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Differentiating Approaches to Diabetes Self-Management of Multi-ethnic Rural Older Adults at the Extremes of Glycemic Control

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Purpose of the Study: This study identified approaches to diabetes self-management that differentiate persons with well-controlled from poorly controlled diabetes. Previous research has focused largely on persons participating in self-management interventions. ***Design and Methods:*** In-depth qualitative interviews were conducted with 48 adults, drawn from a population-based sample aged 65 years or older with diabetes. The sample was stratified by sex and ethnic group (African American, American Indian, and White) from the low (A1C <6%) and high (A1C >8%) extremes of the glycemic control distribution. Case-based text analysis was guided by a model, including six self-management domains and four resource types (self-care, informal support, formal services, and medical care). ***Results:*** A "structured" approach to self-management differentiated respondents in good glycemic control from those in poor glycemic control. Those in good glycemic control were more likely to practice specific food behaviors to limit food consumption and practice regular blood glucose monitoring with specific target values. This approach was facilitated by a greater use of home aides to assist with diabetes care. Respondents in poor glycemic control demonstrated less structure, naming general food categories and checking blood glucose in reaction to symptoms. ***Implications:*** Results provide evidence that degree of structure differentiates self-management approaches of persons with good and poor glycemic control. Findings should provide a foundation for further research to develop effective self-management programs for older adults with diabetes.

Key Words: Self-management of chronic disease, African American, American Indian, Diabetes, Qualitative methods

This article compares the diabetes self-management strategies of older adults from a population-based sample whose diabetes is well controlled with the strategies of those whose diabetes is poorly controlled. The objective is to identify approaches to self-management that differentiate these two groups and that may serve as the basis for more effective diabetes education or assistance for those whose diabetes is poorly controlled. We base our analysis on a conceptual model for diabetes self-management that expands and specifies the chronic disease self-management models proposed by Clark, Gong, and Kaciroti (2001) for general chronic disease and Quandt, Arcury, and Bell (1998) for nutrition.

Twenty-five percent of U.S. residents aged 60 years and older have diagnosed diabetes (Centers

for Disease Control and Prevention [CDC], 2008). Diabetes substantially increases the risk of cardiovascular disease and complications. In 2007, the U.S. direct costs of diabetes were $116 billion; indirect costs for disability, lost work, and premature mortality added another $58 billion (American Diabetes Association [ADA], 2008). Members of minority groups are at even higher risk for diabetes. The age-adjusted prevalence of diabetes in Whites is 6.8% compared with 12.3% in African Americans and 17.2% in American Indians or Alaska Natives (CDC, 2009). Complication rates are higher among minorities, including end-stage renal disease, amputations, and retinopathy (Lanting, Joung, Mackenbach, Lamberts, & Bootsma, 2005).

Diabetes, like other chronic diseases (Albert, Musa, Kwoh, Hanlon, & Silverman, 2008; Lorig & Holman, 2003), requires that patients take considerable responsibility for self-management. The way that older adults with diabetes self-manage should have significant effects on blood glucose levels and be reflected in glycosylated hemoglobin (hemoglobin A1C) measurements. Over time, blood glucose levels influence the types and severity of complications experienced (Diabetes Control and Complications Trial [DCCT] Research Group, 1993; UK Prospective Diabetes Study Group, 1998).

Clinical trials and community interventions where individuals are specifically taught self-management skills have shown the efficacy of these behaviors for A1C control (e.g., DCCT Research Group, 1993; Speer et al., 2008). However, in observational studies, there is frequently little association between these practices and A1C (e.g., Harris, 2001; Speer et al., 2008). Understanding this discrepancy requires examining the approach to and details of self-management practiced by individuals, including how they understand what behaviors they should be implementing and how behaviors from different domains of self-management (e.g., medication use and diet) fit together. We describe here the results of a study undertaken to accomplish this using qualitative methods that allow exploration of the approach to self-management in order to generate specific hypotheses for later study. Existing research on self-management in older adults has focused on beliefs and attitudes toward self-management (Schoenberg, Traywick, Jacobs-Lawson, & Kart, 2008), on the practice of specific components of self-management (Arcury et al., 2006), or on interventions (Gary et al., 2003), with little except intervention research examining self-management behaviors in terms of glycemic control. Thus, this study adds to the literature by considering self-management for diabetes as an integrated package of behaviors practiced by older adults with no specific intervention.

Conceptual Model

Diabetes management is based on the regulation of blood glucose. Current medical standards put recommended levels of preprandial blood glucose at 70–130 mg/dl and postprandial levels at less than 180 mg/dl (ADA, 2009). The achievement of these glucose levels is accomplished by medical prescription of medications and recommendations for diet and other health behaviors. Implementing this on a daily basis is modeled by the self-regulatory approach to chronic disease (Clark, 2003; Clark et al., 2001). This argues that individuals are active problem solvers, observing their condition and reacting to achieve a disease-related goal. They interpret their observations based on experience; education; beliefs about health and illness; and interactions with health care providers, family, and friends (Cameron & Leventhal, 2003).

Following from social cognitive theory (Bandura, 1986), Clark (2003) proposes that self-management strategies evolve from self-regulation based on feedback loops of observing, judging, and reacting in order to reach endpoints. These endpoints vary in saliency to the individual and are personally identified. A physician may consider a medical test value to be a goal (e.g., for diabetes, an A1C level below 7%, ADA, 2009), whereas a patient may focus more on relief of symptoms (e.g., not feeling tired).

Quandt and colleagues (1998) have shown that the input from a variety of resources is used by older adults to create a self-management strategy. Clark has presented these as a set of concentric circles of influence, including family involvement, clinical expertise, and community-wide environmental characteristics (Clark, 2003; Clark et al., 2001). We conceptualize self-regulation for diabetes as resulting in a diabetes self-management strategy, the set of behaviors older adults with diabetes use to achieve the goal of glucose regulation (Figure 1). These behaviors fall into domains that include managing dietary intake, engaging in regular physical activity, monitoring blood glucose levels, practicing regular foot care, managing medications, and seeking regular medical care. The goals of these practices were to maintain blood glucose levels within a safe range and to watch for signs

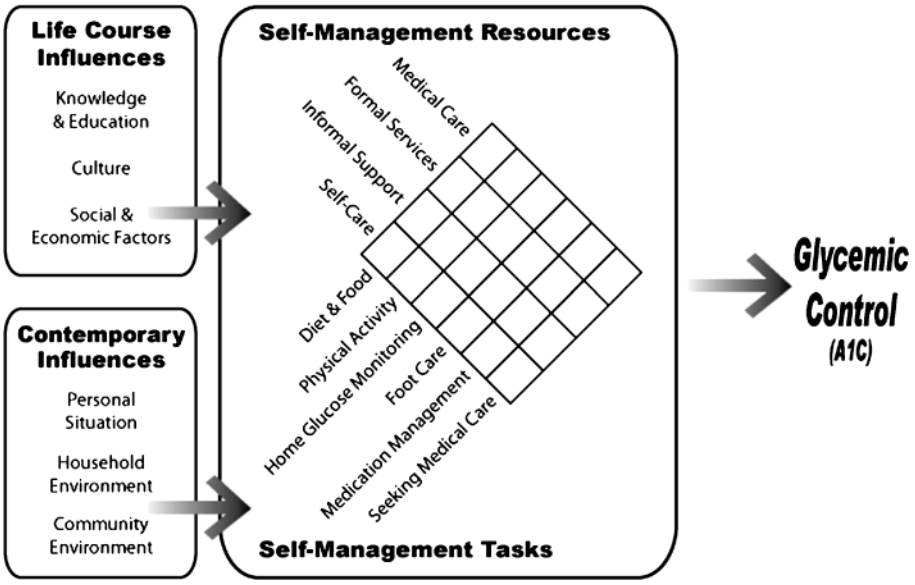

Figure 1. Model of a diabetes self-management strategy, showing the intersection of self-management resources and self-management tasks and their combined effects on glycemic control.

(e.g., slow-healing foot wounds) that can lead to complications.

Persons with diabetes draw on four types of resources to practice these behaviors. First, they draw upon themselves, through self-care (Ory & Defriese, 1998), based on their knowledge, beliefs, and resources. Second, informal support of friends and family constitutes a potential resource. Families bring such resources as knowledge, instrumental support, and material support (e.g., ideas about the best way to cook, transportation to grocery stores and pharmacies, money to purchase foods or medicine), though they can also drain resources, providing negative support. Third, formal support, including transportation, home care, and other services paid for by individuals, insurance, or governmental entities, can be used to accomplish disease-related tasks. Finally, medical care is a significant resource, supplying information, medication, diagnosis, and treatment. Because the influences, both life course and contemporary, are the same for all six self-management domains, the way the self-management behaviors are carried out is likely to be similar.

In this article, we first summarize our review of six separate domains of diabetes self-management: diet, physical activity, medication use, home glucose monitoring (HGM), foot care, and medical consultation. We present the approaches used and attitudes toward the domains by persons with diabetes well controlled and those with diabetes poorly controlled, comparing these self-management strategies to identify factors that appear to differentiate persons with well-controlled diabetes from those with diabetes poorly controlled. Finally, we suggest applications of these findings for improving the self-management strategies of older adults with diabetes.

Materials and Methods

Design

These data come from the ELDER (Evaluating Long-term Diabetes Self-management among Elder Rural Adults) Study, a mixed-methods study designed a priori with two components: a population-based cross-sectional survey that comprehensively assessed the self-care strategies of rural adults aged 65 years and older with diagnosed diabetes and their glycemic control (A1C; Quandt et al., 2005, 2007) and in-depth interviews with a subset of survey participants to further elucidate self-management strategies. The survey occurred May through October, 2002, and the in-depth interviews were conducted March through October, 2003. Participants were selected from two largely rural counties in central North Carolina with a high proportion of ethnic minorities and persons living below the poverty level. The study was approved by the Institutional Review Board of Wake Forest University School of Medicine.

Participant Recruitment and Selection

The survey component of the ELDER Study recruited a random sample of community-dwelling older adults with diabetes, including African

American, American Indian, and White. The sampling frame was Medicare claims records from two counties with at least two outpatient claims for diabetes (ICD-9 250) in 1998–2000. Random samples of men and women were selected. An interviewer contacted each participant to confirm diabetes status and ethnicity and assess eligibility (age ≥65 years, English speaking, and physically and mentally able to participate in survey) and willingness to participate in the study.

Of the 1,222 persons contacted, 313 were disqualified when initially contacted for recruitment because they reported that they did not have diabetes (n = 118), lived out of study counties (n = 51), lived in a nursing home (n = 84), were less than 65 years of age (n = 2), did not speak English (n = 1), failed Mini-Mental State Exam (n = 5), or were deceased (n = 52). We were unable to assess the eligibility of an additional 122 persons because a surrogate refused their participation in the study (n = 48) or reported they were physically (n = 8) or mentally (n = 14) unable to respond to eligibility questions; the remainder could not be located (n = 52). For those who met the eligibility criteria at initial recruitment, 74 refused participation and study staff determined that six were physically and six mentally unable to participate when the interview was attempted. The final sample included 701 individuals. The overall response rate for eligible participants was 89% (701/787).

From these survey participants, a sample of 48 persons was selected for the in-depth interview component. A1C data were used to rank order all persons in the survey. Cut points were chosen considering the distribution of A1C in the sample (Quandt et al., 2007) and existing clinical standards of care (ADA, 2002). Those with A1C less than 6% were classified as being in good glycemic control (GOOD-GC). Those with A1C greater than 8% were classified as being in poor glycemic control (POOR-GC). Those lists were then divided into 12 control/race/gender groups. Any persons for whom duration of diabetes, age of diabetes onset, or A1C were missing were eliminated. The remaining persons on the lists were then randomized and recruited in order until 4 persons in each of the 12 groups were recruited. Fifteen persons were not recruited because they had been rated at the time of the survey as having speech difficulties or unwilling to talk (n = 3), had communication impairments that required another person present (n = 2), were said by caregivers to be cognitively impaired (n = 2), were in nursing homes (n = 2), were deceased (n = 2), could not be located (n = 2), could not schedule an interview (n = 1), or refused (n = 1).

Data Collection

A1C was assessed at the time of the survey by a fingerstick blood sample collected in a capillary tube, stored in the AccuBase A1c Kit (Diabetes Technologies, Inc., Thomasville, GA), and shipped to Premiere Laboratories, Inc. (Kansas City, MO) for A1C assessment; quality control results are presented elsewhere (Quandt et al., 2007; Voss et al., 1992).

Participant in-home, in-depth interviews were completed in approximately 1.5 hr and collected information on how respondents implemented six domains of self-management (diet, physical activity, foot care, HGM, medication management, and seeking medical care) and the extent to which they used four self-management resources (self-care, informal support, formal services, and medical care). Two qualitative interviewers experienced with all three ethnic groups in the study area received additional extensive training in the interview guide; each conducted practice interviews in another rural population. The interview guide and probes were designed to tap respondents' knowledge and beliefs concerning diabetes self-management, as well as their behavior and factors influencing their behavior. Interviewers compiled field notes on the conduct of the interview following its completion. Data (e.g., duration of diabetes, poverty status) were also available for each participant from the survey interview.

Data Analysis

Interviews were transcribed verbatim and verified against the audiotapes. Case-based analysis was conducted. Cases were randomly ordered to mix good and poor control cases. Analysts were the authors. They based their identification of content for self-management domains and resources on a coding dictionary used earlier in variable-based coding not reported here. First, a case synopsis was written by one of two analysts (the lead and senior authors) based on the transcript and field notes. Then, that analyst completed a matrix data display for the interview of self-management domains by resources used. The matrix was constructed a priori from the conceptual framework. Each analyst constructed the matrix for one half of

Table 1. Comparison of Personal Characteristics of Samples of Older Adults With Diabetes, In Good Glycemic Control (HBA1C <6%) and Poor Glycemic Control (HBA1C >8%)

	Good glycemic control		Poor glycemic control	
Characteristic	Male (n = 12)	Female (n = 12)	Male (n = 12)	Female (n = 12)
Age (year), $M \pm SD$	72.9 ± 3.5	77.4 ± 8.0	71.9 ± 3.1	74.5 ± 6.0
Duration of diabetes (year), $M \pm SD$	8.4 ± 7.3	11.6 ± 9.4	13.9 ± 10.0	20.7 ± 9.9
≥High school graduate, n	1	4	5	5
Married, n	10	2	8	1
Medicaid, n	5	9	4	3

the cases and served as the critical reviewer for the other half. The matrix was based on the conceptual model and followed techniques described by Miles and Huberman (1994). Investigators met after approximately each four cases were summarized to review each with its transcript for thoroughness, to resolve differences through consensus, and to compare and contrast cases. This cross-case analysis continued until all 48 had been read and summarized. Throughout the process, notes were kept of emerging patterns of differences between the GOOD-GC and POOR-GC groups, and these patterns and cases were shared with the other authors. When necessary, analysts returned to the transcripts to add more information to the cases. When all cases were summarized, the notes on patterns were themselves converted to conceptually clustered summary matrices (Miles & Huberman) to contrast GOOD-GC and POOR-GC groups.

Results

In both samples, women were older than men (Table 1). Marital status was similar in both samples. Most men were married, whereas women were not (18 vs. 3, overall). On average, the POOR-GC sample was somewhat younger but had had diabetes longer than the GOOD-GC sample. More of the POOR-GC sample had a high school or greater education compared with the GOOD-GC (10 vs. 5). More of the GOOD-GC sample received Medicaid than the POOR-GC sample (14 vs. 7).

Differences between the GOOD-GC and POOR-GC samples were most striking for the self-management domains of food and diet and HGM. In both of these domains, the GOOD-GC sample's self-management approach tended to have more structure, reflect a higher level of self-discipline, and depend more on home health aides than those of the POOR-GC sample. These differences are consistent with the better glycemic control in the GOOD-GC sample. The domains of physical activity, medication management, medical care, and foot care show almost no differences between the GOOD-GC and POOR-GC samples. The levels of physical activity and foot care reported were particularly low.

Food and Diet

All respondents appeared keenly aware that people with diabetes should make dietary adjustments. However, the nature of the discussion was qualitatively different in the two samples. GOOD-GC elders' conversations were characterized by specificity. When they discussed foods, they named specific foods rather than broad categories. For example, a White woman in the GOOD-GC group said that she eats "green leafy vegetables . . . like cabbage and turnip [greens], and also broccoli." Others talked about having eliminated specific foods from the diet (e.g., jelly and preserves, chocolate covered peanuts, Little Debbie Oatmeal Cakes®), substituted foods (Sweet 'n Low® rather than sugar in tea), limited foods (only small portions of cakes and potatoes), or altered foods (one man "weakened" Pepsi® by diluting it with water, several others reported removing skin from chicken). In contrast, The POOR-GC sample used nonspecific categories to describe their diet approach. Some made statements that sounded like they came from general diet suggestions (e.g., "I try to follow the diet of lean meat, green vegetables, and fruit") without considering what that might mean in terms of actual foods consumed. Many stated that they "watched" what they ate, with no specifics. One American Indian woman, for example, described her approach to diet: "I try to watch, like, all the sugars that I take, or fats." This was said without defining what a "sugar" or a "fat" were. Another stated, concerning soda, that she was "watching how much" she drank. Indeed, the term "watch"

was used consistently in this group rather than more active terms that would indicate consuming, limiting, or eliminating certain foods.

GOOD-GC elders discussed controlling the size of their food portions. One White man stated, "like things that cause the sugar, I just don't eat the second helping of those things." An African American man explained that he avoided starchy food that would "run" his sugar up. "You can't eat too much of that starchy food . . . white potatoes, eat just a little bit of bread . . . . You got to sort of hold it to a standard. You can't eat too much of that." One White man explained that "you can eat most anything you want to, and it don't bother me. Just don't eat any big quantities. Eat small quantities and you'll get along fine."

In contrast, POOR-GC elders expressed frustration and even defiance when talking about adapting their diet to diabetes. One White man laughed, "I don't stay on a diet; I don't think too many people do." Others mentioned that they had "cut back on sweets" but that they would "sneak" sweets. The POOR-GC sample emphasized the need to keep candy and snacks handy in case of low blood sugar. One American Indian woman seemed to sum up the POOR-GC approach when she described her diet with resignation, saying, "Well now, I've been working on it for a long time."

GOOD-GC sample members appear to have greater positive social support with meal preparation. Many reported that a family member cooked for them. In about half of those cases, it was a wife, but female children and grandchildren, nieces, and sisters were all reported to cook, sometimes with more than one person cooking for the person with diabetes. Several persons in the GOOD-GC sample reported that friends monitored what they ate at church events and tried to make sure appropriate food was available. In contrast, few of POOR-GC participants reported family support, primarily from children, with cooking. In some of those cases, this support appears to be negative, undermining good self-management practices. For example, one White woman reported that her daughter brought her food—candy bars, honey buns, and tacos—while she was in the hospital. The POOR-GC sample reported informal support with transportation to the grocery store and having friends or family bring them prepared food, but this was not associated with any special care by the family and friends in providing food appropriate for diabetes.

A striking difference between the groups was observed in the use of formal support services. One third (8 of 24) of the GOOD-GC group had home health aides. These aides had a variety of roles in diet, ranging from complete control of cooking to cooking with the participant, grocery shopping, and picking up special foods from a local food pantry. An American Indian woman reported, "We cook, me and Katy [the aide] cooked something yesterday morning. I put some fresh string beans, some new potatoes . . . . And we had a little bit of collards we fixed, and some chicken and pastry. But I only ate one little helping of that pastry." In contrast, only one person in the POOR-GC sample had a home health aide to help with cooking.

Home Glucose Monitoring

Like diet, the GOOD-GC sample's approach to HGM was characterized by structure, whereas that of the POOR-GC sample was not. Those in the GOOD-GC sample were more likely to check their glucose on a systematic daily schedule. In talking about doing so, three quarters stated a specific target range or the number they usually obtained in testing. These numbers were often not rounded. For example, a White man stated that he aimed for a range of 97–131, and an American Indian woman said that she considered herself in control when she got 131 or 132. Several mentioned that they tried to keep their blood glucose under 100, and most stated target ranges in the low 100s, consistent with current recommendations. In contrast, the POOR-GC sample was more likely to check blood glucose at random times or when symptoms suggested it was high or low. One White man stated that, although he considered checking his blood glucose a way to monitor his diabetes, "I don't use [the glucometer] very often . . . . Sometimes once a month, maybe twice a month, if my vision starts to blur or something like that." An African American man said, "I don't ever check it," and his wife explained that he is afraid of pricking his finger and would "run right out the door" if someone wanted to test his blood glucose. Only half of the POOR-GC sample stated target numbers or their usual glucometer reading. When they did, the numbers were rounded and target ranges were high—around 200.

In both the GOOD-GC and the POOR-GC groups, about one in four participants had family or friends perform the blood glucose monitoring for them rather than do it themselves. Two people in the GOOD-GC checked their own, but reported help, in one case from a wife and the other, a friend's daughter. No one in the POOR-GC group

reported informal help when they performed the glucose test themselves, but several reported help obtaining glucose monitoring supplies.

As for other domains of self-management, home health aides provided support for HGM. This support ranged from complete management of the HGM to reminders to the older adult to do the monitoring. Because eight of the GOOD-GC sample had aides, compared with only one in the POOR-GC sample, the GOOD-GC sample had considerably more support.

The only other formal services noted were the companies that supplied glucometers and testing strips. These were used by almost all participants, with the companies mailing the meters and strips and then billing insurance directly.

Other Self-Management Domains

Seeking Medical Care.—About equal numbers in both groups reported informal and formal transportation assistance for doctor visits. More in the GOOD-GC group reported Medicaid. The only differences between the GOOD-GC and POOR-GC groups in self-management related to seeking medical care were in the frequency of doctor visits. Those in GOOD-GC reported visits at regular intervals: 4 weeks, 6 weeks, 3 months, and 6 months. A third of the POOR-GC group reported that they had no regular schedule; most of the others were scattered at intervals ranging from 1 week to 6 months.

Medication Management.—GOOD-GC and POOR-GC groups were quite similar in the numbers of individuals taking diabetes medications. Several in the GOOD-GC group took no medications. The POOR-GC group had several more participants taking insulin than the GOOD-GC group. They were similar in their use of pillboxes to organize their medications and in having help to do so and to pick up medications at the pharmacy. More people in the POOR-GC group reported relying on family members' reminders to take their medications.

People in the GOOD-GC group who had aides reported getting help with their medications. This included help on a daily basis with knowing what to take when, as well as ordering refills. Five in the GOOD-GC group compared with only one in the POOR-GC group had medications delivered either from a local pharmacy or from a mail-order company. One American Indian woman from the GOOD-GC group reported that her aide would "call in" the prescription refill and "in maybe two or three days a truck will bring it out."

Physical Activity.—In general, the level of physical activity reported was low across the entire sample. Seven in the GOOD-GC sample and four in the POOR-GC sample stated that they had no regular form of physical activity. About 60% of participants in both groups talked about walking, but the duration and intensity of walking varied widely. Most reported walking in their yard ("to the curb and back" and "to the mailbox and back") or around inside the house. Four in the GOOD-GC sample and two in the POOR-GC sample reported a mile or more when exercising on a treadmill or out of doors. One in the GOOD-GC group rode a bicycle outdoors or a stationary bicycle in the house about two miles daily.

After walking, the next most reported category in both groups was yard work, gardening, and house cleaning as physical activity. In most cases, the participants did not describe it as strenuous. An African American man in the POOR-GC group stated, "Messing around in the garden, trying to plant a little garden or something or other like that. I get plenty of that." An American Indian woman (POOR-GC) reported, "I don't like staying in the house all the time, so I just get on the outside. Just walk around the house, looking at my flowers or pulling up any grass I see." In fact, being outside in fresh air seemed to be the key point to considering an activity to be exercise or physical activity.

The POOR-GC sample was distinguished from the GOOD-GC sample in bringing up "rest" as important for diabetes self-management when queried about exercise. This was confined to African American individuals. An African American woman said that she "rests whenever I can." She described the kind of rest she thinks is important for diabetes. "Now when I rest, I just relax. I just stop what I'm doing and get still and get quiet and relax. Whether I'm sitting in a chair or lying down, I'm just still and quiet and relaxed. That's what I call resting. I used to give myself an hour, just when I need it." An African American man reported that when his blood sugar was high, "If I rest a while it'll cool back down, you know."

The only informal support reported for physical activity was another person exercising with the person with diabetes. Among GOOD-GC participants, four reported that another person—a neighbor, daughter, or wife—currently exercised with

them. This included meeting at the mall for walking, other walking, or bicycle riding. One woman reported that she used to meet other women at the gym for exercise but no longer did so. Only one POOR-GC participant, an African American man, reported that someone—his son—occasionally exercised with him.

Foot Care.—Overall, the level of foot care reported was low; there were few differences between the GOOD-GC and POOR-GC samples. Only two persons checked for sores; one person reported using a mirror to check feet. About 25% reported using lotions on the feet, and about a third soaked their feet. Six in the GOOD-GC sample compared with three in the POOR-GC sample wore diabetic shoes. One White woman commented, "I get a pair of diabetic shoes a year free, but I have to go to the foot doctor and get a prescription to get the shoes with." Those who had diabetic shoes reported wearing them regularly. Persons in the POOR-GC group were more likely to talk about simply wearing shoes (not necessarily diabetic shoes) rather than going barefoot.

Participants in the POOR-GC sample were more likely to have help with foot care from family. One American Indian man reported that his wife bathed his feet and made sure they were cleaned. She had been providing this care for over 10 years. An American Indian woman reported that her granddaughter cuts her toenails and trims dead skin from her feet. Formal support received included insurance support for special shoes and assistance with foot care by aides. More persons in the GOOD-GC group reported assistance from an aide, including cutting nails, soaking feet, and bathing feet. Five persons in each sample reported seeing a podiatrist for foot care, and about the same number reported foot care advice from their physician.

Discussion

Two factors differentiate the self-management strategies of those in the GOOD-GC and POOR-GC samples. One relates to the overall approach that was particularly evident in the food and diet and the HGM domains. The other involves the use of formal services.

First, the GOOD-GC sample demonstrated an approach to self-management that was more structured and disciplined than that of the POOR-GC sample. This was particularly evident in the food and diet domain. GOOD-GC individuals talked in terms of specific foods, not general categories. They also advocated specific behaviors such as portion control. These aspects of their discourse indicate that these individuals are conscious of the specific foods they eat and have developed ideas about whether such foods should be included in or excluded from their usual diet. Portion control suggests an attitude of discipline and self-control. These individuals also had a social support network that helped them remain self-disciplined by making sure the foods they needed were available. In contrast, the POOR-GC group talked in generalities, using terms like "starches" and "vegetables" that are common in diet instructions but show no evidence of having been translated into practical applications. In contrast to portion control, they confided that they "cheated" on their diet, including consumption of high-fat and high-sugar foods. This cheating was assisted by their social network that provided foods that tempted them away from their recommended diet.

The same difference in approach was evident in language in the discussion of HGM and reported HGM behavior. Persons in the GOOD-GC group evidenced structure and discipline. They stated precise target glucose levels in the range advocated by health professionals. They also monitored their blood glucose levels on a regular basis, being proactive about keeping blood glucose at proper levels. In contrast, the POOR-GC sample listed general glucose levels rather than specific targets. They did not monitor on a regular basis but appeared to monitor in response to symptoms. Their approach was less structured and more reactive.

Second, the two groups differed in their use of formal services. Eight of 24 in the GOOD-GC group had in-home aides compared with only 1 of 24 in the POOR-GC group. None of the aides were interviewed directly, but the respondents referred to their work across different domains of diabetes self-management. There was particular emphasis on the participation of these aides in diet, medication management, and glucose monitoring. By participating in grocery shopping and food preparation, aides may have been able to provide a better balanced meal of appropriate portion size than would the older person alone. It is likely that with an aide preparing meals, family

and friends feel less obligated to provide food (potentially the wrong type of food) in support of these older adults. Medication management should ensure that the person with diabetes takes the prescribed medications at the appropriate times. Respondents also reported that the aides ordered prescription refills as needed, so medication use should have been consistent. With the aide participating in glucose monitoring, as well as medication management and meal preparation, information from the monitoring may have been fed back into alterations of diet or medications to achieve better glycemic control.

These two differences in self-management strategies are likely to account for the much of the difference between the groups in glycemic control. Current dietary advice for persons with diabetes centers on controlling weight, controlling dietary fat and carbohydrate intake, and recognizing foods with a higher glycemic index (ADA, 2009), as these are ways of controlling blood glucose level. Portion control is one of several dietary behaviors that was established to be a lifestyle change conducive to better glycemic control and reduction of diabetes risk factors in the Diabetes Prevention Program (Knowler et al., 2002) and is frequently included in diabetes education. Its adoption in the GOOD-GC group appears to be part of their successful self-management strategy.

HGM is currently recommended for persons with diabetes using insulin and can be used by those on noninsulin regimens. When used, HGM is intended to provide information to a person to assess the success of their self-management strategy (ADA, 2009). The descriptions of usage by the GOOD-GC group, in contrast with the POOR-GC group, indicate that the former are using HGM appropriately to feed information back into their self-management strategy. The POOR-GC group reported monitoring largely in response to symptoms. This may be particularly problematic, as a recent study has shown that older adults are particularly poor at detecting symptoms of abnormal glucose (Bremer, Jauch-Chara, Hallschmid, Schmid, & Schultes, 2009). Thus, monitoring only in response to symptoms increases the likelihood that an individual will unknowingly experience blood glucose extremes.

In-home aides used for diabetes management have not been extensively evaluated. However, interventions using community health workers, who might generally be assumed to have similar levels of skill and training, have been found to result in substantial reductions in emergency room visits, hospital admissions, and Medicaid costs (Fedder, Chang, Curry, & Nichols, 2003) and to be associated with declines in A1C and other health indicators (Gary et al., 2003).

Although moderate-intensity aerobic physical activity and resistance training are recommended as part of diabetes self-management (ADA, 2009), few in either GOOD-GC or POOR-GC samples reported significant physical activity. This is consistent with the quantitative data from the larger sample from which these participants were drawn (Arcury et al., 2006). We found previously that the idea of rest being important for health in older adults in the general population is particularly salient among minority elders, who caution that rest and avoidance of strenuous work are important for staying healthy (Arcury, Quandt, & Bell, 2001). Wilcox, Oberrecht, Bopp, Kammermann, and McElmurray (2005) found similar resistance to "overdoing it" among White and African American southern women and also highlight the environmental barriers (e.g., safety, lack of sidewalks, stray dogs) unique to rural areas.

Paradoxically, the sample in good glycemic control has a number of demographic characteristics that would suggest poorer health status. It has twice as many individuals on Medicaid as the other group (14 vs. 7) and has half the number of high school graduates (5 vs. 10). Low income has been shown by others to restrict self-care options of persons with diabetes. For example, Schoenberg and colleagues (2008) studied largely low-income older adults from around the United States and found their poverty restricted their ability to engage in some self-management behaviors. Savoca, Miller, and Quandt (2004), in a study of middle-aged persons with diabetes, also found poverty associated with poor self-management. Our study differs from these and others by being population based, so that the full range of incomes are represented. It also suggests that there may be opportunities for assistance open to those of low socioeconomic class. In North Carolina, the CAP/DA (Community Alternatives Program for Disabled Adults) provides funding for personal care services in the home to low-income individuals who might otherwise be placed in nursing facilities. Although the present study did not collect information on the funding source for the aides assisting study participants, it is likely that they received assistance from CAP/DA or a similar funding source. Our study suggests that when income is low enough,

and local communities have services available that low-income elders can access, self-care resources can be augmented by formal services that appear to benefit health outcomes, as measured by A1C.

Older adults experience numerous challenges for diabetes self-management. Self-management is a complex set of behaviors that require cognitive and physical skills that may be deteriorating in the older adult. Available self-management training may not be geared for elders. Those who took diabetes training when first diagnosed years prior may need additional training that reflects up-to-date recommendations. The out-dated "diet sheets" that some of these older adults still had posted in their kitchens bore testimony to the need for more contemporary instruction. Studies of older diabetes patients suggest that they need diabetes self-management instruction that stresses problem-solving skills rather than "rules" to follow (Lippa & Klein, 2008).

This study selected samples with equal representation by ethnicity and gender. This was done to produce samples that might capture the range of approaches to self-management across the population. In analyses, the investigators were alert to any ethnic or gender differences in self-management that might emerge. However, few ethnic differences were particularly salient. The approach of structure and self-management was found across ethnic groups, as was the use of informal support and formal services. Differences by gender were not unexpected. Women and men differed in their resources (e.g., men but not women tended to have a spouse to help), but both genders demonstrated the range of approaches to self-management.

This study has limitations that should be considered. Data came from one area of North Carolina and may not represent other areas of the country. Although the sample of 48 was substantial for a qualitative sample, it may not have represented the complete range of behaviors and attitudes in the larger survey sample. Although home aides are an important part of some self-management strategies, complete data on the type of aides were not gathered. It would have been helpful to know the aides' training and how those who had aides qualified to receive such services. The A1C cut points may not have been optimum but reflected the pattern of glycemic control found in the sample. Nevertheless, the study has substantial strengths. The sampling procedure to obtain the in-depth interview participants was scientifically sound and had a high response rate. These participants were themselves drawn from a population-based survey that had an excellent response rate. The study includes three ethnic groups and is one of the only studies of diabetes self-management in older American Indians.

Conclusions and Recommendations

Diabetes rates among older adults are increasing as the population ages and as treatments for diabetes keep people alive longer. This study suggests that diabetes education and counseling might use the model presented here to thoroughly inventory self-management behaviors and explore resource limitations. Unlike younger patients, older adults have special needs in managing their disease. These include problems with vision, cognition, dexterity, and mobility that can reduce the ability to complete self-management tasks and to be physically active.

This study suggests that programs that emphasize structured behaviors and specific information should be developed and evaluated. Diabetes educators should evaluate barriers to recommended behaviors and develop strategies to teach needed information and motivate behavior change. Educators and health care providers should strive to connect clients with community resources. Community resources might include aides, as were found in the present study, or might include community health workers or other nonprofessional personnel as are being evaluated in other current programs (e.g., Gary et al., 2009).

For researchers and others who evaluate adherence to self-management regimens, this study suggests that procedures for self-reporting behaviors may need to be revised. Current instruments that ask, for example, on how many days a healthy eating plan was followed (Toobert, Hampson, & Glasgow, 2000) may be less effective than more specific instruments. The use of such more refined instruments may increase the ability of researchers to detect differences in self-management practices that are associated with differences in glycemic control.

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