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## Identification of Barriers to Adherence to Prescribed Schedules for Self-Monitoring of Blood Glucose

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**IDENTIFICATION OF BARRIERS TO ADHERENCE TO PRESCRIBED  
SCHEDULES FOR SELF-MONITORING OF BLOOD GLUCOSE**

**By**

**Victoria E. Sawhill**

**A THESIS**

**Submitted to  
Grand Valley State University  
in partial fulfillment of the requirements for the  
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## **ABSTRACT**

### **IDENTIFICATION OF BARRIERS TO ADHERENCE TO PRESCRIBED SCHEDULES FOR SELF-MONITORING OF BLOOD GLUCOSE**

**By**

**Victoria E. Sawhill**

The purpose of this descriptive study was to identify barriers to adherence to prescribed self-monitoring blood glucose (SMBG) schedules. Data were collected from a convenience sample of 40 diabetic patients from a rural northern Michigan community, ages 18-84, who completed the modified Barriers to Self-Monitoring Blood Glucose Scale (BSMBG) (Jones, Remley, & Engberg, 1996). The study's theoretical framework was the Health Belief Model (HBM) (Rosenstock, Strecher, & Becker, 1994).

The modified BSMBG scale had a reliability coefficient of 0.95 using Cronbach's alpha. Individual barrier scores were varied indicating a need for individualized assessment of barriers to SMBG. Data analysis demonstrated significant differences between diabetes type, subject age groups, and adherence percentage compared to barrier scores. A significant negative correlation also existed between subjects' ages and barrier scores. Findings suggested a need to assess perceived barriers to SMBG carefully in these groups to aid in intervention development aimed at improved adherence.

## Dedication

This thesis is dedicated to my husband, William F. Sawhill, my children, Andrew, Patrick, and Melissa and to my dear friend and colleague, Patricia Ann Hoban. Their sacrifice, support and encouragement have been instrumental in the completion of this thesis and my education.

### **Acknowledgments**

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I would also like to acknowledge the assistance of Betty Marshall, Hackley Hospital librarian, Muskegon, MI for her research assistance over the past three years. In addition, I would like to acknowledge the support and assistance of Carolyn Garrish, R.N.; Lynette Ringel, R.D.; and the administration of West Shore Hospital, Manistee, MI in my search for subjects for this study. I would like to recognize my research subjects for their willing participation.

Finally, I would like to thank Phyllis Jones, R.N., Ph.D., C.D.E., Visiting Nurses Association, Butler, PA for her permission to use the Barriers to Self-Monitoring Blood Glucose Scale in my study.

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## CHAPTER 1

### INTRODUCTION

#### Significance of the Problem

Diabetes is a heterogeneous class of disorders that affects approximately 16 million persons in the United States ( Haire-Joshu, 1996). The underlying pathogenesis of these disorders is hyperglycemia that results from a lack of insulin or poor utilization of insulin by the body (Peragallo-Dittko, Godley, & Meyer, 1993). Long term neurologic and vascular complications of diabetes that include coronary artery disease, peripheral vascular disease, kidney disease, eye disease, and nerve conduction defects are thought to be a result of the prolonged hyperglycemia (Peragallo-Dittko et al.).

Treatment of diabetes and its complications results in \$105 billion dollars in health care expenditures in the United States annually and accounts for twice as many hospitalizations for persons with diabetes compared to persons without the disease (Haire-Joshu, 1996). The complications of the disease account for the majority of the morbidity and mortality in diabetic patients. Mortality rates for patients diagnosed before age 15 are 11 times higher than the general public and those for patients diagnosed after age 40 are 2-3 times higher (Young & Koda-Kimble, 1995).

The Diabetes Control and Complications Trial, completed in 1993, demonstrated that intensive glycemic control with mean glucose levels of 155 +/- 30 milligrams per deciliter resulted in a 76% reduction in the adjusted mean risk for the development of

retinopathy, a 39% decrease in the occurrence of microalbuminuria, a 54% lowering of albuminuria, and a 60% reduction in clinical neuropathy in Type 1 diabetic patients (The Diabetes Control and Complications Trial Research Group, 1993). According to recent recommendations by Henry and Genuth (1996), management goals for the care of type 2, non-insulin-dependent, diabetic patients should be similar to those recommended for type 1, insulin-dependent, diabetics whenever feasible. These recommendations are based on findings from the Diabetes Control and Complications Trial as outlined in the American Diabetes Association's standards of care (1997). A major component of intensive control is frequent blood glucose monitoring by the patient to determine if adjustments in diet, medication, or activity are needed to re-establish glycemic levels within the recommended range. However, studies indicate that patients' adherence to recommended schedules for blood glucose monitoring continues to be low (Jones, Remley & Engberg, 1996). In a study conducted by Harris (1996) of 2405 diabetic subjects from the 1989 National Health Interview Survey, self-report of self-monitoring of blood glucose (SMBG) indicated rates of 40% for the insulin-dependent patients (type 1), 26% for the non-insulin-dependent patients (type 2) who required insulin for treatment, and 5% for the non-insulin-dependent patients (type 2) who did not require insulin for treatment.

#### Study Problem/Purpose

The purpose of this study was to identify barriers to adherence to prescribed blood glucose monitoring schedules, that occur before testing, for diabetic patients age 18 or older. This was done using, with author permission (Appendix A), the Barriers to

**Self-Monitoring Blood Glucose Scale (BSMBG) (see Appendix B for complete copy) with recommended modifications (Jones et al., 1996) (see Appendix C for complete copy).**

**This study built on previous studies of barriers to adherence to diabetes care aspects, in general, and on studies conducted to expressly address adherence barriers affecting blood glucose monitoring. It specifically built on information compiled by the Visiting Nurses Association of Western Pennsylvania and the University of Pittsburgh School of Nursing in their development and testing of the BSMBG scale (Jones et al., 1996). The current study was conducted with input from members of a diabetes support group, patients enrolled in a cardiac rehabilitation phase 2 program, and patients referred for diabetes diet education in a rural community in northern Michigan.**

## CHAPTER 2

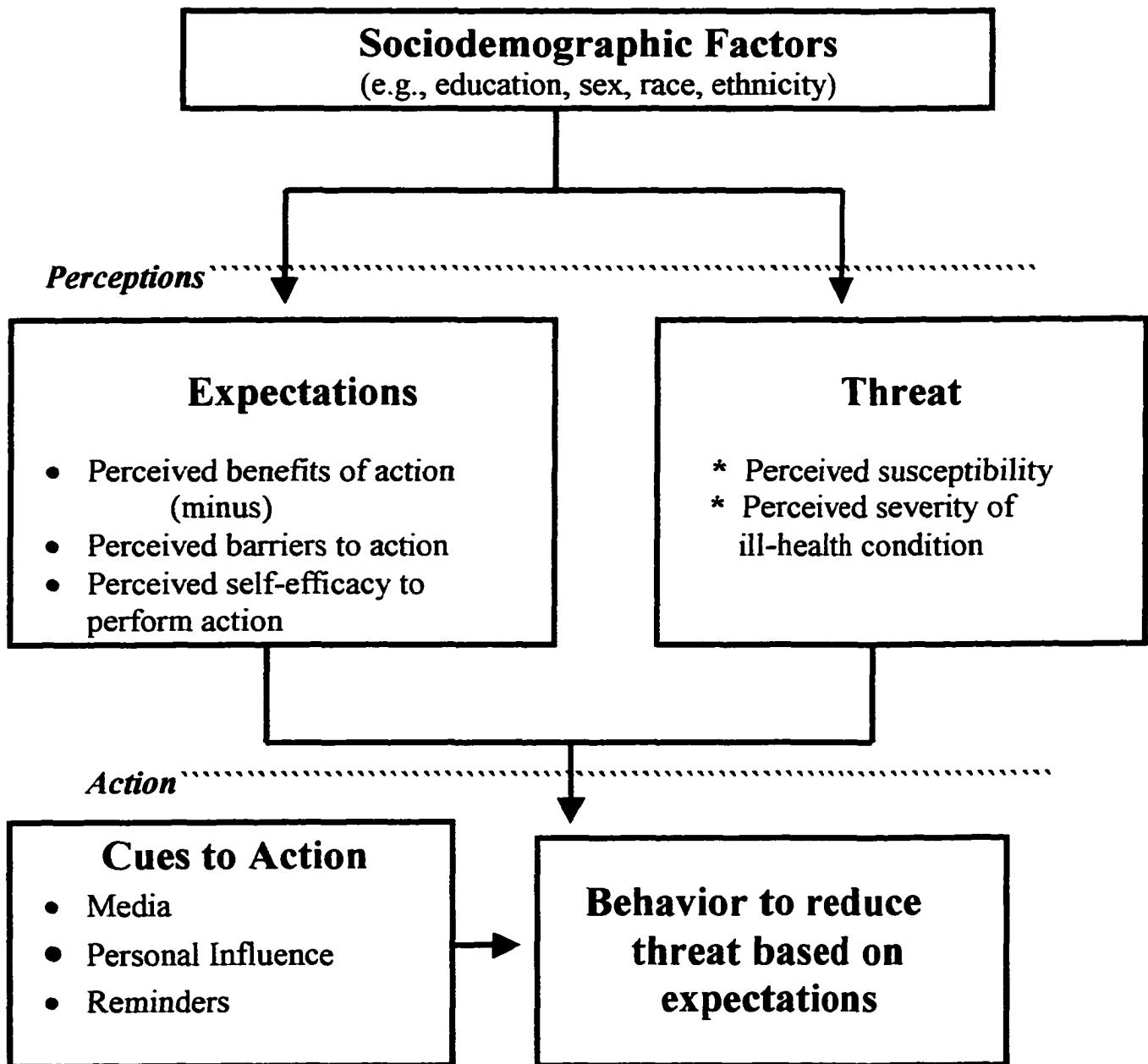
### LITERATURE AND CONCEPTUAL MODEL

#### Conceptual Model

The Health Belief Model (HBM) as conceptualized by Rosenstock, Strecher, and Becker (1994) (see Figure 1) was used to organize this study of barriers to adherence to recommended self-monitoring of blood glucose schedules for diabetic patients age 18 or older. It was derived from the original HBM developed between 1950 and 1960 from independent preventative health behavior research problems that faced several investigators (Becker, 1974). The model is a psychosocial approach developed to explain and predict health-related behavior. It has influences from Kurt Lewin's social psychological theory, particularly those concepts dealing with goal-setting (Mikhail, 1981).

The four major concepts of the original HBM that evolved from this background and were thought to predict personal action to avoid a disease included: (a) perceived susceptibility to the disease, (b) perceived severity of the disease if it occurred, (c) perceived benefits of behavior to avoid the disease, and (d) perceived barriers or costs that had to be overcome to initiate behaviors to decrease susceptibility to the disease. All of these concepts were subjective perceptions that could vary considerably in intensity and frequency of occurrence among different persons (Becker, 1974).

**Background** .....



Source: Rosenstock, I., Strecher, V., & Becker, M. (1994). The Health Belief Model and HIV risk behavior change. In R. J. DiClemente and J. L. Peterson (Eds.) Preventing AIDS: Theories and methods of behavioral intentions (pp. 5-24). New York: Plenum Press.

Figure 1. The HBM as conceptualized by Rosenstock et al. (1994)

Perceived susceptibility and severity, the components of the threat category in the Rosenstock et al. (1994) formulation of the model, was thought to be affected by how emotionally aroused a person became when cognitively considering the disease and the difficulties it could create if it could not be avoided or controlled. These threats, when they occurred, were believed to constitute a force which could stimulate a person to take action related to the disease (Becker, 1974).

The original concepts of perceived benefits of action against a disease, the perceived barriers or costs that could impede action against a disease, and self-efficacy were included in the expectations portion of the Rosenstock et al. (1994) conceptualization of the HBM. Self-efficacy, as a concept, was added to the HBM by Bandura in 1977. It was defined as a person's belief that he was capable of completing a health-related behavior successfully (Rosenstock et al.). A person's beliefs about the availability and effectiveness of an approach to reduce a disease threat coupled with beliefs that the approach was not too costly, inconvenient, painful, or detrimental were thought to determine whether action against a disease would occur (Becker, 1974).

Modifying factors were included in the HBM and were thought to affect a person's perceptions related to the four major variables. However, this influence was considered indirect and not causal in nature. These factors encompassed demographic variables, sociophysiological variables including personality, social class, and peer group pressure, and structural variables like knowledge of the disease or prior contact with the disease (Becker, 1974). All of these items are combined under sociodemographic factors in the Rosenstock et al. (1994) formulation of the model and fall under the background influences.

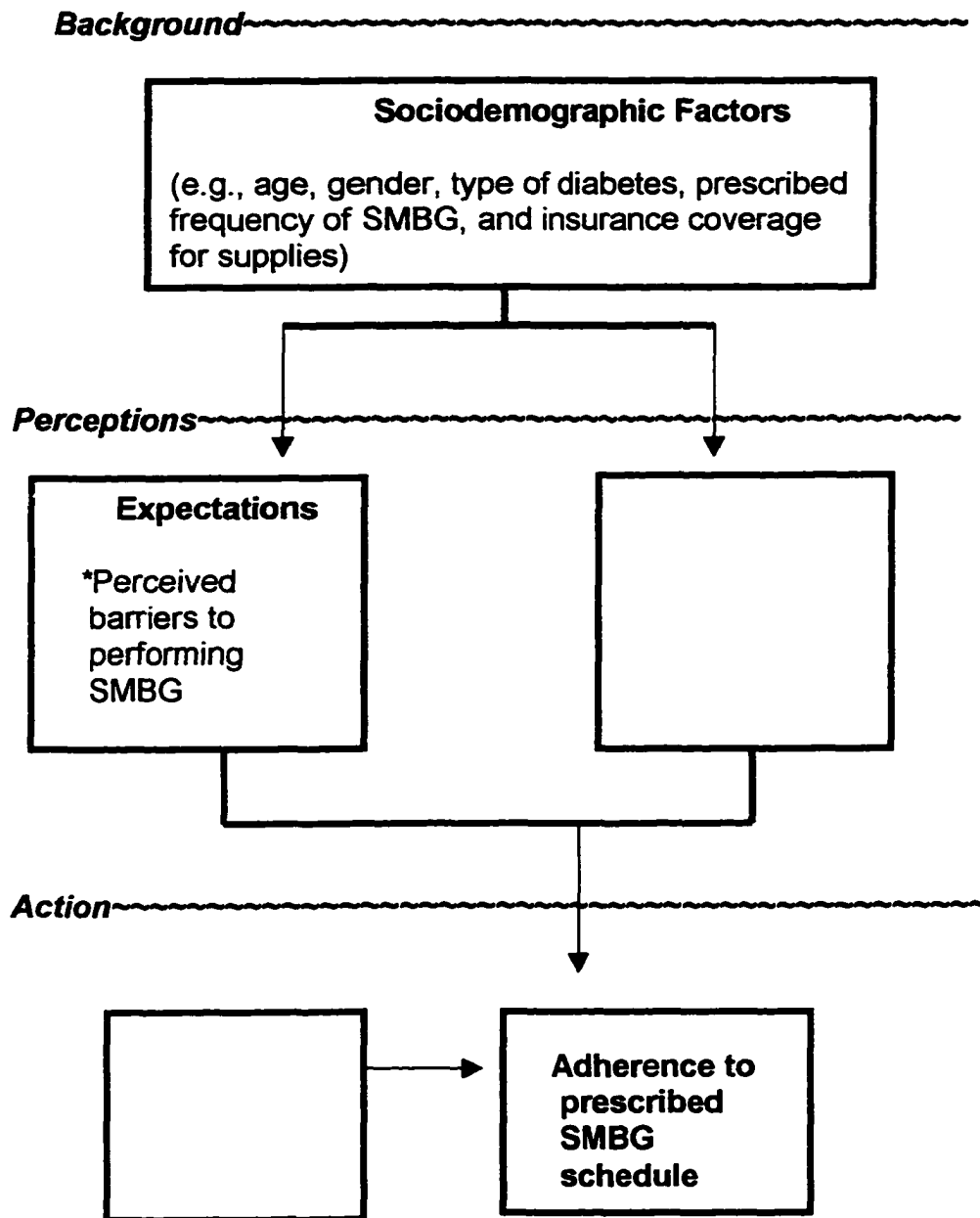


The action category of the Rosenstock et al. (1994) model encompassed the concept of cues to action plus the actual behavior that occurred as a result of all the other influences. It was believed that even if the main four concepts were in place in sufficient intensity for action to occur, an internal or external stimulating event might be necessary to initiate the health-related behavior. The power of the cues required to do this would be inversely related to the force of the other four variables (Becker, 1974).

For this study of barriers to adherence to SMBG schedules, the perceived barriers portion of the HBM was the primary focus of study. This concept was considered in the context of variable relationships as diagrammed in Figure 2. Analysis was done to determine if differences existed between the sociodemographic variables of participant gender, type of diabetes, and insurance coverage for diabetic supplies and subjects' perceived barriers to SMBG. Also, participants' age, level of education, number of years since diagnosis, and adherence to prescribed SMBG schedules were studied to determine if significant relationships existed between these variables and the subjects' perceived barriers to SMBG.

### Literature Review

Health Belief Model. Since the origination of the HBM, numerous research studies have been conducted testing the various concepts thought to predict health-related behavior, including perceived barriers to performing an action. Although the model was initially developed to predict and explain preventative health behavior, it has also been applied to illness and sick-role behavior and behavior related to chronic illness (Becker, 1974). In a comprehensive review of the HBM (Becker, 1974), S. V. Kasl discussed the



**Figure 2.** Relationship among study variables utilizing the HBM framework (Rosenstock et al., 1994).

model related to chronic illness. In this review, he considered response to symptoms, compliance with prescribed regimens, treatment maintenance, and lifestyle modification for risk reduction as components of chronic illness. When discussing compliance, Kasl indicated that particular characteristics of a medical regimen like complexity and length of treatment could impact whether an individual followed the prescribed regimen. Additional factors he felt could alter compliance were the degree of social isolation of the individual and the size of the household where the patient resided. He recommended further research and reformulation of the model related to chronic illness (Becker, 1974).

In 1984, Janz and Becker provided a review of HBM research that had been conducted since Kasl's discussion of the HBM related to chronic illness in 1974. Of the 29 articles included in the Janz and Becker summary, 14 studies investigated preventative health behaviors, 12 researched sick-role behaviors, including diabetic compliance, and 3 studies analyzed clinic utilization behavior. Both prospective and retrospective designs were included in the review, and findings indicated significant support of the four major HBM concepts of perceived benefits, perceived barriers, perceived susceptibility, and perceived severity. However, perceived barriers was the dimension that demonstrated the most consistent and significant relationship with whether a behavior was completed.

Perceived barriers to adherence. Of the three studies included in the Janz and Becker (1984) review related to diabetic compliance, two included perceived barriers in their analysis. Cerkoney and Hart (1980) studied 30 insulin-dependent diabetic patients 6-12 months following completion of diabetic education classes at a community hospital. Both self-report, using a modified version of the Standardized Compliance Questionnaire, and direct observation were utilized to investigate each subject's compliance with insulin

administration, urine testing, diet, hypoglycemia management, and foot care guidelines. Compliance in these areas was studied as they related to the HBM concepts of perceived susceptibility, perceived severity, perceived benefits and barriers, and cues to action. Findings indicated that the highest correlation existed between compliance and cues to action, while no significant correlation was found with perceived barriers. In the second study, Harris, Skyler, Linn, Pollack, and Tewksbury (1982) studied 50 adult onset diabetics at a veterans medical center. Compliance with medication, diet, urine testing, exercise and foot care were analyzed related to the four major concepts of the HBM. These results indicated a significant correlation between perceived barriers and compliance with medication use, particularly use of insulin.

Several other studies also investigated barriers to adherence to diabetic regimens in general, and blood glucose testing specifically. In 1983, Given, Given, Gallin, and Condon studied 156 patients ages 18-70 utilizing a 76 item questionnaire to measure 12 concepts related to patients' beliefs regarding their diabetes and its treatment. Of the 12 scales included in the questionnaire, 4 analyzed barriers to: (a) care in general, (b) to diet, (c) to taking medications, and (d) to exercise. All of these barriers categories, except exercise, demonstrated moderate to high correlation with compliance. This study was limited because instrument validity was not established.

Perceived barriers to SMBG. Jenny (1986) conducted a study investigating differences in adaptation to diabetes between insulin-dependent and non-insulin-dependent patients. She gathered data from 246 ambulatory patients utilizing a 10 page survey covering 12 parameters of adherence: (a) belief in diagnosis, (b) perception of disease severity, (c) benefits of the regime, (d) instruction, (e) health

motivation, (f) social support, (g) satisfaction with clinicians, (h) health and family problems, (i) barriers to regime adoption, (j) special disease concerns, (k) self-reported compliance, and (l) level of disease control. Results demonstrated a higher rate of compliance for the insulin-dependent diabetes mellitus (IDDM) group but better control for the non-insulin-dependent diabetes mellitus (NIDDM) group. For the adherence category of testing, the IDDM group indicated time, inconvenience, and not wanting to be bothered as major barriers, while the NIDDM group identified inconvenience and not wanting to be bothered as their major barriers. An important finding in this study was the variability of responses to barriers suggesting a need for individualized assessment and care plan development to overcome identified barriers. Limitations of this investigation included use of a convenience sample and a previously untested instrument that demonstrated only moderate reliability, and absence of control data for the original sample.

Glasgow, McCaul, and Schafer (1986) studied 65 IDDM patients ages 12-65 who were all from North Dakota. Using a 6 month test-retest correlational design, they investigated barriers to glucose testing, exercise, diet, and insulin injection adherence. Data were gathered with the Barriers to Adherence Questionnaire, developed by the researchers, and self-reported measures of adherence. For glucose testing, frequency of reported barriers was significantly negatively correlated to self-reported measures of adherence,  $r = -0.28$ ,  $p < 0.05$ . Major barriers identified were lack of materials needed for testing at certain times and feeling awkward when testing outside of the home. Limitations of this study included use of a convenience sample, less than optimal

wording on some questions, lack of data related to NIDDM, and potential for improved reliability of the questionnaire.

Another study by Ary, Toobert, Wilson, and Glasgow (1986) attempted to assess patients' perceptions about situations and behaviors that interfered with diabetes regimen adherence. From their exploration of a sample of 208 subjects including 24 type 1 diabetics and 184 type 2 diabetics, they found a reported adherence rate of 55-67% for SMBG using self-report methods. It was noted that findings were similar for both type 1 and type 2 patients, but subjects over age 57 had significantly greater adherence to SMBG at 72% compared to 50% adherence for those subjects less than 57 years old. Open-ended questions related to glucose testing revealed forgetting, being too busy, and concerns about the effectiveness of testing on control as the major barriers to adherence. Again, researchers in this study found that no single reason for nonadherence was given by the majority of subjects indicating, once more, a need for individualized assessment and intervention development. Limitations of this research were the sole use of self-report measures for data collection and cross-sectional rather than longitudinal study design.

Irvine, Saunders, Blank, and Carter (1990) developed the Environmental Barriers to Adherence Questionnaire to analyze 60 barriers related to diet, exercise, blood glucose testing, and medication. Their study was conducted to determine validity of this scale. The research sample consisted of 214 randomly selected type 1 and type 2 outpatient diabetics ages 20-89. No emotional or social support barriers were evaluated. The questionnaire tested by these researchers was compared to the Barriers to Adherence Questionnaire (Glasgow et al., 1986). Results indicated that the Environmental Barriers

to Adherence Questionnaire had a high level of internal consistency with a Cronbach's alpha coefficient of 0.94 and a moderate level of concurrent validity,  $r = 0.63$  compared to the Barriers to Adherence Questionnaire (Glasgow, et al.). In addition, correlations indicated a negative relationship between barriers and adherence behaviors for glucose testing,  $r = -0.46$ ,  $p < 0.001$ . Several limitations of this study were the low volunteer rate of subjects at 18%, use of self-report measures for adherence, and inclusion of only a small number of type 1 diabetic patients.

Polly (1992) studied adherence to self-care regimens of 102 NIDDM patients over age 60 as measured by the Diabetes Self-Care Behaviors Questionnaire. She also analyzed diabetes-specific health beliefs utilizing the Diabetes Health Belief questionnaire and glycemic control determined by measurement of the subjects' glycated hemoglobins. Findings revealed that perceived severity was the only health belief positively correlated with glycemic control,  $r = 0.21$ ,  $p = 0.03$ , while perceived barriers were inversely correlated with adherence,  $r = -0.24$ ,  $p = 0.02$ . Study limitations included self-reported adherence versus direct observation, use of a convenience sample, and use of a psychosocial model that could not explain poor metabolic control despite good adherence.

The effect of perceived barriers on diabetic regimen adherence was also incorporated in a meta-analysis by Brown and Hedges (1994). The purpose of this exploration was to determine the feasibility of using data from 17 studies conducted between 1982 and 1991 to test models developed by the researchers to explain metabolic control. Five causal models were developed with control influenced directly by compliance, knowledge, and health beliefs and indirectly by knowledge and health

beliefs through compliance. Study results indicated that barriers to regimen adherence had a significant indirect effect through compliance,  $r = .333$ ,  $p = 0.05$ . Limitations of this analysis included difficulty with location of appropriate studies for inclusion in the research and absence of complete data in the original investigations, thereby preventing direct checking of data to verify stability of the studies.

Finally, one of the few studies completed to specifically investigate barriers to SMBG was conducted by Jones et al. in 1996. The purpose of this study was to determine the reliability and validity of the 80 item BSMBG scale developed by the researchers to assess circumstances, thoughts, and feelings that could interfere with SMBG. The 74 subjects included in this investigation were age 18 or older, were from two diabetes care clinics affiliated with large metropolitan hospitals, and had been told at least one year prior to the study to monitor their blood glucose. Seven items related to blood glucose monitoring from the Barriers to Adherence Questionnaire (Glasgow et al., 1986) were used to determine construct validity of the BSMBG scale. Findings established reliability with a Cronbach's alpha testing internal consistency of 0.97. Significant correlations,  $r = .73$  on the before testing portion,  $.51$  on the after testing section, and  $.57$  on the after not testing section,  $p < 0.005$ , between items from the Barriers to Adherence Questionnaire and the BSMBG scale demonstrated good concurrent validity. Study limitations were the large number of items on the scale increasing complexity, the confusing nature of the not applicable response category, and the lack of using factor analysis for construct validity.



## Study Implications

Adherence issues. Diabetes is a chronic illness that requires a complex, multifaceted regimen creating permanent changes in the patient's life (Janz & Becker, 1984). The success of treatment largely depends on the patient's degree of participation (Given et al., 1983). However, self-management is challenging due to its complexity, the difficulty inherent in each aspect of the regimen, the requirement that the regimen be maintained for an indeterminate period, and the impact of comorbid diseases with their respective management demands (Glasgow, Toobert, Hampson, & Wilson, 1995). Therefore, it is a major challenge to assist patients with the development of skills needed for the daily management of this disease and with strategies to maintain long-term adherence.

Kurtz (1990) emphasized the need to assess adherence with a comprehensive review of verbal and nonverbal behavior, self reports, physical findings, and laboratory data. He pointed out that questionnaires could be helpful assistive devices in this process, unless they are used to substitute health care provider assessment interviews.

Glasgow et al. (1995) have stressed the importance of assessing each aspect of care individually to avoid the view that adherence is unidimensional. In their study, they also identified barriers as a major area in need of assessment and intervention due to the research evidence that has demonstrated significant associations with compliance and self-care.

In a study by Mollem, Snoek, and Heine (1996), IDDM patients identified insulin injection and SMBG as being the most bothersome aspects of their care. Also, studies by Mazze, Shamoon, Pasmantier, Lucido, and Murphy (1984); Wing, Epstein, Nowalk,

Scott, and Koeske (1985); and Hoskins, Alford, Handelsman, Yue, and Turtle (1988) have all demonstrated less than optimal adherence to recommended SMBG schedules and alterations and/or omissions of results in patient log books.

Implications for nursing education and practice. Based on these findings and the body of additional research already reviewed, it is evident that nurses caring for and educating patients with diabetes can benefit from use of valid and reliable tools to assess barriers to SMBG for both type 1 and type 2 diabetic patients. The intent of this study was to identify SMBG barriers with such a tool, the BSMBG scale, and to add to knowledge regarding the use of this tool in both type 1 and type 2 populations. Also, limited research has been done regarding SMBG for type 2 patients, yet use of SMBG in the treatment of these patients is encouraged. This study will supplement information in this area. Finally, testing and use of instruments like the BSMBG scale utilized in this study are important in the development of individualized interventions to overcome barriers to SMBG, thereby improving the diabetic education process and patient adherence to the self-care regimen (Jones et al., 1996).

#### Research Question

What are the barriers to adherence to prescribed SMBG schedules for diabetic patients age 18 or older?

#### Definition of Terms

For this study, the following variable definitions were used:

1. Age-The chronological age of the participant.
2. Gender-The gender of the participant.

3. Length of time since diagnosis- The number of years since the subject was diagnosed with diabetes.
4. Education-The highest level, in years, of formal education completed by the study participant.
5. Type of diabetes-Type 1/juvenile onset or Type 2/adult onset diabetes.
6. Health insurance-The participant's status regarding health insurance coverage for diabetic supplies.
7. Prescribed frequency of SMBG-The number of times per day/week a health care provider has recommended that the participant monitor his/her blood sugar.
8. Perceived barriers to SMBG-Those perceived thoughts, feelings, and situations that might interfere with the participant's adherence to SMBG per the prescribed schedule.

## CHAPTER 3

### METHODS

#### Design

The research design for this study was a nonexperimental, descriptive design in a survey format used to investigate barriers to blood glucose monitoring for diabetic patients age 18 or older. Advantages of this study design included: (a) the absence of invasive procedures required for subject data collection, (b) ease of administration and completion of study questionnaires, (c) limited cost associated with the research, (d) minimal training required for those assisting with the research, and (e) availability of a scale to study barriers to SMBG that demonstrated reliability and validity. Problems anticipated while doing the research included: (a) acquisition of a sufficient sample size, (b) clear communication of procedures to those assisting with the research and to the subjects, (c) fatigue on the part of study participants, and (d) the threat of hypoglycemic episodes for participants while completing the questionnaires.

Several steps were taken to overcome the problems anticipated during the study. Staff members from the cardiac rehabilitation program at West Shore Hospital, Manistee, MI, the dietitian providing diabetic diet education at that facility, and the facilitator of a diabetic support group sponsored by that institution were asked to identify potential subjects to obtain a sufficient sample. The nurse researcher reviewed procedures,

questionnaires, comfort measures, and methods to maintain confidentiality to the registered dietitian, who was the only person who assisted with the study. The nurse researcher or the registered dietitian explained the purpose of the study to potential subjects, asked for their participation in the study, and reviewed study instructions for proper completion of the questionnaires (Appendix D). The nurse researcher or registered dietitian also made provisions for a comfortable, quiet setting with nearby restroom facilities. Subjects were provided with appropriate snacks, fluids, or glucose sources as required during completion of the study instruments.

### **Population and Sample**

**Sample.** A convenience sample of 40 appropriate subjects was drawn from a diabetic support group, a cardiac phase 2 program, and a pool of patients referred for diabetic diet education at a 54 bed rural northern Michigan hospital. Inclusion criteria for the target population from which the sample of subjects for this study was drawn included: (a) persons diagnosed with diabetes for at least 1 year, (b) persons age 18 or older, (c) persons with the ability to read and comprehend the English language, (d) persons who have been told by their health care provider to monitor their blood glucose regularly, and (e) persons willing to participate in the study.

**Subject Characteristics.** Descriptive statistics for study subjects' demographic characteristics were generated for the sample (N = 40) (see Table 1). One individual did not indicate the number of years of education he had completed.

**Protection of Human Subjects.** Subjects were either mailed or given a letter (Appendices E & F) asking them to participate in the survey. The letter explained the purpose of the study, their right to not participate or end participation in the study at any

**Table 1****Subject Demographic Characteristics**

Characteristic	Number of subjects (N = 40)	Percentage of subjects
<u>Age</u>		
18-56 years	21	52.5
57-84 years	19	47.5
<u>Race</u>		
Caucasian	39	97.5
Native American	1	2.5
<u>Gender</u>		
Male	20	50.0
Female	19	47.5
No indication	1	2.5
<u>Diabetes Type</u>		
Type 1	9	22.5
Type 2	31	77.5
<u>Health Insurance Coverage for Supplies</u>		
Yes	27	67.5
No	13	32.5

Age range 18-84 years (M = 57.85, SD = 13.86)

Age range at time of diagnosis = 7-70 years (M = 40.55, SD = 2.05)

Years of education range = 11-19 year (M = 13.77, SD = 2.05)

time, the fact that their non-participation or participation in the study would in no way affect their care at West Shore Hospital in Manistee, MI, and assurances that their confidentiality and anonymity would be maintained at all times during and following the study.

Subject confidentiality was maintained through the use of identification numbers to code patient survey instruments rather than use of the subjects' names. In addition, subjects were asked to place their response sheets in a sealed envelope upon completion for return to the nurse researcher for data analysis. Finally, all responses were reported as grouped data only to assist in maintenance of subject anonymity.

### Instruments

Two instruments were used in this study for data gathering. The Demographic and Self-Monitoring of Blood Glucose Questionnaire was developed by the nurse researcher to gather descriptive information on demographic variables and information related to SMBG (Appendix G). These variables included age, gender, race, type of diabetes, age at diagnosis, medication(s) used for diabetes treatment, number of years subject had performed blood glucose monitoring, type of equipment utilized to test blood glucose, prescribed frequency of SMBG, self-reported frequency of SMBG, and education regarding SMBG. It was a pencil and paper questionnaire with questions that were answered by the subjects by circling the answer or filling in the blank. This instrument was completed on the same occasion as the BSMBG scale (Jones et al., 1996).

The BSMBG scale (Jones et al., 1996) was developed to assess multiple barriers to self-monitoring of blood glucose utilizing the ABC Behavioral Model (Spiegler, 1983). It was developed and tested by the Visiting Nurses Association of Western

Pennsylvania in conjunction with the University of Pittsburgh School of Nursing. The original scale was an 80 item 5 point Likert type scale with questions related to thoughts, feelings, and situations that could occur and serve as barriers to SMBG before testing blood glucose, after testing blood glucose, or after deciding not to test blood glucose. Spearman's coefficients for concurrent validity comparing the BSMBG scale to the Barriers to Adherence Scale: Problem Situations Checklist (Glasgow et al., 1986) demonstrated significant correlations ( $P < .005$ ) for all sections. Internal consistency was tested with Cronbach's alpha with a score of .97. Test/retest reliability using Kappa values with results of  $n=2$  in the excellent range of  $K > .75$ ,  $n=70$  in the good range of  $.4 < K < .75$ , and  $n=8$  in the marginal range of  $0 < K < .4$ .

Recommended scale modifications based on information compiled concerning validity and reliability of the BSMBG instrument in the Jones et al. study (1996) were made for its use in the current study. These alterations included: (a) use of the 55 before testing questions related to Thoughts, Feelings, and Situations only and (b) deletion of the NA category as a choice on the Likert scale of responses. Alteration of the choices thus read “never, rarely, sometimes, usually, and always” for the five points on the scale. The before testing component of the scale was chosen for use in this study. It was used because it was comprehensive. Also, the questions included in this section were structured to be answered based on the subject's perception of what stimuli occurred before testing that prevented adherence to recommended schedules for SMBG. These responses, therefore, corresponded to perceived barriers as outlined in the Health Belief Model (Rosenstock et al., 1994). Cronbach's alpha utilized to determine the internal consistency of this instrument in the current study indicated a score of 0.95 for the entire



modified instrument. Cronbach's alpha scores for the subscales of Thoughts, Feelings, and Situations were 0.88, 0.84, and 0.90 respectively.

### Procedures

Prior to the start of the study, permission to conduct the research as exempted research was obtained from the Grand Valley State University Human Research Review Committee (Appendix H). Also, the administration of West Shore Hospital, Manistee, MI granted approval for the research to be conducted at that facility (Appendix I). Administrative approval was requested at that facility, because no board committee existed to deal with research issues.

Study subjects were approached in three separate ways. Diabetic support group members were mailed a letter asking them to participate in the survey. Cardiac rehabilitation phase II clients, who met inclusion criteria, were informed of the purpose of the study after an exercise session and were asked by the nurse researcher if they would be willing to participate in the survey. If the client agreed to complete the questionnaires for the study, a date and time was scheduled to do that following one of the client's exercise sessions. Also, a letter explaining the purpose of the study was given to them for review. All cardiac rehabilitation phase II clients who did not wish to participate in the study were thanked for their time and excused. Patients referred for diabetic diet instruction were informed of the purpose of the study by the registered dietitian at the time she scheduled their appointment for teaching. They were asked if they would be willing to participate in the study at that time. If these patients agreed to participate, they were scheduled to complete the questionnaires prior to their teaching appointment on the same date. The nurse researcher also provided them with a letter

explaining the purpose of the study. All patients referred for diabetic diet instruction who did not wish to participate in the survey were thanked, and a time for their teaching was scheduled.

Copies of the Demographic Data and Self-Monitoring of Blood Glucose Questionnaire and the BSMBG scale, with written directions for completion, were provided to subjects at the time they were scheduled to complete the questionnaires. Distribution of the questionnaires, verbal review of the purpose of the study, directions for completion of both instruments, and response to participant questions was provided by the nurse researcher or the registered dietitian. All data were collected at a rural hospital in northern Michigan 30 minutes prior to the meeting time for a diabetes support group, following a scheduled session for cardiac rehabilitation phase 2, or prior to an educational session regarding the subject's diabetic diet. If attendance at the diabetic support group meetings was not possible, the data were collected at the subject's home. Two sessions for members of the diabetic support group were conducted in a group setting. Sessions for phase II cardiac rehabilitation clients, patients scheduled for diabetic instruction, and diabetic support group members unable to attend the group meetings were done on an individual basis. Completion of the instruments required approximately 30 minutes in each situation.

## CHAPTER 4

### RESULTS/DATA ANALYSIS

#### Results

The purpose of this descriptive, nonexperimental study was to identify barriers to adherence to prescribed self-monitoring of blood glucose schedules for diabetic patients age 18 or older. Data for the study were collected with two instruments, the modified BSMBG scale (Jones et al., 1996) and the Demographic Data and Self-Monitoring of Blood Glucose Questionnaire, from a sample of 40 diabetic patients who met inclusion criteria for the study. The data collected from the subjects were analyzed utilizing the Statistical Package for the Social Sciences (SPSS, 1996). The level of significance, or alpha level, used for the study was  $p = .05$ .

Perceived barriers scores. Initially, the 55 questions from the BSMBG (Jones et al., 1996) were ranked from highest to lowest based on their statistical mean score for the 40 study subjects (see Table 2). The range of answers for each question was 0-5, with numbers indicating how often the statement in the question applied to the subject before SMBG during the month prior to completion of the questionnaire. A score of (0) indicated the statement was not applicable to the participant, a (1) represented the statement never occurred for the subject, (2) meant that the statement rarely applied, (3) was circled if the statement sometimes occurred for the subject, (4) was used to

**Table 2****Mean Scores of the Five Highest and Lowest Barrier Statements**

Statement	Subscale	M	SD
<b><u>Highest</u></b>			
18. I don't want to have diabetes.	Thoughts	3.38	1.69
51. It is difficult to test at a restaurant.	Situations	2.90	1.45
33. I feel frustrated because I ate too much.	Feelings	2.83	.90
30. I feel angry for not having better control of my diabetes.	Feelings	2.65	1.21
52. It is difficult to test at someone's house.	Situations	2.60	1.24
<b><u>Lowest</u></b>			
38. I am too tired to test.	Situations	1.45	.68
40. There is no place to discard the testing materials.	Situations	1.33	.57
36. I have no private place to test.	Situations	1.32	.53
37. I have trouble seeing well enough to test.	Situations	1.28	.55
4. I think testing is too complicated.	Thoughts	1.28	.51

indicate that the statement usually applied to the participant, and (5) represented that the statement always applied to the subject before testing their blood glucose. Two subjects failed to circle an answer for one question in the section dealing with Situations that could interfere with SMBG. As recommended by Polit and Hungler (1995), the statistical mean score of 2.00 for the question, calculated from the remaining participants' answers, was used as a response to deal with the missing data. When all statements were considered together, the question with the highest median score, 3.38, dealt with the thought, "I think I don't want to have diabetes", while the question with the lowest median, 1.28, also referred to a thought, "I think testing is too complicated."

Individual barrier subscale scores for Thoughts, Feelings, and Situations were also ranked based on the mean score for the sample (N = 40) (see Table 3). These rankings indicated that the same Thoughts subscale statements that ranked highest and lowest when all barriers statements were considered were also the highest and lowest when the Thoughts subscale statements were considered alone. For Feelings, the statement "I feel frustrated because I ate too much," ranked highest with a score of 2.83. The Feelings answer with the lowest mean score of 1.65 stated, "I feel angry." The rankings of mean scores for the Situations subscale demonstrated that the question with the highest mean score of 2.90 was the statement, "It is difficult to test at a restaurant", while the statement with the lowest mean score of 1.28 read, "I have trouble seeing well enough to test."

The Overall score for each subject on the BSMBG instrument was then calculated. Additionally, scores for the three subscales of Thoughts, Feelings, and Situations were determined for each individual. Descriptive statistics were then generated

**Table 3****Mean Scores of the Three Highest and Lowest Subscale Barrier Statements**

Statement	Subscale	M	SD
<b><u>Highest</u></b>			
18. I don't want to have diabetes.	Thoughts	3.38	1.69
11. I think of how many materials I have left for testing.	Thoughts	2.38	1.25
21. I think I hate testing blood glucose.	Thoughts	2.27	1.24
<b><u>Lowest</u></b>			
24. I think testing is not important to my future health.	Thoughts	1.53	1.01
17. I think I do not want to take responsibility for my blood glucose result.	Thoughts	1.48	.82
4. I think testing is too complicated.	Thoughts	1.28	.51
<b><u>Highest</u></b>			
33. I feel frustrated because I ate too much.	Feelings	2.83	.90
30. I feel angry for not having better control of my diabetes.	Feelings	2.65	1.21
26. I feel unhappy.	Feelings	2.03	.86

**Table 3 (cont.)****Mean Scores of the Three Highest and Lowest Subscale Barrier Statements**

Statement	Subscale	M	SD
<b><u>Lowest</u></b>			
27. I feel depressed.	Feelings	1.78	.83
29. I feel resentful about the time it takes to test.	Feelings	1.70	.91
25. I feel angry.	Feelings	1.65	.86
<b><u>Highest</u></b>			
51. It is difficult to test at a restaurant.	Situations	2.90	1.45
52. It is difficult to test at someone's house.	Situations	2.60	1.24
42. I ate too much.	Situations	2.60	.84
<b><u>Lowest</u></b>			
40. There is no place to discard the testing materials.	Situations	1.33	.57
36. I have no private place to test.	Situations	1.32	.53
37. I have trouble seeing well enough to test.	Situations	1.28	.55

for these four scores for all 40 subjects to determine the range, mean, and standard deviation for the sample (see Table 4).

**Table 4**

**Sample ( N = 40) BSMBG Overall and Subscale Barrier Scores**

Scores	Possible Range	Study Range	M	SD
Overall	55-275	55-160	107.08	27.94
Thoughts Subscale	24-120	24-75	45.40	12.72
Feelings Subscale	9-45	9-33	18.28	43.40
Stiuations Subscale	22-105	22-68	43.40	12.20

Age and adherence compared to perceived barriers. From the demographic data collected, the age and adherence to the prescribed frequency of SMBG were analyzed using range, mean, and standard deviation. A paired t-test was also generated to determine if statistically significant differences existed between actual SMBG and prescribed SMBG as reported by the study subjects.

Self-reported adherence to SMBG per day and/or week indicated a range of SMBG per day of 1-8 times/day ( $M = 2.40$ ,  $SD = 1.74$ ). For SMBG per week, subjects' answers ranged from 1-50 times/week ( $M = 8.58$ ,  $SD = 11.93$ ). The paired t-test that was done indicated no significant difference existed in this study between self-reported SMBG per day compared to prescribed SMBG per day ( $t = 1.43$ ,  $df = 27$ ,  $p = .164$ ).

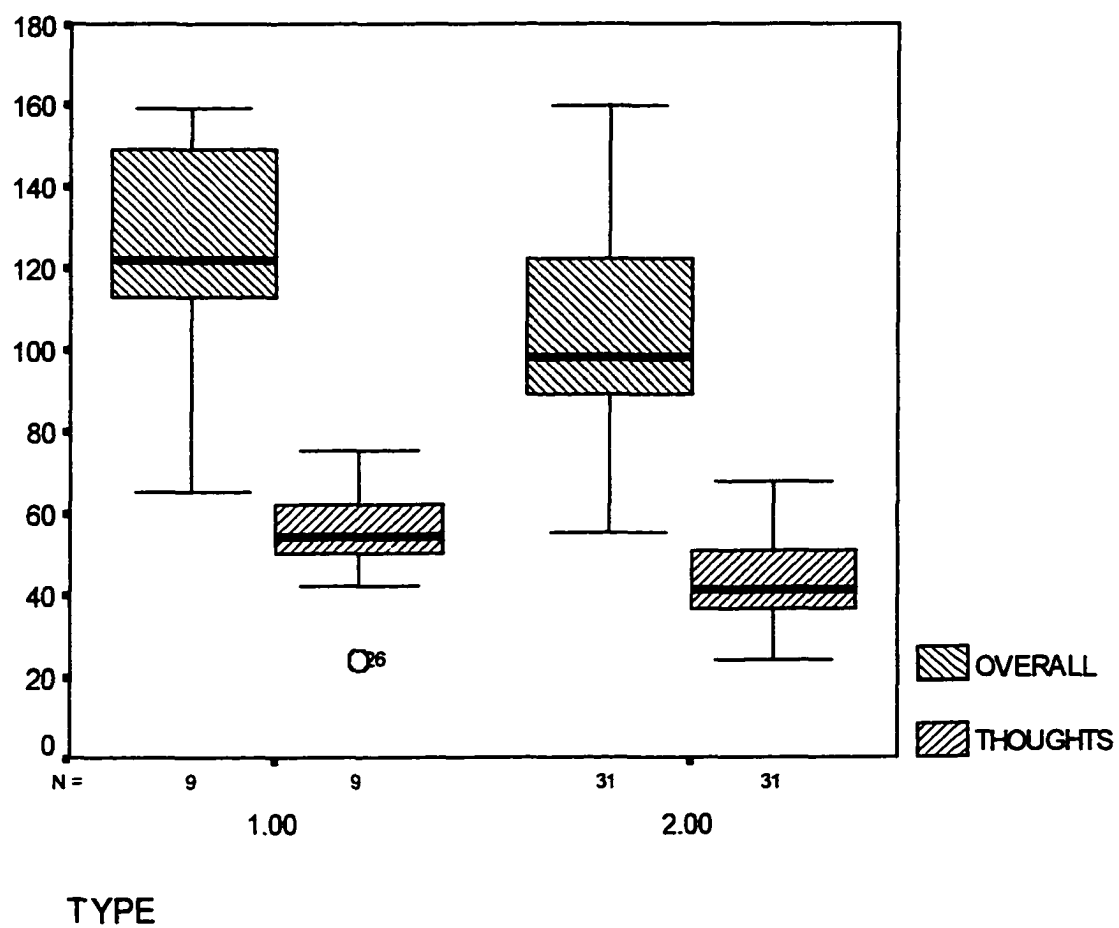


Additionally, no significant difference existed between self-reported SMBG per week and prescribed SMBG per week (  $t = .82$ ,  $df = 12$ ,  $p = .431$ ).

Gender, type of diabetes, and insurance coverage compared to perceived barriers.

The gender, type of diabetes, and insurance coverage for SMBG supplies were described using frequency and percentages. A t-test analysis was then completed to determine if any statistically significant differences existed between the gender, type of diabetes, or insurance coverage for SMBG and the BSMBG (Jones et al., 1996) Overall and subscale scores. Results indicated that statistically significant differences existed between Overall barrier scores and type of diabetes (  $t = 2.21$ ;  $df = 38$ ;  $p = .033$ ) (see Figure 3). Even though the upper limit of scores was the same for both the type 1 diabetics ( $n = 9$ ), indicated by (1) on the boxplot, and the type 2 diabetics ( $n = 31$ ), indicated by (2), the range of scores for the type 2 group was wider. However, the median for the type 1 group was 120 compared to the median of approximately 95 for the type 2 group.

The t-test analysis of the BSMBG (Jones, et al., 1996) Thoughts barrier subscale scores compared to the type of diabetes also indicated a statistically significant difference (  $t = 2.52$ ;  $df = 38$ ;  $p = .016$ ) (see Figure 3). The range of scores for the type 1 group was approximately 42-75, whereas the range for the type 2 diabetics was approximately 25-68. The median scores for the thought subscale for the type 1 diabetic subjects was approximately 53 compared to a median of approximately 42 for the type 2 diabetic participants. It is important to note when analyzing the t-test data that the type 1 group included only 9 subjects compared to 31 subjects in the type 2 group. No other statistically significant differences were found when the subjects' type of diabetes was



**Figure 3.** Boxplot comparisons of overall and subscale barrier scores compared to type of diabetes.

compared to the Feelings and Situations subscales. Also, gender or insurance coverage for diabetic supplies demonstrated no statistically significant differences with the BSMBG (Jones et al., 1996) Overall and subscale barrier scores.

Age of subjects and self-reported adherence compared to perceived barriers.

A Pearson's  $r$  analysis was completed to determine if any statistically significant relationships existed between the age of the subjects or their self-reported adherence to SMBG and their Overall and subscale barrier scores on the BSMBG (Jones et al., 1996). Findings indicated a statistically significant negative correlation between the age of the subjects and the four barrier scores on the BSMBG (Jones et al., 1996) (see Table 5).

**Table 5**

**The Relationship of Subject Age and Reported Adherence to SMBG per Day and Week to Overall and Subscale Barrier Scores (N = 40)**

Scores	Age	SMBG/day	SMBG/week
Overall	-.60*	-.02	-.06
Thoughts Subscale	-.60*	-.02	-.06
Feelings Subscale	-.50**	-.02	-.06
Situations Subscale	-.53**	-.04	-.11
*p = .000      **p = .001			

To further evaluate the statistically significant negative correlation found between age and the Overall and subscale barrier scores, ages were divided into two groups based

on the median of 56 years. A t-test was then generated to determine if a statistically significant difference existed between these 2 groups and the 4 scores. Results indicated that a statistically significant difference did exist in all cases (see Table 6).

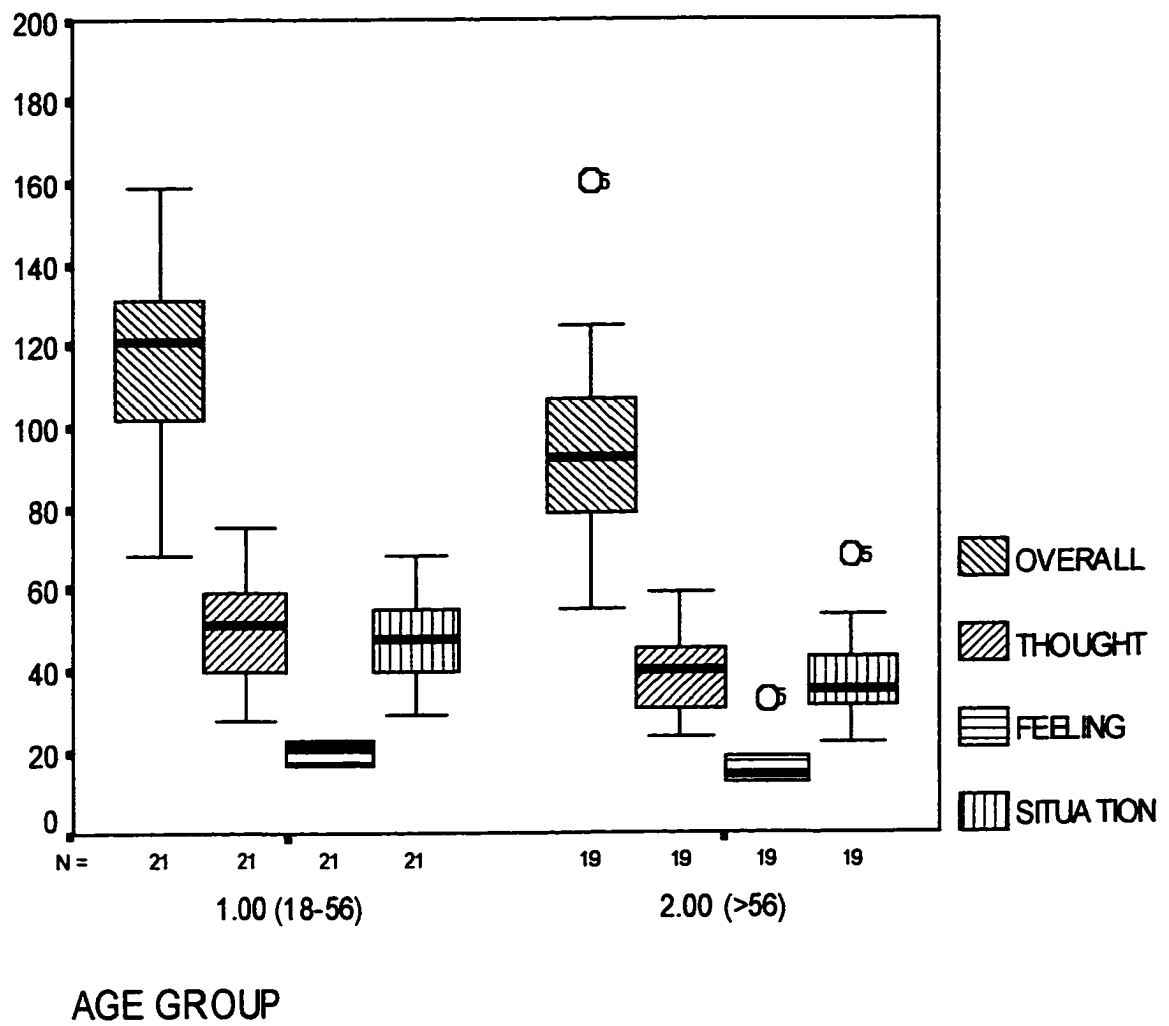
**Table 6**

**Comparison of Age Groups to Overall and Subscale Barrier Scores**

Scores	t	df
Overall	3.24**	38
Thoughts Subscale	3.16**	38
Feelings Subscale	2.26*	38
Situations Subscale	2.94**	38

\* p <.05. \*\*p <.01

Boxplots (see Figure 4) developed for these four scores comparing age group 1 (n = 21), ages 18-56 years, and age group 2 (n = 19), ages 57-84 years, demonstrated the difference in score ranges and median scores for the two groups. Group 1 Overall scores ranged approximately 100-130 with a median of 120, while group 2 scores ranged approximately 75-100 with a median of 90. The Thoughts subscale scores for group 1 ranged approximately 40-60 with a median of 55, and scores for group 2 ranged 35-45 with a median of 40. Subscale scores for Feelings for group 1 were within approximately 18-22 with a median of 22, yet group 2 had totals on this subscale between approximately



**Figure 4.** Boxplot comparisons of age groups 1 and 2 compared to overall and subscale barrier scores.

10-18 with a median of 10. Finally, the Situations subscale scores for group 1 were grouped between approximately 40-55 with a median of 50, while group 2 had scores that ranged about 30-45 with a median of 35.

No statistically significant correlation was demonstrated between the Overall and subscale barrier scores when compared to self-reported adherence of SMBG per day or week to prescribed schedules. To further evaluate adherence, subjects were divided into two groups based on percentage of self-reported adherence of SMBG to prescribed schedules. Group 1 (n = 9) consisted of subjects who indicated adherence levels 50 % or lower. The remainder of the subjects were placed in group 2 (n = 31). These two groups were then compared by t-test analysis to Overall and subscale barrier scores, and a significant difference was found to exist in all cases (see Table 7).

**Table 7**

**Adherence Groups Compared to Overall and Subscale Barrier Scores**

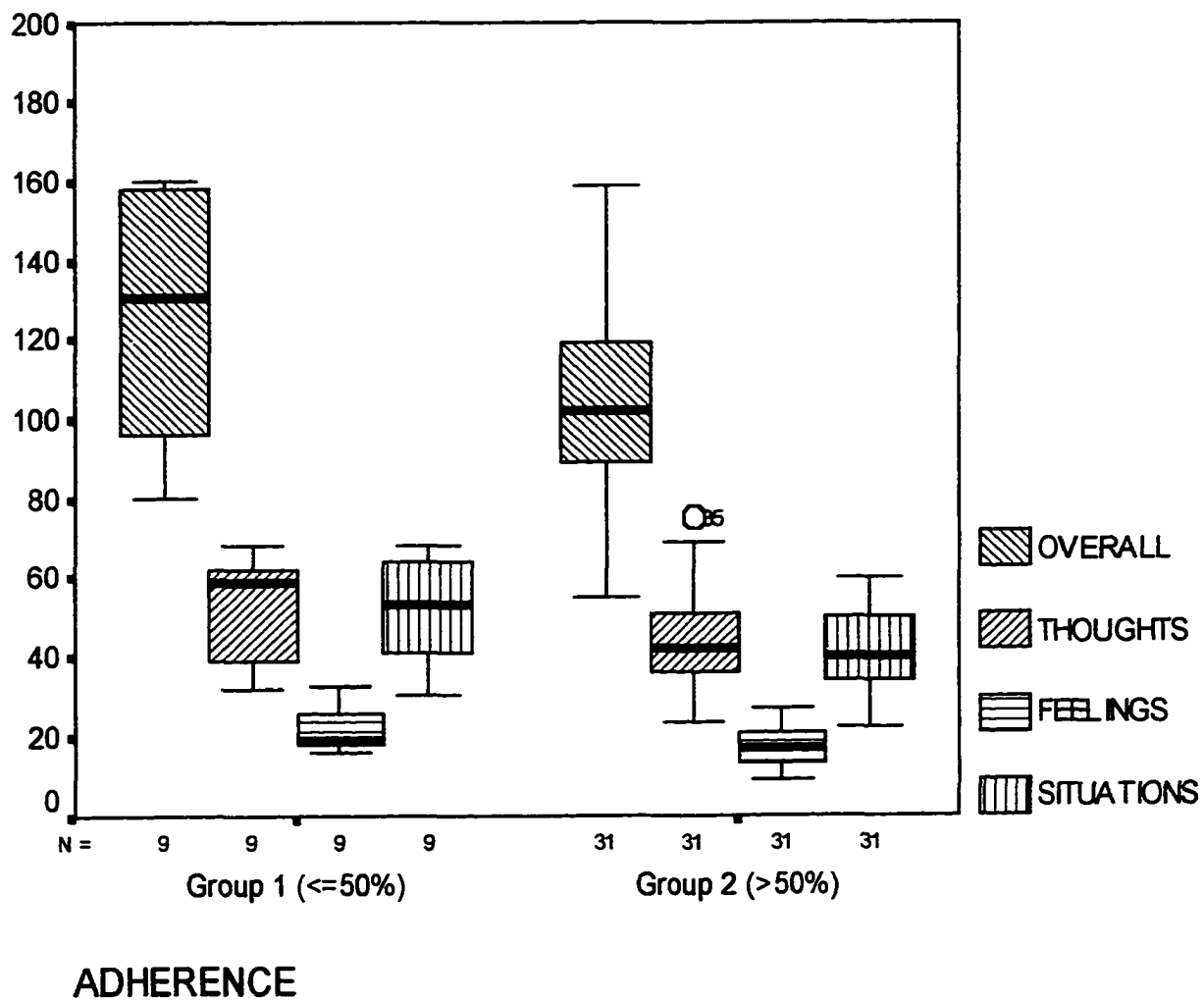
Scores	t	df
Overall	2.52*	38
Thoughts Subscale	2.13*	38
Feelings Subscale	2.47*	38
Situations Subscale	2.35*	38

\*p < .05

Boxplot comparisons (see Figure 5) generated to evaluate these statistically significant differences indicated a range of Overall barrier scores for group 1, the group with less than 50% adherence ( $n = 9$ ), between approximately 80-160 with a median of 135. Group 2, with adherence levels greater than 50% ( $n = 31$ ), scores ranged approximately 55-160 with a median of 100. The Thoughts barrier subscale scores for group 1 were found between approximately 35-70 and had a median of 60, while the group 2 subscale results were in a range from about 25-70 with a median score of 40. Findings for the Feelings subscale indicated a range of approximately 18-35 for group 1 scores with a median of 20, whereas the group 2 results indicated scores between approximately 15-30 with a median of 18. Finally, the Situations barrier subscale scores for group 1 ranged approximately 30-65 with a median of 55, and the group 2 scores fell between approximately 25-55 with a median score of 40. The fact that the group reporting 50% or less adherence to prescribed SMBG schedules had only 9 subjects compared to 31 subjects in group 2 must be considered when analyzing this data.

### Summary

In this study of 40 subjects from rural northern Michigan, a varied range of participant Overall and subscale barrier scores were found. Mean scores for perceived barriers in this group were not high, with the highest mean score being 3.38. The Thoughts perceived barrier with the highest mean score of 3.38 was the statement, “I think I don’t want to have diabetes.” For the Feelings barrier subscale, the answer with the highest mean score of 2.83 read, “ I feel frustrated because I ate too much.” Finally, the Situations barrier subscale statement with the highest mean score of 2.90 stated, “It is difficult to test at a restaurant.”



**Figure 5.** Boxplot comparisons of self-reported adherence groups with barrier scores.



Data analysis indicated that statistically significant differences existed between type 1 and type 2 diabetes and Overall and Thoughts barrier subscale scores. Also, a significant negative relationship was found between the age of the subjects and the Overall and subscale scores for Thoughts, Feelings, and Situations. When age was further analyzed by dividing the sample into two age groups based on the median age of 56 years, a statistically significant difference was found between the age groups and all four barrier scores. Finally, the sample was divided into two groups based on adherence to prescribed SMBG schedules. One group consisted of those reporting less than or equal to 50% adherence, and the remaining group reported greater than 50% adherence to SMBG. A statistically significant difference was found between these groups and the Overall and Thoughts, Feelings, and Situations barrier scores.

## CHAPTER 5

### DISCUSSION AND IMPLICATIONS

#### Discussion

The purpose of this descriptive, nonexperimental study was to identify barriers to adherence to prescribed self-monitoring of blood glucose schedules for diabetic patients age 18 or older. Data for the study were collected with two instruments, the BSMBG scale (Jones et al., 1996) and the Demographic Data and Self-Monitoring of Blood Glucose Questionnaire. The sample included 40 diabetic patients who met inclusion criteria for the study.

Rosenstock, Strecher, and Becker (1994), in their review of the HBM (Becker, 1974), defined perceived barriers, one aspect of the model, as “the potential negative aspects of a health action” ( p. 8). They further described these barriers as things that might interfere with an individual engaging in a recommended health behavior. Generally, these researchers believed a person evaluates the perceived benefits of an action in light of the perceived barriers before he decides whether he will complete the recommended behavior. They reiterated the fact that results from studies of the HBM conducted between 1974 and 1984 indicated that perceived barriers was the strongest portion of the HBM to predict whether a behavior occurred. In this study, perceived barriers to SMBG per prescribed schedules for a sample (N = 40) of diabetic subjects age 18 or older were studied.

The modified BSMBG (Jones et al., 1996) instrument used for this study of perceived barriers to blood glucose monitoring consisted of the 55 before testing questions from the original 80 item BSMBG scale (Jones et al., 1996). Additional modifications included deletion of the not applicable category as a choice on the Likert scale of responses and alteration of the choices to read never, rarely, sometimes, usually, and always. With these modifications, the instrument fell within the satisfactory range of reliability at 0.95 when tested using Cronbach's alpha (Polit & Hungler, 1995). The original BSMBG scale developed by Jones et al. (1996) had a Cronbach's alpha score of 0.97. Additionally, Cronbach's alpha scores for Thoughts, Feelings, and Situations subscales from the instrument used for this study were 0.88, 0.84, and 0.90 respectively. These scores all were within the satisfactory range for reliability (Polit & Hungler, 1995).

The results of this study indicated that the sample ( $N = 40$ ) had no mean barrier scores higher than 3.38 ( $SD = 1.69$ ), which would be in the range between the sometimes and usually categories. This would indicate that this sample had few barriers that would interfere with SMBG. This was substantiated by the fact that 31 of the subjects reported greater than 50% adherence to prescribed SMBG schedules. However, as found by Jones et al. (1996), scores for barriers would have more meaning for individual subjects than for the group entirely. This was evidenced by a varied range of Overall and subscale barrier scores for the subjects in the study. Jenny (1986) found similar variability of responses to barriers in her study of adaptation to diabetes between insulin-dependent and non-insulin-dependent diabetics. Her findings also suggested the need for individualized assessment of identified barriers. Additionally, Ary et al. (1986) found no single reason for nonadherence and also recommended individualized assessment of barriers to

adherence. Individual item scores 3.00 or higher would require assessment to determine how often those barriers actually prevented the individual from performing SMBG according to prescribed schedules. This would be particularly important since the directions for the scale instructed the participant to indicate which statements occurred before blood glucose testing within the last month. Subjects were not asked to indicate which statements occurred and prevented SMBG over the last month. From this information, appropriate plans of care could be developed for each person.

The barrier statement with the highest mean score was the Thought , “I hate to have diabetes.” In the Jones et al. (1996) study, this barrier statement was recorded in the usually or always category by 45% of the subjects. These findings indicate a need to explore this thought with diabetic patients to determine how seriously it interferes with their level of adherence to SMBG. This knowledge could then guide development of interventions in a plan of care.

The Situation barrier statement, “It is difficult to test at a restaurant”, had the second highest mean score in this study. Jones et al. (1996) found in their study that 34% of the subjects marked this statement as usually or always. Another finding in the present study indicated that the Situation statement, “It is difficult to test at someone’s house” ranked fifth in overall barriers. This statement was marked by 45% of the participants in the Jones et al. study (1996). Subjects in research conducted by Glasgow, McCaul, and Schafer (1986) identified feeling awkward when testing outside the home as a major barrier to blood glucose testing. These results suggest a need to discuss strategies to overcome these barriers with diabetic persons who view them as problems, particularly if they must travel frequently or eat meals outside the home on a regular basis.

Feelings barriers rating third and fourth in the present study were the statements, “I feel frustrated because I ate too much” and “I feel angry for not having better control of my diabetes.” In the Jones et al. study (1996), Feelings barriers were not as significant for participants as thoughts and situations. Neither of the Feelings statements that rated high in this study were indicated as significant barriers in the before testing portion of the Jones et al. (1996) study.

Type 1 diabetic subjects (n =9) in the present research had statistically significant higher Overall and Thought barrier scores on the BMSBG (Jones et al., 1996) than the participants in the type 2 group (n = 31). In their study of patients’ perceptions about situations and behaviors that interfered with diabetes regimen adherence, Ary, Toobert, Wilson, and Glasgow (1986) noted findings similar to this study’s results for type 1 and type 2 diabetic subjects. One difference between the current study and the Ary et al. (1986) study, that could impact these findings, was the use of concrete statements in the current study versus open ended statements in the Ary et al. (1986) study. Jones et al. (1996) did not specifically address differences in findings between these two groups. Further study would be required in this area for complete analysis due to the small sample size in the present study with the relatively small number of type 1 diabetics compared to type 2 diabetic participants.

Additional results from the present study indicated that age had a significant negative correlation with Overall and subscale barrier scores, and young subjects had significantly higher scores in all four cases. Similar findings were obvious in the Jones et al. study (1996). The Jones et al. study also found that the higher the barrier scores were for these young subjects, the lower were their rates of adherence to SMBG.

These findings suggest the need to closely assess barriers for these younger patients to determine how significantly adherence to SMBG is impacted. If adherence is compromised, identification of barriers could direct development of interventions to overcome these barriers and improve adherence to prescribed SMBG schedules. This finding corresponds directly to the HBM framework utilized in this study.

Finally, results of the present research indicated no significant correlation with reported adherence to SMBG per day or week and any of the scores on the BSMBG (Jones et al., 1996). However, when subjects were placed in groups of adherence based on percentage, the subjects reporting less than or equal to 50% adherence to SMBG prescribed schedules had significantly higher Overall and subscale barrier scores compared to the group who reported adherence levels greater than 50%. Irvine, Saunders, Blank, and Carter (1990) noted a statistically significant negative correlation between barriers and adherence behaviors for glucose testing when determining the validity of their Environmental Barriers to Adherence Questionnaire. Similarly, Polly (1992) found that perceived barriers were significantly inversely correlated with adherence when she investigated diabetic self-care regimens. In the Jones et al. research (1996), the only significant negative correlation found between perceived barriers and self-reported adherence was in the before testing portion of the instrument used for data collection. All of these results imply the need to closely examine perceived barriers for those patients found to have low adherence levels. Once again, this finding relates directly to the HBM framework on which this study is based. Specific strategies to address perceived barriers, and therefore improve adherence, could then be incorporated in the patient's plan of care.

## **Conclusions**

The following conclusions were derived from findings of this study:

1. The BSMBG scale (Jones et al., 1996), with recommended modifications, is a reliable instrument for assessment of patients' perceived barriers to SMBG per prescribed schedules.
2. Perceived barriers to SMBG per prescribed schedule should be assessed and addressed on an individual basis.
3. Further study would be required to appropriately analyze whether significant differences exist between patients with type 1 and type 2 diabetes and perceived barriers to SMBG.
4. Perceived barriers to SMBG should be diligently assessed for younger patients.
5. If patients' levels of adherence to SMBG per prescribed schedule is low, perceived barriers should be carefully evaluated, so appropriate strategies to address barriers can be included in plans of care.

## **Application to Practice**

The modified BSMBG scale (Jones et al., 1996) used as an instrument in this research study can be used as an assessment tool to evaluate perceived barriers to SMBG for individual diabetic patients. This assessment could occur at the time of initial teaching regarding SMBG or when problems with adherence to prescribed schedules have been identified. From this assessment, those barriers with scores greater than three on the scale could be addressed specifically. Therefore, the scale can serve to guide development of interventions to improve the care of diabetic patients.

Additionally, those persons educating diabetic patients could use these results to improve their practice by carefully analyzing adherence to SMBG, particularly in younger patients. By doing this, needs for further assessment, education, or development of additional interventions could be identified and addressed.

### Threats and Limitations

Threats. Several threats to internal and external validity of the study had to be considered when interpreting the data obtained from the research. Internal validity threats included self-selection bias due to the fact that subjects volunteered to be part of the study and were already participating in an educational program to improve management of their health needs. Also, testing bias was a threat. This could have occurred if subjects wanted to score well on the questionnaire, which they potentially viewed as a test. This would have to be considered particularly in the case of self-reported adherence to SMBG. Threats to external validity included the Hawthorne effect, due to the fact that subjects possibly answered the questionnaire in a way they felt the nurse researcher or registered dietitian would like them to answer, instead of their true perceptions. An additional threat was experimenter effects that could occur if the nurse researcher or registered dietitian inadvertently said or did something that affected the way the subjects answered the questions. Additionally, an external threat to the ability to generalize findings existed because a convenience sample was used from one geographic location.

Limitations. Generalization of these findings was limited by several factors. Use of a relatively small convenience sample ( $N = 40$ ) of subjects from one geographic location was one limitation. The racial homogeneity of the sample would also be a factor. Additionally, the small number of type 1 diabetic subjects ( $n = 9$ ) in the sample made



generalization of significant findings related to this type of diabetes difficult. The fact that the subjects were all volunteers, rather than randomly selected subjects, added to these limitations.

Use of self-reported levels of adherence to SMBG was an additional limitation, particularly since subjects in this study reported much higher levels of adherence compared to findings in other research studies related to SMBG (Mazze et al., 1984; Wing et al., 1985; Hoskins et al., 1988; Harris, 1996). Placement of the questions requesting prescribed frequency of SMBG next to the question on the demographic instrument asking reported frequency of SMBG could have added to this limitation. An added component to this limitation was the fact that the subjects were participants in an educational program to improve management of their disease.

#### Suggestions for Further Research/Modifications

Several recommendations for further research were identified from the results of this study. These included:

1. Replication of this study using a randomly selected large sample of diabetic subjects.
2. Further analysis of differences in perceived barriers to SMBG per prescribed schedules for type 1 and type 2 diabetic subjects.
3. Quantitative analysis of adherence versus self-report of adherence to SMBG when determining how adherence correlates to perceived barriers to SMBG per prescribed schedule.
4. Further instrument psychometric analyses to determine if redundancies exist that could be altered for efficiency of the instrument's use in practice.

5. Testing of the instrument in actual practice to determine its usefulness in assessment of needs related to SMBG and development of interventions to address those needs.

One recommended modification in the study would be revision of the instructions on the BSMBG scale (Jones et al., 1996). More complete information regarding how perceived barriers actually interfere with SMBG could be obtained if directions would ask patients to indicate not only which statements occurred in the month prior to completion of the questionnaire, but which statements occurred and interfered with completion of SMBG per prescribed schedules.

### Summary

The release of the Diabetes Control and Complications Trial results in 1993 demonstrated the benefits of improved glycemic control in the prevention of long term complications associated with diabetes. Monitoring blood glucose has become an integral component of this improved control for both type 1 and type 2 diabetic patients. However, research indicates adherence levels to prescribed SMBG schedules is less than optimal. Therefore, strategies to identify barriers to adherence are needed. With identification of barriers to adherence, interventions to help improve adherence levels can be developed.

The purpose of this study was to identify barriers to adherence to prescribed blood glucose monitoring schedules for diabetic patients age 18 or older that occur before testing. It was conducted utilizing a sample of 40 diabetic patients, who met inclusion criteria, from a rural northern Michigan community. The instrument used to collect data in this study was the modified BSMBG scale (Jones et al., 1996).

Findings indicated a varied range of participant Overall and subscale barrier scores. Mean scores for perceived barriers in this group were not high. Data analysis indicated that statistically significant differences existed between type 1 and type 2 diabetics and Overall and Thoughts barrier subscale scores. Also, a significant negative relationship was found between the age of the subjects and the Overall and subscale barrier scores for Thoughts, Feelings, and Situations. When age was further analyzed by dividing the sample into two age groups based on the median age of 56 years, a statistically significant difference was found between the age groups and all four barrier scores. Finally, the sample was divided into two groups based on adherence to prescribed SMBG schedules. One group consisted of those reporting less than or equal to 50% adherence, and the remaining group reported greater than 50% adherence to SMBG. A statistically significant difference was found between these groups and the Overall and Thoughts, Feelings, and Situations barrier scores.

This study built on previous studies of barriers to adherence to diabetic care aspects, in general, and on studies conducted to expressly address adherence barriers affecting SMBG. Also, the data from this study could be utilized as a basis for further research to improve the care of diabetic patients.

## APPENDIX A

**Phyllis M. Jones, PhD, RN, CDE**  
**Nurse Educator, Certified Diabetes Educator**

---

3048 Haberlein Rd, Gibsonia, PA 15044-8232, (412)443-7413, Email: pmj100+@pitt.edu

January 12, 1998

Victoria E. Sawhill, BSN, CDE  
1336 Timber Ridge Dr.  
Manistee, MI 49660

Dear Victoria Sawhill:

Regarding permission to use the Self-Testing Blood Glucose Questionnaire that I developed:

Yes, you have my permission to use this questionnaire.

Enclosed is a copy of the questionnaire.

My previous recommendations are still relevant. However, since the introduction of newer meters that are easier to use, meters that require a smaller drop of blood , ultrafine lancets, and insurance coverage there may be fewer barriers to actually doing the test. But, thoughts and feelings barriers may remain similar.

Best wishes for your thesis.

Sincerely,



Phyllis Jones, RN, PhD, CDE  
Visiting Nurses Association  
Butler, PA

## **APPENDIX B**

## SELF-TESTING BLOOD GLUCOSE QUESTIONNAIRE

Date: \_\_\_\_\_

**DIRECTIONS:** These statements describe things that may interfere with decisions to test or not test blood glucose (sugar). Please read each statement, then circle one number for each statement that best describes how often the statement applied to you during the past month. Please do not skip any of the statements.

- |      |                                |             |
|------|--------------------------------|-------------|
| 1.   | Never/rarely                   | ( 0 - 25%)  |
| 2.   | Sometimes                      | (26 - 50%)  |
| 3.   | Usually                        | (51 - 75%)  |
| 4.   | Almost always/always           | (76 - 100%) |
| N.A. | Does not apply in my situation |             |

---

	1	2	3	4	NA
	Never/ Rarely	Sometimes	Usually	Almost Always	Does Not Apply
	0-25%	26-50%	51-75%	76-100%	

---

### SECTION I: BEFORE TESTING BLOOD GLUCOSE

**Part A.** These questions refer to thoughts that you may have before testing blood glucose.  
I think:

- |   |   |   |   |   |    |
|---|---|---|---|---|----|
| 1. it is too much of a bother to test.  | 1 | 2 | 3 | 4 | NA |
| 2. about all the things that need to be done.   | 1 | 2 | 3 | 4 | NA |
| 3. the technique for testing is too time consuming.   | 1 | 2 | 3 | 4 | NA |
| 4. testing is too complicated.  | 1 | 2 | 3 | 4 | NA |
| 5. testing is too painful.  | 1 | 2 | 3 | 4 | NA |
| 6. my blood glucose is doing well that day so there is no need to test.                                   | 1 | 2 | 3 | 4 | NA |
| 7. I know what my blood glucose is by estimating it.  | 1 | 2 | 3 | 4 | NA |
| 8. my blood glucose will be high so there is no need to test it.  | 1 | 2 | 3 | 4 | NA |
| 9. the immediate effects of not testing are less important than other things are at that time.            | 1 | 2 | 3 | 4 | NA |
| 10. of how a high blood glucose reading will look in my log book and how I would explain it to my doctor. | 1 | 2 | 3 | 4 | NA |

	1 Never/ Rarely 0-25%	2 Sometimes 26-50%	3 Usually 51-75%	4 Almost Always 76-100%	NA Does Not Apply
I think:					
11. of how many materials I have left for testing.	1	2	3	4	NA
12. about making others wait while I test.	1	2	3	4	NA
13. it is too much trouble to test blood glucose when I feel sick.	1	2	3	4	NA
14. I need a break from testing.	1	2	3	4	NA
15. I am too busy to test.	1	2	3	4	NA
16. I do not want to know the blood glucose result.	1	2	3	4	NA
17. I do not want to take responsibility for my blood glucose result.	1	2	3	4	NA
18. I don't want to have diabetes.	1	2	3	4	NA
19. I just want to forget about my diabetes.	1	2	3	4	NA
20. I am too lazy to test.	1	2	3	4	NA
21. I hate testing blood glucose.	1	2	3	4	NA
22. it is too much trouble to write down the results.	1	2	3	4	NA
23. I wish other people would show concern about my diabetes.	1	2	3	4	NA
24. testing is not important to my future health.	1	2	3	4	NA



	1 Never/ Rarely 0-25%	2 Sometimes 26-50%	3 Usually 51-75%	4 Almost Always 76-100%	NA Does Not Apply
--	--------------------------------	--------------------------	------------------------	----------------------------------	-------------------------

Part B. These questions refer to feelings that you may have before testing blood glucose.

I feel:

25. angry.	1	2	3	4	NA
26. unhappy	1	2	3	4	NA
27. depressed.	1	2	3	4	NA
28. resentful.	1	2	3	4	NA
29. resentful about the time it takes to test.	1	2	3	4	NA
30. angry for not having better control of diabetes.	1	2	3	4	NA
31. good and decided not to test.	1	2	3	4	NA
32. sad that my diabetes is unimportant to others.	1	2	3	4	NA
33. frustrated because I ate too much.	1	2	3	4	NA

Part C. These questions refer to situations that may occur before testing your blood glucose.

34. I do not have the necessary materials for testing with me at the time.	1	2	3	4	NA
35. I do not have the money to buy the necessary materials for testing.	1	2	3	4	NA
36. I have no private place to test.	1	2	3	4	NA
37. I have trouble seeing well enough to test.	1	2	3	4	NA
38. I am too tired to test.	1	2	3	4	NA
39. I have problems getting enough blood to test.	1	2	3	4	NA
40. There is no place to discard the testing materials.	1	2	3	4	NA
41. I do not like to stop and test in the middle of an activity.	1	2	3	4	NA

	1 Never/ Rarely 0-25%	2 Sometimes 26-50%	3 Usually 51-75%	4 Almost Always 76-100%	NA Does Not Apply
42. I ate too much.	1	2	3	4	NA
43. I don't have a daily routine.	1	2	3	4	NA
44. There is no consistency with my meal times.	1	2	3	4	NA
45. I forget to test.	1	2	3	4	NA
46. I do not like to test when other people are around.	1	2	3	4	NA
47. I do not test when I am sick.	1	2	3	4	NA
48. I am too busy to test at home.	1	2	3	4	NA
49. I am too busy to test when away from home.	1	2	3	4	NA
50. I am too busy to test at work.	1	2	3	4	NA
51. It is difficult to test at a restaurant.	1	2	3	4	NA
52. It is difficult to test at someone's house.	1	2	3	4	NA
53. It is difficult to test before lunch.	1	2	3	4	NA
54. It is difficult to test before the evening meal.	1	2	3	4	NA
55. It is difficult to test at bedtime.	1	2	3	4	NA

## Section II: AFTER TESTING BLOOD GLUCOSE

Part A. These questions refer to thoughts you may have after testing blood glucose.

If my blood glucose results is high, I think:

56. I should not have eaten as much as I did.	1	2	3	4	NA
57. I should be more active.	1	2	3	4	NA

	1 Never/ Rarely 0-25%	2 Sometimes 26-50%	3 Usually 51-75%	4 Almost Always 76-100%	NA Does Not Apply
--	--------------------------------	--------------------------	------------------------	----------------------------------	-------------------------

58. I don't care, I'm going to eat what I want.	1	2	3	4	NA
59. I am not following my diabetes treatment plan as I should.	1	2	3	4	NA

Part B: These questions refer to feelings you may have after testing blood glucose.

If the blood glucose reading result is high,

I feel:

60. guilty.	1	2	3	4	NA
61. angry.	1	2	3	4	NA
62. unhappy because my blood glucose is high when I don't think it should be.	1	2	3	4	NA

Part C: These questions refer to situations you may have after testing blood glucose.

When I know my blood glucose result:

63. I know how much to eat.	1	2	3	4	NA
64. I am able to accurately judge how much insulin to take.	1	2	3	4	NA
65. I accept the result.	1	2	3	4	NA
66. I try harder to eat correctly.	1	2	3	4	NA

	1 Never/ Rarely 0-25%	2 Sometimes 26-50%	3 Usually 51-75%	4 Almost Always 76-100%	NA Does Not Apply
--	--------------------------------	--------------------------	------------------------	----------------------------------	-------------------------

### Section III: AFTER DECIDING NOT TO TEST BLOOD GLUCOSE

Part A: These questions refer to thoughts you may have after not testing blood glucose at the scheduled time.

I think:

67. my blood glucose may be high.	1	2	3	4	NA
68. my blood glucose may be low.	1	2	3	4	NA
69. I'll test it later.	1	2	3	4	NA
70. I'm not sure if I took the correct amount of insulin.	1	2	3	4	NA
71. I don't care and I eat what I want.	1	2	3	4	NA
72. I should start getting my life together soon.	1	2	3	4	NA
73. I am not following my blood glucose testing schedule as I should.	1	2	3	4	NA
74. I have freedom from diabetes.	1	2	3	4	NA

Part B: These questions refer to feelings you may have after deciding not to test blood glucose at the scheduled time.

I feel:

75. guilty.	1	2	3	4	NA
76. worried.	1	2	3	4	NA
77. angry that I forget to test.	1	2	3	4	NA
78. nervous about what the results might have been.	1	2	3	4	NA

Part C: These questions refer to situations you may have after deciding not to test blood glucose at the scheduled time.

79. I saved time and effort.	1	2	3	4	NA
80. I saved money.	1	2	3	4	NA

## APPENDIX C

## SELF-TESTING BLOOD GLUCOSE QUESTIONNAIRE

Id# \_\_\_\_\_

Date: \_\_\_\_\_

**DIRECTIONS:** These statements describe **thoughts, feelings, and situations** that may interfere with decisions to test or not test blood glucose (sugar). Please read each statement, then circle **one** number for each statement that best describes **how often** the statement applied to you during the last month. Please do not skip any of the statements, **AND PLEASE REMEMBER THERE ARE NO RIGHT OR WRONG ANSWERS.**

1. Never
2. Rarely
3. Sometimes
4. Usually
5. Always

---

1	2	3	4	5
Never	Rarely	Some- times	Usually	Always

---

### BEFORE TESTING BLOOD GLUCOSE

**Part A:** These questions refer to **thoughts** that you might have before testing blood glucose.

I think:

- |     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| 1.  | it is too much of a bother to test.  | 1 | 2 | 3 | 4 | 5 |
| 2.  | about all the things that need to be done  | 1 | 2 | 3 | 4 | 5 |
| 3.  | the technique for testing it too time consuming.   | 1 | 2 | 3 | 4 | 5 |
| 4.  | testing is too complicated.  | 1 | 2 | 3 | 4 | 5 |
| 5.  | testing is too painful   | 1 | 2 | 3 | 4 | 5 |
| 6.  | my blood glucose is doing well that day so there is no need to test.                                   | 1 | 2 | 3 | 4 | 5 |
| 7.  | I know my blood glucose by estimating it.  | 1 | 2 | 3 | 4 | 5 |
| 8.  | my blood glucose will be high so there is no need to test it.  | 1 | 2 | 3 | 4 | 5 |
| 9.  | the immediate effects of not testing are less important than other things are at the time.             | 1 | 2 | 3 | 4 | 5 |
| 10. | of how a high blood glucose reading will look in my log book, and how I would explain it to my doctor. | 1 | 2 | 3 | 4 | 5 |

**SELF-TESTING BLOOD GLUCOSE QUESTIONNAIRE**

---

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	Never	Rarely	Some- times	Usually	Always

---

I think:

11.	of how many materials I have left for testing.	1	2	3	4	5
12.	about making others wait while I test.	1	2	3	4	5
13.	it is too much trouble to test blood glucose when I feel sick.	1	2	3	4	5
14.	I need a break from testing.	1	2	3	4	5
15.	I am too busy to test.	1	2	3	4	5
16.	I do not want to know the blood glucose result.	1	2	3	4	5
17.	I do not want to take responsibility for my blood glucose result.	1	2	3	4	5
18.	I don't want to have diabetes.	1	2	3	4	5
19.	I just want to forget about my diabetes.	1	2	3	4	5
20.	I am too lazy to test.	1	2	3	4	5
21.	I hate testing blood glucose.	1	2	3	4	5
22.	it is too much trouble to write down the results.	1	2	3	4	5
23.	I wish other people would show concern about my diabetes.	1	2	3	4	5
24.	testing is not important to my future health.	1	2	3	4	5

**SELF-TESTING BLOOD GLUCOSE QUESTIONNAIRE**

1	2	3	4	5
Never	Rarely	Some- times	Usually	Always

**Part B:** These questions refer to feelings that you may have before testing blood glucose.

I feel:

25.	angry.	1	2	3	4	5
26.	unhappy.	1	2	3	4	5
27.	depressed.	1	2	3	4	5
28.	resentful.	1	2	3	4	5
29.	resentful about the time it takes to test.	1	2	3	4	5
30.	angry for not having better control of my diabetes.	1	2	3	4	5
31.	good and decided not to test.	1	2	3	4	5
32.	sad that my diabetes is unimportant to others.	1	2	3	4	5
33.	frustrated because I ate too much.	1	2	3	4	5

**Part C:** These questions refer to situations that may occur before testing your blood glucose.

34.	I do not have the necessary materials for testing with me at the time.	1	2	3	4	5
35.	I do not have the money to buy the necessary materials for testing.	1	2	3	4	5
36.	I have no private place to test.	1	2	3	4	5
37.	I have trouble seeing well enough to test.	1	2	3	4	5
38.	I am too tired to test.	1	2	3	4	5
39.	I have problems getting enough blood to test.	1	2	3	4	5



**SELF-TESTING BLOOD GLUCOSE QUESTIONNAIRE**

		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
		Never	Rarely	Some- times	Usually	Always
40.	There is no place to discard the testing materials.	1	2	3	4	5
41.	I do not like to stop and test in the middle of an activity.	1	2	3	4	5
42.	I ate too much.	1	2	3	4	5
43.	I don't have a daily routine.	1	2	3	4	5
44.	There is no consistency with my meal times.	1	2	3	4	5
45.	I forget to test.	1	2	3	4	5
46.	I do not like to test when other people are around.	1	2	3	4	5
47.	I do not like to test when I am sick.	1	2	3	4	5
48.	I am too busy to test at home.	1	2	3	4	5
49.	I am too busy to test when away from home.	1	2	3	4	5
50.	I am too busy to test at work.	1	2	3	4	5
51.	It is difficult to test at a restaurant.	1	2	3	4	5
52.	It is difficult to test at someone's house.	1	2	3	4	5
53.	It is difficult to test before lunch.	1	2	3	4	5
54.	It is difficult to test before the evening meal.	1	2	3	4	5
55.	It is difficult to test at bedtime.	1	2	3	4	5

**Thank you for your participation. Please check to be certain you have answered all the questions on both questionnaires, place them in the envelope provided, and seal.**

Note. Modified with author permission from "Development and Testing of the Barriers to Self-Monitoring Blood Glucose Scale" by P. M. Jones, C. Remley, and R. A. Engberg, 1996, The Diabetes Educator, 22, pp. 609-616.

## APPENDIX D

**IDENTIFICATION OF BARRIERS TO ADHERENCE TO PRESCRIBED  
SCHEDULES FOR SELF-MONITORING OF BLOOD GLUCOSE  
STUDY INSTRUCTIONS**

This research study is being conducted to identify barriers that could prevent diabetic persons age 18 or older from monitoring their blood sugar as prescribed by their health care provider. This study is being conducted by a Grand Valley State University student, Victoria E. Sawhill, who is seeking her Master's of Science degree in nursing. The information from this study will build on knowledge from other studies already done on similar topics. The purpose of the study is to gather data that would assist health care providers when they form teaching plans to help their diabetic patients overcome barriers they face when trying to do blood sugar monitoring. Your opinions and personal experiences are important and will help build an accurate base of knowledge. The Grand Valley State University Human Research Review Committee and the administration of West Shore Hospital have provided authorization for this study to be conducted.

You have been asked to be part of this study because you have been diagnosed with diabetes, you are age 18 or older, and you have been told to monitor your blood sugar by your health care provider. Your participation in this study is totally voluntary and will involve answering questions on a scale that has been developed to measure barriers to blood sugar monitoring. It will take about 45 minutes to answer all of the questions. If you are uncomfortable answering a question on the scale, please feel free to leave it blank. However, it is important to remember that complete data is important for accurate analysis. Also, please remember that there are no right or wrong answers to the questions on the scale. I will be present to answer any of your questions while you complete the scale. Please try to answer as many questions as you can, and feel free to write any comments at the bottom of the scale or around the margins. Your answers to the questions will be kept confidential, and the data will be coded to prevent identification of individual participants. You are free to end your participation in the study at any time. Your participation or nonparticipation in this study will in no way effect your care at West Shore Hospital, Manistee, MI.

There are two questionnaires to complete. The first questionnaire is the "Demographic Data and Self-Monitoring of Blood Glucose Questionnaire". Please complete the questions on this survey by circling the correct answer or filling in the blank with your answer. You may use the pencil provided to complete the answers. This survey has two pages to complete. The second questionnaire is the "Self-Testing Blood Glucose Questionnaire". It is a four page survey with 55 statements that describe thoughts, feelings, and situations that may interfere with decisions to test or not test blood glucose (sugar). Please read each statement, then circle one number for each statement that best describes **how often** the statement applied to you in the last month. Please be careful not to skip any of the statements.

When you have completed both questionnaires, please place them in the envelope provided, seal the envelope, and return the envelope to me. Thank you very much for your help with this study. Your time and effort is appreciated a great deal in this effort to improve the care of diabetic patients.

## **APPENDIX E**

July 22, 1998

Dear Diabetic Support Group Member:

A research study is being conducted to identify barriers that could prevent diabetic persons age 18 or older from monitoring their blood sugar as prescribed by their health care provider. This study will be conducted by a Grand Valley State University student, Victoria E. Sawhill, who is seeking her Master's of Science degree in nursing. The information from this study will build on knowledge from other studies already done on similar topics. The purpose of the study is to gather data that would assist health care providers when they form teaching plans to help their diabetic patients overcome barriers they face when trying to do blood sugar monitoring. Your opinions and personal experiences are important and will help build an accurate base of knowledge. The Grand Valley State University Human Research Review Committee and the administration of West Shore Hospital have provided authorization for this study to be conducted.

**You are being asked to be part of this study if you have been diagnosed with diabetes, you are age 18 or older, and you have been told to monitor your blood sugar by your health care provider.** Your participation in this study is totally voluntary and will involve answering questions on a scale that has been developed to measure barriers to blood sugar monitoring. It will take about 45 minutes to answer all of the questions. If you are uncomfortable answering a question on the scale, please feel free to leave it blank. The nurse researcher or the dietitian will be present when you complete the scale to answer any of your questions. Please try to answer as many questions as you can, and feel free to write any comments at the bottom of the scale or around the margins. Your answers to the questions will be kept confidential, and the data will be coded to prevent identification of individual participants. You are free to end your participation in the study at any time. Your participation or nonparticipation in this study will in no way effect your care at West Shore Hospital, Manistee, MI.

The completion of the scale for the study will be held at West Shore Hospital in Manistee, MI on August 12, 1998 from 6:45-7:15 PM prior to the regular meeting of the support group. Please wear comfortable clothing. Appropriate snacks, fluids, and sugar sources will be available for your needs. If you have any questions about the study, please contact the nurse researcher at (616) 723-7144 or Paul Huizenga, Chair, Human Research Review Committee, Grand Valley State University at (616) 895-2472. If you request it, a summary of the study results will be sent to you. Thank you very much for your help with this study. Your time and effort is appreciated a great deal in this effort to improve the care of diabetic patients.

Sincerely,

Victoria E. Sawhill  
Master's Candidate  
Kirkhof School of Nursing  
Grand Valley State University

## APPENDIX F

Date

Subject Name

Subject Address

Dear \_\_\_\_\_:

A research study is being conducted to identify barriers that could prevent diabetic persons age 18 or older from monitoring their blood sugar as prescribed by their health care provider. This study will be conducted by a Grand Valley State University student who is seeking her Master's of Science degree in nursing. The information from this study will build on knowledge from other studies already done on similar topics. The purpose of the study is to gather data that would assist health care providers when they form teaching plans to help their diabetic patients overcome barriers they face when trying to do blood sugar monitoring. Your opinions and personal experiences are important and will help build an accurate base of knowledge. The Grand Valley State University Human Research Review Committee and the administration of West Shore Hospital have provided authorization for this study to be conducted.

You have been selected to be part of this study because you have been diagnosed with diabetes, you are age 18 or older, and you have been told to monitor your blood sugar by your health care provider. Your participation in this study is totally voluntary and will involve answering questions on a scale that has been developed to measure barriers to blood sugar monitoring. It will take about 45 minutes to answer all of the questions. If you are uncomfortable answering a question on the scale, please feel free to leave it blank. The nurse researcher or the dietitian will be present when you complete the scale to answer any of your questions. Please try to answer as many questions as you can, and feel free to write any comments at the bottom of the scale or around the margins. Your answers to the questions will be kept confidential, and the data will be coded to prevent identification of individual participants. You are free to end your participation in the study at any time. Your participation or nonparticipation in this study will in no way effect your care at West Shore Hospital, Manistee, MI.

The completion of the scale for the study will be held at West Shore Hospital in Manistee, MI on \_\_\_\_\_(date) from \_\_\_\_\_(time). Please wear comfortable clothing. Appropriate snacks, fluids, and sugar sources will be available for your needs. If you have any questions about the study, please contact the nurse researcher at (616) 723-7144 or Paul Huizenga, Chair, Human Research Review Committee, Grand Valley State University at (616) 895-2472. A summary of the study results will be sent to you when it is completed. Thank you very much for your help with this study. Your time and effort is appreciated a great deal in this effort to improve the care of diabetic patients.

Sincerely,  
Victoria E. Sawhill  
Master's Candidate  
Kirkhof School of Nursing  
Grand Valley State University

## **APPENDIX G**



**DEMOGRAPHIC DATA &  
SELF-MONITORING OF BLOOD GLUCOSE QUESTIONNAIRE**

**Id#** \_\_\_\_\_

**Date** \_\_\_\_\_

**Please complete the following questions by circling the correct answer or filling in the blank:**

What is your age? \_\_\_\_\_

Gender: (1) M (2) F

Race: (1) Caucasian (2) African American (3) Native American (4) Hispanic (5) Other

How many years of education have you completed? \_\_\_\_\_

What type of diabetes do you have?

(1) Type 1/Juvenile onset (2) Type 2/Adult onset

How old were you when your diabetes was diagnosed ? \_\_\_\_\_

Do you have health insurance? (0) No (1) Yes

Does your health insurance cover the cost of any of your blood sugar testing supplies?

(0) No/NA (1) Yes

How many years have you checked your blood sugar? \_\_\_\_\_

How often do you check your blood sugar-in a day? \_\_\_\_\_ OR  
in a week? \_\_\_\_\_

How often have you been instructed to check your blood sugar-in a day? \_\_\_\_\_  
OR

in a week? \_\_\_\_\_

Have you ever been taught by a health professional how to check your blood sugar?

(0) No (1) Yes

If yes, how many months ago were you taught? \_\_\_\_\_

**Please go on to page 2**

**Please fill in the correct answers for these questions:**

Diabetes Medicine	Dose	Times Taken

**What type of meter do you use to check your blood sugar?**

\_\_\_\_\_

**Thank you for your participation. Please be certain to answer all of the questions on both questionnaires.**

## APPENDIX I



**GRAND VALLEY  
STATE UNIVERSITY**

1 CAMPUS DRIVE • ALLENDALE, MICHIGAN 49401-9403 • 616/895-6611

April 29, 1998

Victoria Sawhill  
1336 Timber Ridge Dr.  
Manistee, MI 49660

Dear Victoria:

Your proposed project entitled "*Identification of Barriers to Adherence to Prescribed Self-Monitoring of Blood Glucose Schedules*" has been reviewed. It has been approved as a study which is exempt from the regulations by section 46.101 of the Federal Register 46(16):8336, January 26, 1981.

Sincerely,

Paul Huizenga, Chair  
Human Research Review Committee

## APPENDIX H



**WEST  
SHORE  
HOSPITAL**

the art of caring and  
the science of healing...for life.

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March 5, 1998

To Whom It May Concern:

Victoria E. Sawhill, RN, BSN, CDE has been granted permission to conduct surveys with diabetic outpatients at West Shore Hospital related to her thesis research dealing with identification of barriers to prescribed self-monitoring of blood glucose schedules for diabetic patients age 18 or older. This permission is effective through June 30, 1999.

Should there be any questions concerning the above, please feel free to contact me directly at (616) 398-1101.

Sincerely,

  
Burton O. Parks  
Administrator

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## LIST OF REFERENCES

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