DBGN BSN Admission - Readmission Committee

2008 – 2011 DBGN Self Study Work Group

2006 – present DBGN Adult Health Work Group

2004 – present DBGN Public Health Work Group

**Community Service**

Kidney Health Alliance of Kentucky, Lexington, KY – Community volunteer

Madison County Diabetes Coalition, Richmond, KY – Board Member and Secretary

Madison County Emergency Operations Center, Richmond, KY – Safety Day Volunteer

Model Laboratory High School, Richmond, KY – Athletic Program and Project Graduation Volunteer

North Laurel High School Marching Band, London, KY – Community Volunteer

Tates Creek Baptist Church, Richmond, KY – Sunday School and Youth Programs Volunteer

Madison County Health Improvement Committee, Richmond, KY - MAPP Process Volunteer