Assessment of Barriers to Improve Diabetes Management in Older Adults

A randomized controlled study

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OBJECTIVE—To evaluate whether assessment of barriers to self-care and strategies to cope with these barriers in older adults with diabetes is superior to usual care with attention control. The American Diabetes Association guidelines recommend the assessment of age-specific barriers. However, the effect of such strategy on outcomes is unknown.

RESEARCH DESIGN AND METHODS—We randomized 100 subjects aged ≥69 years with poorly controlled diabetes (A1C >8%) in two groups. A geriatric diabetes team assessed barriers and developed strategies to help patients cope with barriers for an intervention group. The control group received equal amounts of attention time. The active intervention was performed for the first 6 months, followed by a “no-contact” period. Outcome measures included A1C, Tinetti test, 6-min walk test (6MWT), self-care frequency, and diabetes-related distress.

RESULTS—We assessed 100 patients (age 75 ± 5 years, duration 21 ± 13 years, 68% type 2 diabetes, 89% on insulin) over 12 months. After the active period, A1C decreased by −0.45% in the intervention group vs. −0.21% in the control group at 12 months. A1C decreased further in the intervention group by −0.21% vs. 0% in control group (linear mixed-model, P < 0.03). The intervention group showed additional benefits in scores on measures of self-care (Self-Care Inventory-R), gait and balance (Tinetti), and endurance (6MWT) compared with the control group. Diabetes-related distress improved in both groups.

CONCLUSIONS—Only attention between clinic visits lowers diabetes-related distress in older adults. However, communication with an educator cognizant of patients’ barriers improves glycemic control and self-care frequency, maintains functionality, and lowers distress in this population.

Diabetes is a major public health problem affecting an increasing number of older individuals (1). Treating older adults with diabetes is complicated by the presence of coexisting chronic conditions, including cognitive dysfunction, depression (2), physical disabilities (3), and polypharmacy (4). Although these conditions, collectively referred to as geriatric syndrome, are not specifically associated with diabetes, they may act as barriers by interfering with patients’ abilities to perform self-care tasks such as glucose monitoring, understanding the role of diet and exercise on glucose excursions, and following complex insulin regimens (5,6). Some comorbidities have subtle presentations and may remain unidentified by medical providers (7). Unaddressed barriers in older adults may lead to nonadherence with diabetes self-care recommendations, treatment complications such as hypoglycemia, and an overall decline in health and quality-of-life. The American Geriatrics Society (4) and the American Diabetes Association (8) recommend assessment for age-specific barriers in older adults to improve diabetes management. However, practical tools, methods of implementing this strategy, and the impacts of these recommendations on outcomes are unknown.

Older adults with diabetes frequently encounter fluctuations in their glucose levels when clinical (e.g., acute infections or exacerbation of heart disease or other chronic diseases), functional (e.g., falls or deconditioning), or social (e.g., illness or death in the family, caregiver stress of aging spouse) circumstances change. Strategies to adjust insulin regimens for fluctuations in blood glucose or dose-adjustment for sick-days commonly used in younger adults are difficult to follow for older patients with multiple medical comorbidities, especially during times of stress. Consequently, when older adults are seen by their medical providers at an interval of 3 to 6 months, small changes made during clinic visits are frequently inadequate to improve overall glycemia.

Phone consultations and telemedicine are a frequently tested approach to improve outcomes in the management of chronic diseases, such as congestive heart failure, particularly when ongoing adjustments in doses of medications, such as diuretics, are required (9). In recent years, successful management of diabetes via telemedicine in older patients living in medically underserved areas has been shown to be successful (10). However, telephone follow-up between clinic visits is typically not used for glycemic management as part of chronic disease management in patients with diabetes. Community-living older adults with poorly controlled diabetes are a vulnerable population with a high risk of acute illnesses and hospitalizations. For these patients, phone calls by diabetes educators to adjust insulin doses or provide coping strategies to maintain self-care may be an effective and inexpensive method for decreasing wide glucose
excursions from hyperglycemia and hypo-
glycemia.

In this study, we hypothesized that providing coping strategies for age-related barriers to self-care by phone contact between clinic visits would be superior to attention alone in improving glycemic control in older adults with poorly controlled diabetes.

RESEARCH DESIGN AND METHODS—The institutional review boards of the Joslin Diabetes Center, the Beth Israel Deaconess Medical Center, and the Human Research Protection Office of the U.S. Department of Defense approved this study.

Participants
Participants were recruited from the Joslin Diabetes Center and the Beth Israel Deaconess Medical Center. Patients aged ≥69 years with type 1 or type 2 diabetes of at least 1-year duration, with poorly controlled diabetes (A1C >8%), were eligible. Exclusion criteria included terminal disesases, living >25 miles from Boston, living in an institutional setting (e.g., nursing home, group home), and inability to complete outcome assessments (e.g., poor vision, severe cognitive decline, unable to speak, read, or write English). Study participants continued to receive their medical care, including diabetes management, from their endocrinologists and/or primary care physicians throughout the study. All patients provided informed written consent.

Study design
Participants were followed up for 1 year. First, all patients were randomized to an intervention or attention control group. Then, the intervention group was further divided randomly to two groups, described below. Randomization was computer-generated and remained independent of participant enrollment. The adequacy of randomization was checked periodically, and patients were stratified once due to unequal number of patients with different durations of diabetes. During the first 6 months of the study, all patients received active intervention or attention as determined by their random assignment. From 6 to 12 months, all patients entered an “independence period” during which there was no contact between the study personnel and patients from either group. The independence period assessed the sustainability of the interventions’ impact.

Group 1: Intervention group
The patients in this group underwent evaluation for barriers to self-care by a diabetes educator well versed with age-specific barriers. A geriatric diabetes team (GDT), consisting of a geriatric diabetologist, a diabetes educator, and a nutritionist, identified strategies to help patients cope with their barriers after consideration of patients’ clinical and psychosocial environments and comorbid conditions. The strategies were designed to optimize patients’ ability to perform self-care leading to better adherence with treatment recommendations given by their medical providers. Importantly, the study staff did not make changes to patients’ diabetes treatment plans. This was important to protect the integrity of the study, particularly the ability to interpret the effect of management of barriers versus change in treatment regimen.

The strategies to cope with barriers were provided to the patients in intervention group via two methods by further randomizing patients into two groups. In one group, an office-based diabetes educator provided the strategy by phone calls, speaking with patients up to 11 times during the intervention period. The initial phone call included educating patients regarding their barriers and providing strategy options to cope with these barriers. Follow-up phone calls included continued assessment and encouragement to cope with barriers, as described in Table 1. In the second group, a non-health professional care manager, trained and briefed by the GDT, provided coping recommendations. The recommendations were conveyed to the patients in this group by the care manager. The care manager visited the patients’ homes to assess safety issues or other needs not known to the study team and helped the patients and caregivers with all aspects of care coordination, including making medical appointments and arranging transportation. Patients in this group received phone contact from the care manager as often as needed during the intervention period.

Group 2: Attention control group
An educator (different from the one involved with the intervention), called participants in this group for total of 11 times within the first 6 months to provide similar attention time. The phone calls differed from the intervention calls in that the educator did not provide any diabetes-related advice or strategies and only discussed non–diabetes-related life events. Participants who asked specific questions related to diabetes management were advised to contact their medical providers.

Outcomes
All study participants underwent the outcome assessment at baseline and at 6 and 12 months, whereas the primary outcome (A1C) was measured at baseline and at 3, 6, and 12 months.

Clinical measures. The primary outcome of the study was glycemic control (A1C), before and after interventions. Other clinical outcomes included blood pressure, BMI, lipids, questionnaire for frequency of hypoglycemia and medication compliance, frequency of self-care activity (Self-Care Inventory-R [SCI-R]) (11), dietary assessment (Determine Your Nutritional Health checklist) (12), and cognition (clock-in-a-box test [7,13], Trail-Making Test A and B [14], and verbal fluency test [15]).

Functional measures. Functional measures included activities of daily living (16) and instrumental activities of daily living (17) number of falls and fear of falls, 6-min walk test (6MWT) (18), and the Tinetti test for gait and balance (19).

Psychosocial measures. Psychosocial measures included a Geriatric Depression Scale (GDS) (20) and/or a diagnosis of depression, diabetes-related distress (Problem Areas in Diabetes [PAID]) (21), and social resource assessment (Older Americans Resources and Services Multidimensional Functional Assessment Questionnaire) (22).

Economic measures. Economic measures included the number of emergency department (ED) visits, hospitalizations, and outpatient care utilization (clinic visits).

Statistical methods
We performed an intent-to-treat analysis with the last observation carried forward. We used paired t tests to assess changes within groups from baseline to 6 months and 12 months. We also compared between-group changes in outcomes at baseline, 6 months (end of intervention period), and 12 months (end of study) with mixed-models, using time and group as fixed factors, interaction between time and group, random intercepts, and an unstructured covariance matrix. A two-sided P value <0.05 indicated statistical significance. Results were confirmed using
Table 1—Commonly found barriers and strategies recommended to overcome the barriers

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Number of times the barrier was identified</th>
<th>Coping strategies</th>
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| Inadequate mediations  
  - Not adequate titrating  
  - Unable to get provider appointment  
  - Too complicated regimen to follow | 87                                        | • Facilitated earlier appointment with diabetes specialist/nurse practitioners or primary care providers |
| Lack of diabetes-related education/information  
  - Inadequate previous education  
  - Low health literacy | 49                                        | • Facilitated appointment with educator  
  • Provided appropriate education material  
  • Reinforcing information given by medical providers |
| Inadequate dietary information/understanding | 52                                        | • Referral for exercise physiologist, physical therapy  
  • Community exercise programs  
  • Home exercise programs |
| Inadequate physical activity | 42                                        |                                                                                  |
| Difficulty coping with comorbid conditions  
  - Cognitive dysfunction  
  - Depression  
  - Visual impairment  
  - Auditory impairment  
  - Mobility/dexterity issues  
  - Swallowing problems | | • Assistance with blood glucose monitoring, meter use, schedule set up  
  • Recommend and set up assistive devices including reminders for meals and monitoring, vision, gait  
  • Recommend referral to audiology  
  • Referral to memory clinic  
  • Referral to mental health clinic  
  • Recommend cognitive aids  
  • Recommend referral to ophthalmology, podiatry |
| Hypoglycemia and fear of hypoglycemia | 31                                        | • Hypoglycemia education/reeducation  
  • Help to use community resources  
  - Health care services  
  - Patient/public assistance programs  
  - Social services  
  - Transportation  
  • Medication-related assistance  
  - Help with discount meds  
  - Pharmacy delivery  
  - Education adherence aids  
  - Pharmacy assistance programs |
| Social barriers  
  - Isolation  
  - Transportation difficulties  
  - Lack of motivation  
  - Caregiver stress  
  - Financial difficulties  
  - Major events self/family members interfering with self-care  
  - Difficulty with care coordination and facilitation  
  - Nonadherence  
  - Inadequate medical visits  
  - Inadequate monitoring  
  - Not integrating recommendations from providers  
  - Health beliefs interfering with therapy | 61                                        |                                                                                  |

Multiple imputations (15) for missing data using PROC MI in SAS (the Markov chain Monte Carlo method).

**RESULTS**—Between August 2007 and May 2010, 103 patients were enrolled and 100 patients were randomized (3 patients dropped out after the screening but before the first study visit). Patients were randomized 2-to-1 in the intervention arm ($n = 70$ with care manager) and $n = 35$ with office-based educator) versus control ($n = 30$). The Consolidated Standards of Reporting Trials study flow diagram is shown in Fig. 1.

The two intervention subgroups with different implementation strategies were compared for baseline characteristics and for all outcome measures. These subgroups did not differ in baseline characteristics or outcome variables at 6 or 12 months and were used for this analysis.

Table 1 summarizes the types of barriers, the number of times these barriers were present, and the coping strategies recommended by the GDT. The most frequent barrier identified in intervention patients was “inadequate medications” due to lack of dose titration between the clinic visits. In addition, participants needed knowledge of insulin action, medication-adherence, and the effect of diet on blood glucose. Comorbidities interfering with diabetes management were another frequent barrier. Multiple social barriers were also identified.

**Baseline characteristics**

Table 2 reports the baseline characteristics of patients by group. The study population was an average age of 75 ± 5 years, duration of diabetes was 21 ± 13 years, 68% had type 2 diabetes, 54% were women, and 77% were Caucasian. Patients in the two groups did not differ on any baseline variable.

**Intervention period**

Changes in variables between the intervention and control groups from baseline to 6 months (during the intervention period) are as follows: Mean A1C was decreased by $-0.45%$ (95% CI $-0.7$ to $-0.2$, $P < 0.007$) in the intervention group compared with $-0.31%$ ($-0.7$ to...
from the control group reported diabetes-related ED visits. One participant from intervention group was hospitalized with hypoglycemia. The difference between the numbers of hypoglycemic episodes between the two groups did not reach statistical significance.

**Missing data**

Overall, 3 of 70 patients dropped out from the intervention group and 4 of 30 from the control group.

**Primary outcome.** A1C data were available for 100% of the study population at the 6-month interval. For patients who dropped out, A1C data were collected from nonstudy visits in 6 subjects (3 from the intervention group and 3 from the control group). A1C data were missing in 3 of 70 in the intervention group and in 3 of 30 in the control group at 12 months.

**Secondary outcomes.** Eight subjects (4 from the intervention group and 4 from the control group) did not complete the 6-month or 12-month study visits for secondary outcomes. Some patients declined to complete assessments as follows: 6 participants from the intervention group and 7 from the control group refused PAID and SCI-R tests. The 6MWT and Tinetti test had a higher number of missing data because these tests require not only the questionnaire but also physical performance. Some subjects were unable to do these tests because of comorbidities such as arthritis and difficulty ambulating at various times. In the intervention group, data on the Tinetti test were missing in 7% at 6 months and in 13% at 12 months, whereas in the control group, data were missing in 10% at 6 months and in 13% at 12 months. Similarly, in the intervention group, the data were missing for 6MWT in 20% at 6 months and in 21% at 12 months. For the control group, data were missing in 10% at 6 months and in 13% at 12 months.

**CONCLUSIONS**—Assessment of age-specific barriers is recommended for management of diabetes in older adults (4). Our study is the first to evaluate the effect of assessing self-care barriers and recommending coping strategies in elderly in a randomized controlled fashion. We identified several self-care barriers in older adults with poorly controlled diabetes. The most common barrier was inadequate medications, primarily due to older patients’ reluctance to make changes in insulin doses between clinic visits or during illnesses. The medical

Figure 1—Randomization and completion of the 6- and 12-month evaluations.

-0.1, \( P = \text{NS} \)) in the control group. The mean SCI-R increased by 4.4 (2.8–5.0, \( P < 0.0001 \)) in the intervention group but did not change the control group \((1.2 \ [−1.7 \text{ to } 4.1], \ P = \text{NS} \) \). The Tinetti test and 6MWT scores worsened in the control group \((−1.6 \ [−2.9 \text{ to } −0.3], \ P = 0.02; \) and \(−4.2 \ [−8.6 \text{ to } 2.6], \ P = 0.06, \) respectively) but remained unchanged in the intervention group \((0.8 \ [−0.1 \text{ to } 1.7], \ P = \text{NS}; \) and \(4 \ [−10.7 \text{ to } 19.2], \ P = \text{NS}, \) respectively). PAID scores decreased in the intervention \((−7.9 \ [−11.4 \text{ to } 4.4], \ P < 0.0001 \) \) and control groups \((−5.2 \ [−9.5 \text{ to } −0.9], \ P = 0.02 \).
during vulnerable periods, such as af-
cacy of such an approach in older patients

Age (years) 75

Bene
ment from a diabetes care provider to adjust
frequently, and even highly functional, in-
clinical and psychosocial events occurred
month period. We found that untoward
condition, surgeries, or death of close

Table 2—Baseline characteristics of the subjects

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Attention control</th>
<th>Intervention group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 30</td>
<td>n = 70</td>
</tr>
<tr>
<td>Age (years)</td>
<td>75 ± 5</td>
<td>75 ± 5</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>53</td>
<td>43</td>
</tr>
<tr>
<td>Female</td>
<td>47</td>
<td>57</td>
</tr>
<tr>
<td>Race (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>80</td>
<td>76</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>32 ± 6</td>
<td>32 ± 7</td>
</tr>
<tr>
<td>Education (years)</td>
<td>14 ± 3</td>
<td>15 ± 3</td>
</tr>
<tr>
<td>Living alone (%)</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>Number of daily medications</td>
<td>9 ± 4</td>
<td>8 ± 4</td>
</tr>
<tr>
<td>A1C at baseline (%)</td>
<td>9% ± 0.8</td>
<td>9.3 ± 1.2</td>
</tr>
<tr>
<td>Diabetes duration (years)</td>
<td>23 ± 14</td>
<td>20 ± 12</td>
</tr>
<tr>
<td>Treatment (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral agents</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Insulin</td>
<td>57</td>
<td>44</td>
</tr>
<tr>
<td>Combination</td>
<td>37</td>
<td>46</td>
</tr>
<tr>
<td>Cognitive dysfunction (%)</td>
<td>−0.07 ± 0.8</td>
<td>0.02 ± 0.8</td>
</tr>
<tr>
<td>Depression (%)</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>Independent in ADL</td>
<td>12 ± 0.3</td>
<td>12 ± 0.4</td>
</tr>
<tr>
<td>Independent in IADL</td>
<td>15.3 ± 1.2</td>
<td>15.3 ± 1.8</td>
</tr>
<tr>
<td>Score on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinetti</td>
<td>24.5 ± 5.7</td>
<td>24.4 ± 6.4</td>
</tr>
<tr>
<td>6MWT (m)</td>
<td>317 ± 154</td>
<td>331 ± 107</td>
</tr>
<tr>
<td>SCI-R</td>
<td>69.5 ± 14</td>
<td>63.2 ± 15</td>
</tr>
<tr>
<td>PAID</td>
<td>24.7 ± 18</td>
<td>28 ± 17.6</td>
</tr>
</tbody>
</table>

Data are mean ± SD or as indicated. ADL, activities of daily living; IADL, instrumental activities of daily living.
*Calculated as combined z score for three tests of cognitive dysfunction: clock-in-a-box, Trail-Making Test A and B, and verbal fluency.

providers for most of the patients had pre-
scribed insulin dose self-adjustment
during a clinic visit, but the patients felt un-
comfortable acting on the advice without
talking to a health care provider. High glu-
cose excursions were noted during many
clinical and social life-events. In the inter-
vention group, 24% of the patients had at
least one unfavorable life-event (e.g., hospi-
talization, ED visits for non–diabetes-related
conditions, surgeries, or death of close
family members) that required addi-
tional medication adjustment during a 6-
month period. We found that untoward
clinical and psychosocial events occurred
frequently, and even highly functional, in-
dependent older adults needed encourage-
ment from a diabetes care provider to adjust
medications. This strategy is more likely to
benefit elderly patients who are taking insu-
lin because they require dose adjustments
with changes in overall health status. Fur-
ther studies are also needed to see the ef-
cacy of such an approach in older patients
during vulnerable periods, such as af-
fter hospitalizations or rehabilitation,
where the need for insulin adjustment is
unavoidable.

In our study, the intervention and
control groups both showed improve-
ment in glycemic control after contact
with educators. However, the phone con-
tact by an educator cognizant of patient’s
age-related barriers (intervention group)
showed the additional benefit of main-
taining functionality during the interven-
tion period. The results of the 6MWT
need caution in interpretation due to
some older patients’ inability or unwilling-
ness to complete the test at each time
period. Our results were unexpected be-
cause specific physical training programs
were not included in coping strategies.
Encouraging physical activity appropriate
for the patient’s overall health and social
situation based on assessment of barriers
may have helped improve compliance.
We encouraged simple solutions, such as
going to the senior center, joining a senior-
friendly gym, or walking the hallways in
apartment buildings, and using “exercise
pedals” to maintain physical activities
during the inclement weather frequently
seen in New England. Our results are
very encouraging, because maintaining or
improving functionality is a desired out-
come for chronic disease management
and leads to improvement in overall health
and quality of life (23). During the inde-
pendence period, functionality declined
but remained above the baseline level.
Our results underscore the need for peri-
odical encouragement to improve func-
tional capacity in elderly diabetic subjects,
easily achievable by phone contact.

One of the strategies used for improv-
ing medication adjustment was encour-
aging earlier appointments with the
health providers. We found that patients
had difficulty navigating appointment
systems and automated phone systems,
and were hesitant or unable to send home
monitoring numbers to providers for
adjustment. Phone contact with the edu-
cators helped in facilitating communica-
tions. A large number of patients also
lacked basic understanding of how med-
ications work and/or dietary skills. Al-
though most patients had previous
education in these areas, they did not
understand or remember the informa-
tion. This was a discouraging finding in
patients treated at a tertiary care diabetes
clinic. Whether the need for reeducation
is a function of aging should be studied
further. This deficit in knowledge would
likely be greater in communities where
diabetes education is not readily available.
In patients with adequate knowledge, we
found that educator still needed to pro-
vide assurance regarding adjustment of
insulin doses and encouragement to call
providers when glucose levels were not
well controlled. Thus, even though the
control group educator did not perform
an intervention, she encouraged contact
with providers for any diabetes-related
question. This may have led to therapeu-
tic adjustments by patients’ providers that
would not have otherwise taken place.
We believe this may be the reason why
the primary outcome (A1C) improved in
both arms in our study, albeit more clin-
ically significant improvement occurred
in the intervention arm.

As expected, diabetes-related distress
improved in both groups. Talking to an
educator helped lower the stress levels
concerning diabetes in elderly patients.
We also showed that during the inde-
pendence period, distress scores worsened
in both groups; however, they did not re-
turn to the patients’ baseline levels. The
frequency of self-care also improved in
both groups during the intervention period, likely due to attention by the educators. The improvement was sustained only by the intervention group, probably due to the tailored strategies provided during the intervention period.

When we measured resource utilization, no difference in outpatient care was seen between the two groups. There were more diabetes-related ED visits and hospitalizations in the intervention group, although the numbers were too small to make definite conclusions. Our small sample size and relatively short study period limits the ability to generalize this information.

However, when comparing two high-risk groups, improvement in surrogate markers (improved functionality and self-care, reduced diabetes-related stress) indicate potential for cost-benefits in a large population over a longer period of time.

In this study, no changes were recommended to the diabetes treatment provided by patients’ providers so that we could target the effect of overcoming barriers and not the change in treatment regimen. The interventions focused on optimizing patients’ environment to enhance their ability to follow provider-led treatment recommendations. The study team felt that many patients with multiple comorbidities were on complex regimens that were clearly beyond their coping abilities. Studies evaluating the effect of regimen change to accommodate individual barriers are needed to improve management in this population.

No difference was found between the two methods of providing strategies to the intervention group. We believe this was due to the nature of our study population, who were highly functional and well-educated individuals who used a tertiary care facility for diabetes management. This population was highly functional and did not require assistance once recommendations were made.

Figure 2—Changes in variables from baseline to 6 and 12 months for A1C (A), PAID score (B), Tinetti scores (C), SCI-R (D), and 6MWT (E). *P ≤ 0.05.
were provided by the study team. Thus, when strategies were suggested via phone calls by the educator, patients did as well as those who received additional assistance by care manager. These findings may differ for a smaller population that may require assistance to perform care-coordination and implement suggestions such as arranging transportation, finding exercise venues, and scheduling appointments with multiple providers. In this study, the two methods for providing strategies were equally effective, simple phone calls by an educator cognizant of patients’ barriers may prove to be a less costly approach. This area needs further investigation.

Our study highlights the complex challenge in studying older patients with multiple medical comorbidities. First, it was difficult to recruit and retain older patients with chronic medical conditions for a 12-month period. We also found that changes in A1C due to non–diabetes-related health issues and adverse medical and social events occurred in a large portion of our population beyond anyone’s control. However, we believe this is a strength of the study, increasing its generalizability.

Our study indicates the importance of age-specific barrier assessment and provides a practical approach for intervention. The study also shows the important role of phone contact with an educator between clinic visits in elderly patients with diabetes. This inexpensive strategy, if proven beneficial in a larger population, would form the basis for long-term policy change.

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M.N.M. researched data, contributed to discussion, and wrote the manuscript. A.R.S. researched data and edited the manuscript. E.Su., C.R., A.S., J.G., E.St., P.B., L.D.R., and R.M. researched data. Y.L. and S.F. analyzed data. K.W. researched data, contributed to discussion, and edited the manuscript. M.N.M. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Parts of this study were presented in poster form at the 71st Scientific Sessions of the American Diabetes Association, San Diego, California, 24–28 June 2011.

References