DIABETES SELF-CARE ACTIVITIES IN OLDER ADULTS AND THE ABILITY OF A NUTRITION AND DIABETES EDUCATION PROGRAM TO EFFECT CHANGE

by

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(Under the Direction of Mary Ann Johnson)

ABSTRACT

This study was designed to test several hypotheses related to diabetes translation in elders participating in Georgia's Older Americans Nutrition Program (OANP). OANP populations are at high risk for diabetes because of advanced age, low income, and minority group status (ASA, 2003; Boyle et al., 2002; Ponza et al., 1996). This study evaluates four primary hypotheses for OANP participants with diabetes: 1) higher frequencies of diabetes self-care practices, positive health beliefs, and certain demographic variables would be associated with lower blood A1C at baseline in OANP participants with diabetes; 2) a nutrition and diabetes education program delivered at senior centers would increase the frequency of diabetes self-care activities; 3) improvements in diabetes self-care practices would be associated with decreases in blood A1C following an educational intervention; and 4) healthcare providers would report patients' lack of ability to follow self-care behaviors, as well as their lack of confidence in facilitating change, as a barrier.

Older adult participants with diabetes were a convenience sample (n = 105) of OANP participants with a mean age 73 years (58% Caucasian, 42% African American, 70% women, and 29% with $\leq$ 8 years of education). Twenty-five percent of participants had an A1C blood value > 8% (poor control). In regard to diabetes self-care activities, participants were most likely

to be compliant ($\geq$ 5 days per week) with medication use (97%); moderately compliant with diet, glucose testing, and daily foot checks (49% to 65%); and least compliant with exercise and foot wear inspections (37% to 39%). More than half of the participants (60%) agreed that their lack of understanding of the diabetes diet was a barrier to them. Following the intervention, compliance ($\geq$ 5 days/week) substantially increased from baseline for participants following a healthful diet, following an eating plan, avoiding high fat foods, spacing carbohydrates, testing blood sugar as recommended by their health care provider and inspecting shoes ($p < .05$). Decreases in A1C among those with an initial A1C $\geq$ 7% were correlated with post-intervention self-care activities and/or increases in self-care activities related to consuming 5 servings of fruits and vegetables a day, spacing carbohydrates, physical activity, and checking shoes and feet ($p < .05$). Healthcare providers rated their older adult patients' ability to undertake specific diabetes related activities as a barrier to care. Overall, providers were much more confident in their own ability to give instructions or examinations than in facilitating actual change.

INDEX WORDS: A1C, Older Americans Nutrition Program (OANP), Elderly, Diabetes Self-Care Activities, diabetes translation, glucose testing, foot care, eating plan.

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DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2004

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May 2004

DEDICATION

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ACKNOWLEDGEMENTS

I would like to thank my major Professor Dr. Mary Ann Johnson. You did a wonderful job of accommodating the life I brought to school. I would also like to thank everyone in the lab for all their help, it has been a wonderful place to work because of you. My committee members have also been helpful and supportive, thank you.

Most of all I must thank all of the family and friends who have provided moral support, child care and friendship through this academic undertaking. I would never have made it without all the resources and support available and offered to me. I would specifically like to thank my parents who have been extremely supportive, even though I am too old to still be in school. Lastly, I would like to acknowledge and thank my wonderful husband and daughters, I Love You! And the fur bus was fun too!

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CHAPTER 1

INTRODUCTION

This study evaluates the effectiveness of a nutrition and diabetes education program in older adults in north Georgia who attend a county Older Americans Nutrition Program (OANP). Older adults were selected as the target population because they make up the bulk of diabetes cases in the United States. Over 18% of Americans, 60 years and older, were diagnosed as having diabetes in 2002 (CDCP, 2002a). The Centers for Disease Control and Preventions' Division of Diabetes Translation projects that by the year 2050 diabetes will increase to 29 million cases, or 7.2% of the worldwide population. In the United States those 75 years and older, as well as minorities, will make up the bulk of this increase (Boyle et al., 2001; Hiss, 2001). This rise may be particularly pronounced in Georgia because of its large older adult population (GDHR, 2003). OANP participants in northeast Georgia have been found to have high levels of nutritional risk factors and poor glycemic control (Brackett, 1999). Moreover, Georgia was found to be remiss in meeting the recommended standards of care for its diabetes Medicare patients (Jencks et al., 2003).

Currently, the most important laboratory test to monitor long term blood glucose or metabolic control is hemoglobin A1C, generally known as A1C (ACE, 2002a). Patients' success at diabetes management is often based on their metabolic control (Glasgow et al., 2000). However, diabetes education focuses heavily on self-care activities and changes in these activities should also be evaluated for progress, not just reductions in A1C (Fain et al., 1999). To find out how the OANP population can improve diabetes self-care practices and gain better glycemic control, assessments of their routine practices and typical barriers are needed. There is little information about the interrelationship among diabetes self-care behaviors and beliefs, and A1C control in elders in Georgia OANPs. The concept of diabetes translation is to put research findings into practice so that those with diabetes can achieve and maintain recommended

glycemic control in diabetes management. The National Institutes of Health has charged Diabetes Research and Training Centers (DRTC) to "address barriers between what is thought to represent ideal diabetes care …and what is routinely practiced." From this, the Michigan DRCT developed a framework to better approach their charge (Appendix A) (Hiss, 2002). The research presented in this dissertation addresses aspects of this charge and attempts to answer some of the same questions for older adults attending north Georgia OANPs as well as healthcare providers in the same regions.

In looking at this framework, this dissertation attempts to answer several questions concerning diabetes translation in older adults attending OANPs in north Georgia. That is to summarize the diabetes self-care practices of older adults attending OANPs; to measure the effectiveness of a nutrition and diabetes education program among these older adults; to determine the relationship of A1C blood levels to self-care activities and health beliefs; and to assess the impact of healthcare providers' beliefs concerning the importance of self-care activities.

Chapter 3 discusses a cross sectional study that focuses on current diabetes self-care practices and health beliefs and if these self-care practices and health beliefs relate to control of A1C blood levels. A baseline sample of 105 north Georgia older adults with diabetes was studied. The baseline data included demographic data, a questionnaire on diabetes self-care activities, an assessment of A1C knowledge, health beliefs and barriers, and a blood sample used to evaluate A1C and glucose values. Overall, older adults in Georgia have not been found to complete all the necessary tasks needed for good glucose control (GDR, 1999). Moreover, older adults have been more likely to rate their abilities to complete these tasks as "poor" or "fair" (Kart and Dunkle, 1989).

Next, Chapter 4 addresses whether or not a nutrition and diabetes education program, offered to older adults at their OANP, can increase diabetes self-care activities and result in reductions in A1C blood values. Other outcome research conducted with this population has shown that older adults attending Georgia OANPs are able to adopt significant changes in several nutrition and health related behaviors (Cheong et al., 2003; McCamey et al., 2003). A diabetes-focused intervention by Glasgow et al. (1992) specifically designed for adults 60 years and older (mean age 67) with diabetes, showed improvements in diet and self-glucose monitoring with a mean change in A1C of – 0.5% (baseline A1C of 6.8%; post-test of 6.3%). In the present study, a pre-test/post-test design was utilized to collect the data to answer these questions. Ninety-one of the original 105 older adults answered post-test questions following the intervention which included a second questionnaire on self-care activities, A1C knowledge, and a second A1C and glucose blood sample.

Lastly, Chapter 5 identifies possible barriers to translation by healthcare providers. A two-paged survey was mailed to county healthcare providers (n = 73) to assess three main areas: how important do healthcare providers rate diabetes self-care activities; do healthcare providers and their patients see the barriers to diabetes self-care behaviors equally; and do healthcare providers feel responsible and confident in their abilities to facilitate changes in these activities. Diabetes self-care activities, such as diet, exercise, foot care, and self-glucose monitoring are considered a cornerstone to good diabetes care. Unfortunately, healthcare providers have not always found these activities as important as more clinical aspects of medical care (Glasgow, 2000).

The study found (Chapter 3) that at baseline, older adults were very compliant with taking medication but were only moderately compliant to diet and self-glucose monitoring and

least compliant to exercise. Avoiding high fat foods was the only self-care activity statistically related to A1C level of control. Health beliefs and health barriers were not associated with blood A1C levels. The majority of participants (60%) agreed that understanding their diet was a barrier, but only 21% reported that availability of nutrition services was a barrier. After concluding the nutrition and diabetes education program older adult OANP participants were able to make major improvements in diabetes self-care activities (Chapter 4). Good compliance ($\geq$ 5 days/week) increased in these areas: following a healthful diet, following an eating plan, avoiding high fat foods, spacing carbohydrates, testing blood sugar as recommended by health care providers, and inspecting shoes. Moreover, those participants most in need of change with self-care activities at baseline made the most significant improvements in self-care activities. Decreases in A1C were correlated with post-intervention self-care activities and/or increases in self-care activities related to the consumption of five servings of fruits and vegetables a day, spacing carbohydrates, physical activity, and checking shoes and feet. Finally, in Chapter 5 it was shown that healthcare providers were more likely to rate their patients' ability to undertake an activity as a barrier to care than were their patients. Although providers believed diabetes management was an important responsibility, they did not have confidence in facilitating positive change in their patients.

With the number of older adults expected to rise exponentially in the coming years (Boyle et al., 2002), healthcare resources will be inevitably strained. Previous research has shown diabetes self-care activities to be related to A1C values (Hiesler et al., 2002) and that changes in these activities can reduce A1C values in older adults (Glasgow et al., 1992). Other outcome research conducted with the northeast Georgia OANP population has shown that older adults attending OANPs are able to adopt significant changes in several nutrition and health

related behaviors (Cheong et al., 2003; McCamey et al., 2003), thus it would be expected that this population would make improvements in diabetes self-care activities with concurrent reductions in A1C values. Going forward, more research must be focused on diabetes self-care behaviors in older adult populations. Research is needed to identify nutrition and diabetes interventions that will help older adults make significant changes in their self-care activities and improve their metabolic control. Long-term studies with larger numbers of participants must be included to more fully evaluate specific older adult populations and target the most beneficial self-care activities. With the increasing prevalence of diabetes, there is an urgent need to improve the diabetes self-care activities of older adults in order to improve their quality of life, to prevent life-threatening complications, and decrease overall health care costs (ASA, 2003).

CHAPTER 2

LITERATURE REVIEW

THE BURDEN OF DIABETES

Prevalence of Diabetes

Diabetes is becoming a serious threat worldwide with significant increases projected in the United States. This increase will drain healthcare and financial resources and government and community services, and will negatively impact quality of life. In 2002, it was estimated that 13 million adults nationwide had been diagnosed with diabetes and another 5.2 million remained undiagnosed. That figure translates into 6.2% of the population nationwide (CDCP, 2003b). Older adults make up the bulk of diabetes cases in the United States and statistics bare witness to the seriousness of the situation with a prevalence of over 18% for those adults 60 years and older (CDCP, 2003a). It is, therefore, imperative that we look at who is expected to develop diabetes and what can be done to prevent or manage the disease in order to best utilize the finite resources available at the national, state, county and individual level.

Increases in Diabetes

In order to know how best to disseminate available resources we must anticipate emerging patterns of diabetes. The Center for Disease Control and Prevention's Division of Diabetes Translation projects that by the year 2050 diabetes will increase to 29 million cases, or 7.2% of the United States population (Boyle et al., 2001). Though these projections are merely estimates and subject to change if based on incorrect assumptions, previous projections have been found to underestimate the actual increases. The worldwide prevalence is expected to double by 2025 with the majority of these cases occurring in developing countries (Boyle et al., 2000; Steyn et al., 2002). The Division speculates that in the United States, those 75 years and older, as well as minorities, will represent the bulk of the increase, with a 336% and a 275%

increase, respectively. Diabetes prevalence in women age 75 and older will increase by 271%; and among men it will increase by 437%. Among ethnic groups, blacks are expected to have the greatest increase, with a 271% increase in black women and a 363% increase in black men (Boyle et al., 2001).

Diabetes in Georgia

In Georgia, 7% of men and 8% of women have been diagnosed with diabetes by a physician in 2002. The number increases to 10% of the population if both diagnosed and undiagnosed cases are included (GBRFSS, 2002; GDR, 2003). The percentage of adults diagnosed with diabetes increases with age, until age 70, with 12%, 17%, and 16% of those 50 – 59, 60 – 69 and 70+ plus years old having been diagnosed with diabetes, respectively (GDR, 2003). Georgia has the sixth fastest aging population in the nation for those 60 years and older, and the fastest aging population for those 85 years and older. For Georgia's population 60 years and older, the expected growth rate is 82% from 1990 - 2010. For those 85 and older, the growth rate is expected to rise 264% (GDHR, 2003). In the Atlanta regional area, the percentage of the population 60 and older is expected to double over the next 30 years (ARC, 2003). Both state and regional figures are significantly higher than the national increase of 34% for those 60 years and older and 88% for those 85 years and older (GDHR, 2003). This expected increase could lead to a significant rise in the percentage of the population with diabetes in Georgia.

GLYCOSYLATED HEMOGLOBIN

Recommended Levels

Currently, the most important laboratory test to monitor a patient's level of blood glucose or metabolic control is A1C. It is becoming increasingly important that individuals know and

understand their A1C blood levels. Monitoring A1C levels will help healthcare providers and patients to assess their level of metabolic control and to anticipate the possible degree of complications. A1C is directly related to the level of mean metabolic control. It represents the amount of blood glucose that has adhered to a person's hemoglobin, given as a percentage. Because red cells live for two to three months, an A1C test can assess the average blood sugar over that time period. An A1C blood level of 6%, 7%, and 8% correlates with a mean plasma glucose of 135 mg/dl, 170 mg/dl, and 205 mg/dl, respectively (ADA, 2003a). This test has been invaluable in studying the effects of differing levels of blood glucose control. Epidemiological data has shown that for each 1% absolute decrease in A1C, micro-vascular and macro-vascular complications were decreased approximately 30% and 14%, respectively (ACE, 2002a).

There is considerable controversy on the appropriate recommended A1C level. The American College of Endocrinologists (ACE) 2002 consensus statement on glycemic control noted that an A1C blood level of 6.5% is "3.5 standard deviations above the mean A1C in non-diabetics," and recommended $\leq$ 6.5% as an A1C goal for those with diabetes (ACE, 2002a). Mean (±SD) A1C was found to be 5.17 ± 0.45% for a subset of those in NHANES III without diabetes or elevated fasting plasma glucose (Rolfing et al., 2000). The American Diabetes Association (ADA) currently recommends an A1C blood level of < 7.0%. An A1C blood level > 8% is considered high (ADA, 2002a).

Landmark Studies on Metabolic Control of Diabetes

Two landmark studies have been completed concerning diabetes metabolic control: the Diabetes Complication and Control Trial (DCCT), and the United Kingdom's Prospective Diabetes Study (UKPDS). Both studies examined the number of complications associated with different levels of A1C and found that those participants who were able to keep their blood sugar

levels closer to normal or maintain tight control (defined by a lower level of A1C) did not experience the rates of complications associated with higher A1C levels (DCCT, 2002; UKPDS, 1998). The DCCT was initially published in 1993. It examined tight control versus conventional treatment of type 1 diabetes and achieved a 1.9% difference in A1C between the two groups. The tight control group achieved an A1C of 7.2%, compared to 9.1% in the controls (Mooradian and Chehade, 2000). The study demonstrated conclusively that there was a statistically significant reduction in retinopathy, neuropathy, and nephropathy with tight control (DCCT, 2002; Mooradian and Chehade, 2000).

The second major study was the UKPDS, which looked at 5,102 newly diagnosed type 2 diabetes patients from 1977 to 1991. The study compared conventional to intensive treatment and achieved a 0.9% difference in A1C between the two groups. The intensive treatment group achieved an A1C of 7.0%, compared to 7.9% in the control (Mooradian and Chehade, 2000). To date, no randomized controlled trial has achieved a mean A1C blood level below 7% (Abraira et al., 2003). Tight control was found to result in statistically significant lower rates of retinopathy and nephropathy over ten years. The study also found a 35% reduction in complications for each percentage point of decrease in the A1C number (UKPDS, 1998). In the UKPDS, complications began to rise with an A1C of 6.5% and for each 1% absolute rise in the A1C level, micro-vascular complications rose 25%. Neither study showed a statistically significant reduction in cardiovascular complications (DCCT, 2002; UKPDS, 1998). The two primary drawbacks associated with tight control are an increase in hypoglycemic episodes and body weight gain (DCCT, 2002; Krentz, 1999). There were significantly more hypoglycemic episodes in those being treated with insulin. In the UKPDS, the hypoglycemic rate in those treated with diet was 0.7%, compared to 1.8% of those using insulin (Krentz, 1999). Together these studies provide

the information needed for doctors and patients to understand the importance of monitoring A1C levels and to bring a fuller understanding of the relationship between the level of metabolic control and the increased risk of complications.

Characteristics of A1C Levels

Some studies have found specific characteristics that may assist health care providers in identifying those patients who may have the most difficulty in obtaining controllable A1C levels. An inner city outpatient diabetes clinic in Atlanta, Georgia, serving a primarily black population with type 2 diabetes, analyzed poor responders, as defined by A1C levels, to look for "distinguishing variables." The program's standard care was an initial visit, followed by six visits over the following six months, with an additional two visits by year's end. The mean initial A1C level for all patients included in the study was 9.6%, followed by 8% at their six-month visit. Patients were divided into groups based on their A1C levels at twelve months. Out of all of those attending, 166 participants were considered responders to treatment reporting an initial A1C of 8.8%, followed by 6.2% after one year. There were 123 poor responders with an initial A1C of 10.8% and an A1C of 10.9% at one year. Poor responders were more likely to have had diabetes longer, had a greater BMI, as well as a higher A1C at the initial visit (Cook et al., 2001). The UKPDS also found poorer glycemic control with duration of diabetes (Mooradian, 1999; UKPDS, 1998).

In contrast, a study by Murata et al. (2003) found those participants with an elevated A1C at baseline to make statistically significant reductions in A1C blood levels following increased self-glucose monitoring. The study included 201 participants with stable insulin treated type 2 diabetes. Mean A1C blood level was 8.1%, and 45% of participants had an A1C > 8%. Decreases in A1C were only significant for those with baseline A1C blood levels of > 8% or

those most compliant to glucose-self monitoring. The results of this study are encouraging because it demonstrates that those most in need of change (with an A1C > 8%) were able to make significant improvements (Murata et al., 2003).

Older Adults and A1C Control

Older adults may not be fully aware of A1C or of the need to closely track their own A1C levels. In a review of NAHNES III data, poor control (> 8%) of A1C was found in 37% of those with diabetes. In looking at older adults with diabetes, researchers found 38%, 37% and 27% of those ages 55-64, 65-74, and 75 years and older respectively, to have poor A1C control (> 8%) (Shorr et al., 2000). The 1999 Georgia Diabetes Report found that only 22% of Georgia seniors 65 and older with diabetes had even heard of A1C and of those, only 40% had their A1C level checked 1 or 0 in the last year.

It is important that older adults begin to understand and to follow their own A1C level especially since the report also noted that only 6% of those patients with diabetes received the minimum standard for care, while 11% received no routine care (GDR, 1999). Routine care includes visits to healthcare professionals, foot checks at each visit, dilated eye exam, and testing of hemoglobin A1C. Often healthcare providers of older adults do not utilize A1C as recommended, which can further exacerbate older adults' ability to maintain acceptable A1C control. The Health Care Finance Association (HCFA) in collaboration with the American Diabetes Association has developed the Diabetes Quality Improvement Project (NCQA, 2003) to "create consensus around a single set of diabetes measures for performance reporting." The HCFA has begun a systematic program to evaluate the quality of care received by fee-for-service Medicare beneficiaries and has ranked states on the quality of medical care they are providing for diabetes. The state of Georgia was ranked 47 out of 51 states in 1999 (HCFA, 2002). In

reviewing the state's delivery of medical care in 1997 – 1999, Jenkins et al. (2000) found that only 63% of Georgia Medicare beneficiaries had A1C values measured as recommended by the DQIP. In reviewing 2000 – 2001 data, the state showed some improvement with A1C testing performed for 74% of beneficiaries. The performance rate of the median state was 78%, with a range of 55% - 87% of beneficiaries having A1C taken as recommended (Jencks et al., 2003).

The DQIP, as well as the American Diabetes Association Clinical Practice Recommendations, recommend that healthcare providers collect A1C levels for monitoring purposes and that values should be maintained at < 7.0%. Unfortunately, healthcare providers are not collecting A1C routinely and many see A1C levels related to compliance with an "all or nothing" view. Deichmann et al. (1999) also found A1C to be underutilized by physicians. Harris (2001) found that those with diabetes who tested their blood glucose levels generally had higher A1C levels, possibly indicating that physicians may not begin to take diabetes seriously until the disease starts to progress and becomes more difficult to treat. Perhaps, once consistent monitoring of A1C becomes standard practice, those with diabetes and their healthcare providers will begin to undertake the routine assessments and daily activities required to bring down A1C levels and thus the risk of future complications.

Summary

Monitoring A1C blood levels is currently the best way to control diabetes. It is recommended that levels be kept at $\leq$ 6.5% (ACE, 2002a). Both the UKPDS and the DCCT found tight control to be associated with lower rates of complications associated with the disease (DCCT, 2002; UKPDS, 1998). It is therefore imperative that older adults, as well as their healthcare providers, become aware of the need to consistently track A1C levels.

DIABETES SELF-MANAGEMENT

Diabetes Self Management Education (DSME)

Though genetics play an important role in the development of diabetes, monozygotic twin studies have certainly shown the importance of environmental influences (Paulsen, 1999). Individuals with diabetes have been shown to make a dramatic impact on the progression and development of their disease by participating in their own care (DCCT, 2002; UKPDS, 1998). This participation can happen only if those with diabetes, and their health care provider, are informed about how to care effectively for the disease with diabetes education. It is expected that those with the greatest knowledge will have a fuller understanding on how to deal with their diabetes on a daily basis and will be able to make the biggest impact on the progression of the disease and their risk of complications.

The American Association of Clinical Endocrinologists emphasizes the importance of patients becoming active, knowledgeable participants in their care (ACE, 2002b). Likewise, the World Health Organization's Joint Task Force for Diabetes recognized the importance of patients learning to manage their diabetes, noting that special consideration should be given to the education of older adults (Hendra and Sinclair, 1997). The American Diabetes Associations Task Force reviewed the National Standards of Diabetes Self Management Education (DSME) and found that there was a four-fold increase in diabetic complications for those individuals with diabetes who did not receive formal education concerning self-care practices. The Task Force also found that the majority of people with diabetes did not receive formal diabetes education (Mensing et al., 2002). Healthy People 2010, the U.S. government's health related goals for the nation states the need to "Increase the proportion of persons with diabetes who receive formal

diabetes education." The new target is that 60% of those with diabetes should receive formal diabetes education. Based on 1998 data, only 47% of all those with diabetes received formal diabetes education. Unfortunately, older adults received less education and the percentage of those receiving education decreased with age. For those aged 65 - 74, only 40% received formal education and this declined to only 27% of those 75 years and older (Healthy People 2010; Mensing et al., 2002). This appears contradictory because it is expected that older adults and minorities will be hardest hit by the epidemic of diabetes. It is shortsighted to ignore the potential benefits of diabetes education in older adults.

A review article on diabetes self-management education by Norris et al. (2002) found education to be successful in lowering A1C levels. The majority of the studies were conducted by a team of healthcare professionals in a clinic setting with an educational focus on lifestyle interventions. Reductions in A1C were most significantly related to the contact time between the participants and the educator with a 1% reduction for every 23.6 hours. Intervention participants achieved a mean A1C reduction of 0.76% more than controls.

Diabetes Self Care Activities

Diabetes education is important but it must be transferred to action or self-care activities to fully benefit the patient. Self-care activities refer to behaviors such as following a diet plan, avoiding high fat foods, increasing exercising, self-glucose monitoring, and foot care. Ruggiero et al. (1997) stated that diabetes self-care should be "considered a cornerstone of the overall management of diabetes." Focusing primarily on increases in knowledge or on laboratory improvements may miss substantial changes made by patients. Health care providers have not delivered diabetes self-management activities as frequently as more clinical requirements of diabetes care (Glasgow et al., 2000). In collecting data we must consider a broader aspect of

diabetes care. Decreasing the patient's A1C level may be the ultimate goal of diabetes self-management but it cannot be the only objective included in a study design. Changes in self-care activities should also be evaluated for progress toward behavioral change (Walker, 1999). In reviewing patient education research, Fain et al. (1999) recommends "collecting data that reflect the efforts of diabetes education." If participants are being asked to monitor their carbohydrate intake to achieve better metabolic control then the number of days they spread their carbohydrates evenly through the day should be counted as well, not solely the changes in A1C values. Some patients may begin to be aware of their diet and the need to monitor carbohydrates but be unsure of what to do in every situation. Their A1C levels may not decrease yet they are beginning to undertake a pivotal self-care behavior. Ultimately, it is adherence to self-care activities that will reduce A1C blood levels and thus the risk of developing future complications. Therefore, changes in self-care activities should be followed when evaluating education programs.

Compliance to Self-Care Activities

The majority of patients with diabetes can significantly reduce the chances of developing long-term complications by improving self-care activities. Despite this fact, compliance or adherence to these activities has been found to be low, especially when looking at long-term changes. Patient compliance with all recommended treatment activities has ranged from 7 - 25% in previous studies (Becker and Janz, 1984; Shabhana et al., 1999; Cerkoney and Hart, 1980). Though not consistent, the ability or willingness to comply with self-care activities has been associated with several factors including demographics; the specific change; what the patient is going through; the degree of symptoms; the state of the disease; difficulty of the behaviors; duration of disease; age of the patient; perception of severity; knowledge scores; patient

satisfaction with their medical care; patient provider relationship; gender; lower perceived competency of their doctor; and health beliefs (Albright et al., 2001; Algona, 1980; Ciechaowski et al., 2001; Cerkoney and Hart, 1980; Kurtz, 1990; McNabb, 1997; Nagy and Wolfe, 1984; Rosenstock, 1985; Schartz, 1988; Wing et al., 2001).

The degree of symptoms may also contribute to compliance rates. Patients with fewer symptoms may feel like their behaviors are actually helping them and, over time, the behaviors may keep their symptoms low. Consequently, patients with more symptoms feel like they are fighting an uphill battle and have lower levels of compliance (Nagy and Wolfe, 1984). An unfortunate reality of the progressive nature of type 2 diabetes is that adherence to self-care activities does not automatically mean good metabolic control and this may lead to apathy of self-care activities (Muntra et al., 2003; Rost et al., 1990). Harris (2001) did not find the frequency of self-glucose monitoring to be strongly related to glycemic control. Research has shown that metabolic control is a combination of many variables, not just patient compliance. Generally, the less patients follow recommended self-care activities, the more likely they will be to have higher glucose levels; unfortunately, there is no guarantee that full compliance with self-care activities will result in good metabolic control (Kurts, 1990; Mazze et al., 1985; McNabb, 1997; Toljamo and Hentinen, 2001). Consequently, because it can be difficult to discern when a lack of compliance is the culprit of poor metabolic control or merely the natural physiologic progression of the disease, it can be difficult to keep patients motivated to maintain self-care activities. Healthcare providers should be aware of these influences and work toward encouraging long-term compliance.

Research has also shown that patients are more likely to comply with more straightforward aspects of care, such as taking medication (Ary et al., 1986; Glasgow et al., 1987

and 1992), though not all previous studies have found this to be true (Shobhana et al., 1999). How many changes the patient is being asked to make may also have an impact. The Hypertension Trial found participants were more likely to make changes when each change was implemented individually and less compliant on any single change when given as a combination of changes (Wing et al., 2001). Success, therefore, may vary depending on how the changes are implemented, simultaneously or individually.

Recommendations for Self-Care Activities

Because diabetes self-care activities can have a dramatic impact on lowering A1C levels, healthcare providers and educators should evaluate perceived patient barriers to self-care behaviors and make recommendations with these in mind. Continued follow-up is also crucial. Some patients may have a difficult time understanding and following the basics of diabetes self-care activities. When adhering to self-care activities patients are sometimes expected to make what would in many cases be a medical decision, and many patients are not comfortable or able to make such complex assessments. Patients should eat heart healthy diets but they must also be aware of how carbohydrates affect their glucose levels. They are asked to exercise but must also be aware of their blood sugar levels before, during, and after exercise. They are also asked to add further daily activities such as self-glucose monitoring, foot care, and medication. Furthermore, these requirements are specific to each patient and can change regularly depending on the patient's response (McNabb, 1997).

Health care providers should begin by taking time to evaluate their patients' perceptions and make realistic and specific recommendations for self-care activities. Unfortunately, though patients often look to healthcare providers for guidance, many healthcare providers are not discussing self-care activities with patients (MMWR, 2002; Ruggiero et al., 1997). Patient

barriers, as perceived by patients and diabetes educators, have been evaluated for differences. Many barriers were similar for both patients and educators though they did not always view the barriers equally (Shultz et al., 2001).

Diabetes Self-Management Programs

There are many reports of diabetes interventions that have been shown to improve metabolic control (Glasgow et al., 1992; Miller et al., 2002; Murlow et al., 1987; Norris et al., 2002; Ridgeway, 1999). The program we sought to offer needed not only to fit the OANP community but also to be flexible enough to adjust to the characteristics of each individual OANP site. Many of the pre-set programs available were made for clinical settings or focused too narrowly on a specific ethnic, income, age, or literacy group. Our program also needed to cover all of the topics included in our assessment tools and not focus exclusively on one or two diabetes self-care activities, such as diet or glucose monitoring. In reviewing all of the information available, we found many topics well covered in several sources. Therefore, it was decided that our team of nutrition and health educators specializing in older adults would develop the program/intervention to appropriately address the community setting covering those topics believed to be most important to diabetes care in our population while being flexible enough to be adjusted for the characteristics of each site. The focus of the program was on increasing knowledge and self-care behaviors leading to a lowering of A1C blood levels. The Health Belief Model was utilized for the development because it is based on motivating people to take action**.** "Eat Well, Live Well" was developed by our nutrition and health educators and reviewed by experts in the field of diabetes.

Summary

It is important that those with diabetes begin to contribute to the management of their own care through self-care activities. There is a four-fold increase in diabetes complications for those with diabetes who do not receive formal diabetes education (Mensing et al., 2002). Furthermore, diabetes education focuses heavily on self-care activities and thus changes in these activities should be evaluated for progress, not just reductions in A1C (Fain, et al., 1999). Unfortunately, compliance to these activities is poor and does not automatically translate into lower A1C blood values (Becker and Janz, 1984; Shabhana et al., 1999; Toljamo and Hentinen, 2001). Healthcare providers should give realistic and specific recommendations. Diabetes education or programs should be custom fit to meet the individual needs of the participants it seeks to serve.

SPECIAL CONCERNS OF OLDER ADULTS

Because a patient's ability to follow and understand his or her recommended regimen can have a significant impact on the disease, it is important that individual needs are considered. Therefore, when discussing diabetes self-care activities, the difficulties of the older adult should not be overlooked or simplified**.** Self-care activities can be complex, time consuming, and costly to maintain in a life-long chronic condition such as diabetes, especially in an elderly population (ADA, 2002a). In 1984, the National Center on Health Statistics found adults 85 and older were more likely to rate their ability to complete self health care as "poor" or "fair" compared to younger people (Kart and Dunkle, 1989).

Glucose Control

A1C blood values have been identified as the best way to monitor metabolic control. A1C levels have been shown to be predictive of cardiovascular mortality in older adults and control of A1c reduces complications associated with type 2 diabetes (Mooradian et al., 1999 and 2000; UKPDS, 1998). Many older Georgia adults are not aware of their own A1C level (GDHR, 1999). Unfortunately, people with diabetes trying to maintain strict glucose control are at a higher risk for complications from hypoglycemia, or low blood sugar (Grossain et al., 1994). Hypoglycemia may be exacerbated in older adults by a reduction in glucagon response making older adults more dependent on epinephrine (Meneilly and Tessier, 2001). In the DCCT people trying to achieve tight blood glucose control tested their blood sugar three to four times a day or more, suffered three times more hypoglycemia and gained an average of 10 pounds (DCCT, 1998). Research has shown that diabetic hypoglycemic episodes can impair cognitive functions even in healthy male volunteers. Normal cognition did not necessarily return along with glucose levels (Evans, 2000). Older diabetic adults are at higher risk of strokes or heart attacks from hypoglycemia than the general population (ADA, 2002a). Therefore, older adults and healthcare providers may also worry about possible complications associated with maintaining tight control of A1C blood levels though new medications make such complications less of a threat (Mooradian et al., 1999). It has been recommended that older adults with medical conditions such as poor eyesight, kidney disease or cardiovascular disease not undertake standard tight blood glucose control. Adults with type 2 diabetes taking oral or no medication can often maintain good glucose control by monitoring their diet and exercise and working with their doctor. Furthermore, for those who can keep their A1C low, glucose testing may be needed only once a day or once a week (ADA, 2002a). This variation in the pathway to "good glucose

control" that must be considered when giving individual patient recommendations, especially to the elderly.

Cognition

Another concern in older adults with diabetes is that they may be more likely to have reduced functional and cognitive abilities independent of hypoglycemic episodes (Gregg et al., 2002; Jacobson, 1986; Meneilly and Tressier, 2000; Ryan and Geckle, 2000). Gregg et al. (2002) examined 8344 women age 65 and older, enrolled in the Study of Osteoporotic Fractures. Five hundred and twenty-seven of the women had diabetes and were found to suffer two times the rate as non-diabetic women (9.8% compared to 4.7%) in functional disabilities. In reviewing the literature concerning cognitive skills, verbal learning and memory were found to be lower in older adults (65+) with type 2 diabetes (Ryan and Geckle, 2000). In a case control study of 396 subjects with diabetes compared with matched non-diabetic controls, those with diabetes were significantly more likely to have impaired cognitive abilities. A comparison of adults with diabetes, with and without cognitive impairment, found the differences in diabetes self-care performance and activities of daily living to be significant (O'Doud, 2001). Studies have also shown decreasing A1C levels in the elderly to be associated with improved cognition (Meneilly and Tressier, 2000). Healthcare providers and educators must ensure that their recommendations take individual abilities into account.

Ability to Make Change

On a more positive side, research has shown that older adults with diabetes are able to make significant changes in diabetes self-care activities. Glasgow et al. (1992) examined 102 patients with diabetes, 60 years and older, from several large diabetes centers. In a cross over study design, half the participants were assigned to the full intervention, a 10-session self-

management class directed at improving self-care activities immediately (immediate), while the other half started later and were used as controls (delayed). Both groups had the same mean age of 67, diabetes duration of 9 years, and were predominately female. The baseline A1C level was 6.8% for the immediate intervention group and 7.4% for the delayed. The program produced a change in dietary intake and glucose testing; the decrease in A1C was statistically significant for the intervention group at post-testing, though not at a three-month follow up**.** The post-test A1C was 6.3% (-0.5%) for the early intervention group and 7.0% (-0.4%) for the delayed. The study assessed diabetes self-care in five areas using food and exercise diaries, as well as several clinic appointments along with a modified Summary of Diabetes Self-Care Activities (SDSCA). The authors' concluded that older adults with diabetes are able to make significant changes with a tailored intervention (Glasgow et al., 1992). Other nutrition education programs with older adults have also have shown improved metabolic control compared to controls in randomized studies (Miller et al., 2002). Unfortunately, each of these studies was clinic based. Significantly fewer studies are available on older adults in community settings. Coonrod et al. (1994), in a review of diabetes education, found adults with lower socioeconomic status and living outside of metropolitan areas were less likely to have received diabetes education.

ASSESSMENTS TOOLS IN DIABETES RESEACH

Self-Report

The following discussion reviews the tools used to assess adherence to self-care behavior, health beliefs and A1C knowledge with self-report. There has been considerable research and discussion on how best to assess adherence of diabetes self-care (McNabb, 1997). In the 1980's, glucose meters with memory were introduced and several studies were done to assess the accuracy of patient reports of self-monitoring of blood glucose. Patients unaware of the meter's

feature were significantly more likely to falsify reports, as opposed to those notified of the meter's memory (Masse et al., 1984, Williams et al., 1988; Wilson and Endres, 1986). Similar studies have also been done on the difficulties of obtaining accurate self-reports of diet (Riley and Blizzard, 1995; Schoeller, 1995; Vulckovic et al., 2000). Though self-report has its flaws and biases, it remains an easy, inexpensive, and practical way of assessing patient adherence in several areas. In a survey of 1,032 older adult patients with diabetes from Veterans Administration facilities, Heisler et al. (2003) found higher diabetes self-management to be significantly related to lower A1C blood level and receipt of diabetes related medical services. Self-report of medication, diet, blood glucose monitoring and exercise were each individually related to A1C levels. The study included a self-assessment of diabetes self-management over the past year combined with a review of medical records.

Summary of Diabetes Self-Care Activities, SDSCA

The Summary of Diabetes Self-Care Activities (SDSCA) is a validated self-report tool that has been used for 18 years. The SDSCA has 11 core questions that assess the level of self-care in five main areas considered essential for diabetes care. The areas are diet (general and specific), exercise, self-glucose monitoring (SGM), foot care, and smoking. The questions are about personal self-care activities, not about the patient's compliance to a specific regimen or plan provided by the healthcare provider. The form assesses each area individually and does not compute a total "adherence" score. The questionnaire also contains 14 additional items on self-care recommendations that have not been validated for reliability (Toobert et al., 2000). Each of the five areas is reviewed below.

There are four questions on diet, two concerning eating plans or general diet, and two on specific dietary intakes of fruits and vegetables and avoiding high fat foods. In a study of 208

subjects, those with diabetes were most likely to report the least amount of compliance to diet and exercise. The two primary reasons for not adhering to their diet were based on where they were eating and what was being offered (Ary et al., 1986). Previous research has shown that medical nutrition therapy or nutrition interventions can have a significant impact on weight loss and metabolic control, decreasing overall A1C levels by 0.9 – 2% (Pastors et al., 2002). In Georgia, 19% of those with diabetes claim to consume five or more servings of fruits and vegetables a day, compared with 23% of the non-diabetic population (GDR, 2003). There has been considerable debate on the best distribution of macronutrients for those with diabetes (Howard, 2002). The quality and quantity of dietary fat have both been found to affect metabolic control. High fat diets are associated with insulin resistance in animal studies, but human studies have been less consistent (Howard, 2002; Styn et al., 2002). Observational studies have maintained an association between a higher fat intake and prevalence of diabetes (Howard, 2002). Current dietary fat recommendations for those with diabetes have been based on elevated cardiovascular risk from diabetes and the level of obesity (ADA, 2002b; Howard, 2002).

There are two questions concerning exercise participation. Exercise has been shown to decrease blood glucose levels by increasing insulin sensitivity and benefiting carbohydrate metabolism. In their 2002 position statement on exercise and diabetes the American Diabetes Association recommended exercise as a high priority for those with type 2 diabetes encouraging adherence to the Surgeon General's report to participate in 30 minutes of exercise most days of the week (ADA, 2003b). In Georgia, 68% of those with diabetes claim to get some exercise, compared with 72% of the non-diabetic population (GDR, 2003).

There are two questions regarding routine foot care. Many of those with diabetes do not see foot care as a priority and many physicians do not make foot exams part of their standard

care. In a study comparing the ability of younger and older adults to undertake routine foot care, older adults were unable to perform many of the basic tasks necessary, such as reaching their feet or treating plantar lesions (Thompson and Mason, 1992). Consequently, inadequate foot care is considered a primary cause of emotional distress, morbidity and amputation. Peripheral disease can lead to a loss of feeling in a patient's foot, causing the patient to be unaware of blisters or cuts until significant damage has been done (ADA, 2002b). Stuart et al. (1983) found that physicians were three times more likely to examine a patient's feet in a clinic setting if the patient's shoes and socks were removed. National data collected from 1995 – 2002 showed improvements in the number of older adults receiving an annual foot exam (MMWR, 2002).

There are two questions pertaining to self glucose monitoring. As has been discussed, A1C is a powerful tool in guiding diabetes care. The Diabetes Quality Improvement Plan (DQIP) as well as the American Diabetes Association recommend that healthcare providers collect hemoglobin A1C levels for monitoring purposes. The ADA recommends levels should be maintained < 7.0% (ADA, 2003c). The American Association for Endocrinologists has stated that A1C levels for diabetics should be maintained at $\leq$ 6.5% (ACE, 2002a). National data collected from 1995 - 2001 showed that older age groups had lower rates of self-glucose monitoring (MWMR, 2002).

In reviewing NHANES III national data Harris (2001) found that the majority, some 80%, of those being treated with diet had never monitored their blood glucose levels. Of those taking oral medication 65% had never self-monitored their blood glucose levels and only 5-6% tested once per day (Harris, 2001). In Georgia, 51% of those with diabetes tested their blood sugar once per day and 21% of those not using insulin tested their blood sugar once a day (GDR, 1999 and 2003). Nationally, 29% of those being treated with insulin had never tested their own

blood sugar and 39% tested only once per day (Harris, 2001). In Georgia 66% of those using insulin checked their blood sugar once per day, almost double the national average (GDR, 1999). It does not appear that blood glucose testing becomes a priority until diabetes is severe, with an elevated A1C elevated (Harris, 2001).

There is one question concerning smoking in the study: Do you smoke? No other tobacco products are examined. Smoking is not directly related to diabetes but is addressed in the majority of health programs for those with diabetes because it is associated with such significant increases in complications. The ADA's 2003 position paper on smoking and diabetes found that "only about half of the individuals with diabetes are advised to quit smoking by their health care providers." Tobacco use among those with diabetes is similar to that of the general population, with 26-28% being smokers. The rates tend to be lowest in the oldest population. The ADA's position statement concerning smoking and diabetes recommends that all physicians conduct "routine and thorough health assessments of tobacco" (ADA, 2003d).

Health Beliefs and the Health Belief Model

There are several behavioral theories that can help to explain health related behaviors. One of the most popular is the Health Belief Model (HBM). The HBM considers factors within a person or intrapersonal factors. The model was originally developed in the 1950's to assess preventive health behaviors or willingness to undertake preventative health care practices (Rosenstalk, 1974). Participant characteristics, such as demographics, have not consistently shown a predictive value in evaluating participant success (O'Connor et al., 1997; Walker, 1999). The HBM relies on the individual's perception that a health problem may affect him. It also deals with the person's view of steps to take in regard to the health problem or potential health problem. The theory looks at how perceived susceptibility, severity, benefits and barriers

affect a person's readiness to act. The theory also assesses cues to action and self-efficacy (NIH, 2002; USF, 2002). It is believed that a person's perceived susceptibility and severity, combined with what he or she sees as a threat of disease, inspires the person to follow recommended activities. It is the perceived benefits, minus the barriers, that determine which activities or behaviors the patient chooses to act or comply with. The cues to action, motivation and self-efficacy, provide the energy needed to step the patient up to the decision to act (Janz and Becker, 1984; Rosenstock, 1974; Yarborugh, 2001).

Research has shown support for the relationship of adherence to diabetes self-care activities and health beliefs (Polly, 1992). Interventions based on the HBM or other theory driven interventions have been shown to be successful (Miller et al., 2002; Schatz, 1988). Studies have been done using the HBM to predict adherence to self-care activities in several medical conditions such as hypertension, heart disease, arthritis, cancer, and diabetes (Becker, 1974; McDonald-Miszczak et al. 2001; Yarborough, 2001). Alogna (1980) assessed 50 patients' perceived severity of their diabetes. The participants were assigned to one of two categories, compliant or noncompliant, based on weight loss and metabolic control at baseline. The two groups were found to have an equal number of complications. The study showed that the compliant group perceived their diabetes as more serious. The criteria for metabolic control were a random plasma glucose of 195 mg/dl or less, combined with a set criteria for weight loss. The primary flaw of this study was the use of a single random blood sample with a cut-off of 195 mg/dl as a marker of metabolic control. The assignment to the compliant or not compliant group may have been different if the researchers had used A1C level as a marker of compliance. Significant associations were also found between the HBM and compliance to self-care regimens and physiologic measures in two other studies. However, both of these studies used a composite

score for diabetes self-care compliance no longer considered to be an accurate way to assess compliance. It has proven difficult to find a specific behavior or belief that determines commitment in all populations (Cerkoney and Hart, 1980; Glasgow et al., 2000; Harris et al., 1982**).**

The HBM was used to develop a tool to help researchers better understand why patients with diabetes did or did not comply with their self-care activities (Becker and Janz, 1984; Given et al 1983). In 1990, Hurley reviewed and tested 16 questions concerning the HBM and diabetes and found the reliability and validity of 11 to be acceptable. The 11 questions were in 3 of the 4 HBM areas and included barriers, benefits, and seriousness. Hurley's questionnaire can help to identify specific health beliefs and possible areas of association.

The HBM was utilized in the development and evaluation of the "Eat Well, Live Well" nutrition and diabetes education program for Georgia OANP participants. Because diabetes education programs in specific populations, such as those with low literacy, have not always been successful (Mulrow et al., 1987), it was strongly believed that the selection of a suitable program was essential to its success. The program was developed to increase knowledge, as well as self-care behaviors. The HBM was chosen because it is based on motivating people to take action. It is a good fit with diabetes because it is a 'value-expectancy' theory meaning it combines the avoidance of a perceived threat with the belief that a specific action will prevent the threat. The "Eat Well, Live Well" program was developed with a focus on the seriousness of uncontrolled diabetes, the benefits of individual self-care behaviors, and an assessment of possible barriers. Research has shown support for the relationship of adherence to diabetes self-care activities and the HBM domains, benefits (Koch, 2002), barriers (Aljaem et al., 2001; Polly, 1999), and severity (Algona, 1980; Kurtz, 1990). Others have found the relationship of health

beliefs and diabetes activities to be complex and difficult to summarize (Glasgow et al., 1992). In a theory based nutrition intervention for older adults with diabetes Miller et al. (2002) found it successful to limit the number of concepts at any one time and continually reinforce the health relationships throughout the entire program. The "Eat Well, Live Well" program was also designed this way with a limited number of new concepts introduced at each lesson. However, in order to reinforce basic concepts, the ABC (controlling A1C, blood pressure and cholesterol) message was reinforced at each visit.

Barriers to Diabetes Care

As stated previously, it is the perceived benefits minus the barriers that determine which behaviors the patient chooses to act on or comply with. Therefore, prior to discussing the benefits of adhering to diabetes self-care activities it would be beneficial to know the most commonly perceived barriers in the population. There are many types of barriers those with diabetes may encounter related to their medical care. Following diabetes recommendations must be perceived as beneficial and worth overcoming any barriers. Zigibor and Simmons (2002) reviewed the results of 323 multiethnic diabetic participants who reported experiencing barriers to self-care practices. Subjects who were experiencing financial and access problems were least likely to perform self-glucose monitoring a minimum of twice per week. Subjects were also less likely to comply if they were experiencing barriers related to support, self-efficacy, motivation and health beliefs. Once the patient's perceived barriers are addressed he or she can often begin to focus on the benefits of behaviors. Unfortunately, the barriers a patient experiences are frequently not what the health care provider perceives the patient as experiencing, making it difficult for the health-care provider to help.

Barriers to Diabetes Care as Perceived by Health Care Providers

Healthcare providers should be an important part of patient care. In order to provide adequate support healthcare providers must see the reality of adhering to diabetes self-care activities as perceived by their patients and avoid blaming patients when compliance is low (Marrero, 2000). Chin et al. (2001) administered the Provider Barriers Survey to 279 healthcare employees providing care for the underserved. The questionnaire assessed the barriers to care in regard to six areas of diabetes care; A1C, self-glucose monitoring, dilated eye exams, foot examinations, diet, and exercise. Providers believed affordability was a barrier, but did not generally believe lack of services was a barrier. In addition, Chin et al. (2001) found that though providers themselves had a great belief in the benefits and importance of diabetes care, they did not believe that their patients saw these benefits as strongly. They also found that providers saw a need to aid those with diabetes in making behavior changes but unfortunately, providers did not have confidence in their ability to help participants actually make changes. Some 40% of the providers believed that their patients were not able to make the changes alone. Healthcare providers' perception of their patients' abilities will undoubtedly have an effect on their recommendations of self-care activities and should be included in an assessment of older adults with diabetes.

OLDER AMERICANS NUTRITION PROGRAM (OANP)

Some older adult populations may need greater support from health care professionals and would benefit from additional education and assessment. Those attending the Older Americans Nutrition Programs (OANP) are currently one of the largest populations in need. The OANP is administered under Title III of the U.S. Department of Health and Human Service's Administration on Aging. The Administration on Aging distributes the funds to the states (AOA,

1996). The OANP served nearly 3 million meals to seniors 60 years and older each day. In 2003 over 14,000 seniors were served over 1.5 million meals in Georgia at Senior Meal Centers (GDHR, 2003). These meals supply a minimum of 33% of the RDAs for specific nutrients and must follow the Dietary Guideline for Americans. However, states have considerable latitude in interpreting and implementing these guidelines. Many of the seniors depend on these meals as a primary means of sustenance. The majority of those who participated in the program had incomes well below the poverty level and generally live alone. Nationwide, minorities make up 27% of the OANP congregate meals service, with 12% black (AOA, 1996). Nationwide Title III OANP congregate meal participants have approximately 2.4 diagnosed chronic conditions with 18% stating they have diabetes (AOA, 1996; Ponza et al., 1996). Consequently, almost half of congregate sites offer modified meals such as those low in fat, sodium, or calories. Up to 90% of participants have moderate to high nutritional risk, as assessed by the Nutritional Screening Initiative (AOA, 1996; GDHR, 2001). Previous research has also shown that participants attending Older Americans Nutrition Programs in northeast Georgia have a high prevalence of diabetes, nutritional risk factors and poor glycemic control (Brackett, 1999). However, they have also shown the ability to increase knowledge and adopt health related self-care activities following health promotion programs on nutrition and bone health (Cheong et al., 2003) and nutrition and physical activity (McCamey et al., 2003).

PROPOSED STUDY: RATIONALE, SPECIFIC AIMS, HYPOTHESIS AND DESIGN

The proposed study builds on previous reports that show the nutrition and diabetes education curriculum "Eat Well, Live Well" lowers blood A1C and increases A1C knowledge in a convenience sample of Georgia OANP participants with diabetes (Burnett, 2003). The curriculum was developed in response to the high prevalence of diabetes in OANP participants in

Georgia and is designed to be delivered in group settings on site, at senior centers. OANP participants who completed this education intervention had significant decreases in their A1C levels (A1C decreased .66% among those with initial A1C $\geq$ 6.5%, $p < .01$, and by 1.46% among those with initial A1C levels of > 8.0%, $p < .01$). Following the intervention, the percentage of participants who scored 40% correct or higher on an A1C knowledge questionnaire increased from 48% to 82% ($p < .0001$) (Burnett, 2003).

The purpose of the studies described in this dissertation is to further explore the benefits of the "Eat Well, Live Well" nutrition and diabetes program by examining diabetes self-care activities at baseline and following the intervention, as well as to identify healthcare providers' beliefs about their patients' abilities and barriers to complete self-care behaviors. The rationale for investigating diabetes self-care activities is that compliance with self-care activities is associated with better metabolic control (Heisler et al., 2003) and diabetes self-management education can increase self-care activities (Glasgow et al., 1992), but older adults are less likely to receive formal diabetes education (Mensing et al., 2002). This is unfortunate because older adults, including those attending OANPs in Georgia, have shown the ability to make significant changes in nutrition and health related self-care activities in other areas such as those related to bone health (Cheong et al., 2003) and general nutrition and physical activity (McCamey et al., 2003). Older adults with diabetes attending OANPs could therefore benefit from a program explaining and encouraging the basics of diabetes self-care. These include many simple tasks that together can significantly reduce the risk of complications.

The rationale for examining healthcare providers beliefs is that providers' knowledge of diabetes and patients' involvement in medical decision making are important aspects of diabetes care that should not be overlooked when evaluating a diabetes education program (Deichmann,

1999; Vinicor et al., 1987; Greenfield et al., 1998). In a study by Chin et al. (2001) some 40% of providers felt their patients were not able to make changes in diabetes care alone, but did not have confidence in their professional abilities to facilitate change. Because healthcare providers can have a strong impact on patient self-management it was decided that an assessment of healthcare providers was needed to better understand the participants' overall diabetes environment.

When looking at all of these factors together, the increase in diabetes (especially among the elderly), the impact healthcare providers can make, the use of A1C as a clinical tool for diabetes control, and the importance of diabetes self-care activities in maintaining A1C level of control, it becomes clear that diabetes self-management education is essential. The number of older adults with diabetes is expected to increase dramatically over the next several decades. The OANP is one of the largest nutrition providers to older adults in the United States and, as its client load increases, must also evaluate its efficiency and the impact of the services offered. In order to ensure that a broad range of support is available, collaborative efforts among various services providers must be initiated and evaluated.

The proposed study not only searches for the current level of compliance to self-care activities and their relationship with A1C control, but also includes a nutrition and diabetes education intervention program aimed at increasing self-care activities in older adults with diabetes attending Georgia OANPs. The study will evaluate the success of the program by assessing the changes in self-care activities and any possible relationships to changes in A1C blood levels. The rationale for the study was that a nutrition and diabetes education program, provided on site at congregate meal centers, would be readily accessible to older adults in OANPs and may facilitate behavior change and diabetes management.

The specific aims of the proposed studies are to: 1) determine the compliance to diabetes self-care practices and health beliefs, and their relationship with A1C control in OANP participants with diabetes; 2) examine the influence of a nutrition and diabetes education program delivered at senior centers on the frequency of diabetes self-care activities; 3) identify diabetes self-care practices that are associated with decreases in blood A1C following the intervention; and 4) identify healthcare providers' beliefs of patient barriers to complete self-care behaviors, and their ability to facilitate change as a healthcare provider.

It was hypothesized that: 1) higher frequencies of diabetes self-care practices, positive health beliefs, and certain demographic variables would be associated with lower blood A1C at baseline in OANP participants with diabetes; 2) a nutrition and diabetes education program delivered at senior centers would increase the frequency of diabetes self-care activities; 3) improvements in diabetes self-care practices would be associated with decreases in blood A1C following the intervention; and 4) healthcare providers would report patients' lack of ability to follow self-care behaviors, as well as their lack of confidence in facilitating change, as barriers.

The general design of the study in Georgia OANP participants with diabetes was pre-test, intervention, post-test. The intervention consisted of a nutrition and diabetes education program that included six to eight lessons delivered over three to five months at senior centers. The program was developed with an emphasis on the ability to increase diabetes self-care activities and the relationship of those increases to decreases in A1C level of control. The study also included a survey that was mailed to healthcare providers in the same north Georgia counties from which OANP participants were selected. The survey was used to evaluate providers' views of the importance of diabetes self-care behaviors, patients' barriers to self-care, and providers perceived responsibility and confidence in aiding patients in adhering to them.

The following chapters discuss the outcomes of these investigations. Chapter 3 evaluates the rate of adherence to diabetes self-care activities and health beliefs and their relationship with A1C level of control before the nutrition and diabetes education intervention (Specific Aim #1). Chapter 4 explores the ability of the nutrition and diabetes education program to increase the frequency of diabetes self-care activities, as well as the relationship of changes in self-care activities with changes in A1C control (Specific Aims #2 and 3). Chapter 5 examines the healthcare providers' beliefs about their patients' abilities and barriers in performing diabetes self-care activities, as well as the providers' ability to facilitate changes in self-care activities (Specific Aim #4).

In summary, the "Eat Well, Live Well" nutrition and diabetes education intervention has already been shown to improve A1C control and knowledge about A1C (Burnett, 2003). The proposed studies will extend these observations by providing much needed information on the compliance to diabetes self-care activities and their role in A1C control in these same Georgia OANP participants, the ability of these participants to make meaningful changes in their self-care activities, and the healthcare providers' perspectives related to diabetes self-care activities in older people. The findings from these investigations will be used to improve the "Eat Well, Live Well" intervention for OANP participants with diabetes as well as to identify future interventions for healthcare providers who care for older adults with diabetes in our community.

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CHAPTER 3

CHARACTERISTICS, DIABETES SELF-CARE ACTIVITIES, HEALTH BELIEFS AND A1C CONTROL IN OLDER ADULTS ATTENDING GEORGIA OLDER AMERICANS NUTRITION PROGRAM[1]

[1] Redmond EH, Burnett SM, Stone S, Fischer JG, & Johnson MA. To be submitted to: *The Diabetes Educator*.

PURPOSE

Data were collected to determine the demographic, diabetes self-care activities and health beliefs of older adults with diabetes, and to evaluate relationships with blood A1C levels of control.

METHODS

Participants were a convenience sample (N=105, mean age =73 years, 58% Caucasian, 42% African American, 70% women, 30% had <8 years of education) of older adults attending their county Older Americans Nutrition Program (OANP). Participants were asked a series of questions including: demographics, diabetes self-care behaviors, health beliefs and A1C knowledge. A1C blood levels were also measured.

RESULTS

Twenty-five percent of participants had an A1C blood level >8% (poor control). Participants were most likely to be compliant ($\geq$5 days per week) with medication use (97%), moderately compliant with diet, glucose testing and daily foot checks (49-65%), and least compliant with exercise and foot wear inspection recommendations (37–39%). The avoidance of high fat foods was related to better A1C level of control. More than half the participants (60%) agreed that their understanding of the diabetes diet was a barrier to them, but only 21% noted that availability of nutrition services was a barrier.

CONCLUSION

OANP participants with diabetes have room for improvement in both compliance with self-care activities and A1C level of control.

The Centers for Disease Control and Prevention's Division of Diabetes Translation has projected that the prevalence of diabetes nationwide will increase to 29 million by the year 2050, and that minorities and persons 75 years and older and will make up the bulk of the increase.[1] Georgia has one of the fastest growing aging populations in the nation. The number of persons 75 years and older is expected to increase over 120% from 1990-2010 in Georgia, compared to a national increase of 41%.[2] The percentage of the population 60 and older is expected to double in the Atlanta Regional Area over the next 30 years.[3] A1C blood values are used to assess metabolic control and have been correlated to mortality in the elderly.[4] Epidemiologic data have shown that for each 1% absolute decrease in A1C blood values, micro-vascular and macro-vascular complications were decreased approximately 30% and 14% respectively, making the lowering of A1C a priority in diabetes care. The American College of Endocrinologists recommends an A1C level of $\leq$6.5%.[5] The American Diabetes Association currently recommends <7.0% as its A1C goal.[6]

Diabetes self-care activities have been found to improve glucose control leading to a lower A1C and thus reducing the risk of complications.[7,8] This should make diabetes self-care activities a primary focus in diabetes evaluation and risk prediction. Unfortunately, older adults were more likely to rate their ability to complete self-care as 'poor' or 'fair' when compared to younger people.[9] In Georgia only 6% of seniors admitted to completing four routine diabetes management tasks considered necessary for good glucose control.[10]

The United States Department of Health and Human Service's Administration on Aging administers the Older Americans Nutrition Program (OANP). In 2002 OANPs in Georgia served over 4 million meals to adults 60 years of age and older.[2] Many of these seniors were vulnerable and also benefited from other health related programs offered at the centers. Nationally, up to

90% of OANP participants have incomes below the poverty level, many live alone, there is a high rate of functional impairment of everyday tasks, and 18% of participants reported to have diabetes.[2,11]

Previous research of OANPs in northeast Georgia found a high prevalence of diabetes, nutritional risk factors, and poor glycemic control.[12] What is missing is an assessment of self-care activities, health beliefs, demographic characteristics, and how these relate to the level of A1C control. This lack of published information on such a large and vulnerable segment of the population hinders the abilities of educators and clinicians to serve this population. In this study, baseline data were collected and used to tailor a health and wellness program for OANP participants. The program was successful both in reducing A1C blood levels and in increasing participants' knowledge of A1C; it can be replicated for use in other OANPs or organizations serving older adults.[13] The purpose of the study was to: 1) determine the demographics (age, gender, ethnicity, education) BMI (Body Mass Index), duration of diabetes, A1C knowledge, type of treatment and multivitamin use, diabetes self-care practices and health beliefs of the study participants; and 2) analyze the relationship of the demographics, diabetes self-care practices and health beliefs in predicting A1C level of control.

METHODS

The present study was a convenience sample of 105 older adults attending their local OANP at ten senior centers, both urban and rural, in nine Georgia counties (Franklin, Barrow, Jackson, Madison, Gilmer, Cherokee, Henry, Newton, and Fulton). Inclusion criteria required that participants had diabetes (as per self-report), were members of their local senior center and attended the OANP at that center. Data collection began after the informed consent was read aloud and each participant gave written consent. Only data collected from individuals with a self-

report of diabetes were examined in this paper, though all members of the OANP were invited to have their blood levels evaluated. Participants were recruited into the program through advertisement and enrollment. Approval for the study was obtained from the Institutional Review Boards of the Georgia Department of Human Resources and The University of Georgia for all procedures.

Instruments

Questionnaires were read aloud to participants and filled out by trained staff. Demographics included age, years of education, gender, ethnicity, BMI, duration of diabetes, A1C knowledge, multivitamin use and diabetes treatment.

Summary of Diabetes Self-Care Activities (SDSCA)

Questions concerning diabetes self-care activities were taken from the Summary of Diabetes Self-Care Activities (SDSCA). The SDSCA is a validated questionnaire covering diabetes self-care behaviors.[14] The participants were asked on how many of the last seven days they had participated in each self-care activity. A score was given for each question, thus scoring ranged from 0-7. Five areas were reviewed: diet; exercise; self-glucose monitoring; foot-care; and medication use. If the participant undertook the self-care activity a minimum of five days a week or more then, for the purposes of this study, the participant was considered compliant with the activity.

A1C knowledge

The A1C knowledge questionnaire was developed by the National Diabetes Education Program.[15] It consists of 10 true or false questions. Each question was assigned 10 points, with 100% representing all questions correct.

Health Beliefs and Barriers

Eight questions were asked pertaining to three of the four Health Belief Model domains (benefit, seriousness, barriers). The first four questions asked participants how much they agreed or disagreed with a series of statements that related to benefits, seriousness and barriers. In the last four questions participants were asked how much they agreed or disagreed the statement represented a barrier to them.[16,17]

Blood Analysis

On the same day the questionnaires were administered, participants were asked to provide blood samples to assess A1C and glucose levels. Whole blood (3 ml) was obtained via venipuncture by a licensed phlebotomist (n=100). Blood samples were sent to Quest Diagnostic™ Laboratory, Atlanta, Georgia, for analysis. Affinity chromatography was used to analyze the percentage of glycosylated hemoglobin. In some instances, where individuals were unable or unwilling to provide a blood sample, blood work taken by their physicians on similar dates was collected (n=4). All participants were asked to take their blood report to their healthcare provider. A1C values of 10% or higher were sent directly to the subject's physician, with the participant's permission.

Data Analysis

All data entry was checked for accuracy. Once entered, recorded data were printed out and compared against actual data for validation. The Statistical Analysis System was used for all analysis (SAS, Version 8.2, Cary, NC). Descriptive statistics means, standard deviations, frequencies and percentages were calculated from demographic data, diabetes self-care activities, and health beliefs. Relationships between A1C blood values and continuous demographic

variables were investigated with Spearman rho correlations and General Linear Models. Normality was evaluated using Shapiro –Wilcox. The Fisher Exact test was used to evaluate levels of significance in dichotomous demographic variables, compliance to self-care activities and agreement with health beliefs. A *P*-value of <.05 was considered statistically significant.

RESULTS

There were 105 participants with diabetes evaluated, 58% were white and 42% were African American. The majority (70%) were women, taking oral glucose medication (57%), with a low mean A1C knowledge score (40%±31) and a higher than recommended mean BMI (29 kg/m^2). Mean age was 73 with more than two-thirds of the participants 70 years or older (Table 3.1). Table 3.1 also lists the means (±SD) and percentage distribution of each variable in three levels of A1C control (Excellent ≤6.5%, Moderate 6.6–8.0%, and Poor >8.0%)[5,6] for all participants. The demographic variables associated with the level of A1C control were ethnicity (*P*=.04), BMI (*P*=.04) and age (*P*=.03).

A1C values were then evaluated by age, examining means, range, and % in each A1C level of control (Table 3.2). The mean A1C blood value for all participants was 7.3%. Mean A1C blood values were lowest for participants in the middle age group (70-79 years) and highest for those in the youngest age group (≤69 years). In the total sample, 43% had A1C values that met the ACE recommendations[5] of ≤6.5% and 25% had poor glycemic control of >8.0%.

The diabetes self-care activities are summarized in Table 3.3. Compliance was defined as practicing the desired activity ≥5 days/week. Because answers to the questions revealed that participants were either very compliant or not at all compliant, means were not reported. Compliance was highest for medication (97%), moderate for following an eating plan, avoiding high fat foods, eating fruits and vegetables, spacing carbohydrates, testing blood sugar and

checking feet daily (48-66%), and low for exercising and checking foot wear daily (37-40%). In evaluating the significance between A1C level of control and compliance with self-care activities, avoiding high fat foods was statistically correlated to A1C level of control (P=.003). Although not significant, participants in the "excellent" category generally practiced the self-care activities to a greater extent than those in the "moderate" or "poor" categories.

Table 3.4 summarizes the relationship of three Health Belief Model domains (benefits, severity, barriers) with the level of A1C control. The Health Belief Model domain most agreed upon by participants was the benefits of diabetes care (93%). The majority (86%) of participants also agreed with the seriousness of diabetes and that they would always need to follow their diabetes diet and medication. The last 5 questions referred to perceived barriers to diabetes care. Sixty percent of participants agreed that they could not understand everything they had been told about their diet, while 35-39% indicated that their ability to follow diet, exercise, and home glucose monitoring recommendations were also barriers. Only 20% indicated that the availability of nutrition services was a barrier. No statistical significance was found between questions concerning the Health Belief Model and the A1C level of control.

CONCLUSIONS

The major findings of this study were: 1) 25% of participants had an A1C blood level considered high (>8%); 2) only 37-66% of participants were compliant with self-care activities (≥5 days/week); 3) a significant relationship was found between avoiding high fat foods and A1C level of control; and 4) health beliefs and barriers were not associated with A1C blood levels of control.

The findings that 25% of participants had an elevated A1C blood value (>8%) is of concern because elevated levels are associated with increased risk of diabetes complications.[5]

Poor A1C control was observed in 29% of participants <69 years of age, 24% of those aged 70-79, and 22% of those >80 years. Though organizations vary in their recommendations for A1C blood levels, both the United Kingdom's Prospective Diabetes Study (UKPDS) and the Diabetes Complications and Control Trial (DCCT) found lower A1C levels to be associated with decreased rates of diabetes complications.[18-20] The American College of Endocrinology consensus statement reported that any reduction in A1C is associated with a decreased risk of complications.[21] The American Diabetes Association recommends a change in treatment for those with an A1C blood level >8%.[22]

Elevated blood levels may be related to several factors in older adults. For example, older adults may not be fully aware of A1C or of the need to closely track their own A1C level.[10] The 1999 Georgia Diabetes Report found that only 22% of Georgia seniors 65 and older with diabetes had heard of A1C.[10] This lack of awareness may be exacerbated by Georgia healthcare providers not fully utilizing A1C values resulting in 25% of monitored Medicare beneficiaries with diabetes not having an A1C test performed as recommended.[23,24] Age related variations in physiology may also account for some older adults experiencing elevated blood levels.[4] Research has demonstrated that participants with elevated A1C blood levels (>8%) have been successful at lowering levels with increased self-glucose monitoring.[25]

Though important, the focus of diabetes care should not be exclusively on A1C blood values; recommended diabetes self-care activities should also be encouraged and monitored. Overall, compliance with self-care activities ($\geq$5 days/week) in our participants was found to be low. In regard to individual self-care activities, exercise was found to have the lowest level of compliance and medication the highest. This is consistent with studies that have found patients are more likely to comply with more straightforward aspects of care, such as taking medication,

while compliance to diet and exercise is reported to be more difficult.[14,8,26-28] In comparing our results to those of the 2003 Georgia Diabetes Report,[10] the OANP participants were less likely to smoke (9% vs.19%), more likely to consume 5 servings of fruits and vegetables daily (34% vs. 19%), and equally likely to test their blood sugar daily (50% vs. 51%), though when sub-dividing by medication OANP participants using insulin were more likely to test their blood sugar each day (87% vs. 66%). Thirty-seven percent of OANP participants claimed to exercise five days a week or more, and 27% of those in the Georgia Diabetes Report claimed to get some regular physical exercise.[10]

Compliance with self-care activities in older adults depends on several factors. Previous research has found that older adults may not have confidence in their abilities to undertake diabetes self-care activities.[9] Sixty percent of the participants in the present study did not believe their ability to undertake diet, exercise, or self-glucose monitoring was a barrier to them. Older adults may also be concerned that better metabolic control may lead to hypoglycemic episodes, although current clinical strategies generally reduce the threat of hypoglycemia.[5] In the DCCT, those on tight glucose control suffered three times more hypoglycemic episodes.[20] Older adults should be reassured that complying with self-care activities may simply include testing glucose once a day or once a week, depending on the individual.[29]

Healthcare providers and older adults may also be concerned with the risk of reduced cognitive abilities that have been reported in older adults with diabetes, making rigorous self-care activities more difficult.[30-33] Research has shown inadequate performance of diabetes self-care activities in those with cognitive impairment to be significant.[34] Decreasing A1C levels has been associated with improved cognition in the elderly.[32] The degree of symptoms patients' experience could also contribute to their level of compliance. While we did not correlate

compliance with the participants' degree of symptoms, those with fewer symptoms may have viewed self-care activities as beneficial, encouraging them to continue with the activities and thus reap the metabolic benefits. In contrast, those with many symptoms may not have felt like they could make a difference in their care.[35] Unfortunately, good metabolic control is a combination of many variables, not just compliance with self-care activities. This lack of a relationship may be one reason why it is difficult to keep patients motivated to adhering with self-care activities; and it may contribute to patient's confusion about why specific activities are recommended. One recommendation from these findings is to ensure OANP participants are aware of why specific activities are recommended and what to do with collected information. The results of this paper emphasize the need to ensure that older adults with diabetes understand the importance of self-care activities but do not become overly discouraged if they are unable to attain recommended metabolic control.

Some studies have found that diabetes self-care activities are associated with A1C blood values, [19,20,27] though not all research has supported this relationship. [36,37] Heisler et al. (2003) in a study of 1,032 older adults found the self-report of medication use, diet, self-glucose monitoring, and exercise to be related to A1C blood values; no correlation was found with foot care practices.[27] The avoidance of high fat foods was the only self-care activity in our study to be significantly correlated to A1C level of control. Participants who avoided high fat foods 5 days a week or more were more likely to have good metabolic control ($\leq$6.5%). Previous studies have been supportive of nutrition as an effective means of metabolic control.[38,39] The American Diabetes Association recommends that people with diabetes consume a low saturated-fat, heart healthy diet due to their elevated risk of heart disease and increased prevalence of obesity.[38,40] It is possible that participants trying to avoid high-fat foods are also trying to maintain an overall

healthy lifestyle. Participants may be more concerned about their fat than their carbohydrate intake or other aspects of diet. A lack of more detailed dietary components makes further speculations difficult.

Health Belief Model domains have been used as a tool to assess and enhance diabetes self-care compliance,[16,41-43] but few studies have evaluated the association between health beliefs and A1C level of control. The research that has been completed has shown support for the relationship between health beliefs and metabolic control. However, the markers used for assessment of metabolic control were inadequate in earlier studies and question the validity of the correlations.[44] No health belief or barrier was related to A1C blood level of control in the present study.

In looking specifically at the barriers participants' experienced in relation to diet and nutrition it seems that the participants' responses implicate the message being given concerning diet recommendations. More than half of the participants agreed that they did not understand everything they have been told about their diet yet they did not agree that their ability to understand the message or the availability of nutrition services was a barrier to them. It is highly likely that participants are simply confused by a barrage of seemingly contradictory messages about their diet. Previous research has found many healthcare providers to have limited technical knowledge of the diabetes diet and are unsure of their ability to help patients make changes.[17,45] Thus it is important that those working with older adults or OANPs should ensure they receive nutrition information from qualified sources or healthcare professionals.

Limitations

The primary limitations of this study were that the participants were not randomly selected, there were no controls, data concerning self-care activities were not comprehensive,

and all data (except BMI) were collected from self-report. Additionally, the sample size was a limitation in that there may not have been enough participants to detect a difference among each of the A1C categories of control.

Implications for Educators

Though overall compliance with self-care activities did not predict A1C level of control, diabetes self-care activities have been shown to have an impact on A1C blood levels in some studies [8,46] and should continue to be an educational focus for older adults with diabetes. The American Diabetes Association's Task Force reported that there was a four-fold increase in diabetes associated complications for those individuals with diabetes who did not receive formal education concerning diabetes self-care practices. Unfortunately, the Task Force also reported that the majority of those with diabetes did not receive formal diabetes education.[46] Research in senior centers in Georgia, as well as in other settings, has shown that older adults are able to adopt significant changes in health related behaviors, including diabetes.[13,46-48] This same population significantly increased A1C knowledge, with a concurrent decreases in A1C blood values, following a nutrition and diabetes program.[13]

In summary, many OANP participants had poor A1C control, low levels of self-care compliance, and did not understand their dietary instructions but only a small percentage (20%) reported that the availability of nutritional services was a barrier. Because of the high prevalence of diabetes in OANPs it is recommended that research on the effectiveness of nutrition and exercise promotion in preventing and managing diabetes on site in OANPs be continued. Though it can be difficult to discern the cause of an elevated A1C, it is important that those working with older adults begin to encourage their clients to understand, monitor, and use their own A1C blood level as a tool to improve or maintain their health.

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Table 3.1.

Relationship of Demographic and Diabetes Characteristics to A1C Blood Levels

Variables			**Stage of A1C Control ‡**			***P*-value**		
			Excellent	Moderate	Poor	Correlation	GLM	χ^2
	N*	N†	≤6.5%	6.6-8.0 %	>8.0			
Mean (range)	%	%	n=43	n=32	n=25			
Age (years)						.07	.03	.70
73±8 (47 – 93)	105	100	75±8	73±8	71±9			
≤69 (%)	31	31	32	39	29			
70-79 (%)	47	46	48	28	24			
≥80 (%)	22	23	48	30	22			
Gender	105	100						.51
Female (%)	70	70	47	23	30			
Male (%)	30	30	41	36	23			
Ethnicity	105	100						.04
Caucasian (%)	58	58	53	24	22			
African-American (%)	42	42	29	43	29			
Education (years)	105	100	10.0±5	10.2±5	10.1±4	.76	.89	.62
10.0±5 (0-19)								
0–8 (%)	29	30	50	29	21			
9-11 (%)	22	22	39	26	35			
12 (%)	22	22	35	48	17			
13-19 (%)	27	27	46	27	27			
BMI (kg/m^2)	97	95	28.7±6	29.4±7	31.7±7	.04	.09	.45
29±6 (18.8 – 51.8)								
<25 (%)	24	24	48	35	17			
25 – <30 (%)	38	37	47	33	19			
≥30 (%)	38	39	33	31	36			
Diabetes Duration	102	97	9±8	11±12	12±9	.11	.23	.35
10+10 (0-57)								
0-10 years (%)	65	64	46	29	25			
≥11 years (%)	35	36	31	41	28			
A1C knowledge	105	100	39.1±29	44±31	38±33	.75	.93	.87
(% correct)								
40±31 (0-100)								
≤30% (%)	54	54	44	30	26			
≥40% (%)	46	46	31	35	24			
Treatment	105	100						.11
Diet only (%)	21	22	59	32	9			
Oral medication (%)	57	57	44	33	23			
Insulin + oral (%)	7	7	14	29	57			
Insulin only (%)	15	14	29	29	43			
Multivitamin	105	100						.32
(%yes)	40	41	47	41	28			

*Data are N and % for all participants. †Data are N and % for all participants with an A1C blood value. ‡Data are mean ±SD in each A1C level of control, and % per each variable category. Spearman rho was used for correlations, GLM (General Linear Model) was used for regression on continuous variable. Fisher Exact test was used for dichotomous variables.

Table 3.2

A1C Range, Means and Level of Control for Each Age Group

Age Category		**A1C Values**		**Level of A1C Control ***		
Years	N	Range	Mean	Excellent ≤6.5% n=43	Moderate 6.6-8.0% n=32	Poor >8.0% n=25
47-93	100	5.1-15.8	7.28±1.97	43	32	25
≤69	31	5.4-15.8	7.62±2.22	32	39	29
70-79	46	5.3-11.2	7.06±1.50	48	28	24
≥80	23	5.1-15.6	7.25±2.44	48	30	22

*Data are N, range, mean and % in A1c control for each age category.

Table 3.3

Relationships of SDSCA Questions to Levels of Control for A1C Blood Values

SDSCA Questions			**Level of A1C Control‡**			
	N* %	N† %	Excellent ≤6.5% n=43	Moderate 6.6-8.0% n=32	Poor >8.0 n=25	*P*
1. How many of the last seven days have you followed a healthful eating plan?	105	100				
0 – 4 days a week	42	41	33	50	44	
5 days a week or more	58	59	67	50	56	.29
2. On average, over the past month, haw many days per week have you followed your eating plan?	104	99				
0 – 4 days a week	47	46	44	44	54	
5 days a week or more	53	53	56	56	46	.72
3. On how many of the last seven days did you eat five or more serving of fruits and vegetables?	105	100				
0 – 4 days a week	50	51	44	56	56	
5 days a week or more	49	49	56	44	44	.53
4. On how many of the last seven days did you avoid high fat foods such as red meat or full-fat dairy products?	104	99				
0 – 4 days a week	37	37	21	37	64	
5 days a week or more	63	63	79	63	36	.003
5. On how many of the last seven days did you space carbohydrates evenly through the day?	104	100				
0 – 4 days a week	54	55	56	53	56	
5 days a week or more	46	45	44	47	44	1.0

*Data are N and % for all participants. †Data are N and % for all participants with an A1C value. ‡Data are % of compliant and non-compliant participants in each level of A1C control. Fisher Exact test was used to test significance. Percents may not add up to 100 % due to rounding.

Table 3.3 Continued

Relationships of SDSCA Questions to Levels of Control for A1C Blood Values

SDSCA Questions	N* %	N† %	**Level of A1C Control‡** Excellent ≤6.5 % n=43	Moderate 6.6-8.0 % n=32	Poor >8.0 n=25	*P*
6. On how many of the last seven days did you participate in at least 30 minutes of physical activity?	105	100				
0 – 4 days a week	63	63	58	66	68	
5 days a week or more	37	37	42	34	32	.69
7. On how many of the last seven days did you participate in a specific exercise session other than what you do around the house?	105	100				
0 – 4 days a week	61	61	58	63	64	
5 days a week or more	39	39	42	37	36	.89
8. On how many of he last seven days did you test your blood sugar?	105	100				
0 – 4 days a week	49	50	53	53	40	
5 days a week or more	51	50	47	47	60	.54
9. On how many of the last seven days did you test your blood sugar that number of times recommended by your health care provider?	105	100				
0 – 4 days a week	49	51	49	50	56	
5 days a week or more	50	49	51	50	44	.85
10. On how many of the last seven days did you check your feet?	105	100				
0 – 4 days a week	34	35	35	35	36	
5 days a week or more	66	65	65	66	64	1.00
11. On how many of the last seven days did you inspect the inside of your shoes?	105	100				
0 – 4 days a week	60	62	56	66	68	
5 days a week or more	40	38	44	34	32	.56
12. How many of the last seven days have you taken your diabetes medication	81	76				
0 – 4 days a week	2	2	7	0	0	
5 days a week or more	97	97	93	100	100	.15

*Data are N and % for all participants. †Data are N and % for all participants with an A1C value. ‡Data are % of compliant and non-compliant participants in each level of A1C control. Fisher Exact test was used to test significance. Compliant is ≥5 days/week. Percents may not add up to 100 % due to rounding.

Table 3.4

Relationship of Participants who Agree or Disagree with the Health Beliefs in each Level of Control for A1C Blood Values

Health Belief Questions			**Stage of A1C Control ‡**			
	N* %	N† %	Excellent n=43	Moderate n=32	Poor n=25	*P*
1. I believe that my diet and medication will prevent complications related to diabetes. (benefit)	103	99				
Agree	93	93	95	94	92	
Disagree	7	6	5	6	8	.87
2. I believe I can control my diabetes. (benefit)	104	100				
Agree	93	94	93	91	100	
Disagree	7	6	7	9	0	.37
3. I believe I will always need my diabetes diet and medication. (serious)	104	100				
Agree	86	85	86	81	88	
Disagree	14	15	14	19	12	.82
4. I cannot understand everything I have been told about my diet. (barrier)	102	98				
Agree	60	60	60	60	60	
Disagree	40	40	39	40	40	1.00
5. My ability follow diet recommendations is a barrier to me. (barrier)	104	100				
Agree	39	39	37	31	52	
Disagree	60	61	63	69	48	.27
6. My ability to follow exercise recommendations is a barrier to me. (barrier)	104	100				
Agree	38	38	30	44	44	
Disagree	61	62	70	56	56	.39
7. My ability to do home glucose monitoring is a barrier to me. (barrier)	100	96				
Agree	35	34	26	47	33	
Disagree	65	66	74	53	67	.20
8. The availability of nutritional services is a barrier to me. (barrier)	102	98				
Agree	20	21	23	16	25	
Disagree	79	79	77	84	75	.67

*Data are N and % for all participants. † Data are N and % for all participants with an A1C value. ‡Data are % who agree or disagree in each A1C level of control. Fisher Exact test was used to test significance. Benefit, seriousness and barriers are three of the four Health Belief Model domains. Percentages may not add up to 100 due to rounding.

CHAPTER 4

CHANGES IN DIABETES SELF-CARE ACTIVITIES FOLLOWING A NUTRITION AND DIABETES EDUCATION PROGRAM IN GEORGIA'S OLDER AMERICANS NUTRITION PROGRAMS[1]

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[1]Redmond, E.H., Burnett, S.M., Johnson M.A., Stone, S., Fischer, J.G., & Johnson, J.T. To be submitted to: *Journal of Nutrition for the Elderly.*

ABSTRACT

Changes in diabetes self-care activities and correlations with changes in A1C blood values were evaluated following the nutrition and diabetes education intervention "Eat Well, Live Well." Participants were 91 older adults with diabetes attending a Georgia Older Americans Nutrition Programs (OANP). Compliance substantially increased from baseline for participants following a healthful diet, following an eating plan, avoiding high fat foods, spacing carbohydrates, testing blood sugar as recommended by health care provider and inspecting shoes ($p < .05$). Following the intervention, decreases in A1C among those with an initial A1C $\geq$ 7% were correlated with post-intervention self-care activities and/or increases in self-care activities related to consuming 5 servings of fruits and vegetables a day, spacing carbohydrates, physical activity, and checking shoes and feet ($p < .05$). The results of this study show that a group based nutrition and diabetes program led by trained nutritionists and registered dietitians can lead to significant improvements in diabetes self-care behaviors, with concurrent decreases in A1C blood levels in older adults in north Georgia.

KEYWORDS. Older Adult Nutrition Program (OANP), A1C, older adults, diabetes, diabetes self-care activities, nutrition, diabetes program.

INTRODUCTION

The Centers for Disease Control and Prevention's Division of Diabetes Translation projects the prevalence of diabetes nationwide will increase to 29 million by the year 2050. Those 75 years and older, and minorities, will make up the bulk of the increase (Boyle et al., 2001; Hiss, 2001). Georgia has one of the fastest growing aging populations in the nation. The number of persons 60 years and older is expected to increase by 82% and those 85 years and older by 265%, from 1990 to 2010 (GDHR, 2003). The U.S. Department of Health and Human Service's Administration on Aging administers the Older Americans Nutrition Program (OANP). The program serves 20% of low-income adults 60 years and older. Many live alone, 18% of program participants report having diabetes, up to 90% have incomes significantly below the poverty level and there is a high rate of functional impairment in everyday tasks (Ponza et al., 1996). Though each state's OANP population varies, studies of Georgia's OANP participants have revealed a significant level of nutritional risk factors and poor glycemic control (Brackett et al., 1999). The 1999 Georgia Diabetes Report found that only 22% of Georgia seniors 65 and older with diabetes had heard of A1C (Powell et al., 2000). It is becoming more important that individuals themselves know and understand what influences their A1C blood values.

Diabetes self-management education is effective in reducing A1C blood values, and has been successful in older adult populations (Glasgow et al., 1992; Norris et al., 2002). Moreover, self-assessed compliance to self-care behaviors has also been associated with A1C values (Heisler et al., 2003). Unfortunately, older adults, those with lower socioeconomic status, and those living outside of metropolitan areas were less likely to receive diabetes education (Coonrod et al., 1994; Mensing et al., 2002). In previous work we developed the "Eat Well, Live Well" nutrition and diabetes education program for Georgia OANP participants and reported that the

program significantly decreased A1C blood values in participants with initial A1C values $\geq$ 6.5% (Burnett, 2003). The purpose of this study was to establish if the beneficial changes in A1C were related to changes in diabetes self-care activities. The specific aims were to determine: 1) the participants' change in diabetes self-care activities following the "Eat Well, Live Well" intervention; 2) if changes in diabetes self-care activities were associated with changes in A1C blood values; and 3) recommendations for adjustments to the program to enhance compliance to self-care behaviors.

METHODS

Study Population

The present study is a subset of a convenience sample of older adults attending an OANP at their county senior center in north Georgia with a self-report of diabetes. Of the 105 participants initially enrolled, 91 answered at least 8 of the 11 self-care activity questions at baseline (pre-testing) and following the intervention (post-testing), and 77 of those 91 provided A1C blood samples at baseline and following the intervention. The program was conducted at ten senior centers in nine Georgia counties (Walton, Jackson, Franklin, Greene, Fulton, Newton, Cherokee, Gilmer and Henry). Senior center directors and staff at each center helped with recruitment at each site. Approval for the study was obtained from the Institutional Review Boards of the Georgia Department of Human Resources and The University of Georgia. Inclusion criteria required that participants were members of their local senior center and attended their OANP at that center. A consent form was read aloud and reviewed for each participant prior to obtaining written informed consent. Only data collected from individuals with a self-report of diabetes were examined in this paper, though all members of the OANP

were invited to have their glucose and A1C blood levels evaluated. All questionnaires were read aloud and filled out by trained staff or graduate students and reflect participants' self-reports.

Demographic Data

Demographic data were collected at baseline and included age, years of education, gender, race, BMI, duration of diabetes, A1C knowledge, smoking habits, class attendance and diabetes treatment.

Summary of Diabetes Self-Care Activities (SDSCA)

Diabetes self-care activates were evaluated using questions from the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire (Toobert et al., 2000). The SDSCA is a validated questionnaire covering diabetes self-care behaviors. Participants were asked on how many of the last seven days they participated in each of 11 activities, thus scores ranged from 0 - 7. A score was given for each question. For the purposes of this study good compliance with self-care activities was considered $\geq$ 5 days per week, low compliance was < 5 days per week. The SDSCA was administered at baseline and following the intervention.

A1C knowledge and blood Analysis

Whole blood (3 ml) was obtained via venipuncture by a licensed phlebotomist. Blood samples were sent to Quest Diagnostic™ Laboratory, Atlanta, Georgia, for analysis. Affinity chromatography was used to analyze the percentage of glycosylated hemoglobin. A1C knowledge questionnaires collected at baseline and following the intervention have been previously reported elsewhere (Burnett, 2003).

Intervention

The intervention was a nutrition and diabetes education program that consisted of 6 - 8 lessons conducted over 3 – 5 months, following pre-testing in the fall of 2001. The program was

developed and administered by the Department of Foods and Nutrition at the University of Georgia. The curriculum was developed for a low literacy older adult population and is available at the web site Nutrition for Older Adults' Health: NOAHnet: www.arches.uga.edu/~noahnet. Each lesson was approximately 30 - 45 minutes and was often filled with personal experiences from participants. Another 15 – 30 minutes were used for questions and answers, and group discussions. The first lesson was an introduction and overview to diabetes. The second lesson, 'In check with your diabetes,' covered self-glucose monitoring. The third, fourth and fifth lessons 'Portion Control,' 'Plate Method,' and 'Meal Planning and Timing,' covered diet and nutrition information. The sixth lesson, 'Complicated Matters' reviewed complications associated with diabetes. The seventh lesson reviewed foot care. The last lesson discussed ways to receive diabetes supplies for free or reduced prices, 'How to Pay for Supplies.' All study sites received the same information, all met for a minimum of six lessons and two centers had two additional meetings to ensure coverage of the information. The order of the lessons changed depending on client preferences. Each class also included the ABC message, lower A1C, blood pressure and cholesterol, promoted by the American Diabetes Association and the National Diabetes Education Program. The lessons also incorporated the benefits of exercise in maintaining glycemic control. A second assessment was conducted following the intervention. Patients were questioned concerning any changes in their medication status and were asked to rate their satisfaction with the program.

Statistical Analysis

The Statistical Analysis System was used for all analysis (SAS, Version 8.2, Cary, NC). Descriptive statistics, means, standard deviations, frequencies and percents were calculated from demographic and SDSCA data. Fisher Exact test was used to test probability (proc freq;

tables*time/fisher;). Shapiro-Wilk was used to evaluate normality of data. Non-parametric paired t-tests were used to evaluate the differences between baseline scores and scores following the intervention (proc univariate; var;). Spearman rho correlations (proc corr spearman; = variables;) were used to evaluate relationships of changes in A1C blood values following the intervention with changes in the diabetes self-care activities scores and diabetes self-care activities scores following the intervention. The criteria for statistical significance was $p < .05$.

RESULTS

Demographics

The mean age of the 91 participants was 73 years, 60% were white and 40% were African American. The majority (70%) were women and took oral glucose medication (56%). Mean A1C knowledge score was 42 ± 30% and participants had a higher than recommended mean A1C blood level (7.3 ± 2%) and BMI (29 kg/m^2) (Table 4.1).

Increases in Self-care Activities

Table 4.2 lists the mean days per week that participants complied with self-care activities at baseline and following the intervention, and the percentage compliant for all participants. It also lists the means and percent compliant for those who had low compliance (< 5 days/week) at baseline. Mean scores for all diabetes self-care activities increased following the intervention. The self-care activities for all participants with statistically significant mean changes were: following an eating plan (question #1, $p = .004$; question #2, $p = .0003$), spacing carbohydrates (question #5, $p < .0001$), participating in 30 minutes of exercise (question #6, $p = .02$), testing blood sugar as recommended by healthcare provider (question #9, $p < .0001$), and foot care (question #10, $p = .002$; question #11, $p < .0001$). Activities that showed the greatest statistical

improvements in percent compliant for all participants following the intervention were: following an eating plan (question #2, p = .003), avoiding high fat food (question #4, p = .03), spacing carbohydrates (question #5, p < .0001), testing blood sugar as recommended by a healthcare provider (question #9, p = .003), and inspecting footwear (question #11, p < .0001). When subdividing to include only those participants who were not compliant (< 5 days/week) at baseline, all self-care activities become statistically significant for mean improvement and percentage compliant. Exercise (questions #6 and #7), and daily self-glucose monitoring (question #8) had the lowest mean improvements with increases of less than 2 days per week.

Associations with A1C Blood Values

The decrease in mean A1C blood values was not significant for the total sample (n = 77, -.24%, p = .47, baseline mean A1C 7.3% ± 2.1). The greatest improvements were seen in those with the highest A1C blood values at baseline. Those with an A1C baseline blood level of > 6.5% had a change of - .67% (n = 42, p = .01, baseline mean A1C 8.5% ± 2.2), those with an A1C blood level of > 7% at baseline had a change of – .85% (n = 33, p = .007, baseline mean A1C 8.9% ± 2.3) and those with an A1C blood level of > 8% at baseline decreased 1.46% (n = 21, p < .0001, baseline mean A1C 9.9% ± 2.3) following the intervention.

Spearman rho correlations were used to evaluate the possible associations of baseline diabetes self-care activities, changes in self-care activities, and self-care activities following the intervention with changes in A1C blood values for all participants following the intervention. How often participants checked their feet at baseline was the only significant association (n = 77, p = .05). Because the majority of change in A1C blood values came from those participants with the highest A1C blood values at baseline, two additional correlations were calculated. The first included only those participants who had an A1C blood value of > 7% at baseline and the second

included only those with a value > 8% at baseline. Table 4.3 shows the correlations of both changes in self-care activities and the level of self-care activities following the intervention with changes in A1C blood values for participants who had an A1C value of 7% or higher at baseline. Decreases in A1C were associated with exercising 30 minutes per day (question #6, $p = .009$ for change in the activity and $p = .03$ for the number of days participants under took the activity following the intervention), and inspecting the inside of shoes (question #11, $p = .02$ for the change in the activity and $p = .009$ for the number of days participants under took the activity following the intervention). Increases in the number of days per week participants participated in other exercise sessions was significantly related to decreases in A1C blood values (question #7, $p = .03$). Decreases in A1C were associated with post-intervention increases in fruit and vegetable consumption (question #3, $p = .01$), spacing carbohydrates (question #5, $p = .02$), and checking feet (question #10, $p = .04$).

Among participants with an A1C blood value > 8.0% at baseline, decreases in A1C were associated with increases in fruit and vegetable consumption at baseline (question #3, $p = .006$, $n = 21$), and post-intervention (question #3, $p = .003$, $n = 21$).

DISCUSSION

The primary findings of this study were: 1) participants were able to make major improvements in diabetes self-care activities following the intervention; 2) those participants complying < 5 days per week with self-care activities at baseline made the most significant improvements; and 3) increases in several self-care activities were correlated with decreases in A1C blood values.

Improvements in Self-Care Activities

The findings of this study emphasize the abilities of older adults with diabetes to aid in the management of their own care through increases in self-care activities following a nutrition and diabetes education program. There is a four-fold increase in complications for those with diabetes who do not receive formal diabetes education, illustrating its importance (Mensing et al., 2002). A smaller percentage of older adults (27% of those 75 years and older), compared to younger (48% of those 18-44 years of age), have received diabetes education, and the percentage decreases with age (Coonrod et al., 1994; Healthy People 2010; Mensing et al., 2002). A lack of diabetes education has also been found in lower income and rural populations (Coonrod et al., 1994). Diabetes education is only successful if participants increase their self-care activities because it is these activities that can lead to better metabolic control. In order to meet expected standards of care, patients are encouraged to be active learners in the management of their diabetes (ACE, 2002). Thus, changes in self-care activities should be evaluated for progress, not just reductions in A1C blood values (Fain et al., 1999). Unfortunately, self-care activities can be complex, time consuming, and costly to maintain in a life-long chronic condition such as diabetes, thus their level of efficacy should be evaluated specifically in older adults (ADA, 2003a).

When looking at all participants the greatest mean improvements were seen in spacing carbohydrates and inspecting the inside of shoes, as well as testing blood sugar as recommended by a healthcare provider. Some research has shown that patients are more likely to comply with the more straightforward aspects of care (Ary et al., 1986; Glasgow et al., 1987 and 1992). It is possible that spacing carbohydrates and foot care were perceived as more uncomplicated aspects

of care. It is difficult to assess specifically why participants were successful at spacing carbohydrates, as opposed to avoiding high fat foods or consuming 5 serving of fruit and vegetables per day. Though the intervention was broad overall, three of the eight lessons covered dietary concepts by using the plate method, portion control, and meal timing in place of more complex instructions. It may be that participants were able to utilize these more flexible concepts to aid in spacing carbohydrates throughout the day. Foot care has been found to be a primary source of emotional distress for those with diabetes (ADA, 2003b). Patients may be unsure of their part in foot care and the simple preventative act of checking their feet or the inside of their shoes may have been appealing.

The self-care activities with the least improvements were exercise and testing blood sugar everyday. This is consistent with other research that has found it difficult to encourage participants to increase their level of exercise with lifestyle management education (Ary et al., 1986). In regard to testing blood sugar, research has found the level of monitoring to be low. NHANES III data showed that only 5 - 6% of those on oral hypoglycemic medications tested their blood sugar once per day (Harris, 2001). The American Diabetes Association has stated that not all patients with type 2 diabetes need to perform self-glucose monitoring everyday, consequently, many older adults may be asked to test less often (ADA, 2002). This may explain why there was a significant improvement in participants testing their blood sugar as recommended by their healthcare provider, but not a correlating improvement in testing everyday.

Participants with the lowest level of compliance at baseline, those the most in need of change, had significant increases in all self-care activities with the greatest improvements in spacing carbohydrates and foot care. The results of this intervention demonstrate that older

adults, even those not currently complying, are able to make significant improvements in diabetes self-care activities and should be encouraged.

Another finding from this study was that those participants with the highest A1C at baseline saw the greatest A1C reductions following the intervention. This is consistent with research by Murata et al. (2003) of older adults with diabetes that evaluated the success of an intensive self-glucose monitoring program and found decreases in A1C were only significant for those with a baseline A1C blood level of > 8% or those most compliant with glucose-self monitoring. Other studies, however, have found that those participants with the highest A1C levels at baseline were poor responders to standard diabetes care (Cook et al., 2001).

Correlations with of Self-Care Activities and Changes in A1C

Diabetes self-management education overall has been shown to decrease A1C blood values (Ary et al., 1996; Bourn et al., 1994; Glasgow et al., 1992; Norris et al., 2002). Glucose tolerance and A1C blood values have been correlated to mortality in older adults (Croxson et al., 1993; Meneilly and Tressier, 2001). Therefore, it is important that future research focuses on those self-management areas that can make the greatest impact on lowering A1C blood values. In the current study, decreases in A1C blood values were most strongly related to increases in exercise and inspecting foot wear following the intervention for those participants with a baseline A1C blood level of $\geq$ 7%. Exercise was discussed in the lessons, its benefits were endorsed by the participants and many of the senior centers offered exercise programs. Exercise increased less than one day per week for all participants and less than two days per week for those with low compliance, but was significantly related to decreases in A1C. Maintaining fitness in older adults is believed to decrease vascular disease and improve general quality of life (Zinman, 2003). The American Diabetes Association recommends exercise as a high priority in

diabetes care (ADA, 2003b). In regard to inspecting footwear, it may be that simple foot care activities are a gateway to overall better self-care.

In evaluating only those participants with an A1C > 8% at baseline, consuming 5 servings of fruits and vegetable a day was significantly related to reductions in A1C blood values. Nutrition has certainly been shown to have a significant impact on metabolic control (Pastors et al., 2002). Caloric, carbohydrate and fiber intakes were not monitored during this study, making it difficult to speculate on how increases in fruit and vegetable intakes might have contributed to lower A1C values for this segment of participants. It could be that as participants' fruit and vegetable consumption increased their total calories decreased or fiber increased. Spacing of carbohydrates was not significantly related to A1C blood values for this group.

Further study on the specific activities that may relate to the greatest decreases in A1C blood values is warranted. The success of the program should caution against any dramatic revision of the curriculum. The addition of an exercise component to the program is suggested. Though exercise was discussed, participation in exercise at each lesson is recommended. It may also be of benefit to ensure that there is a focus on the simplest activities, such as checking the inside of shoes prior to putting them on. Because long term follow up is recommended when evaluating diabetes education programs (Norris et al., 2002), and because at least some of the learning in the groups may have been from group discussions, it would be of benefit to offer on-going diabetes support groups in settings such as OANPs. Another recommended change is to ensure that adequate emphasis is placed on communicating to current participants the success of past participants.

There are limited dietary interventions for older adults with diabetes (Meneilly and Tressier, 2001). The results of this study, as well as other research with this population, has

shown that older adults attending OANPs are able to adopt significant changes in health and diet related behaviors (Cheong et al., 2003; McCamey et al., 2003). An intervention by Glasgow et al. (1992) designed for older adults with diabetes, focused primarily on dietary and exercise behaviors, also showed improvements in diet and self-glucose monitoring. The participants experienced a total A1C reduction of .5%, going from 6.8% to 6.3%, following the education program. However, the intervention was conducted by an interdisciplinary team that included a psychologist, a registered dietitian, certified exercise instructors, and educators; this arrangement could be difficult to replicate in rural locations or with a limited budget. The education program that was delivered to the OANP population in our study can be downloaded from the internet at no cost. A large portion of the success of the intervention may have been related to the design of the program, which worked in conjunction with the community aspect of the senior centers. Previous research had shown that participants are more successful making individual changes as opposed to a combination of changes (Wing et al., 2001). Therefore, the program discussed the topics in individual lessons and encouraged participants to follow basic diabetes self-care activities. Though research has demonstrated that tight glucose control can lower risk of complications by decreasing A1C levels, the current study did not recommend that older adults begin strict glucose control; it simply informed and encouraged participants concerning basic diabetes guidelines.

LIMITATIONS

There were several limitations to this study. The participants were not randomly selected and it may have been that those who were most motivated attended the program. The sample size was limited, and there were no controls for comparison. There may have also been unidentified confounding variables. Weight was not collected following the intervention,

making it difficult to speculate on the influence weight loss may have contributed to reductions in A1C. It would therefore be of benefit to collect weight at post-test in future studies. The data (except BMI) were collected from self-report, and were not comprehensive. Though not tested, cognition may have impacted the ability of participants to accurately remember their level of self-care activity. Decreased cognition has been cited as a concern in those with diabetes (Gregg et al., 2002; Ryan and Geckle, 2000). Senior centers also vary tremendously in community involvement, available resources, and participant demographics. No follow-up was conducted to monitor if reductions in A1C were maintained following the end of the intervention program.

CONCLUSIONS

In conclusion, this study has shown that OANP participants receiving a nutrition and diabetes education program at their county senior centers improved self-care behaviors with concurrent decreases in A1C blood values. This collaborative relationship of educators and researchers with OANPs should be encouraged in other studies aimed at older adults. Education on diabetes self-care activities has been shown to have an impact, and should continue to be a focus for OANP populations.

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TABLE 4.1 Baseline demographics.

	n	Mean ± SD (range) or %
Age (years)	91	
Mean ± SD (range)		73 ± 8 (47-93)
≤ 69 (%)		30
70 –79 (%)		49
≥ 80 (%)		21
Race	91	
Caucasian (%)		60
African American (%)		40
Gender	91	
Male (%)		30
Female (%)		70
Education (years of school)	91	
Mean ± SD (range)		10 ± 4 (0-18)
0 - 8 (%)		31
9 -11 (%)		23
12 (%)		21
13 -19 (%)		25
Duration of diabetes (years)	88	
Mean ± SD (range)		10 ± 10 (0-57)
0 -10 (%)		66
≥ 11 (%)		34
A1c blood values (%)	87	
Mean ± SD (range)		7.3 ± 2.0 (5.1-15.8)
≤ 6.5 (%)		44
6.6 – 8 (%)		29
> 8.0 (%)		28
A1c knowledge (% correct)	91	
Mean ± SD (range)		42 ± 30 (0-100)
0 – 30 (%)		52
> 30 (%)		48
Treatment	91	
Diet only (%)		22
Oral medication (%)		56
Insulin and oral medication (%)		7
Insulin only (%)		15
BMI ($kg/m^{2)}$)	84	
Mean ± SD (range)		29 ± 6.8 (18.8-51.8)
< 25 (%)		26
25 – 29.9 (%)		36
≥ 30 (%)		38
Smoking (% yes)	91	8
Attendance (number of lessons)	75	
Mean ± SD (range)		3.9 ± 2.3 (0-8)

Data are means ± SD or % as indicated. Percentages may not add to 100% due to rounding.

TABLE 4.2. Means and percents of self-care activities for all participants and those with low compliance.

Diabetes Self-Care Activities	n	Baseline	Post-test	Change	p
1. How many of the last seven days have you followed a healthful eating plan?					
All participants (mean ± SD)	89	4.6 ± 2.7	5.5 ± 2.1	.9 ± 2.8	.004
≥ 5/week (%)		58	74	27	.04
Low compliance at baseline (mean ± SD)	37	1.8 ± 1.7	4.6 ± 2.6	2.8 ± 2.9	< .0001
< 5/week (%)		0	54		< .0001
2. On average, over the past month, how many days per week have you followed your eating plan?					
All participants (mean ± SD)	89	4.1 ± 2.9	5.4 ± 2.1	1.2 ± 3.0	.0003
≥ 5/week (%)		53	75	42	.003
Low compliance at baseline (mean ± SD)	42	1.4 ± 1.6	4.7 ± 2.4	3.3 ± 3.0	< .0001
< 5/week (%)		0	59		< .0001
3. On how many of the last seven days did you eat five or more servings of fruits and vegetables?					
All participants (mean ± SD)	91	4.3 ± 2.7	4.8 ± 2.5	.5 ± 3.2	.13
≥ 5/week (%)		52	64	23	.13
Low compliance at baseline (mean ± SD)	44	1.9 ± 1.6	4.2 ± 2.7	2.4 ± 3.0	< .0001
< 5/week (%)		0	53		< .0001
4. On how many of the last seven days did you avoid high fat foods such as red meat or full-fat dairy products?					
All Participants	90	4.7 ± 2.1	5.1 ± 1.6	.5 ± 2.2	.07
≥ 5/week (%)		61	77	26	.03
Low compliance at baseline (mean ± SD)	35	2.5 ± 1.5	4.5 ± 1.8	2.0 ± 2.4	< .0001
< 5/week (%)		0	60		< .0001
5. On how many of the last seven days did you space your carbohydrates evenly through the day?					
All participants (mean ± SD)	88	3.4 ± 3.1	5.3 ± 2.6	1.8 ± 3.8	< .0001
≥ 5/week (%)		45	73	62	< .0001
Low compliance at baseline (mean ± SD)	48	.8 ± 1.4	5.0 ± 2.7	4.2 ± 3.1	< .0001
< 5/week (%)		0	68		< .0001

Low compliance refers to participants who undertook the activity < 5 days/week at baseline. Non-parametric t-test was used to evaluate means. Fisher exact test was to compare percents.

TALBLE 4.2. Continued

Diabetes Self-Care Activities	n	Baseline	Post-test	Change	p
6. On how many of the last seven days did you participate in at least 30 minutes of physical activity?					
All participants (mean ± SD)	91	3.3 ± 2.8	3.9 ± 2.5	.6 ± 2.6	.02
≥ 5/week (%)		39	45	15	.55
Low compliance at baseline (mean ±SD)	55	1.3 ± 1.5	2.9 ± 2.3	1.6 ± 2.4	< .0001
< 5/week (%)		0	24		< .0001
7 On how many of the last seven days did you participate in a specific exercise session?					
All participants (mean ± SD)	90	3.3 ± 2.9	3.5 ± 2.6	.2 ± 2.8	.52
≥ 5/week (%)		42	40	-5	.88
Low compliance at baseline (mean ±SD)	52	1.0 ± 1.3	2.5 ± 2.4	1.5 ± 2.4	< .0001
< 5/week (%)		0	21		< .0001
8. On how many of the last seven days did you test your blood sugar?					
All participants (mean ± SD)	91	4.0 ± 3.1	4.4 ± 2.9	.4 ± 2.5	.08
≥ 5/week (%)		49	56	14	.46
Low compliance at baseline (mean ±SD)	46	1.1 ± 1.3	2.5 ± 2.6	1.4 ± 2.6	.0003
< 5/week (%)		0	24		< .0001
9. On how many of the last seven days did you test your blood sugar the number of times recommended by your health care provider?					
All participants (mean ± SD)	87	3.6 ± 3.3	5.3 ± 2.7	1.7 ± 3.4	< .0001
≥ 5/week (%)		48	71	48	.003
Low compliance at baseline (mean ±SD)	45	.5 ± 1.0	4.3 ± 3.1	3.7 ± 3.2	< .0001
< 5/week (%)		0	53		< .0001
10. On how many of the last seven days did you check your feet?					
All participants (mean ± SD)	91	5.0 ± 3.0	6.1 ± 2.0	1.1 ± 3.3	.002
≥ 5/week (%)		68	81	19	.06
Low compliance at baseline (mean ±SD)	29	.8 ± 1.1	5.6 ± 2.2	4.8 ± 2.4	< .0001
< 5/week (%)		0	69		< .0001
11 .On how many of the last seven days did you inspect the inside of your shoes?					
All participants (mean ± SD)	91	3.1 ± 3.5	5.1 ± 3.0	2.0 ± 4.3	< .0001
≥ 5/week (%)		44	70	59	< .0001
Low compliance at baseline (mean ±SD)	51	.1 ± 0.5	4.8 ± 3.1	4.7 ± 3.2	< .0001
< 5/week (%)		0	65		< .0001

Low compliance refers to participants who undertook the activity < 5 days/week at baseline. Non-parametric t-test was used to evaluate means. Fisher exact test was to compare percents among participants.

TABLE 4.3. Correlations of changes in A1C for participants with baseline A1C $\geq$ 7 % with a Change in SDSCA and the Mean SDSCA level following the intervention.

Diabetes Self-Care Activities	Change in SDSCA*			SDSCA Following the Intervention		
	n	r	p	n	r	p
1. On how many of the last seven days have you followed a healthful eating plan?	32	.14	.45	32	-.07	.69
2. On average, over the past month, how many days per week have you followed your eating plan?	32	.21	.24	32	-.12	.52
3. On how many of the last seven days did you eat five servings of fruits and vegetables?	33	-.30	.09	33	-.42	.01
4. On how many of the last seven days did you avoid high fat foods such as red meat or full-fat dairy products?	33	-.28	.11	33	.07	.70
5. On how many of the last seven days did you space carbohydrates evenly through the day?	31	-.19	.31	31	-.41	.02
6. On how many of the last seven days did you participate in at least 30 minutes of physical activity?	33	-.45	.009	33	-.37	.03
7. On how many of the last seven days did you participate in a specific exercise session other than what you do around the house?	32	-.39	.03	32	-.33	.07
8. On how many of he last seven days did you test your blood sugar?	33	.14	.42	33	.003	.98
9. On how many of the last seven days did you test your blood sugar the number of times recommended by your health care provider?	32	-.09	.62	32	-.15	.42
10. On how many of the last seven days did you check your feet?	33	.19	.29	33	-.35	.04
11. On how many of the last seven days did you inspect the inside of your shoes?	33	-.40	.02	33	-.45	.009

Correlations are Spearman rho. *Change from baseline to following the intervention.

CHAPTER 5

GEORGIA HEALHTCARE PROVIDERS PERCEPTIONS OF DIABETES SELF-CARE ACTIVITES IN OLDER ADULTS[1]

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[1]Redmond, E.H., Fischer, J.G., & Johnson, M.A.
To be submitted to: *American Journal of Preventive Medicine.*

Background: To evaluate healthcare providers' ratings of the importance of diabetes management, as well as their responsibilities and confidence in providing them. To assess health care providers and older adults agreement with barriers to diabetes care.

Methods: Data presented here are an extension of previously reported research that included barriers to diabetes self-care behaviors in older adults.[1] The current study consists of two primary mailings to healthcare providers in north Georgia, conducted in the spring of 2001 and the fall of 2002. Seventy-three returned questionnaires were received and evaluated for this report.

Results: Seventy-six percent of respondents were medical doctors. Providers overall perceived themselves as rating diabetes care as more important than their patients. When compared to older adults with diabetes, providers were more likely to rate patients' abilities to undertake the activities as a barrier to care. The majority agreed that instruction of many of the diabetes activities were their responsibilities, though they were not confident in their abilities to facilitate change.

Conclusions: The results indicate the need to increase providers' confidence and training in facilitating change, and their awareness of patients' actual barriers.

Medical Subject Heading (MeSH): Older Adult Nutrition Program (OANP), Aged, A1C, self-care, barriers, health care providers, diabetes mellitus.

Introduction

Diabetes among older adults is expected to rise exponentially over the next decades.[2] This rise may be particularly pronounced in Georgia because of its large older adult population, [3] combined with the state's underperformance in meeting the recommended diabetes standards of care for its Medicare patients.[4,5] Research must begin to evaluate the barriers that may keep older adults from receiving recommended care.

Diabetes self-care activities such as diet, exercise, foot care, and self-glucose monitoring are considered a cornerstone to good diabetes care. Unfortunately, health care providers have not delivered these self-management activities as frequently as more clinical aspects of diabetes care,[6] and have been more likely to implicate patients when adherence was low.[7] In previous research, health care providers noted the need to aid their patients with diabetes in making behavior changes, but did not have confidence in their abilities to help patients actually make changes and some 40% felt their patients were not able to make these changes alone.[8] If health care providers are expected to encourage diabetes self-care behaviors, as well as follow recommended clinical guidelines, provider attitudes and confidence should be evaluated so needed interventions can be completed. The specific aims of this paper were to identify health care providers from north Georgia and assess: 1) how important providers perceive diabetes care practices in older adult patients; 2) the barriers to self-care; and 3) how responsible and confident health care providers feel facilitating behavioral change.

Methods

Health care providers were evaluated using a 2 paged, mailed, questionnaire concerning older adults with diabetes in their practice. It included four sections: 1) importance of the processes of care; 2) patient barriers; 3) provider responsibility; and 4) provider confidence. All responses

were confidential. In the initial mailings in the spring of 2001, 75 letters were sent to health care providers. The names of health care providers were collected from five Georgia counties, Morgan, Jackson, Franklin, Greene and Barrow. Letters were also sent to each of the 5 locations for the Georgia Association for Primary Health Care. The second mailing in the spring of 2002 included 75 names of health care providers from doctors' offices in all initial five counties, plus Fulton, Cherokee, Henry and Gilmer. The names collected in the second mailing included health care providers of older adult participants in previous studies, local phone books and at two internet sites, http://www.calladoctor.net/atlanta-health-organizations/Health-Organizations.htm and www.aahps.com/pharmacylist. Of the 150 letters that were mailed, 38 were stamped 'Return to Sender,' 3 were returned blank and 73 were returned completed, resulting in a 68% participation rate from viable addresses. The present study was an extension of a convenience sample of 105 older adults attending their local Older American Nutrition Program at 10 senior centers in the same counties the health care providers were selected[1]. The Statistical Analysis System was used for all analysis (SAS, Version 8.2, Cary, NC).

Results

The majority of questionnaire respondents were medical doctors (63%), 4% were certified diabetes educators, 4% were registered nurses, 1% were physician assistants, 1% were registered dieticians, 20% were pharmacists, and 5% were listed as others. The first set of questions lists how important specific diabetes management activities are to the provider and how important the provider believes they are to their patients (Table 5.1). Overall, providers rated the performance of home glucose monitoring and ordering an A1C to be more important than the other activities listed. Providers believed themselves to see these activities as more important than their patients. Table 5.2 includes the responses from both health care providers (N=73) and older adults with

diabetes (N=105). It compares how strongly health care providers and older adults agreed the items listed are barriers to older adults with diabetes. Health care providers were more likely to agree that the items listed were barriers to older adults with diabetes, than were older adults with diabetes. Only the availability of nutritional services was not significantly different between providers and patients.

Health care providers were also asked how confident they felt in performing and facilitating diabetes self-care activities (1=not at all confidant at, to 5=completely confident). Overall, health care providers were less confident in their abilities to facilitate change, with a mean score of 2.7 ± 1.2 for both diet and exercise, than to provide instruction on diet (3.4 ± 1.1), exercise (3.6 ± 1.2), or self-glucose monitoring (4.0 ± 1.1). While health care providers may not feel completely confident in their abilities to assist with self-care activities, the majority did agree they were responsible for them; 92% felt responsible for instruction on self-glucose monitoring, 89% for exercise instruction, 76% for diet instruction and 87% for foot care.

Discussion

The major findings were healthcare providers: 1) did not believe patients saw diabetes management as important; 2) were more likely than patients to agree with the barriers to care; and 3) were not confident in their abilities to facilitate change in their patients.

Healthcare providers rated their patients as not believing as strongly as providers in the importance of diabetes self-care activities. This is consistent with the results found by Chin et al. (2000),[8] and suggests that healthcare providers should ensure that they are appropriately evaluating their elderly patients for progress in all areas of diabetes care.[6,9] The beliefs of older adults in the importance of self-care, as well as their abilities to adhere should be evaluated. Older adults may have less confidence in performing self-care activities or impaired cognition

levels may warrant extra attention when prescribing self-care.[10-12] Research has reviewed the agreement between patients and providers in regard to setting goals.[13] but there is very little work on how healthcare providers rate their patients' beliefs on the importance of specific processes of diabetes care. There are many reasons why patients may be unsure of the importance of diabetes related activities. Their own individual requirements may change regularly, causing them to shift focus from one activity to another.[14] They may find that, even in light of adherence to diabetes care activities, they continue to have poor glycemic control, leading to frustration and a questioning of the importance of diabetes care practices.[14-17] Another concern is that healthcare providers may focus on more measurable clinical aspects of care, such as metabolic control.[6] Providers in our study rated the ordering of an A1C test as 'extremely important' more often than any other activity listed. Diabetes self-care activities are crucial and their importance should be discussed between the provider and patient.[18] In reality, patients may not be receiving instructions on self-care activities from their healthcare provider, thus giving patients the impression that providers do not see them as a priority.[19,20]

Healthcare providers' perception of the barriers patients encountered was significantly different than what patients from the same counties claim to experience. Such large discrepancies would appear to affect their ability to give specific relevant recommendations. Barriers to self-care activities have been associated with adherence to them.[21] The majority of north Georgia providers saw patient's abilities as a significant barrier, and more than half saw affordability of following diet and self-glucose monitoring as a barrier. A previous study of mid-western health care providers found providers' perception of their patients' affordability was similar to the perceptions of north Georgia providers.[8] In reviewing older adults' perceptions of their barriers to self-care, the majority did not agree that their abilities were barriers to care as

strongly as healthcare providers, nor did they agree affordability was a barrier as frequently. Studies reviewing patients and educators have also reported an unequal view of barriers.[9] Appropriate support from health care providers would certainly be expected to make a significant impact on patient success. Previous reports have suggested that providers' attitudes toward diabetes care can have a significant impact on providing recommended care and should be addressed.[19,20]

Health care providers agreed that instruction of self-care behaviors were their responsibilities. Unfortunately, the majority did not have confidence in their abilities to facilitate change. Because self-care activities can have a substantial impact on improving diabetes outcomes,[21,22] health care providers should ensure they have the skills and confidence themselves or accept the responsibility to make appropriate referrals. Previous reports have shown significant improvements in self-care behaviors in these older adults with diabetes attending a nutrition and diabetes education program at their county OANP.[1]

These findings suggest healthcare providers should stress the importance of diabetes management, and work to identify patients' actual barriers to diabetes self-care behaviors. Providers would benefit from receiving education and training on how to increase their confidence in facilitating change in patients.

Acknowledgments

Thanks are due to Sarah Burnett and Jean Edmonds for providing the names of local health care practitioners in local counties. Financial Support was given by the Northeast Georgia Area Agency on Aging.

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Tables 5.1. Healthcare providers reports of importance of diabetes self-care activities.

Process of Care	n	Not at all Important %	A little Important %	Somewhat Important %	Very Important %	Extremely Important %
Patents' regular performance of home glucose monitoring.						
Importance to provider	73	0	1	5	45	48
Importance to patients*	73	1	5	30	32	32
Ordering an A1C test twice a year.						
Importance to provider	73	1	3	4	30	62
Importance to patients*	71	7	21	21	25	25
Performing a foot examination at each visit.						
Importance to provider	73	3	11	27	30	29
Importance to patients*	72	8	29	31	18	12
Close monitoring of diet.						
Importance to provider	73	1	1	18	46	33
Importance to patients*	72	1	21	33	29	15
Close monitoring of exercise.						
Importance to provider	73	1	3	30	38	27
Importance to patients*	72	7	30	24	22	17

Data are n and %. Importance was rated as (1) Not at all – (5) Extremely Important.
*As perceived and reported by provider.

Table 5.2. Healthcare providers and older adults perceptions of barriers to self-care activities.

	Health care Providers		Older Adults with Diabetes		Statistic
	n	Agree %	n	Agree %	*p*
Ability to follow diet recommendations.	72	89	104	39	<0.0001
Ability to follow exercise recommendations.	72	88	104	38	<0.0001
Ability to do home glucose monitoring.	72	64	100	35	0.0002
Home glucose monitoring is too painful.	72	43	100	19	0.0006
Affordability of following diet recommendations.	71	58	103	22	<0.0001
Affordability of following exercise recommendations.	72	28	103	14	0.02
Affordability of home glucose monitoring.	71	54	100	17	<0.0001
Affordability of A1C.	72	31	102	14	0.007
Availability of nutritional counseling.	71	20	103	21	0.80

Data are n and %. Chi-square was used for statistical evaluations.

CHAPTER 6

SUMMARY

Diabetes is becoming a significant problem among the elderly and ways to decrease possible complications should be identified. The Division of Diabetes Translation projects that by the year 2050 diabetes will increase to 29 million cases, or 7.2% of the population (Boyle, 2001). Georgia has one of the fastest growing older adult populations in the nation. From 1990 to 2010 it is expected that adults 60 and older in Georgia will increase 82%, and those 85 and older will increase 264%, while over the same time period the national increase is expected to be 34% and 88%, respectively for these two age ranges (GDHR, 2003). Currently, the most important laboratory test to monitor a patient's blood glucose concentration or metabolic control is A1C, and reducing A1C has been shown to reduce the risk of complications (DCCT, 2002; UKPDS, 1998). Older adults receive less education and the percentage decreases with age (Mensing et al., 2002). The majority of patients with diabetes can significantly reduce the chances of developing long-term complications from elevated blood glucose levels by improving self-care activities. Health care providers should also do their part and begin by taking time to evaluate their patients' perceptions and make realistic and specific recommendations for self-care activities. Studies have been done using the Health Belief Model to predict adherence to self-care activities in several medical conditions such as hypertension, heart disease, arthritis, cancer, and diabetes (Janz and Becker, 1984; McDonald-Miszczak et al. 2001; Yarborough, 2001). This dissertation examined the level of compliance to diabetes self-care activities, health beliefs and barriers, and their relationship to A1C control; the effects of a nutrition and diabetes education program; correlates associated with changes in baseline data following the intervention; and the beliefs of healthcare providers.

Characteristics, diabetes self-care activities, health beliefs, and predictors of A1C and in older adults attending the Older Americans Nutrition Program

In Chapter 3, current diabetes self-care practices, A1C values, and health beliefs in the population, as well the relationship of these baseline values to A1C level of control, are summarized. The major findings were that 25% of participants had an A1C blood value considered high (≥ 8%), only 37 - 66% of participants were compliant to the self-care activities, the majority of participants (60%) agreed that understanding everything about their diet was a barrier, but only 21% reported that availability of nutrition services was a barrier. Furthermore, statistical analysis revealed that diabetes self-care activities, health beliefs and health barriers were generally not associated with A1C blood values.

Changes in diabetes self-care activities following a nutrition and diabetes education program in title III-C funded Georgia Older Americans Nutrition Program

In Chapter 4, the effects of the nutrition and diabetes education program, "Eat Well, Live Well," on improving diabetes self-care activities and/or decreases in A1C blood levels was examined. The primary findings were that after concluding the program OANP participants in north Georgia made major improvements in diabetes self-care activities. Moreover, the participants most in need of change, those not complying (< 5 days per week) with self-care activities at baseline, made the most significant improvements in self-care activities. Improvements in A1C blood levels were correlated to increases in specific self-care activities.

Georgia healthcare providers' perceptions of diabetes self-care activities in older adults

In Chapter 5, possible barriers to translation by healthcare providers were identified. Results suggested that health care providers should be better informed about patients' actual

barriers to diabetes self-care behaviors and that many providers could benefit from education and training to increase their confidence in their ability to facilitate change in their patients.

Conclusions

Older adults attending north Georgia OANPs were found to have low mean compliance to diabetes self-care activities and elevated A1C levels, with few associations between the two. Following the "Eat Well, Live Well" nutrition and diabetes educations program, participants made significant increases in diabetes self-care activities and reductions in A1C blood levels. This was in spite of the fact that the majority of surveyed healthcare providers from the same counties were unsure of their abilities to facilitate change in their patients. The primary findings of each chapter works toward the ultimate goal of establishing that older adults overall should and can make significant improvements in diabetes self-care activities leading to better metabolic control. Once all data were collected and evaluated the curriculum was modified to better fit the population and can be reviewed elsewhere (Burnett, 2003). These changes included renaming the curriculum from "Diabetes and You" to "Eat Well, Live Well," the inclusion of a section on cardiac health, and new techniques for obtaining A1C blood values.

This collaborative relationship of educators and researchers with OANPs should be encouraged in other studies focusing on older adults, while the diabetes and nutrition education program should be offered in other OANPs or older adults populations. OANPs are ideal places to offer diabetes programs because it brings informed, continued and cumulative information, and support to those who need it, at a location older adults are comfortable attending. Education on diabetes self-care activities has been shown to have an impact on overall health and should continue to be a focus in OANP populations. This is especially true for more rural populations who may have limited educational resources available.

Limitations

The present study utilized a one group pretest, intervention, post-test design in a convenience sample of older adults with diabetes to collect data concerning baseline diabetes self-care activities, health beliefs, and A1C blood levels, and to evaluate the effectiveness of a nutrition and diabetes education intervention. The study also used mailed surveys to county healthcare providers to evaluate their beliefs of their older patients with diabetes.

The primary limitations in this study were the lack of a control group or a randomized sample and the small sample size (N=105). The use of a convenience sample, in place of randomly selected participants, is a limitation that can lead to significant selection bias. In a study population that is randomly selected, all participants have an equal probability of being chosen, including motivated and unmotivated individuals. This helps avoid a regression effect of selecting only the most or least compliant subjects. The sample may or may not have been a true representative sample. The participants were predominately community dwelling white females. The use of a mailed survey may have also limited the response of healthcare providers. Differences in the population selected compared to the total population can have a significant effect. Compared to national OANP title III congregate meal participants, our study had greater minority participation, primarily blacks (42% versus 12% black; 42% versus 27% minority), though age and gender were roughly equivalent. Clients with low literacy or impaired hearing or vision, and who were unsure of their abilities to attend or understand every lesson may have avoided or simply not been aware of the program. It may have been that those participants who attended the intervention were the ones most likely to make a change.

Without the inclusion of a control group for comparison changes following the intervention could be due to confounding factors not controlled for, making it difficult to fully

judge the success of the intervention. Participants may have improved their level of self-care activities simply by having a purpose for coming to the center. It is also possible that participants experienced the Hawthorne effect; that merely being evaluated improved their behavior (Gerstam, 2003). Another limitation was the small sample size. Small sample sizes have been found to increase the risk of obtaining a type II error, of not detecting something that was there (Freidman et al., 1978). Small sample sizes can also increase the chances of random errors or reliability (Young, 1998).

The use of self-report for collecting data can also lead to information biases. Although its results have been cited as being unreliable, self-report is a practical and cost-effective research tool that has shown to be effective in many situations (Gerstam, 1998; Toobert et al., 2000). One of the strongest criticisms of self-report is the recall ability of those being questioned. This is something that could be especially pronounced in an older adult population at higher risk for cognitive deficits (Gregg et al., 2002; O'Dowd, 2001). Social desirability is also a significant problem in using self-reports. Another concern of the study was the type of intervention, group versus individual. Previous reports have shown diabetes group interventions to be successful (Glasgow et al., 1992; Ridgeway et al., 1999;Trento et al., 2002). Nutrition research has also shown that individual nutritional counseling makes significant improvements in lowering A1C values (Zeller, 2000). In a meta-analysis of the effect of diabetes self-management education Norris et al. (2002) did not find type of educational focus (diet versus lifestyle), group or individual educational presentations, or the identity of the person who delivered the intervention to be associated with glycemic outcomes.

A primary concern of the assessment tool utilized in this study to collect self-care behaviors is that it only represents the last seven days. It is thus unknown how long the

participant has undertaken the activity, making conclusions concerning baseline levels less certain. It is possible that the questionnaires used do not accurately evaluated participants. Though the tools utilized for the study had been previously validated, they had not been used in an OANP population (Hurley, 1990; Toobet et al., 2000). The assessment tool utilized for evaluating participants' health beliefs was a modified form originally developed for patients with type 1 diabetes. Not utilizing all the questions together may have had an effect, and rewording the questions to include those not using insulin also may have affected the outcome. Accurate health beliefs have been difficult to obtain in other studies. Another concern is that the interviewers may have influenced participants with non-verbal cues, also referred to as the Clever Hans effect (Gerstam, 2003).

A concern in any study is the significance of the data not collected, and possible confounding variables. Two primary confounding variables are the participants' interaction with their healthcare providers, and weight loss. Participants could have begun discussing diabetes self-care practices or metabolic control with their healthcare providers during the study period. The study did query participants on the self-care activity recommendations given them by their healthcare providers and found no significant differences from pre-test to post-test. No data was collected on participants' previous diabetes education, cognition, living situations, or family support. In a study of disease whose primary side effect is metabolic, there were no detailed dietary records or post-test weights collected, making it difficult to speculate on correlations. A decrease in high fat foods, an increase in fruits and vegetables, or exercise may have led to weight loss.

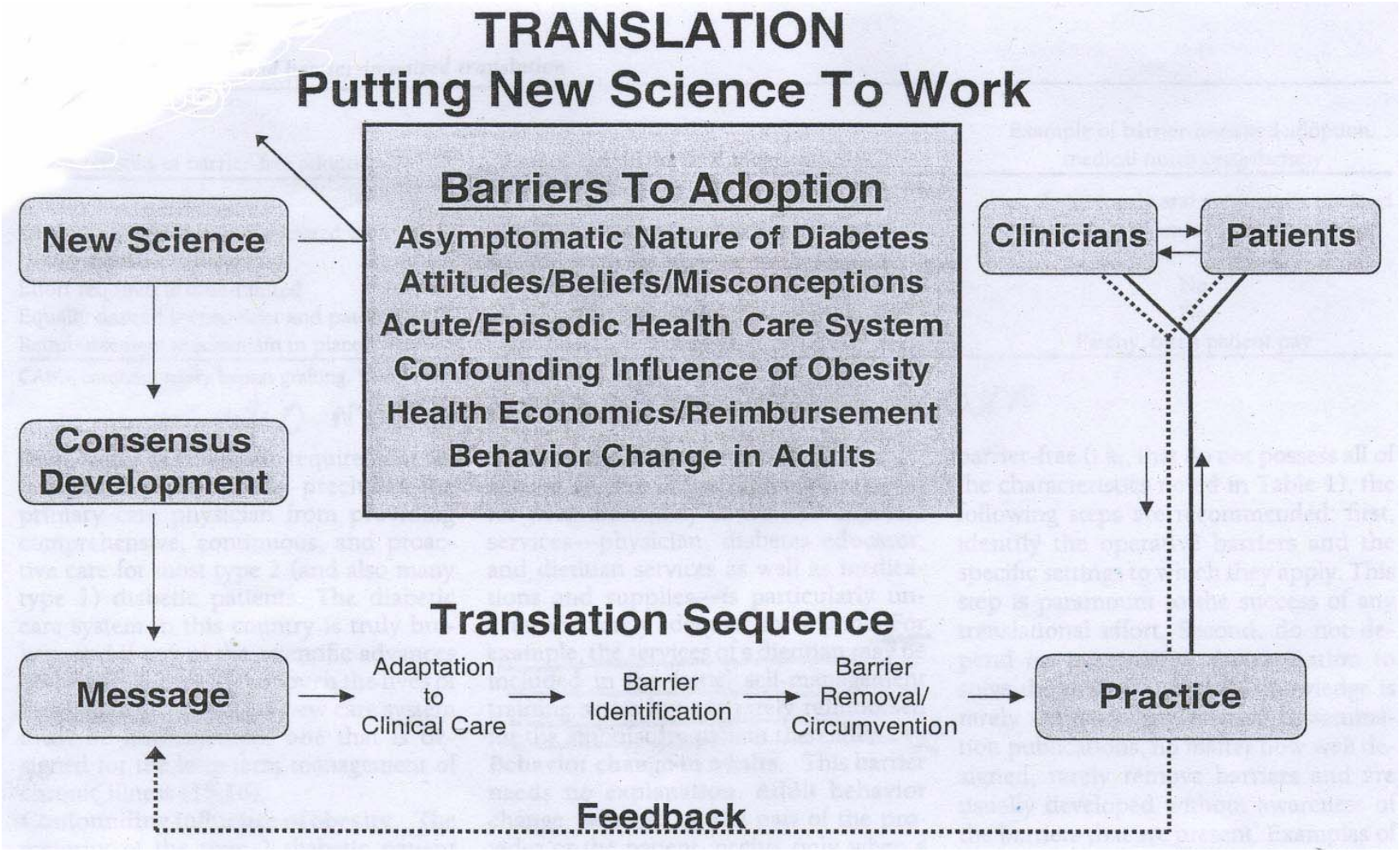
The study was done to establish the level of self-care activities and test the effectiveness of the intervention; it is not known if participants were able to maintain improved self-care

activities or glucose control after post-testing was completed. Previous research would argue against the possibility of participants being able to maintain behavioral changes (Norris et al., 2002;Wing et al., 2001). Several clinic-based programs have shown educational programs to lower A1C initially, but found the results to be diminished upon follow-up (Glasgow, 1992; Ridgeway, 1999). Long term group visits (four years) have been shown to reduce A1C blood values, compared to controls receiving individual care and basic education (Trento et al., 2002).

There are many ways to control for bias in a study population. We worked to decrease bias by standardizing the training and intervention, and by having objective measures of A1C. The population in our study varied tremendously in abilities; therefore, trained graduate students or staff completed all forms, in order to reduce any possible bias from participants' abilities. The study presented here shows that older adults attending north Georgia OANPs have a low level of compliance to self-care activities, but can make significant improvements by attending group meetings utilizing the "Eat Well, Live Well" diabetes program. However, because of the biases and the small sample, caution should be used when generalizing to other older adult populations.

Appendix A

DIABETES TRANSLATION FRAMEWORK


TRANSLATION
Putting New Science To Work
Barriers To Adoption
Asymptomatic Nature of Diabetes
Attitudes/Beliefs/Misconceptions
Acute/Episodic Health Care System
Confounding Influence of Obesity
Health Economics/Reimbursement
Behavior Change in Adults
New Science
Consensus Development
Clinicians
Patients
Translation Sequence
Message
Adaptation to Clinical Care
Barrier Identification
Barrier Removal/ Circumvention
Practice
Feedback

Appendix B

UPDATED “EAT WELL, LIVE WELL” CONSENT FORM

Updated

"Eat Well, Live Well" Consent Form

Consent Form DR

Authorization to Use and Disclose Protected Health Information for Research Purposes

The privacy law, Health Insurance Portability & Accountability Act (HIPAA), protects my health information. The privacy law requires me to sign an agreement in order for researchers to be able to use or disclose my protected health information for research purposes in the study entitled "Diabetes in Older Adults."

I authorize Dr. Mary Ann Johnson and her staff to use my most recent physician-obtained blood test values for glucose and hemoglobin A1c. The researchers will use this information to find out how well the diabetes and nutrition education program is helping people manage their diabetes. The researchers will protect this information by using it only as permitted by me in this Authorization and as directed by state and federal law. If I have any questions and/or wish to revoke this Authorization in writing at any time, I can contact Dr. Mary Ann Johnson at the Dept. of Foods and Nutrition, Dawson Hall, The University of Georgia, Athens, GA, 30602, 706-542-2292. This Authorization expires at the end of the research study. My decision to release or not to release this information will not affect the services I receive at the Senior Center or my ability to participate in the study. My protected health information that may be used is the most recent physician-obtained blood test values for glucose and hemoglobin A1c.

I, _____, give permission for _____ to release my most recent blood test values for glucose and hemoglobin A1c to Dr. Mary Ann Johnson for the "Diabetes and Older Adults" program. I will sign two copies of this form. I understand that I am agreeing by my signature on this form to allow the release of the information stated above. I will receive a signed copy of this consent form for my records.

_____ _____

Signature of Participant Date

_____

Participant Address and Phone

_____ Dr. Mary Ann Johnson ____

Signature of Investigator Printed Name of Investigator Date

Questions or problems regarding your rights as a participant should be addressed to Dr. Christina Joseph; Institutional Review Board; Office of V.P. for Research; The University of Georgia; 604A Graduate Studies Research Center; Athens, GA 30602-7411; Telephone 706-542-6514.

UGA project number: H2002-10285 DHR project number: 011102 3/17/03 SS

Authorization to Use and Disclose Protected Health Information for Research Purposes

Date: _____
To: (Physician)_____
From: Dr. Mary Ann Johnson, Professor of Foods and Nutrition
Re: Release of blood glucose and hemoglobin A1c of (patient's name)

The University of Georgia is conducting a nutrition education program, "Diabetes in Older Adults," at the Senior Center in your area. Your patient has agreed to participate in the program, but would prefer to have his/her blood glucose and hemoglobin A1c values provided by your office instead of our phlebotomist and laboratory. If you could provide the most recent blood glucose and hemoglobin A1c value for the named patient above, we would greatly appreciate it. We have provided the signed consent from the patient. After completing the following information, please fax or mail this form using the provided contact information.

Please complete:
Patient Name_____

Lab Values:

Blood Glucose _____ Date_____

Hemoglobin A1c _____ Date_____

_____ _____
Printed Name of Physician Phone Number of Physician's Office

_____ _____
Signature of Physician Date

_____ Dr. Mary Ann Johnson _____
Signature of Investigator Printed Name of Investigator Date

Please return complete and fax this form to: **Attention: Dr. Mary Ann Johnson**
706-542-5059

If preferred, you may mail this form to: **Dr. Mary Ann Johnson**
Dept. of Foods and Nutrition
Dawson Hall, The University of Georgia
Athens, GA 30602

If you have any further questions about the study, now or during the course of the project, you may call [staff name] at 706-542-4838 or Dr. Mary Ann Johnson 706-542-2292.

UGA project number: H2002-10285 DHR project number: 011102 3/17/03 SS

Appendix C

ORIGINAL “EAT WELL, LIVE WELL” CONSENT FORM

Original

"Eat Well, Live Well" Consent Form

"DIABETES AND YOU" CONSENT FORM FOR OLDER ADULTS

I, _____, agree to participate in the study titled "Diabetes and You" conducted by Dr. Mary Ann Johnson in the Department of Foods and Nutrition at the University of Georgia. I understand that I do not have to take part if I do not want to. I can stop taking part without giving any reason and without penalty. I can ask to have all information concerning me removed from the research records, returned to me, or destroyed. My decision to participate will not effect the services that I receive at the Senior Center.

The benefits of this study are to help me learn more about preventing diabetes in myself and other older adults, and how to better manage diabetes if I already have it. This study will also help the investigators learn more about helping older adults prevent and manage diabetes. This study will be conducted at my local Senior Center. If I volunteer to take part in this study, I will be asked to do the following things:

1) Answer questions about my health, food intake, and nutrition status.

2) Provide blood samples for hemoglobin A_{1c} and/or glucose. A medical technologist will obtain 2-3 drops (about 35 microliters) of whole blood via finger stick for glucose measures on up to six occasions and/or b) up to 3 ml of whole blood by venipuncture for hemoglobin A1c measures on two occasions at least three months apart.

3) Attend up to 6 nutrition, health, and fitness programs that will last about 30 to 60 minutes each.

4) Take part in a physical activity program to improve my strength and balance.

5) Attend two sessions for collecting information about my health, fitness, food, and nutrition habits. Each session will last up to 60 minutes.

6) Someone from the study may contact me to clarify my information.

My blood will not be tested for HIV-AIDS. I understand that these questions and blood tests are not for diagnostic purposes. I should see a physician if I have questions about my test results. In the event that I have any health problems associated with the blood sample my insurance or I will be responsible for any related medical expenses.

The instructor will provide food to taste. Mild to no risk is expected by tasting food. However, I will not taste foods that I should not eat because of swallowing difficulties, allergic reactions, dietary restrictions, or other food-related problems.

No risk is expected, but I may experience some discomfort or stress when the researchers ask me questions about my food intake, nutrition status, and health. The risks of drawing blood from my arm include the unlikely possibilities of a small bruise or localized infection, bleeding and fainting. These risks will be reduced in the following ways: my blood will be drawn only by a qualified and experienced person who will follow standard sterile techniques, who will observe me after the needle is withdrawn, and who will apply pressure to the blood draw site. The leaders will advise me to stop exercising if I experience any discomfort or chest pains. No information concerning myself or provided by myself during this study will be shared with others without my written permission, unless law requires it or I am found to have diabetes, as defined by the study, in which case my physician will be notified of my elevated glucose level only. I may choose not to answer any question or questions that may make me uncomfortable. I will be assigned an identifying number and this number will be used on all of the questionnaires I fill out. Data will be stored in locked file cabinets under the supervision of Dr. Mary Ann Johnson at the University of Georgia; only the staff involved in the study will have access to these data and only for the purpose of data analyses and interpretation of results. The data will be destroyed by January 1, 2012.

I give my permission for you to release my blood analysis information to my health care providers. Circle one: YES / NO. Initial _____.

I will allow the staff to take my picture, videotape, or record me on audiotape while participating in the study. I can verbally refuse at anytime, and my wishes will be upheld. My pictures will only be used to promote this diabetes program.

- I will allow my picture/video/audio recordings to be used for promotional purposes.
  Circle one: YES / NO. Initial _____.

- I will allow the staff to take my picture.
  Circle one: YES / NO. Initial _____.

- I will allow the staff to videotape me.
  Circle one: YES / NO. Initial _____.

- I will allow the staff to record me on audiotape.
  Circle one: YES / NO. Initial _____.

If I have any further questions about the study, now or during the course of the project I can call Ms. Susan Stone 706-542-4838 or Dr. Mary Ann Johnson 706-542-2292.

I will sign two copies of this form. I understand that I am agreeing by my signature on this form to take part in this project. I will receive a signed copy of this consent form for my records.

_____	_____	_____
Signature of Participant	Participants' Printed Name	Date

_____

_____

Participant Address and Phone

_____	Dr. Mary Ann Johnson	_____
Signature of Investigator	Printed Name of Investigator	Date

Questions or problems regarding your rights as a participant should be addressed to Dr. Christina Joseph; Institutional Review Board; Office of V.P. for Research; The University of Georgia; 604A Graduate Studies Research Center; Athens, GA 30602-7411; Telephone 706-542-6514.

UGA project number: *DHR project number:* *12/11/01 maj*

Appendix D

ORIGINAL “EAT WELL, LIVE WELL” QUESTIONNAIRE

Original

"Eat Well, Live Well" Questionnaire

Demographic Information – Pre-Test - For Older Adult Participants

This questionnaire should be administered by a UGA staff person.

Date: _____

UGA Staff administering the questionnaire: _____

Read the questions to the participant and circle the answer given.

Read to the participant: "Now I am going to ask you a few questions about yourself."

	Demographics		Line 1
	Questions	**Answers**	
Demo1	Participant ID	___ ___ ___	1-3
Demo2	County	___ ___	4-5
Demo3	Date of birth?	___ ___ / ___ ___ / ___ ___ Month/Day/Year	6-11
Demo4	How old are you?	Age: ___ ___ ___	12-14
Demo5	How long have you had diabetes?	Number of years: ___ ___	15-16
Demo6	Ethnicity?	1) White 2) Black 3) Hispanic 4) Asian 5) other_____	17
Demo7	Gender?	0)Male 1)Female	18
Demo8	Years completed in school?	Years: ___ ___	19-20
Demo9	Name of Healthcare Provider? 0 = no 1 = yes	Name:_____ Address:_____ _____ Phone:_____	21
Demo 10	Name of Pharmacists? 0 = no 1 = yes	Name:_____ Address:_____ _____ Phone:_____	22

	Current Health Conditions and Illnesses				Line 1
	Ask the client if their doctor has told them they have any of the following conditions.	No (0)	Yes (1)	Don't know (2)	(.)
Demo11	Weight loss				23
Demo12	Vision problems				24
Demo13	Retinopathy				25
Demo14	Kidney Disease				26
Demo15	Hearing problems				27
Demo16	Neuropathy or nerve problems				28
Demo17	Numbness or tingling in their feet (patient report)				29
Demo18	Heart disease				30
Demo19	Diabetes				31
Demo20	If yes to Diabetes, what type?	I = (0)	II = (1)	DK = (3)	32

	Prescription Medication		line 1
	Do you take the following medications*? (list the diabetes or HTN medication if available)*		
Demo21	Oral diabetes medication? _____	(0) = no (1) = yes	33
Demo22	Oral diabetes medication? _____	(0) = no (1) = yes	35
Demo23	Oral diabetes medication?	(0) = no (1) = yes	37
Demo24	Insulin? _____	(0) = no (1) = yes	39
Demo25	Insulin? _____	(0) = no (1) = yes	41
Demo26	HTN _____	(0) = no (1) = yes	43

	Vitamins and Minerals				Line 1
	Do you take vitamins or minerals? *(List the multivitamin, vitamin or mineral if available.)*		Dosage?	How long they have been taking it?	
Demo27	Multivitamin?	(0) = no (1) = yes			44
Demo28	Vitamin?	(0) = no (1) = yes			45
Demo29	Vitamin?	(0) = no (1) = yes			46
Demo30	Vitamin?	(0) = no (1) = yes			47
Demo31	Mineral?	(0) = no (1) = yes			48
Demo32	Mineral?	(0) = no (1) = yes			49

Demo33	Weight in pounds:	_____ _____ pounds	50-52
Demo34	Height in feet and inches:	____ feet ____ ____ inches	53-55
Demo35	BMI (see chart on next page to calculate):	kg/m^2	55-56
	If your BMI is:		
	18 or less: You are at risk of <u>being</u> underweight. See your health care provider to help you find out why you are losing weight and to help you gain weight.		
	19 to 24: This is the normal healthy range.		
	25 or higher: You are overweight. See your health care provider to help you find out why you are gaining weight and to help you lose or stop gaining weight.		

Body Mass Index Chart for the Educator

Health Risk based on BMI (weight in kg/height in m^2)

- Dark gray = moderate to extremely high
- Light gray = low
- White = minimal

Source: http://www.sugar.org/health/carbohydrates.html

WEIGHT	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	245	250
HEIGHT																															
5'0"	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
5'1"	19	20	21	22	23	24	25	26	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	43	44	45	46	47
5'2"	18	19	20	21	22	23	24	25	26	27	27	28	29	30	31	32	33	34	35	36	37	37	38	39	40	41	42	43	44	45	46
5'3"	18	19	19	20	21	22	23	24	25	26	27	27	28	29	30	31	32	33	34	35	35	36	37	38	39	40	41	42	43	43	44
5'4"	17	18	19	20	21	21	22	23	24	25	26	27	27	28	29	30	31	32	33	33	34	35	36	37	38	39	39	40	41	42	43
5'5"	17	17	18	19	20	21	22	22	23	24	25	26	27	27	28	29	30	31	32	32	33	34	35	36	37	37	38	39	40	41	42
5'6"	16	17	18	19	19	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32	33	34	35	36	36	37	38	39	40	40
5'7"	16	16	17	18	19	20	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32	33	34	34	35	36	37	38	38	39
5'8"	15	16	17	17	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	30	31	32	33	33	34	35	36	36	37	38
5'9"	15	16	16	17	18	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	30	31	32	32	33	34	35	35	36	37
5'10"	14	15	16	17	17	18	19	19	20	21	22	22	23	24	24	25	26	27	27	28	29	29	30	31	32	32	33	34	34	35	36
5'11"	14	15	15	16	17	17	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28	29	29	30	31	31	32	33	33	34	35
6'0"	14	14	15	16	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28	28	29	30	31	31	32	33	33	34
6'1"	13	14	15	15	16	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28	28	29	30	30	31	32	32	33
6'2"	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	28	28	29	30	30	31	31	32
6'3"	12	13	14	14	15	16	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26	26	27	27	28	29	29	30	31	31
6'4"	12	13	13	14	15	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	24	25	26	26	27	27	28	29	29	30	30

Summary of Diabetes Self-Care Activities (SDSCA)-For Older Adult Participants

This questionnaire should be administered by a UGA staff person.

Pre-Test **Date: _____**

UGA Staff administering the questionnaire: _____

Read the questions to the participant, and circle the answer given.
If 'other' is given as an answer, then fill in the space provided.

Read to the participant: "Now I am going to ask you a few questions about yourself."

"The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick. "

	Questions	**Answers**	code
	Diet	**Circle answer**	line 2
SELF1	Participant ID	_____ _____ _____	1-3
SELF2	County	_____ _____	4-5
SELF3	How many of the last SEVEN DAYS have you followed a healthful eating plan?	0 1 2 3 4 5 6 7	6
SELF4	On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?	0 1 2 3 4 5 6 7	7
SELF5	On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	0 1 2 3 4 5 6 7	8
SELF6	On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat diary products?	0 1 2 3 4 5 6 7	9
	Exercise		line 2
SELF7	On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking).	0 1 2 3 4 5 6 7	10
SELF8	On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as walking, swimming, biking) other that what you do around the house or as part of your daily activates?	0 1 2 3 4 5 6 7	11
	Blood Sugar Testing		line 2
SELF9	On how many of the last SEVEN DAYS did you test your blood sugar?	0 1 2 3 4 5 6 7	12
SELF10	On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?	0 1 2 3 4 5 6 7	13
	Foot Care		line 2
SELF11	On how many of the last SEVEN DAYS did you check your feet?	0 1 2 3 4 5 6 7	14
SELF12	On how many of the last SEVEN DAYS did you inspect the inside of your shoes?	0 1 2 3 4 5 6 7	15

	Smoking		line 2
SELF13	Have you smoked cigarettes - even one puff - over the last seven days?	(0) No (1) Yes	16
SELF14	If yes, how many cigarettes did you smoke on an average day?	Number of cigarettes _____	17-19 (...)
	Self-Care Recommendations		line 2
SELF15	In which of the following has your healthcare team (doctors, nurse, dietitian, or diabetes educator) advised you to do? Please read to client and check all that apply.	(1) Follow a low fat eating plan? (2) Follow a complex carbohydrate diet? (3) Reduce the number of calories you eat to lose weight? (4) Eat lots of foods high in dietary fiber? (5) Eat lots (at least 5 servings per day) of fruits and vegetables? (6) Eat very few sweets (for example desserts, non-diet sodas, candy)? (7) Other(specify)_____ (8) I have not been given any advice about diet by my health care team.	20-27 (8)
SELF16	Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please read to client and check all that apply.	(1) Get mild level of exercise (such as walking) on a daily basis. (2) Exercise continuously for a least 20 minutes at least 3 times a week (3) Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk etc.) (4) Engage in a specific amount, type, duration and level of exercise. (5) Other (specify) _____ (6) I have not been given any advice about exercise by my health care team.	28-33 (6)
SELF17	Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please read to client and check all that apply.	(1) Test your blood sugar using a drop of blood from your finger and a color chart. (2) Test your blood sugar using a machine to read the results. (3) Test your urine for sugar. (4) Other (specify) _____ (5) I have not been given any advice about testing my blood, or urine, for sugar by my health care team.	34-38 (5)

SELF18	Which of the following medications for your diabetes has your doctor prescribed? Please read to client and circle all that apply.	(1) An insulin shot 1 or 2 times a day. (2) An insulin shot 3 or more times a day. (3) Diabetes pills to control my blood sugar level. (4) Other (specify): _____ (5) I have not been prescribed either insulin or pills for my diabetes.	39--43 (5)
	Diet		line 2
SELF19	On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?	0 1 2 3 4 5 6 7	44
	Medications		line 2
SELF20	On how many of the last SEVEN DAYS, did you take your diabetes medication?	0 1 2 3 4 5 6 7 9	45
SELF21	On how many of the last SEVEN DAYS did you take your recommended number of insulin injections?	0 1 2 3 4 5 6 7 9	46
SELF22	On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?	0 1 2 3 4 5 6 7 9	47
	Foot Care		line 2
SELF23	On how many of the last SEVEN DAYS did you wash your feet?	0 1 2 3 4 5 6 7	48
SELF24	On how many of the last SEVEN DAYS did you soak your feet?	0 1 2 3 4 5 6 7	49
SELF25	On how many of the last SEVEN DAYS did you dry between your toes after washing?	0 1 2 3 4 5 6 7	50
	Smoking		line 2
SELF26	At your last doctor's visit, did anyone ask you about your smoking status?	(0) no (1) yes (2) don't know	51
SELF27	If you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program?	(0) no (1) yes (2) don't smoke	52
SELF28	When did you last smoke a cigarette?	(1) More than two years ago, or never. (2) One to two years ago. (3) Four to twelve months ago. (4) One to three months ago. (5) Within the last month. (6) Today.	53

	Scoring
	Step 1: For items 1 -10, use the number of days per week on a scale of 0-7. Step 2: Scoring Scales: *General Diet = Mean number of days for items 3 and 4. *Specific Diet = Mean number of days for items 5, and 6, reversing item 6 (0=7, 1=6, 2=5, 3=4, 4=3, 5=2, 6=1, 7=0). Using the individual items is recommended. *Exercise = Mean number of days for items 7 and 8. *Blood-Glucose Testing = Mean number of days for items 7 and 8. *Foot care = Mean number of days for items for 9 and 10. *Smoking status = Items 13 (2=nonsmoker, 1=smoker), and number of cigarettes smoked per day. *Recommended regimen = Items 15 - 18. *Diet = Use total number of days for item 19. *Medications = Use item 20 or 21 AND 22, use total number of days for item 20, use mean number of days if both 21 and 22 are applicable. *Foot care = Mean number of days for items 23 - 25, after reversing 24 and including items 23 and 24 from the brief version.

Adapted from: Toolbert, D.J., Hampton, S.E., Glasgor, R.E. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes Care, 23: 943-50, 2000.

Health Belief / Questionnaire on Stages of Change

UGA Staff administering the questionnaire: _____

This questionnaire should be administered by a UGA staff person

	Questions	Answers **(circle answer, fill in 'other')**	Line 3
SOC1	Do you check your blood sugar yourself?	(0) no (1) yes (2) don't know	1
SOC2	If you don't check your blood sugar yourself, why not?	(1) do not know how (2) do not want to (3) do not find it helpful (4) painful (5) expensive (6) time consuming (7) scared (8)other_____	2

For questions 3 - 5, read to the participant: "Now I am going to ask you a few questions about yourself. When you think about the changes you have tried to make or have made, please rate them as, easy, difficult, or impossible. Easy means you have made the changes and have maintained them for more than six months. Difficult means you have tried to make these changes at least once, but have been unable to maintain them and have reverted back to your old ways. Impossible means you have not ever tried to change and do not think about changing." Show the client the appropriate page, "Easy, Difficult, Impossible".

	Easy	Which changes were easy? (Fill in answer below)	Line 3
SOC3	When you think about changes you have been asked to make because of your diabetes, which type of change was the easiest for you to make?	(1) Diet (2) Exercise (3) Self-Testing Glucose (4) Foot Care (5) Medications (6) Other_____	3-8 (6)
	Difficult	Which changes were difficult? (Fill in answer below)	Line 3
SOC4	When you think about changes you have been asked to make because of your diabetes, which type of change was difficult for you to make?	(1) Diet (2) Exercise (3) Self-Testing Glucose (4) Foot Care (5) Medications (6) Other_____	9-14 (6)
	Impossible	Which changes are impossible? (Fill in answer below)	Line 3
SOC5	When you think about changes you have been asked to make because of your diabetes, which type of change was impossible for you to make?	(1) Diet (2) Exercise (3) Self-Testing Glucose (4) Foot Care (5) Medications (6) Other_____	15-20 (6)

For questions 6 - 14, read the following, “Please rate, on a scale of 1 - 4, how much you agree with the following statements ‘.

		Strongly Disagree (1)	**Disagree (2)**	**Agree (3)**	**Strongly Agree (4)**	Line 3
SOC6	I believe that my diet and medications will prevent complications related to diabetes.					21
SOC7	My diabetes is not a problem as long as I feel all right.					22
SOC8	My diabetes will have a bad effect on my future health.					23
SOC9	My diabetes will cause me to be sick a lot.					24
SOC10	I believe I can control my diabetes.					25
SOC11	I believe my diet and medication will control my diabetes.					26
SOC12	I cannot understand everything I've been told about my diet.					27
SOC13	I believe I will always need my diabetes diet and medication.					28
SOC14	I have more serious health concerns than diabetes.					29

For questions 15- 26, read the following, "Please rate, on a scale of 1 - 4, how much you believe the following are **barriers to you**". Check the box that applies.

		Strongly Disagree (1)	**Disagree (2)**	**Agree (3)**	**Strongly Agree (4)**	line 3
SOC15	My ability to follow diet recommendations?					30
SOC16	My ability to follow exercise recommendations?					31
SOC17	My ability to do home glucose monitoring?					32
SOC18	Home glucose monitoring is too painful?					33
SOC19	Affordability of following diet recommendations?					34
SOC20	Affordability of following exercise recommendations?					35
SOC21	Affordability of home glucose monitoring?					36
SOC22	Affordability of hemoglobin A_{1c}?					37
SOC23	Affordability of dilated eye exam?					38
SOC24	*Availability* of laboratory facilities for glycosolated hemoglobin?					39
SOC25	*Availability* of ophthalmology services?					40
SOC26	*Availability* of nutritional counseling?					41

Adapted from:

Hurley, C.A. (1990). The health belief model: Evaluation of a diabetes scale. The Diabetes Educator, 16(1):44-48.

Chin, M.H., Cook, S., Jin, L., Drum, M.L., Harrison, J. F., Koppert, J., Thiel, F., Herrand, A.G., Schaefer, C.T., Takaachima, H.T., Chin, S.C. Barriers to providing diabetes care in community health center, Diabetes Care, 24 (2): 274-86, 2001.

Sullivan, E.D., Joseph, D.H. Struggling with behavioral changes: a special case for clients with diabetes. The Diabetes Educator, 24: 72-76, 1998.

Questionnaire on Hemoglobin A_{1c} Blood Test

This questionnaire should be administered by a UGA staff person.

Date: _____

UGA Staff administering the questionnaire: _____

Read the questions to the participant and circle the answer given. Read to the participant:
"Next, we are going to talk about the hemoglobin A_{1c} test (also called H-b-A-1-c). I'll read a statement to you and then ask you to tell me if you think it is "true" or "false," then we'll discuss the statement."

HT1	Participant ID	___ ___ ___	Line 1 1-3
HT2	County	___ ___	4-5
	Questions	Circle answer 0 1 2	
HT3	1. A hemoglobin A_{1c} test measures the average amount of sugar in your blood over the last 3 months.	False True Don't Know	6
HT4	2. It's important to know your hemoglobin A_{1c} number.	False True Don't Know	7
HT5	3. All people with diabetes need to have a hemoglobin A_{1c} test.	False True Don't Know	8
HT6	4. The hemoglobin A_{1c} goal for people with diabetes is less than 6.5%	False True Don't Know	9
HT7	5. Most people can tell what their blood sugar levels are simply by how they feel.	False True Don't Know	10
HT8	6. You can have a "touch of sugar" but don't have to do anything about it.	False True Don't Know	11
HT9	7. You can do something about high blood sugar.	False True Don't Know	12
HT10	8. A hemoglobin A_{1c} number over 8% is a sign that one or more parts of your treatment plan needs to be changed.	False True Don't Know	13
HT11	9. A hemoglobin A_{1c} test should be done about once a year.	False True Don't Know	14
HT12	10. There's no proof that lowering your hemoglobin A_{1c} number can reduce your chances of getting serious eye, kidney, or nerve disease.	False True Don't Know	15
HT13	correct:	____ ____ ____ %	16-18
HT14	A1c lab. value	____ ____ ____	19-22

Educator: Review the correct answers with the client in an individual session or in a group session (see next page).

National Diabetes Education Program, http://ndep.nih.gov/materials/pubs/HbA1c/HbA1c-checkIQ.h

Answers to the Hemoglobin A_{1c} I.Q. Quiz

1. True. The hemoglobin A_{1c} test shows the average amount of sugar in your blood over the last 3 months. It is a simple lab test done by your health care provider. The hemoglobin A_{1c} is the best test to find out if your blood sugar is under control. Return to Quiz

2. True. If you know your hemoglobin A_{1c} number, you will know if your blood sugar is under control. A high number is a sign that you should work with your health care provider to change your treatment plan. A good test result is a sign that your treatment plan is working and your blood sugar is under control. Return to Quiz

3. True. All people with diabetes should have a hemoglobin A_{1c} test at least twice a year. Regular hemoglobin A_{1c} testing can help you track your blood sugar levels over time to see if they stay close to normal or go up and down. If your blood sugar levels are too high or too low, work with your health care provider to change your treatment plan and reach your target level of control. Return to Quiz

4. True. The hemoglobin A_{1c} goal for people with diabetes is less than 6.5%. The findings of a major diabetes study, the Diabetes Control and Complications Trial (DCCT), showed that people with diabetes who keep their hemoglobin A_{1c} levels close to 6.5% have a much better chance of delaying or preventing diabetes problems that affect the eyes, kidneys, and nerves than people with hemoglobin A_{1c} levels 8% or higher. A change in treatment is almost always needed if your hemoglobin A_{1c} is over 8%. But, if you can lower your hemoglobin A_{1c} number by any amount, you will improve your chances of staying healthy. Return to Quiz

5. False. Research shows that few people can tell their blood sugar levels simply by how they feel. Testing your blood sugar is the only way to know for sure whether you are reaching your blood sugar goals. Return to Quiz

6. False. If you have "sugar" you have diabetes. Diabetes is a serious disease that causes the sugar in your blood to build up in your body. This buildup of sugar can cause you to go blind, suffer a heart attack, lose your feet or legs to amputations, stop your kidneys from working, and even kill you. There is no cure for diabetes, but there is a lot you can do to control it. For example, you can see your health care provider more often. You can change some of the foods you eat. You can stay at a weight that is right for you. And you can get regular physical activity. Return to Quiz

7. True. You can do a lot to bring down high blood sugar and get it under control. Start by asking your health care provider for a hemoglobin A_{1c} test. If your hemoglobin A_{1c} test result is too high, talk to your health care provider about how to lower it. To get your blood sugar under control, follow the meal plan recommended by your health care provider, stick to a physical activity program, take prescribed diabetes medicines, and consult your health care provider often. Return to Quiz

8. True. A change in treatment is almost always needed if your hemoglobin A_{1c} is over 8%. Common causes of high blood sugar include eating too much food or eating the wrong foods, lack of physical activity, stress, a need to change medicines, and infection or illness. If your hemoglobin A_{1c} number is too high, work with your health care provider to change your treatment plan and reach the goal of less than 6.5%. Return to Quiz

9. False. You should get a hemoglobin A_{1c} test at least two times a year if your blood sugar is in the target range and stable. If your treatment changes or if your blood sugar stays too high, you should get a hemoglobin A_{1c} test at least every 3 months until your blood sugar level improves. Return to Quiz

10. False. The DCCT showed that the lower the hemoglobin A_{1c} number, the greater the chances that people with diabetes will slow or prevent the development of serious eye, kidney, and nerve disease. The study also showed that if you can lower your hemoglobin A_{1c} number by any amount, you will improve your chances of staying healthy. Return to Quiz

Record for Diabetes Education Programs, and Glucose and Hemoglobin A_{1c} Measures Taken at Senior Center

Client:					
Date	**Attended Diabetes Program.** *If yes, indicate topic. If no, write in "no".*	**Glucose (mg/dL)**	**Hours since last eaten before glucose measured.**	**Hemoglobin A_{1c} (%)**	**Comments**

Participant must be referred to their physician if they have any of the following which indicates a possible diagnosis of diabetes; any *one* of the following on *two* separate occasions;

1.Fasting blood sugar of >126 mg./dl.

2.Random blood sugar > 200 mg./dl

Adapted from; Diabetes Care, vol. 24 (7), July 2001.

Glucose and Hemoglobin A_{1c} Report for Participants - Please take to your physician.

From: Department of Foods and Nutrition, University of Georgia
Please contact Ms. Jean Edmonds for further information (706-542-4838).

Client:	
Date (M/D/Y):	
Glucose (mg/dL):	
Hours since last eaten before glucose was measured:	
Hemoglobin A_{1c} (%):	
Glucose (mg/dL)	

Glucose and Hemoglobin A_{1c} Report for Participants - Please take to your physician.

From: Department of Foods and Nutrition, University of Georgia
Please contact Ms. Jean Edmonds for further information (706-542-4838).

Client:	
Date (M/D/Y):	
Glucose (mg/dL):	
Hours since last eaten before glucose was measured:	
Hemoglobin A_{1c} (%):	
Glucose (mg/dL):	

Glucose and Hemoglobin A_{1c} Report for Participants - Please take to your physician.

From: Department of Foods and Nutrition, University of Georgia
Please contact Ms. Jean Edmonds for further information (706-542-4838).

Client:	
Date (M/D/Y):	
Glucose (mg/dL):	
Hours since last eaten before glucose was measured:	
Hemoglobin A_{1c} (%):	
Glucose (mg/dL):	

Post - Tests

Diabetes Self-Report

Older Adult Participant Satisfaction Questionnaire

This questionnaire should be administered by a UGA staff person.

Date: _____

UGA Staff administering the questionnaire: _____

Read the questions to the participant and circle the answer given.
Read to the participant: "Now I am going to ask you a few questions about yourself."

	Demographics		Line 1
	Questions	**Answers**	
PSAT1	Participant ID	___ ___ ___	1-3
PSAT2	County	___ ___	4-5

PSAT3	How would you rate your overall satisfaction with the "Diabetes and You" program that we have offered in your senior center during the past several months?	1) Poor 2) Fair 3) Good 4) Very Good 5) Excellent	6
PSAT4	Have you changed the way you were taking your medication, stopped taking your medication, or started taking any new medication since the program started?	0) no 1) yes 9) DK	7
PSAT5	If yes, then what changes have been made to your medication?	1) I started taking a new medication. 2) I changed how I was taking my medication. 3) I stopped taking my medication. 4) DK	8

Post-Test

Summary of Diabetes Self-Care Activities (SDSCA)-For Older Adult Participants

This questionnaire should be administered by a UGA staff person.

Date: _____UGA Staff administering the questionnaire: _____

Read the questions to the participant, and circle the answer given. If 'other' is given as an answer, then fill in the space provided.

Read to the participant: *"Now I am going to ask you a few questions about yourself. The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick. "*

	Questions	**Answers**	code
	Diet	**Circle answer**	line 2
SELF1	Participant ID	_____ _____ _____	1-3
SELF2	County	_____ _____	4-5
SELF3	How many of the last SEVEN DAYS have you followed a healthful eating plan?	0 1 2 3 4 5 6 7	6
SELF4	On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?	0 1 2 3 4 5 6 7	7
SELF5	On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	0 1 2 3 4 5 6 7	8
SELF6	On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat diary products?	0 1 2 3 4 5 6 7	9
	Exercise		line 2
SELF7	On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking).	0 1 2 3 4 5 6 7	10
SELF8	On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as walking, swimming, biking) other that what you do around the house or as part of your daily activates?	0 1 2 3 4 5 6 7	11
	Blood Sugar Testing		line 2
SELF9	On how many of the last SEVEN DAYS did you test your blood sugar?	0 1 2 3 4 5 6 7	12
SELF10	On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?	0 1 2 3 4 5 6 7	13
	Foot Care		line 2
SELF11	On how many of the last SEVEN DAYS did you check your feet?	0 1 2 3 4 5 6 7	14

SELF12	On how many of the last SEVEN DAYS did you inspect the inside of your shoes?	0 1 2 3 4 5 6 7	15
	Smoking		line 2
SELF13	Have you smoked cigarettes - even one puff - over the last seven days?	(0) No (1) Yes	16
SELF14	If yes, how many cigarettes did you smoke on an average day?	Number of cigarettes _____	17-19 (...)
	Self-Care Recommendations		line 2
SELF15	In which of the following has your healthcare team (doctors, nurse, dietitian, or diabetes educator) advised you to do? Please read to client and check all that apply.	(1) Follow a low fat eating plan? (2) Follow a complex carbohydrate diet? (3) Reduce the number of calories you eat to lose weight? (4) Eat lots of foods high in dietary fiber? (5) Eat lots (at least 5 servings per day) of fruits and vegetables? (6) Eat very few sweets (for example desserts, non-diet sodas, candy)? (7) Other(specify)_____ (8) I have not been given any advice about diet by my health care team.	20-27 (8)
SELF16	Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please read to client and check all that apply.	(1) Get mild level of exercise (such as walking) on a daily basis. (2) Exercise continuously for a least 20 minutes at least 3 times a week (3) Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk etc.) (4) Engage in a specific amount, type, duration and level of exercise. (5) Other (specify) _____ (6) I have not been given any advice about exercise by my health care team.	28-33 (6)
SELF17	Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do? Please read to client and check all that apply.	(1) Test your blood sugar using a drop of blood from your finger and a color chart. (2) Test your blood sugar using a machine to read the results. (3) Test your urine for sugar. (4) Other (specify) _____ (5) I have not been given any advice about testing my blood, or urine, for sugar by my health care team.	34-38 (5)

SELF18	Which of the following medications for your diabetes has your doctor prescribed? Please read to client and circle all that apply.	(1) An insulin shot 1 or 2 times a day. (2) An insulin shot 3 or more times a day. (3) Diabetes pills to control my blood sugar level. (4) Other (specify): _____ (5) I have not been prescribed either insulin or pills for my diabetes.	39--43 (5)
	Diet		line 2
SELF19	On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?	0 1 2 3 4 5 6 7	44
	Medications		line 2
SELF20	On how many of the last SEVEN DAYS, did you take your diabetes medication?	0 1 2 3 4 5 6 7 9	45
SELF21	On how many of the last SEVEN DAYS did you take your recommended number of insulin injections?	0 1 2 3 4 5 6 7 9	46
SELF22	On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?	0 1 2 3 4 5 6 7 9	47
	Foot Care		line 2
SELF23	On how many of the last SEVEN DAYS did you wash your feet?	0 1 2 3 4 5 6 7	48
SELF24	On how many of the last SEVEN DAYS did you soak your feet?	0 1 2 3 4 5 6 7	49
SELF25	On how many of the last SEVEN DAYS did you dry between your toes after washing?	0 1 2 3 4 5 6 7	50
	Smoking		line 2
SELF26	At your last doctor's visit, did anyone ask you about your smoking status?	(0) no (1) yes (2) don't know	51
SELF27	If you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program?	(0) no (1) yes (2) **don't smoke**	52
SELF28	When did you last smoke a cigarette?	(1) More than two years ago, **or never**. (2) One to two years ago. (3) Four to twelve months ago. (4) One to three months ago. (5) Within the last month. (6) Today.	53

	Scoring
	Step 1: For items 1 -10, use the number of days per week on a scale of 0-7. Step 2: Scoring Scales: *General Diet = Mean number of days for items 3 and 4. *Specific Diet = Mean number of days for items 5, and 6, reversing item 6 (0=7, 1=6, 2=5, 3=4, 4=3, 5=2, 6=1, 7=0). Using the individual items is recommended. *Exercise = Mean number of days for items 7 and 8. *Blood-Glucose Testing = Mean number of days for items 7 and 8. *Foot care = Mean number of days for items for 9 and 10. *Smoking status = Items 13 (2=nonsmoker, 1=smoker), and number of cigarettes smoked per day. *Recommended regimen = Items 15 - 18. *Diet = Use total number of days for item 19. *Medications = Use item 20 or 21 AND 22, use total number of days for item 20, use mean number of days if both 21 and 22 are applicable. *Foot care = Mean number of days for items 23 - 25, after reversing 24 and including items 23 and 24 from the brief version.

Adapted from: Toolbert, D.J., Hampton, S.E., Glasgor, R.E. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes Care, 23: 943-50, 2000.

Post-Test

Questionnaire on Hemoglobin A_{1c} Blood Test

This questionnaire should be administered by a UGA staff person.

Date: _____

UGA Staff administering the questionnaire: _____

Read the questions to the participant and circle the answer given. Read to the participant:
"Next, we are going to talk about the hemoglobin A_{1c} test (also called H-b-A-1-c). I'll read a statement to you and then ask you to tell me if you think it is "true" or "false," then we'll discuss the statement."

HT1	Participant ID	___ ___ ___	Line 1 1-3
HT2	County	___ ___	4-5
	Questions	Circle answer 0 1 2	
HT3	1. A hemoglobin A_{1c} test measures the average amount of sugar in your blood over the last 3 months.	False True Don't Know	6
HT4	2. It's important to know your hemoglobin A_{1c} number.	False True Don't Know	7
HT5	3. All people with diabetes need to have a hemoglobin A_{1c} test.	False True Don't Know	8
HT6	4. The hemoglobin A_{1c} goal for people with diabetes is less than 6.5%.	False True Don't Know	9
HT7	5. Most people can tell what their blood sugar levels are simply by how they feel.	False True Don't Know	10
HT8	6. You can have a "touch of sugar" but don't have to do anything about it.	False True Don't Know	11
HT9	7. You can do something about high blood sugar.	False True Don't Know	12
HT10	8. A hemoglobin A_{1c} number over 8% is a sign that one or more parts of your treatment plan needs to be changed.	False True Don't Know	13
HT11	9. A hemoglobin A_{1c} test should be done about once a year.	False True Don't Know	14
HT12	10. There's no proof that lowering your hemoglobin A_{1c} number can reduce your chances of getting serious eye, kidney, or nerve disease.	False True Don't Know	15
HT13	% correct:	_____ _____ ____ %	16-18
HT14	A1c lab. value	_____ _____ ____	19-22

Educator: Review the correct answers with the client in an individual session or in a group session (see next page).

National Diabetes Education Program, http://ndep.nih.gov/materials/pubs/HbA1c/HbA1c-checkIQ.h

Appendix E

REVISED "EAT WELL, LIVE WELL" QUESTIONNAIRE

Revised "Eat Well, Live Well" Questionnaire

Diabetes and You" Pre/Post-test Questionnaire

Questionnaire DY

Circle one: Pre-Test or Post-test Questionnaire
Date: _____
UGA Staff administering questionnaire:_____

Participant Name:	County:		Code
Date of birth?	___ ___/ ___ ___ /___ ___ Month/Day/Year		
How old are you?	Age: ___ ___ ___		Line 1-3
How long have you had diabetes?	Number of years: ___ ___		4-5
Ethnicity?	1) Caucasian 2) African American 3) Hispanic 4) Asian 5) other_____		6
Gender?	0)Male 1)Female		7
Years completed in school?	Years: ___ ___		8-9
Healthcare Provider?	Name:_____Address:___ _____ _____ Phone: _____		
	Hemoglobin A1c		
SDSCA1	Have you heard of (hemoglobin)A1c?	(0) N (1) Yes	Line 1
SDSCA2	If yes, what should your level be?		
	The questions are for activities during the past 7 days. If you were sick think of the 7 days before.	**Days**	code
	Diet		line 2
SDSCA3	How many of the last SEVEN DAYS have you followed a healthful eating plan?		6
SDSCA4	On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?		7
SDSCA5	On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?		8
SDSCA6	On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat diary?		9

	Exercise		line 2
SDSCA7	On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity		10
SDSCA8	On how many of the last SEVEN DAYS did you participate in a specific exercise session other than what you do around the house or as a part of a your daily activities?		11
	Blood Sugar Testing		line 2
SDSCA9	On how many of the last SEVEN DAYS did you test your blood sugar?		12
SDSCA10	On how many of the last SEVEN DAYS did you test your blood sugar as recommended by your Doctor?		13
	Foot Care		line 2
SDSCA11	On how many of the last SEVEN DAYS did you check your feet?		14
SDSCA12	On how many of the last SEVEN DAYS did you inspect the inside of your shoes?		15
	Smoking		line 2
SDSCA13	Have you smoked cigarettes - even one puff - over the last seven days?	(0) No (1) Yes	16
SDSCA14	If yes, how many cigarettes did you smoke on an average day?	Number of cigarettes	17-19
	Self-Care Recommendations		line 2
SDSCA15	Which medication has your Doctor prescribed for your diabetes?		39—43
	Diet		line 2
SDSCA16	On how many of the last SEVEN DAYS did you space carbohydrates evenly?		44
	Medications		line 2
SDSCA17	On how many of the last SEVEN DAYS, did you take your medication?		45
	Foot Care		line 2
SDSCA18	On how many of the last SEVEN DAYS did you wash your feet?		48
SDSCA19	On how many of the last SEVEN DAYS did you soak your feet?		49
SDSCA20	On how many of the last SEVEN DAYS did you dry between your toes after washing?		50

Adapted from: Toolbert, D.J., Hampton, S.E., Glasgor, R.E. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes Care, 23: 943-50, 2000. Updated S. Stone- 4/02/03

Questionnaire on Hemoglobin A_{1c} Blood Test

Date: _____

UGA Staff administering the questionnaire: _____

Read the questions to the participant and circle the answer given. Read to the participant: "Next, we are going to talk about the hemoglobin A_{1c} test (also called H-b-A-1-c). I'll read a statement to you and then ask you to tell me if you think it is "true" or "false," then we'll discuss the statement."

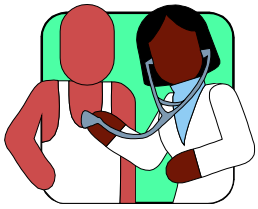
HT1	Participant ID	___ ___ ___	Line 1 1-3
HT2	County	___ ___	4-5
	Questions	Circle 0 1 2	
HT3	1. A hemoglobin A_{1c} test measures the average amount of sugar in your blood over the last 3 months.	F T DK	6
HT4	2. It's important to know your hemoglobin A_{1c} number.	F T DK	7
HT5	3. All people with diabetes need to have a hemoglobin A_{1c} test.	F T DK	8
HT6	4. The hemoglobin A_{1c} goal for people with diabetes is less than or equal to 6.5%.	F T DK	9
HT7	5. Most people can tell what their blood sugar levels are simply by how they feel.	F T DK	10
HT8	6. You can have a "touch of sugar" but don't have to do anything about it.	F T DK	11
HT9	7. You can do something about high blood sugar.	F T DK	12
HT10	8. A hemoglobin A_{1c} number over 8% is a sign that one or more parts of your treatment plan needs to be changed.	F T DK	13
HT11	9. A hemoglobin A_{1c} test should be done about once a year.	F T DK	14
HT12	10. There's no proof that lowering your hemoglobin A_{1c} number can reduce your chances of getting serious eye, kidney, or nerve disease.	F T DK	15
HT13	% correct	____ %	16-18
HT14	A1c lab value	____ %	19-22
HT15	**Post-Test only: How would you rate this program? 1=Excellent, 2=Good, 3= Fair, or 4=Poor**		23

Educator: Review the correct answers with the client in an individual session or in a group session

From: **National Diabetes Education Program, http://ndep.nih.gov/materials/pubs/HbA1c/HbA1c-checkIQ.h**

Appendix F

“EAT WELL, LIVE WELL” FLYER



Diabetes and You Program

Volunteers, with and without Diabetes, needed from Senior Nutrition Centers for a study to help discover ways to control diabetes and its complications.

BENEFITS ARE FREE:

- Classes where you will learn about diabetes, diabetes monitoring, proper foot care techniques, meal planning, and complications associated with diabetes.
- Glucose and Hemoglobin A_{1C} monitoring tests.

For more information, please contact:

Ms. Susan Stone, RD, LD Project Coordinator, Department of Foods and Nutrition, University of Georgia, Athens, Georgia 30602
Phone: (706) 542-4838
-Or-
Ms. _____, _____ County Senior Center

Appendix G

HEALTH CARE PROVIDER QUESTIONNAIRE

Print on UGA-FDN letter head

Date:

Dear Health Care Provider,

We are contacting you to ask that you please complete the attached questionnaire, and return it to us in the stamped/addressed envelope provided. It is part of a study being conducted by Dr. Mary Ann Johnson in the Department of Foods and Nutrition at the University of Georgia. The goals of the study are to find barriers to change for older adults with diabetes. Part of this assessment includes collecting views from health care providers who serve older adults. This questionnaire will take approximately 5 to 10 minutes to complete. The benefit to you is the satisfaction of contributing to scientific research, with the only the discomfort being completing the attached form.

Your name was given to us by a patient with diabetes in your care, a Senior Nutrition Center director at a county Senior Center, or was found in the local phone book. Participation is completely voluntary. No names will be collected on the forms returned to us. No envelopes will be kept, and all responses will be considered anonymous. Your information will be compiled with those of other Health Care Providers in Georgia. By returning the questionnaire, you agree to the above conditions. If you have any questions you may contact Ms. Betsy Redmond at 706-542-4838 or Dr. Mary Ann Johnson at 706-542-2292.

Thank you for your time, your response is greatly appreciated.

_____ _____

Betsy Redmond, M.S., R.D., L.D. Mary Ann Johnson, PhD.

Questions or problems regarding your rights as a participant should be addressed to Dr. Christina Joseph; Institutional Review Board; Office of V.P. for Research; The University of Georgia; 604A Graduate Studies Research Center; Athens, GA 30602-7411; Telephone 706-542-6514

Questionnaire on Diabetes for Health Care Providers

Circle one: M.D. D.O. R.N. P.A. R.D. C.D.E. L.N. M.A. Other_____ (HCP1)

County: _____

A. Importance of processes of care: medical, diet, exercise for older adults aged 60+.

1. Please rate, on a scale of 1 - 5, how important you believe the following items are to **you as a provider** for patients 60 years and older**.** Check the box that applies.

		Not at all Important (1)	**A little Important (2)**	**Somewhat Important (3)**	**Very Important (4)**	**Extremely Important (5)**
HCP3	Patient's regular performance of home glucose monitoring?					
HCP4	Ordering a hemoglobin A_{1c} test twice a year?					
HCP5	Referral to a dilated eye exam?					
HCP6	Performing a foot examination at each visit?					
HCP7	Close monitoring of diet?					
HCP8	Close monitoring of exercise?					

2. Please rate, on a scale of 1 - 5, how important you believe the following items are to **patients** 60 years and older. Check the box that applies.

		Not at all Important (1)	**A little Important (2)**	**Somewhat Important (3)**	**Very Important (4)**	**Extremely Important (5)**
HCP9	Regular performance of home glucose monitoring?					
HCP10	Having a hemoglobin A_{1c} test twice a year?					
HCP11	Dilated eye exam?					
HCP12	Having a foot examination at each visit?					
HCP13	Close monitoring of diet?					
HCP14	Close monitoring of exercise?					

B. Patient Barriers

1. Please rate, on a scale of 1 -5, how much you agree or disagree that the following are **barriers to your patients**. Check the box that applies.

		Strongly Disagree (1)	**Disagree (2)**	**Agree (4)**	**Strongly Agree (5)**
HCP15	Patient's ability to follow diet recommendations?				
HCP16	Patient's ability to follow exercise recommendations?				
HCP17	Patient's ability to do home glucose monitoring?				
HCP18	Home glucose monitoring is too painful?				
HCP19	Affordability of following diet recommendations?				
HCP20	Affordability of following exercise recommendations?				
HCP21	Affordability of home glucose monitoring?				
HCP22	Affordability of hemoglobin A_{1c}?				
HCP23	Affordability of dilated eye exam?				
HCP24	*Availability* of laboratory facilities for glycosolated hemoglobin?				
HCP25	*Availability* of ophthalmology services?				
HCP26	*Availability* of nutritional counseling?				

C. Provider Responsibility

1. Please rate, on a scale of 1 - 5, how much you agree or disagree that the following are **your** responsibilities as the provider. Check the box that applies.

		Strongly disagree (1)	**Disagree (2)**	**Agree (4)**	**Strongly agree (5)**
HCP27	Instruction on home glucose monitoring?				
HCP28	Foot examinations?				
HCP29	Referral for a dilated eye exam?				
HCP30	Instruction on diet?				
HCP31	Instruction on exercise?				

D. Provider Barriers

1. Please rate, on a scale of 1 - 5, how much you agree or disagree that the following are **barriers to care for you as a provider.** Check the box that applies.

		Strongly Disagree (1)	Disagree (2)	Agree (4)	Strongly Agree (5)
HCP32	Unable to order hemoglobin A_{1c} ?				
HCP33	Unable to dilated eye exam?				
HCP34	Unable to perform foot exam?				
HCP35	Too time consuming to perform a foot exam?				
HCP36	Too time consuming to complete an ophthalmology referral?				
HCP37	Too time consuming to teach home glucose monitoring?				
HCP38	It is inconvenient to order a hemoglobin A_{1c}?				
HCP39	Language and cultural barriers hinder patient education?				

E. Provider Confidence

1. Please rate, on a scale of 1 -5, how **confident you feel as a provider in performing and facilitating** the following quality markers. Check the box that applies.

		Not at all Confident (1)	Somewhat Confident (2)	Confident (3)	Very Confident (4)	Completely Confident (5)
HCP40	Instruction on home glucose monitoring?					
HCP41	Foot examination?					
HCP42	Dilated eye exam?					
HCP43	Instruction on diet?					
HCP44	Instruction on exercise?					
HCP45	Facilitate change in diet?					
HCP46	Facilitate change in exercise?					
HCP47	Communicate with patients with language and cultural differences?					

Chin, M.H., Cook, S., Jin, L., Drum, M.L., Harrison, J. F., Koppert, J., Thiel, F., Herrand, A.G., Schaefer, C.T., Takaachima, H.T., Chin, S.C. Barriers to providing diabetes care in community health center, Diabetes Care, 24 (2): 274-86, 2001.

Appendix H

INDIVIDUAL DIABETES SELF-CARE ACTIVITIES AND DOMAINS

PURPOSE

Older adults make up the bulk of diabetes cases in the United States (CDCP, 2003). Georgia's population growth for those 60 years and older, and 85 years and older, is expected to be 82% and 264%, respectively from 1990 – 2010 (GDHR, 2003). Diabetes self-care activities are a cornerstone of care (Ruggiero et al., 1997). Previous work has shown that older adults are able to make significant lifestyle changes (Glasgow et al., 1992; Murata et al., 2003). It is imperative that Georgia has a diabetes program that has proven to be successful in older adults, even in its most vulnerable populations, such as those attending their county Older Americans Nutrition Program (OANP) (Ponza et al., 1996). Chapters 3 and 4 revealed that baseline levels of self-care activities were low but that participants were able to make significant changes in recommended self-care activities with concurrent reductions in A1C blood values following the 'Eat Well, Live Well' program. The purpose of this section was to further explore possible associations of diabetes self-care activities which included: 1) mean Summary of Diabetes Self-Care Activities (SDSCA) domain scores and correlations with change; 2) correlations of changes in A1C and SDSCA domain scores; 3) the relationship of demographics and compliance to individual SDSCA at baseline; 4) the relationship of health beliefs and compliance to individual SDSCAs at baseline; and 5) correlations of changes in individual SDSCAs with demographic variables.

RESULTS

Mean SDSCA Domain Scores and Correlations with Change

The SDSCA was designed to be put into summary domains. Each Domain includes two questions, each of which has a maximum score of 7, representing that the activity was completed every day of the week. Each domain, therefore, has a maximum score of 14. Table 6.1 describes

the mean values for each of the SDSCA domain scores at baseline and post-testing. Paired t-test for non-parametric data were used to compare changes in means. The increases were statistically significant for each of the domain scores. The greatest change was seen in the foot care domain, the least in the exercise domain.

Spearman rho correlations were calculated between changes in SDSCA domain scores and both study variables (A1C blood values, A1C knowledge, attendance, age, education, BMI, gender, race, and treatment) and post-test SDSCA domain scores (Table 6.2). Residualized gain scores were used to blunt the effect of the gains in SDSCA domains coming primarily from those with the lowest domain score at baseline. Chi-square was used to evaluate the dichotomous variables. All domain change scores were correlated to their own post-test scores. Specific diet and foot care change scores were both significantly correlated to all other SCDCA post-test scores except the self-glucose monitoring post-test score. Self-glucose monitoring change scores were most correlated to A1C knowledge and type of treatment but not to any other SDSCA post-test scores. Of the demographic characteristics, BMI was significantly correlated to general diet, exercise, and foot care gain scores.

Correlations of Changes in A1C and SDSCA Domain Scores

Table 6.3 summarizes the correlation of changes in A1C blood values with mean SDSCA for baseline, post-test, and change scores following the intervention, for all participants who had a baseline and post-test A1C blood value (n = 78). Only foot care at baseline and specific diet at post-test were statistically significant.

Relationship of Demographics and Compliance to Individual SDSCA at Baseline

Chi-square was used to compare demographic characteristics and health beliefs between those participants who were compliant ($\geq$ 5 days/week) at baseline with individual SDSCA

activities against those who were not compliant (< 5 days/week). Type of treatment, duration of diabetes, gender, education, and level of A1C control were all statistically significant. Those using insulin were more likely to be compliant to testing their blood sugar five days a week or more (question #8, p = .0002) and testing their blood sugar as recommended by their healthcare provider (question #9, p = .01). Participants who had had diabetes ten years or more were more likely to be compliant to testing their blood sugar five days a week or more (question #8, p = .0003) and to testing their blood sugar as recommended by their healthcare provider (question #9, p = .02). Men were less likely to inspect the inside of their shoes (question # 11, p = .05) and women were less likely to participate in 30 minutes of exercise (question #6, p = .01) or in an exercise session other than what is done around the house (question #7, p = .03). Participants with an education beyond a tenth grade education were more likely to be compliant to eating five serving of fruits and vegetables a day (question #3, p = .04), following a healthful eating plan (question #1, p = .03), and testing their blood sugar as recommended by their healthcare provider (question #9, p = .04). Those who were compliant with avoiding high fat foods were less likely to have poor (> 8.0%) A1C control (question #4; p = .002).

Relationship of Health Beliefs and Compliance to Individual SDSCAs at Baseline

Table 6.4 summarizes how the level of compliance to individual SDSCA activities at baseline relates to health beliefs. In looking at barriers, the participants who agreed their ability to follow diet recommendations was a barrier to them were less likely to comply with diet and exercise activities. Participants who were not compliant with following a healthy eating plan, exercising, and foot checks were more likely to agree that their ability to follow exercise recommendations was a barrier to them. Those participants who believed that their ability to follow self-glucose monitoring recommendations was a barrier to them were less likely to self-

monitor their glucose. Participants who were compliant to testing blood sugar were more likely to agree that diet and medications would prevent complications and that they would always need their diet and medications.

Correlations of Changes in Individual SDSCAs with Demographic

Spearman rho correlations were calculated for the changes in individual self-care activities after the intervention using residualized gain scores with a list of variables (age, attendance, educations, BMI, duration of diabetes, gender, type of treatment, A1C knowledge at baseline, A1C blood values at baseline). Changes in the avoidance of dietary fat (question #4) and medication use (question #11) were not significantly correlated to any other variables. Increases in following a healthy eating plan were correlated to age (question #1, $p = .01$, $n = 89$; question #2, $p = .04$, $n = 89$), BMI (question #1, $p = .049$, $n = 82$) and attendance (question #1, $p = .006$, $n = 89$). Increasing fruit and vegetable consumption was related to A1C blood values at baseline (question #3, $p = .02$, $n = 87$). Increases in exercise were correlated with A1C knowledge scores at baseline (question #5, $p = .02$, $n = 91$) and BMI (question #6, $p = .006$, $n = 83$). Self-glucose monitoring correlated to age (question #7, $p = .02$, $n = 91$), A1C at baseline (question #7, $p = .001$, $n = 87$; question #8, $p = .04$, $n = 83$), and type of treatment (question #7, $p = .002$, $n = 91$). Increases in foot care correlated to A1C knowledge at baseline (question #9, $p = .03$, $n = 91$) and BMI (question #10, $p = .048$, $n = 83$).

DISCUSSION

The primary findings from these data were: 1) participants who agreed, at baseline, that their ability to follow self-care activities was a barrier were less likely to be compliant to self-care activities; 2) changes in A1C blood values were associated with foot-care at baseline and specific diet post-test scores; 3) the least improvement was seen in the specific diet and exercise

domains; and 4) associations with changes in individual self-care activities and domains were complex and inconsistent.

Previous reports have described the relationship of health beliefs and compliance to diabetes self-care activities (Polly, 1992; Zigibor and Simmons, 2002). In the Health Belief Model, a person's perceived susceptibility and severity combine to become the perceived threat of disease, while the perceived benefits minus the barriers then determine the selected behavior (Becker and Janz, 1984; Rosenstock, 1974; Yarborough, 2001). Participants who agreed that their ability to undertake an activity was a barrier to them were significantly less likely to be compliant with the activity. The Health Belief Model has been predictive in adherence to chronic disease in other studies (Becker, 1974; McDonald-Miszczak et al., 2001). Participants who agreed that their ability to follow diet recommendations was a barrier to them were less likely to be compliant with following a healthful diet, eating 5 servings of fruits and vegetables, avoiding high fat foods, exercising, or inspecting shoes. Those who agreed that their ability to follow exercise recommendations was a barrier were less likely to follow a healthful eating plan, exercise, or check their feet. Those who agreed that their ability to perform home glucose monitoring was a barrier to them were less likely to test their blood sugar. Patients' self-report of their abilities to follow self-care behaviors appears consistent with their level of compliance, though they did not correlate to level of A1C control in Chapter 3. Participants' compliance level was found to be low (Chapter 3) and previous reports in other studies have found that older adults rate their confidence in their abilities as low (Hiesler, 2003; Kart and Dunckle, 1989).

Changes in A1C blood values were related to the baseline foot-care domain score (checking feet and checking the inside of shoes) and changes in the specific diet domain scores (avoiding high fat foods and eating 5 servings of fruits and vegetables). Compliance to self-care

activities has been associated with maintaining good metabolic control (Mensing et al., 2002; Heislier et al, 2003; DCCT, 2002; UKPDS, 1998). In a study of 1,032 veterans with diabetes, Heisler et al. (2003) found self-glucose monitoring, diet, and exercise to be statistically correlated to A1C level of control but no correlation was found between foot-care and A1C control. At baseline, avoiding high fat foods was associated with better A1C control (Chapter 3). Changes in A1C following the nutrition and diabetes intervention program were related to an increase in inspecting shoes and post-test values of inspecting shoes, checking feet, and consuming 5 servings of fruits and vegetables (Chapter 4).

Observation studies have found an association with increased fat intakes and prevalence of diabetes but there have been fewer reports investigating the relationship of fat intake and metabolic control (Howard, 2002; Styn et al., 2002). Macronutrient recommendations have changed considerably over the last decades and remain controversial, possibly bringing confusion to an older adult population who may have previously received diet recommendations (ACE, 2002; ADA, 2002).

Specific diet and exercise domains had the least improvement following the intervention. This is consistent with the finding from Chapter 4 in which diet (eating 5 serving of fruits and vegetables and avoiding high fat foods) and exercise showed the least improvement overall. Other research has shown changes in diet and exercise to be difficult (Ary et al., 1986; Shultz et al., 2001). Though an increase in physical activity did not show dramatic improvements compared to other activities, an increase in participating in 30 minutes of physical activity was significantly associated with reductions in A1C blood levels; suggesting that even small improvements in exercise can make significant improvements. The level of compliance may have been set higher than was necessary.

There were several variables associated with changes in SDSCA individual and domain scores, but relationships were inconsistent and multifarious. Correlations were found with age, BMI, attendance, A1C level at baseline, A1C knowledge at baseline and type of treatment. Previous research of compliance to self-care activities and demographic variables found compliance to be related to duration of diabetes, education, gender, age, and knowledge level (Albright et al., 2001; Schatz et al., 1988). Other studies have reviewed possible predictive characteristics in participants' success in lowering A1C values following a diabetes treatment program. Diabetes duration, BMI, and baseline A1C were correlated with a poor glycemic response following treatment (Cook et al., 2001). Demographic variables have not consistently been related to compliance or program success in diabetes self-care (O'Conner et al., 1997; Walker, 1999).

CONCLUSION

This evaluation of the data shows that participants' self-reported abilities were significantly related to self-care compliance at baseline. Demographic variables were not consistent in predicting compliance to self-care behaviors with older adults attending OANPs. There appears to be no significant advantage in using the SDSCA domain scores, as opposed to individual SDSCA questions, when evaluating diabetes self-care activities. Utilizing the questions individually offers more detailed information. Future research should also focus on evaluating and increasing participants' confidence in diabetes self-care activities.

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TABLE 6.1. SDSCA domain scores.

		Mean (±SD)		
	n	Baseline	Post-test	Change
SDSCA Domains				
General Diet (times/week)**	89	8.76 ± 5.2	10.88 ± 4.1	2.11 ± 5.3†
Specific Diet (times /week)	90	8.94 ± 3.5	9.91 ± 3.3	.97 ± 3.9*
Exercise (times /week)	90	6.53 ± 5.4	7.38 ± 4.8	.84 ± 4.6*
Self-Glucose Monitoring (times /week)	87	7.72 ± 5.9	9.82 ± 5.2	2.09 ± 5.1†
Foot Care (times /week)	91	8.13 ± 5.0	11.19 ± 4.4	3.05 ± 5.9†

Significance is p * < .05, p † < .01. **Out of a maximum 14 times/week.

TABLE 6.2. Correlations of changes in SDSCA domain scores following the intervention.

	Change in SDSCA Domain Scores									
	General Diet		Specific Diet		Exercise		SGM		Foot Care	
Variables	n	r	n	r	n	r	n	r	n	r
HbA_1 at baseline	85	.05	86	-.24*	86	-.05	83	.29†	86	-.14
HbA_1 post test score	78	.06	79	-.25*	79	-.004	76	.20	80	-.07
HbA_1 blood level - change	75	-.07	76	-.02	76	-.06	73	-.09	77	.01
HbA_1 knowledge baseline	89	-.13	90	-.07	90	-.17	87	.03	90	-.05
HbA_1 knowledge – post test	89	.009	90	.06	90	-.09	87	.30†	90	-.07
HbA_1 knowledge change	89	.21*	90	.06	90	.09	87	.23*	90	.0008
Type of treatment	89	-	90	-	90	-	87	*	91	-
Attendance	89	.19	90	.21*	90	.05	87	.14	90	.01
Age (years)	89	.27†	90	.08	90	.08	87	-.16	90	.11
Gender (0 = male, 1 = female)	89	-	90	-	90	-	87	-	91	-
Race (1 = Caucasian, 2 = African American)	89	-	90	-	90	-	87	-	91	-
Education (years)	89	-.04	90	-.15	90	-.04	80	.02	90	-.03
duration of diabetes	86	.004	87	-.01	87	.09	84	-	87	-.03
BMI ($kg/m^{2)}$	82	-.21*	83	-.03	83	-.26*	80	.09	83	-.24*
General diet post-test	89	.90†	88	.21*	88	.07	85	.02	88	.26*
Specific diet post-test	88	.13	90	.88†	89	.27*	86	-.04	89	.26*
Exercise post-test	88	.03	89	.33†	90	.81†	86	-.03	89	.24*
SGM post-test	85	-.16	86	-.008	86	-.01	87	.67†	86	.05
Foot care post-test	88	.20*	89	.23*	89	.20	86	-.06	90	.93†

Significance is p * < .05; p † < .01. SGM = Self-Glucose Monitoring. Correlations are Spearman rho.

TABLE 6.3. Correlation of A1C blood values and SDSCA domain scores.

	Change in A1C Blood Level		
	Statistics		
Variables	n	r	p
SDSCA baseline score – general diet	78	.05	.65
SDSCA baseline score - specific diet	78	-.19	.10
SDSCA baseline score - exercise	78	-.005	.96
SDSCA baseline - SGM	78	.12	.30
SDSCA baseline - foot care	78	-.22	.05*
SDSCA post-test score – general diet	75	.09	.46
SDSCA post-test score - specific diet	76	-.28	.01*
SDSCA post-test score - exercise	76	-.10	.39
SDSCA post-test score - SGM	73	.18	.12
SDSCA post-test score - foot care	77	-.11	.34
Change in SDSCA– general diet	75	.007	.94
Change in SDSCA - specific diet	76	-.06	.60
Change in SDSCA – exercise	76	-.08	.48
Change in SDSCA – SGM	73	.07	.55
Change in SDSCA - foot care	77	.01	.89

Significance is p * < .05, p † < .01. SGM = Self-Glucose Monitoring. Correlations are Spearman rho.

TABLE 6.4. Percent of not compliant and compliant participants who agree the health belief is a barrier.

SDSCA Questions	Percent who agree their ability to follow diet is a barrier (barrier)			Percent who agree their ability to follow exercise is a barrier (barrier)			Percent who agree their ability to do SGM is a barrier (barrier)		
	n	%	p	n	%	p	n	%	p
1. On how many of the last seven days have you followed a healthful eating plan?	104			104			100		
Not compliant		66	< .0001		52	.01		44	.12
Compliant		20			28			29	
2. On average, over the past month, on how many days per week have you followed your eating plan?	104			104			100		
Not compliant		37	.45		34	.18		34	.74
Compliant		44			47			37	
3. On how many of the last seven days did you eat five or more servings of fruits and vegetables?	104			104			100		
Not compliant		58	< .0001		45	.15		36	.83
Compliant		20			31			34	
4. On how many of the last seven days did you avoid high fat foods such as red meat or full-fat dairy products?	103			103			99		
Not compliant		54	.01		36	.63		41	.40
Compliant		30			41			32	
5. On how many of the last seven days did you space carbohydrates evenly through the day?	104			104			100		
Not compliant		47	.07		38	.97		42	.08
Compliant		30			38			26	
6. On how many of the last seven days did you participate in at least 30 minutes of physical activity?	104			104			100		
Not compliant		50	.004		52	.0003		38	.40
Compliant		21			16			30	
7. On how many of the last seven days did you participate in a specific exercise session other than what you do around the house?	104			104			100		
Not compliant		50	.005		55	< .0001		36	.78
Compliant		23			13			33	
8. On how many of the last seven days did you test your blood sugar?	104			104			100		
Not compliant		35	.40		35	.51		55	< .0001
Compliant		43			42			17	
9. On how many of the last seven days did you test your blood sugar the number of times recommended by your health care provider?	104			104			100		
Not compliant		44	.32		37	.69		47	.01
Compliant		35			40			24	
10. On how many of the last seven days did you check your feet?	104			104			100		
Not compliant		51	.07		51	.05		27	.26
Compliant		33			32			39	
11. On how many of the last seven days did you inspect the inside of your shoes?	104			104			100		
Not compliant		48	.02		42	.37		35	1.00
Compliant		26			33			35	

Data are total n, and % who agreed for compliant and not compliant. SGM = Self-glucose Monitoring. High compliance refers to participants who undertook the activity ≥ 5 days a week. Low compliance refers to participants who undertook the activity < 5 days/week at baseline.

TABLE 6.4. Continued.

SDSCA Questions	Percent who agree diet and medications will prevent complications (benefit)			Percent who agree they can control their diabetes (benefit)			Percent who believe they will always need their diet and medication (barrier)		
1. How many of the last seven days have you followed a healthful eating plan?	n	%	p	n	%	p	n	%	p
	100			104			104		
Not compliant		95	.43		98	.12		84	.71
Compliant		92			90			87	
2. On average, over the past month, how many days per week have you followed your eating plan?	103			104			104		
Not compliant		91	.25		91	.24		85	.91
Compliant		97			97			86	
3. On how many of the last seven days did you eat five or more servings of fruits and vegetables?	96			104			104		
Not compliant		92	.76		98	.04		83	.45
Compliant		94			88			88	
4. On how many of the last seven days did you avoid high fat foods such as red meat or full-fat dairy products?	102			104			103		
Not compliant		95	.59		95	.60		82	.45
Compliant		92			92			88	
5. On how many of the last seven days did you space carbohydrates evenly through the day?	103			104			104		
Not compliant		91	.35		93	.90		82	.31
Compliant		96			94			89	
6. On how many of the last seven days did you participate in at least 30 minutes of physical activity?	103			104			104		
Not compliant		91	.20		92	.65		85	.80
Compliant		97			95			87	
7. On how many of the last seven days did you participate in a specific exercise session other than what you do around the house?	103			104			104		
Not compliant		92	.60		94	.80		84	.66
Compliant		95			93			88	
8. On how many of the last seven days did you test your blood sugar?	103			104			104		
Not compliant		86	.006		92	.66		78	.04
Compliant		100			94			92	
9. On how many of the last seven days did you test your blood sugar the number of times recommended by your health care provider?	103			104			104		
Not compliant		87	.007		92	.70		77	.01
Compliant		100			94			94	
10. On how many of the last seven days did you check your feet?	103			104			104		
Not compliant		91	.57		91	.60		77	.08
Compliant		94			94			90	
11. On how many of the last seven days did you inspect the inside of your shoes?	103			104			104		
Not compliant		94	.86		62	.01		82	.24
Compliant		93			42			90	

Data are total n, and % who agreed for compliant and not compliant. High compliance refers to participants who undertook the activity $\geq$ 5 days a week. Low compliance refers to participants who undertook the activity < 5 days/week at baseline.

Appendix I

HEALTHCARE PROVIDER RECOMMENDATIONS TO OLDER ADULTS WITH DIABETES

PURPOSE

Diabetes self-care practices are a cornerstone to diabetes management. It is these daily self-care activities that can have a significant impact on the progression of diabetes (Mensing et al., 2002). Patients with diabetes are asked to follow many of the same recommendations as the general population, but are also asked to adjust these activities to fit their medical needs and make changes accordingly (ADA, 2002). Although patients often look to healthcare providers for guidance, the majority of healthcare providers are not providing patients with instructions on self-care activities (Litzelmen et al., 1997; Ruggiero et al., 1997). The following data assess: 1) the self-care recommendations patients' report that their healthcare providers have given them; 2) healthcare providers' barriers to care; 3) healthcare providers' perceived responsibilities; and 4) healthcare providers' confidence in facilitating change.

RESULTS

Diabetes self-care activities considered to be important to care are listed in Table 7.1. Older adults with diabetes (n = 89) were asked if their healthcare provider had recommended any of these activities, both prior to a nutrition and diabetes education program and again following the intervention three months later. The table shows that greater than 50% of the participants received recommendations concerning testing blood sugar with a machine and diet related recommendations such as eating few sweets, eating a low fat diet, and eating lots of fruits and vegetables, as well as the recommendation to get mild exercise daily. However, less than 50% of participants received recommendations on consuming a diet of complex carbohydrates or the remaining choices for exercise recommendations. Consuming a diet of complex carbohydrates was the only recommendation to show a statistically significant change. Surprisingly 16% and

25% of participants had not been given any recommendations concerning diet or exercise, respectively.

Healthcare providers in the same counties as the older adult participants included in the study were sent a 2-page questionnaire (Chapter 5). The questionnaire asked if they agreed with the list of barriers to providing care, their confidence in providing care to patients, and how much they agreed that self-care activities were their responsibility. The majority of providers did not agree that the barriers listed in Table 7.2 were a problem. The time it took to teach home glucose monitoring was most often reported as a barrier (40%). Healthcare providers were also asked if they disagreed or agreed that the activities listed in Table 7.3 were their responsibilities. The majority (92 - 76%) agreed they felt responsible for the activities.

Table 7.4 reports how confident healthcare providers feel in performing and facilitating diabetes self-care activities. Provider confidence was reported in a range from (1) not at all confident to (5) completely confident. Providers were more confident about providing instruction, with a mean 3.4 – 4.0, than in facilitating change, with a mean of 2.7. Mean confidence values are listed. ANOVA was used to evaluate statistical significance of responses based on the type of provider; no significant differences were found between healthcare providers.

DISCUSSION

Individuals with diabetes have been shown to make significant reductions in A1C blood values by participating in their own care with rigorous adherence to self-care activities (DCCT, 2002; UKPDS, 1998). The ability or willingness to comply with self-care activities depends on several factors, though research has found that the patient-practitioner relationship can have a

strong influence (Kurtz, 1990; Schartz, 1988). It is important that healthcare providers understand their influence in their patients' self-care and make recommendations accordingly. Although patients often look to healthcare providers for guidance, many healthcare providers are not providing patients with instructions on self-care activities (MMWR, 2002; Ruggiero et al., 1997). Older adults in our study reported that more than half of providers had given recommendations to get mild exercise everyday and over 80% had been advised to test their blood sugar with a machine. More than 50% of the participants had been given recommendations on eating more fruits and vegetables, and on cutting back on fat. Unfortunately, the dietary recommendation given most often (67%) was to eat fewer sweets, something the American Diabetes Association does not see as a priority in a diabetic diet (ADA, 2002). It is of note that the recommendations were from healthcare providers, not just physicians, making the high percentage of participants not receiving any dietary or exercise advice even more surprising.

Often times, patients may be unsure who is responsible for providing different aspects of care. The American Association of Clinical Endocrinologists recommends that a team of healthcare professionals treat the patient. The Association also states that as the leader, the endocrinologist should develop recommendations for patients concerning nutrition, exercise, self-glucose monitoring and medication, and use his or her abilities "to educate and train" both patients and other team members (ACE, 2002). Therefore, it is not surprising that physicians had a strong belief in their responsibility to provide instruction on diet, exercise, foot care, and self-glucose monitoring, though the other types of providers strongly agreed that the activities were their responsibilities as well. It is interesting that healthcare providers conveyed a strong belief in their responsibility to provide self-care activities, yet 16% and 25% of participants reported

that they had not received any advice from their healthcare provider on diet or exercise, respectively.

Providers overall claimed to be moderately confident in their ability to provide instruction on these activities but were less confident in their ability to actually facilitate such change in their patients. Other studies have found similar results (Chin et al., 2001). The level of confidence varied based on the type of provider, with physician assistants and registered dietitians feeling more confident in their ability to facilitate change.

CONCLUSIONS

Health care providers may benefit from taking time to evaluate their patients' perceptions and make realistic and specific recommendations for self-care activities. If healthcare providers are not confident in their ability to facilitate changes in patients regarding self-care behaviors, then they should be encouraged to make appropriate referrals. Research has shown that older adults attending diabetes intervention programs are able to make changes in self-care activities and recommendations to successful programs should be encouraged (Glasgow et al., 1992: Chapter 4).

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TABLE 7.1. Healthcare provider recommendations.

Questions	n	Baseline	Following the Intervention	Chi-square
Healthcare team has advised		% yes	% yes	p
Eating low fat eating	89	59	53	.45
A complex carbohydrate diet	89	28	48	.008
Reducing calories for weight loss	89	37	40	.76
Eating high dietary fiber	89	43	48	.55
Eating lots of fruits and vegetables	89	55	55	1.00
Eating few sweets	89	67	64	.75
Mild exercise daily	89	52	56	.65
Exercising 20 min./3x week	89	18	27	.21
Fitting exercise into daily routine	89	18	32	.30
A specific amount of exercise	89	9	11	.80
Other exercise measures	89	7	8	1.00
Testing blood sugar using a chart	89	3	10	.13
Testing blood sugar using a machine	89	81	74	.36
Testing urine for sugar	89	2	2	1.00
Healthcare team has not given dietary advice	89	16	18	.84
Healthcare team has not given exercise advise	89	25	22	.54

Data are means and %.

TABLE 7.2. How much providers disagree or agree the following are barriers to care.

	n	Disagree %	Agree %
Unable to order an A1C	71	72	28
It is inconvenient to order A1C	69	88	12
Unable to perform foot exam	71	80	20
Too time consuming to perform foot exam	70	71	29
Too time consuming to teach home glucose monitoring	70	60	40
Language and cultural barriers	72	63	37

Data are n and %.

TABLE 7.3. Healthcare providers who disagree or agree the following activities are their responsibility.

	n	Disagree %	Agree %
Instruction on home glucose monitoring.	72	8	92
physicians	46	11	89
certified diabetes educator	3	0	100
registered nurse	3	0	100
physician assistant	1	0	100
registered dietitian	1	0	100
pharmacist	15	7	93
other	4	0	100
Foot examination.	71	13	87
physicians	45	0	100
certified diabetes educator	3	0	100
registered nurse	3	0	100
physician assistant	1	0	100
registered dietitian	1	100	0
pharmacist	15	73	27
other	3	33	66
Instruction on diet.	72	14	76
physicians	45	11	89
certified diabetes educator	3	0	100
registered nurse	3	0	100
physician assistant	1	0	100
registered dietitian	1	0	100
pharmacist	15	20	80
other	4	50	50
Instruction on exercise.	72	11	89
physicians	45	2	98
certified diabetes educator	3	0	100
registered nurse	3	0	100
physician assistant	1	0	100
registered dietitian	1	0	100
pharmacist	15	33	87
other	4	50	50

Data are n and %.

TABLE 7.4. How confident healthcare providers feel on instructing and facilitating.

	n	mean ± SD	p
Instruction on home glucose monitoring.	72	4.0 ± 1.1	.15
physicians	46	3.7 ± 1.1	
certified diabetes educator	2	4.5 ± .7	
registered nurse	3	5.0 ± .0	
physician assistant	1	5.0 ± .0	
registered dietitian	1	5.0 ± .0	
pharmacist	15	4.4 ± 1.0	
other	4	4.3 ± 1.0	
Instruction on diet.	71	3.4 ± 1.1	.13
physicians	45	3.3 ± 1.0	
certified diabetes educator	2	3.0 ± .0	
registered nurse	3	5.0 ± .0	
physician assistant	1	4.0 ± .0	
registered dietitian	1	5.0 ± .0	
pharmacist	15	3.2 ± 1.1	
other	4	3.2 ± 2.0	
Instruction on exercise.	71	3.6 ± 1.1	.07
physicians	46	3.7 ± 1.0	
certified diabetes educator	2	3.5 ± .7	
registered nurse	3	5.0 ± .0	
physician assistant	1	4.0 ± .0	
registered dietitian	1	5.0 ± .0	
pharmacist	14	3.1 ± 1.1	
other	4	3.2 ± 2.0	
Facilitate change in diet.	71	2.7 ± 1.2	.14
physicians	46	2.6 ± 1.0	
certified diabetes educator	2	2.5 ± .7	
registered nurse	3	3.6 ± 1.5	
physician assistant	1	4.0 ± .0	
registered dietitian	1	5.0 ± .0	
pharmacist	14	2.2 ± 1.2	
other	4	3.3 ± 2.0	
Facilitate change in exercise.	70	2.7 ± 1.2	.18
physicians	45	2.6 ± 1.1	
certified diabetes educator	2	2.5 ± .7	
registered nurse	3	3.6 ± 1.5	
physician assistant	1	4.0 ± .0	
registered dietitian	1	5.0 ± .0	
pharmacist	14	2.3 ± 1.3	
other	4	3.3 ± 2.0	

Data are n and mean ± SD. ANOVA was used to evaluate statistical significance. Provider confidence was (1) not at all confident – (5) completely confident.

Appendix J

STAGES OF CHANGE

PURPOSE

While the belief system chosen for this dissertation was the Health Belief Model, questions were also asked concerning the transtheroretical model or Stages of Change. The model was originally developed in the 1950's to address smoking cessation. It distilled all the major theories of change to 5 common stages of change an individual goes through on his or her way to completing a change. The stages are pre-contemplation, contemplation, preparations, action, and maintenance (CPRC, 2002). The current data evaluates older adults' perceptions of the difficulties of diabetes self-care activities to find the activities that were believed to be most difficult.

RESULTS

For this study, older adults with diabetes (n = 105) were asked which changes they believed were easy, which they believed were difficult, and which they believed were impossible. 'Easy' was meant to represent the action and maintenance stages, the 'difficult' category represented preparation, and 'impossible' represented those participants in the pre-contemplation and contemplation stage for that activity. However, the majority of participants strongly believed that nothing was 'impossible,' even if they had never attempted it or did not expect to try it any time in the near future. Table 8.1 summarizes older adults' responses to the level of difficulty in making changes in the areas listed. The majority (53%) felt that medication was the easiest, while almost half (46%) believed diet to be the most difficult with 13% finding it to be impossible to master.

DISCUSSION

Some research has shown that patients are more likely to follow direct instructions, such as medication, as opposed to diet and exercise (Ary et al., 1986; Glasgow et al., 1987).

Participants were more likely to believe medication was easy and less likely to believe it was impossible, compared to diet and exercise. Of the participants who selected a change as easy, 26 - 28% chose exercise and diet, respectively, while 53% selected medication. Of those who selected a change as impossible, 10 - 13% chose diet and exercise, respectively, and 2% chose medication. There have been reports of evaluating the transthreoretical model of change in promoting diabetes self-care behaviors. A program using the stages-of-change model was found to be more successful for increasing self-glucose monitoring, reducing dietary fat, and smoking cessation when compared against usual care (Jones et al., 2003). No reports were found that made comparison between the stages of change model and other belief models for diabetes self-care behaviors. The model's major flaw is that it may work in identifying the level of commitment people have toward a particular behavior but it does not concentrate on the behavioral techniques used to make the change. Identifying how diabetes education actually produces change or targeting a person's specific stage for individual activities has proven to be extremely complex (Kasila et al., 2003; Peyrot, 1999).

CONCLUSION

The data collected in our study found that older adults with diabetes were more likely to view diet, exercise, and self-glucose monitoring as more difficult than medication use, foot care, or other activities. Thus, it may be of benefit to offer greater support for these activities.

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TABLE 8.1 Stages of change.

		(%) yes*
What changes did you think were easy?	102	
a. diet		28
b. exercise		26
c. self-glucose monitoring		36
d. foot care		11
e. medications		53
f. other changes		0
What changes did you think were difficult?	102	
a. diet		46
b. exercise		23
c. self-glucose monitoring		24
d. foot care		6
e. medications		9
f. other changes		2
What changes did you think were impossible?	102	
a. diet		13
b. exercise		10
c. self-glucose monitoring		8
d. foot care		2
e. medications		2
f. other changes		1

* Participants were allowed to answer yes to none or all of the activities in each stage, thus each % represents the % of all participants who answered yes.